

**EVALUACIÓN DE LAS FACILIDADES DE LA ESTACION DE REGULACIÓN DE
COGUA PARA EL INCREMENTO DE LA CAPACIDAD DE TRANSPORTE
DESDE 100 MMSCFD HASTA 270 MMSCFD**

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**UNIVERSIDAD INDUSTRIAL DE SANTANDER
FACULTAD DE INGENIERÍAS FISICOQUÍMICAS
ESCUELA DE INGENIERÍA DE PETRÓLEOS
ESPECIALIZACIÓN EN INGENIERÍA DEL GAS
BUCARAMANGA**

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Trabajo de Grado para optar al Título de Especialista en Ingeniería del Gas

Director

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DEDICATORIA

A Dios

Fuente Suprema de Sabiduría,

A mi Madre Rosalba y mi Padre Laureano

Causa, motivo y razón de mis actos,

*Por Acompañarme, por escucharme, por su amor, comprensión, su
caríño, su ejemplo, enseñanzas y apoyo en todas las etapas de mi
vida,*

A mi hermana Tatiana

Por su apoyo, preocupación e impulso.

AGRADECIMIENTOS

A la Universidad Industrial de Santander escuela de Ingeniería de Petróleos por brindarme la oportunidad de participar en el programa de Especializaciones, ofreciéndome nuevos y amplios conocimientos y perspectivas como profesional.

Al ingeniero Cesar Quiroz, profesional de experiencia y gran conocimiento.

A todos aquellos que de una u otra forma están presentes en la consecución del presente logro.

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RESUMEN

TITULO: EVALUACIÓN DE LAS FACILIDADES DE LA ESTACION DE REGULACIÓN DE COGUA PARA EL INCREMENTO DE LA CAPACIDAD DE TRANSPORTE DESDE 100 MMSCFD HASTA 270 MMSCFD*. *

AUTOR: NATHALIA MERCEDES GÓMEZ COBOS**. **

PALABRAS CLAVES: Gas Natural, Estación, Regulación, Simulación, Capacidad, Filtración y Medición.

En los últimos años, las necesidades de gas de las diferentes poblaciones del Departamento de Cundinamarca han incrementado progresivamente como resultado principalmente de la sustitución por fuentes de energías menos costosas y más amigables ambientalmente. Cundinamarca, uno de los departamentos de mayor consumo de gas natural; su demanda y creciente consumo energético debido a su zona industrial, vivienda entre otros; se proyecta grandes requerimientos a futuro, lo que implica considerar el incremento de la capacidad de transporte actualmente instalado, la cual llega hoy en día a su límite.

Este documento evalúa las alternativas técnicamente viables para superar las actuales restricciones en donde se realiza la evaluación y diagnóstico de las facilidades de la estación de regulación de Cogua propiedad de TGI S.A. ESP para el aumento de la capacidad del gasoducto de La Sabana, este trabajo incluye los sistemas de Trampa de recibo, Filtración, Regulación, y Medición y la evaluación del sistema de calentamiento de propiedad de Gas Natural, que suministra gas y entrega en el punto de interconexión donde abastece al Departamento de Cundinamarca. El análisis de los escenarios evaluados, pretende la entrega eficiente a futuro de 270 MMSCFD.

Una de las soluciones más conveniente a proponer es implementar los requerimientos técnicos y logísticos de ejecución de manera que se pueda realizar esta ampliación.

* Trabajo de Grado de Especialización.

** Facultad de Ingeniería Físicoquímicas, Escuela de Ingeniería de Petróleos. Especialización de Ingeniería de Gas. Director: Ing. Cesar Quiroz

SUMMARY

TITLE: EVALUATION OF COGUA REGULATION STATION FACILITIES FOR THE INCREASE OF TRANSPORT CAPACITY FROM 100 MMSCFD TO 270 MMSCFD.*

AUTHOR: NATHALIA MERCEDES GÓMEZ COBOS. ** **

KEYWORDS: Natural Gas, Regulation Station, Simulation, Capacity, receipt Trap, Filtration, Regulation and Measurement.

In recent years, the gas needs of different populations of Cundinamarca Department have progressively increased due mainly to less expensive and environmentally friendly energy sources substitution. Cundinamarca is one of the higher natural gas consumption department; its demand and growing energy consumption are due to its industrial sector and housing among others; it is projecting long term requirements, which means to consider an increasing in the currently installed transportation capacity, which nowadays is about to reach its limit.

This document evaluates the technically feasible alternatives to overcome the current restrictions where the assessments and diagnostic of Cogua regulation station (owned by TGI S.A. ESP) takes place for increasing La Sabana pipeline capacity, this work includes the receipt trap systems, filtration, regulation, measurement, and the heating system evaluation owned by Gas Natural, which supplies gas and delivery to the interconnection point where provides to Cundinamarca Department. The evaluated scenarios analysis aims the efficient future delivery of 270 MMSCFD.

One of the best solutions to propose is to implement technical and logistical requirements for implementation so that this extension can be performed

* Specialization Degree Work

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INTRODUCCIÓN

El objetivo de las facilidades para el manejo del gas natural es, separarlo de sus condensados, crudo y agua, además de prepararlo, de tal manera, que se encuentre apto para su disposición, transporte y venta, contemplando los escenarios: ambiental, operacional y de producción, entre otros. El manejo del gas natural requiere un gran trabajo multidisciplinario, el cual, abarca todas las áreas de posibles aspectos e impactos que este puede llegar a generar.

A causa del aumento en la demanda de Gas Natural, es deseo de las compañías de hidrocarburos, introducir gas proveniente de pozo al sistema nacional de transporte y con ello contribuir a los proyectos de expansión que se están desarrollando actualmente en el país, por lo tanto, es menester un estudio minucioso de las posibilidades y facilidades existentes para hacer realidad este proyecto y, responder oportunamente en un futuro a la proyección creciente de consumo. Por tanto, se hace indispensable, dadas las intensiones de la nación, la pronta ampliación de la estación de regulación de Cogua.

Actualmente la estación de regulación de Cogua propiedad de TGI S.A. ESP, recibe 110 MMSCFD de gas a presiones que oscilan entre los 600 y 1000 psig de presión, el cual, es regulado a una presión constante de 500 psig, sin embargo, debido al aumento de la demanda de gas contratada por TGI S.A. ESP para los próximos años, la cual asciende a cerca de 215 MMSCFD promedio y se esperan picos de consumo de 270 MMSCFD, por consiguiente, en este documento se desarrolla la evaluación de las facilidades presentes en la estación, de manera que se puedan establecer los requerimientos técnicos para esta ampliación.

1. INFORMACIÓN GENERAL

1.1 OBJETIVOS DEL PROYECTO

1.1.1. Objetivo General

Evaluar la capacidad de las facilidades existentes en la estación de regulación de Cogua para el aumento de la capacidad de transporte del gasoducto de la sabana desde un flujo de 140 MMSCFD hasta 270 MMSCFD.

1.1.2. Objetivos Específicos

- Verificar la capacidad actual de las facilidades de la estación de regulación de Cogua propiedad de TGI S.A. ESP para el aumento de la capacidad del gasoducto de La Sabana.
- Diagnosticar el estado de las facilidades de la estación de regulación de Cogua propiedad de TGI S.A. ESP para el aumento de la capacidad del gasoducto de La Sabana.
- Simular la estación de regulación de Cogua en AspenHYSYS v.7.2, considerando los escenarios de mínimo flujo (140 MMSCFD) y máximo flujo (270 MMSCFD).
- Determinar si se requiere un sistema de calentamiento adicional para evitar formación de hidratos por el efecto Joule Thompson de la regulación.

1.2. DESCRIPCIÓN DEL PROBLEMA

Actualmente la estación de regulación de Cogua propiedad de TGI S.A. ESP, recibe 110 MMSCFD de gas a presiones que oscilan entre los 600 y 1000 psig de presión, el cual, es regulado a una presión constante de 500 psig, sin embargo, debido al aumento de la demanda de gas contratada por TGI S.A. ESP para los

próximos años, la cual asciende a cerca de 215 MMSCFD promedio y se esperan picos de consumo de 270 MMSCFD, se hace necesario la evaluación de las facilidades presentes en la estación, de manera que se puedan establecer los requerimientos técnicos para esta ampliación.

1.3. ALCANCE DEL ESTUDIO

El alcance de la monografía se limita a la evaluación y diagnóstico de las facilidades de la estación de regulación de Cogua propiedad de TGI S.A. ESP para el aumento de la capacidad del gasoducto de La Sabana, este trabajo incluye los sistemas de Trampa de recibo, Filtración, Regulación, y Medición y la evaluación del sistema de calentamiento de propiedad de Gas Natural.

1.4. JUSTIFICACIÓN

Debido al aumento en la demanda de Gas Natural, las compañías de hidrocarburos desean ingresar gas proveniente de pozo al sistema nacional de transporte y con ello contribuir en los proyectos de expansión que se están desarrollando actualmente en el país, lo que hace necesario un estudio minucioso de las posibilidades y facilidades existentes para hacer realidad este proyecto y, responder en un futuro a la proyección creciente de consumo. Por tanto, se hace indispensable, dadas las directrices de la nación, la pronta ampliación de la estación de regulación de Cogua.

2. CONTEXTO TEÓRICO

2.1 GAS NATURAL

El Gas natural se define como el gas que se obtiene de reservas subterráneas naturales, ya sea como gas libre o gas asociado con crudo. Casi siempre contiene una gran cantidad de metano acompañado de hidrocarburos más pesados como etano, propano, isobutano (i-butano), butano normal (n-butano), etc. En su estado natural a menudo contiene una cantidad considerable de sustancias que no son hidrocarburos como el nitrógeno, dióxido de carbono y sulfuro de hidrógeno; en ocasiones también puede contener trazas de compuestos como el helio, sulfuro de carbonilo y varios mercaptanos. En su estado natural casi siempre está saturado con agua.

El gas que se entrega para consumo final como combustible o materia prima tiene una composición diferente a la presente en el yacimiento o en boca de pozo. Composición que debe definirse mediante una calidad específica que requiere ser cumplida por todos los productores que comercializan gas natural, que para efectos de nuestra nación, esta calidad se especifica en el RUT (Registro Único de Transporte) que se observa en la tabla 2.1. La composición del gas natural a transportar, se indica en la tabla 2.2.

Tabla 2.1. Especificaciones de calidad del gas natural.

ESPECIFICACIONES DE CALIDAD DEL GAS NATURAL		
Poder Calorífico bruto mínimo, en MJ/m ³ (BTU/ft ³)	35.4	950 (Nota 1)
Poder Calorífico bruto máximo, en MJ/m ³ (BTU/ft ³)	42.8	1150
Contenido de Líquido (Nota 2)	Libre de Líquidos	
Contenido total de H ₂ S máximo mgr/m ³ (granos/100ft ³)	6	0.25
Contenido total de azufre máximo, mgr/m ³ (granos/100ft ³)	23	1.0
Contenido de CO ₂ máximo, %Vol.	2	2
Contenido de N ₂ máximo, %Vol.	3	3
Contenido de inertes máximo, %Vol. (CO ₂ + N ₂ + O ₂) (Nota 3)	5	5

Contenido de Oxígeno máximo, %Vol.	0.1	0.1
Contenido de agua máximo, mg / m ³ (lb / MMSCF)	97	6.0
Temperatura de entrada máxima, °C (°F)	49	120
Temperatura de entrada mínima, °C (°F)	7.2	45
Contenido máximo de polvos y material en suspensión, mg / m ³ (granos/1000 scf) (Nota 4)	1.6	0.7
Libre de Gomas	Sí	Sí

Nota 1: Todos los datos sobre metro cúbico o pie cúbico de gas están referidos a Condiciones Estándar.

Nota 2: Los líquidos pueden ser: hidrocarburos, agua y otros contaminantes en estado líquido.

Nota 3: Se considera como contenido de inertes la suma de los contenidos de CO₂, nitrógeno y oxígeno.

Nota 4: El máximo tamaño de las partículas debe ser 15 micrones.

Salvo acuerdo entre las partes, el Productor-comercializador y el Remitente están en la obligación de entregar Gas Natural a la presión de operación del gasoducto en el Punto de Entrada hasta las 1.200 Psig, de acuerdo con los requerimientos del Transportador. El Agente que entrega el gas no será responsable por una disminución en la presión de entrega debido a un evento atribuible al Transportador o a otro Agente usuario del Sistema de Transporte correspondiente.

Si el Gas Natural entregado por el Agente no se ajusta a alguna de las especificaciones establecidas en este RUT, el Transportador podrá rehusar aceptar el gas en el Punto de Entrada.

Fuente: CREG

Tabla 2.2. Composición del gas natural a transportar.

COMPOSICIÓN DEL GAS (Porcentaje Molar)	
N ₂	0.62
CO ₂	1.77
C ₁	82.93
C ₂	9.87
C ₃	3.58
iC ₄	0.53
nC ₄	0.54
iC ₅	0.10
nC ₅	0.08
nC ₆	0.03
H ₂ O	6 lb/MMscf
Peso Molecular	19.57
Gravedad Especifica	0.67

Fuente: CREG

2.2. TIPOS DE GAS NATURAL

El gas natural se puede presentar mediante diferentes medios dentro de un yacimiento, entre estos tipos de gas natural, se tienen los siguientes:

- ✓ **Gas Libre.** Cuando se habla de contenido de gas en un yacimiento de petróleo, por lo general cierta cantidad se encuentra en solución en el aceite y cierta cantidad como gas. El gas que existe como tal en el yacimiento, es denominado gas libre. Esto ocurre, por consiguiente, cuando los yacimientos se encuentran saturados, es decir, su presión permanece por debajo de la presión del punto de burbuja y la saturación de gas asciende de tal manera que supera la saturación crítica y permite la formación de la capa de gas.
- ✓ **Gas Asociado.** Son aquellos hidrocarburos gaseosos que ocurren como gas libre en un yacimiento a condiciones iniciales, en contacto con petróleo crudo comercialmente explotable. Al igual que el gas libre, esto ocurre, cuando los yacimientos de aceite se encuentran saturados.
- ✓ **Gas Rico.** Este tipo de gas, es el que contiene una cantidad de compuestos más pesados que el etano, alrededor de 0,7 galones de C₃⁺ (componentes por encima del C₃) por 1000 pies cúbicos estándar de alimento a una torre absorbidora.
- ✓ **Gas Acido o Agrio.** Es el tipo de gas que contiene más de 1 gramo de H₂S por 100 pies cúbicos estándar de gas, casi siempre es mucho mayor. Por tanto, la acidez de un gas se determina a partir de la cantidad de Acido Sulfúrico presente en el mismo.

- ✓ **Gas Dulce.** Es el gas que contiene menos de 1 gramo de H₂S por 100 pies cúbicos estándar de gas o cantidades bajas de CO₂.

- ✓ **Gas Natural Seco.** Son hidrocarburos en estado gaseoso compuestos casi exclusivamente por metano (generalmente más del 90%). Puede provenir directamente de yacimientos de gas, caso en el cual se le denomina también Gas no asociado, o hidrocarburos gaseosos que ocurren como gas libre en el yacimiento, o también puede provenir de plantas de gasolina natural, donde el gas húmedo ha sido despojado de sus productos más pesados en forma líquida (condensado de gas).

- ✓ **Gas Húmedo.** Son hidrocarburos en estado gaseoso, en cuya composición aún predomina un alto porcentaje de metano (generalmente de 75 a 90 %), aunque las cantidades relativas de los componentes más pesados son mayores que en el caso de gas seco. El gas húmedo es aproximadamente equivalente a condensado de gas, fluido existente en yacimientos denominados yacimientos de condensado de gas. El fluido en el yacimiento (condensado de gas) se encuentra en estado gaseoso en el momento de su descubrimiento. Con posterioridad, generalmente exhiben el fenómeno denominado condensación retrógrada, ósea la formación de condensado en el yacimiento debido a reducción en presión y temperatura. Si la temperatura es constante, se denomina condensación retrógrada isotérmica.

- ✓ **Gas Saturado.** Es el gas que contiene la máxima cantidad de vapor de agua a una presión y temperatura específica. En la industria del gas normalmente se expresa en libras de agua por millón de pie cúbico de gas despachado o transportado (lb H₂O/MMPCS). El poder calorífico calculado sobre base de gas saturado es menor que el correspondiente para gas seco o parcialmente saturado, debido al desplazamiento en volumen de gas

combustible por vapor de agua en el sistema de medición. Igualmente, el poder calorífico a condiciones de saturación y una misma temperatura, será mayor en la medida en que la presión aumente.

2.3. SUB-PRODUCTOS DEL GAS NATURAL

El gas natural contiene elementos orgánicos importantes como materias primas para la industria petrolera y química. Antes de emplear el gas natural como combustible se extraen los hidrocarburos livianos como el etano y el etileno, y los pesados, como el butano y el propano. El gas que queda, llamado gas seco, compuesto principalmente por metano, se distribuye a usuarios domésticos e industriales como combustible. A continuación se describe brevemente los principales sub-productos y su uso más frecuente respectivamente.

- ✓ **Metano.** El metano es apreciado como combustible y para producir cloruro de hidrógeno, amoníaco, etino y formaldehído. También para fabricar plásticos, fármacos y tintes.
- ✓ **Etano.** Fundamental para la industria petroquímica. El etano es un hidrocarburo alifático alcano con dos átomos de carbono, de fórmula C_2H_6 . A condiciones normales es gaseoso y un excelente combustible.
- ✓ **Eteno o Etileno.** Se produce comercialmente mediante la destilación fraccionada del gas natural. Es muy reactivo y forma fácilmente numerosos productos como el bromoetano, el etilenglicol y el polietileno. En agricultura se utiliza como colorante y agente madurador de muchas frutas.
- ✓ **Propano.** Utilizado como combustible industrial y doméstico, el propano se separa de sus compuestos afines: el butano, etano y propeno, ya que

rebaja la velocidad de evaporación de la mezcla líquida. El propano forma un hidrato sólido a baja temperatura, lo que constituye un inconveniente cuando se produce una obstrucción en las tuberías de gas natural. También se emplea en el llamado GLP, como combustible para motores, como refrigerante, como disolvente a baja temperatura y como fuente de obtención del propeno y etileno.

- ✓ **Butano.** A menudo se le añade propano en la elaboración del GLP. No obstante, la mayoría de n-butano se transforma en butadieno, que se utiliza para fabricar caucho sintético y pinturas de látex.

- ✓ **Benceno.** El benceno es un disolvente eficaz para ciertos elementos como el azufre, el fósforo y el yodo, también para gomas, ceras, grasas y resinas, y para los productos orgánicos más simples. Es uno de los disolventes más empleados en los laboratorios de química orgánica. Son conocidos sus efectos cancerígenos, y puede resultar venenoso si se inhala en grandes cantidades. A partir del benceno se obtienen numerosos compuestos, como el nitrobenceno. También es empleado en la producción de medicinas y otros derivados importantes como la anilina y el fenol.

- ✓ **Ciclohexano.** Se usa principalmente como disolvente para pinturas, resinas, barnices y aceites, así como intermedio en la fabricación de otros productos químicos industriales y fibras de nylon.

- ✓ **Gases licuados del petróleo.** Comúnmente en inglés se denomina GLP. Son productos de hidrocarburos primordialmente de alta presión de vapor (especialmente butano, propano, etano), obtenidos por equipos especiales en plantas de gasolina, y mantenidos en estado líquido a altas presiones.

- ✓ **GTL (Gas to liquid).** Una de las alternativas que se presentan para la utilización y monetización de las reservas de gas natural es un sistema de transformación del gas en líquidos, es decir en diesel y gasolinas altamente refinados y con un nivel de pureza superior a los derivados del petróleo. 15 La transformación de gases en líquidos se remonta a principios del siglo 20 cuando los alemanes Franz Fischer y Hans Tropsch transformaron algunos gases. Después de muchos años y con los cambios tecnológicos, además de la proliferación de las reservas de gas, el sistema se aplica a través del nombre de GTL, de gas a líquidos.

Actualmente hay algunos proyectos de prueba en el mundo pero no se realizan aún en gran escala porque en todos los países donde se pretende implementar, el costo del líquido final para el consumidor es muy elevado debido a la inversión que se necesita para lograr el proceso. Si bien la idea tecnológica data de 20 años atrás, hasta hoy son contados los proyectos que están en marcha y funcionando a escalas económicamente rentables. El costo de un proyecto se evalúa de acuerdo a la cantidad de barriles que se procesen diariamente y de acuerdo al tamaño de la planta.

Un proyecto GTL tiene tres etapas en el proceso de transformación del gas en líquidos combustibles, las cuales son:

Primera etapa: Gas natural (metano) es mezclado con oxígeno y da como resultado gas sintético.

Segunda etapa: Al gas sintético se le hace una reacción Fisher/Tropsch (apellidos de los alemanes pioneros en transformar gas en líquidos, principios del siglo XX), y se obtiene petróleo sintético.

Tercera etapa: Al petróleo sintético se lo somete a refinación standard y se obtiene, finalmente, diesel de alta calidad y ecológico, gasolinas de alto nivel de parafina, y otros líquidos menores.

Los principales objetivos del GTL es que es un combustible más limpio, que se utiliza el gas como materia prima para obtener líquidos, genera valor agregado al gas natural, ayuda a cubrir la demanda insatisfecha de diesel, representa un ahorro en divisas, el excedente puede ser destinado al mercado internacional.

- ✓ **GNL (Gas natural licuado).** Es gas natural que ha sido procesado para ser transportado en forma líquida. Es la mejor alternativa para establecer reservas en sitios apartados, donde no es económico llevar el gas al mercado directamente ya sea por gasoducto o por generación de electricidad. El gas natural es transportado como líquido a presión atmosférica y a $-161\text{ }^{\circ}\text{C}$ donde la licuefacción reduce en 600 veces el volumen de gas transportado.

3. DESCRIPCIÓN ACTUAL DE LA ESTACIÓN DE COGUA

Actualmente el centro Operacional de Gas Cogua (COGC), recibe 110 MMSCFD, regulando las presiones de entre 600 y 1000 psig hasta una presión constante aguas abajo de 500 psig. Esto genera caídas de temperatura después de la etapa de regulación.

3.1. EQUIPOS ENCONTRADOS ACTUALMENTE EN LA ESTACIÓN

3.1.1. Sistema de Recibo de Raspadores

Este sistema cuenta con una trampa de recibo de raspador de 24 in x 20 in ANSI 600 con estampe ASME. En este sistema se encuentra la llegada del gas a 800 psig en una tubería de 22 in, la cual, se prolonga hasta la entrada de los filtros de succión. El bypass de la estación se encuentra en tubería de 10 in. En la figura 3.1 se encuentra una vista panorámica de la estación.

Figura 3.1. Sistema de recibo de raspadores.



Fuente: TGI S.A.

3.1.2. Sistema de Filtración

El sistema de filtración cuenta con dos equipos de filtrado, uno en stand by y el otro en operación, como se observa en la figura 3.2; ambos filtros cuentan con entradas y salidas de 12 in en ANSI 600. El sistema de control se encuentra bien configurado, aunque se evidencia una gran cantidad de condensados (ver figura 3.3).

Figura 3.2. Sistema de filtración.



Fuente: TGI S.A.

Figura 3.3. Indicador de nivel del filtro en operación



Fuente: TGI S.A.

3.1.3. Sistema de Regulación

Este sistema cuenta con un cabezal de entrada de 12 in antes de regulación, al cual se conectan dos brazos de regulación de 8 in ANSI 600 y un bypass con su correspondiente válvula de bola de 8 in. Aguas debajo de la regulación, se encuentra un cabezal de 16 in, al cual se conectan los brazos de regulación y el bypass. En la figura 3.4 se observa el sistema de regulación.

Figura 3.4. Sistema de regulación.



Fuente: TGI S.A.

3.1.4. Sistema de Medición y Entrega

En la figura 3.5 se muestra el sistema de medición y transferencia de custodia. La medición de gas se realiza con un medidor ultrasónico de 16 in. Después de la medición, el gas pasa a ser propiedad de Gas Natural SA ESP, el cual es recibido y calentado en un intercambiador de calor con las siguientes características (ver figura 3.6):

- Calentador de gas indirecto (Tubo Fuego) de 7.5 MMBTU/h.
- 6 años desde su construcción.
- Combustible: Gas Natural.
- Capacidad de agua de 8000 litros.
- 2 Quemadores internos.
- 2 etapas de regulación de gas combustible uno a 60 psig y otro 3 oz/pulg².
- El consumo de gas combustible oscila entre 200 y 350 m³/h reales.
- Necesita inyección de químicos para el tratamiento del agua.

- El mantenimiento se debe hacer cada 4 años por fábrica y aun no se ha hecho.
- Se manifiesta que después de 2 km en el gasoducto vuelve a la misma temperatura.

Figura 3.5. Sistema de medición y transferencia de custodia.



Fuente: TGI S.A.

Figura 3.6. Intercambiador de calor de Gas Natural SA ESP.



Fuente: TGI S.A.

4. SIMULACIÓN Y ANÁLISIS DE LA SIMULACIÓN DE LA ERM DE COGUA

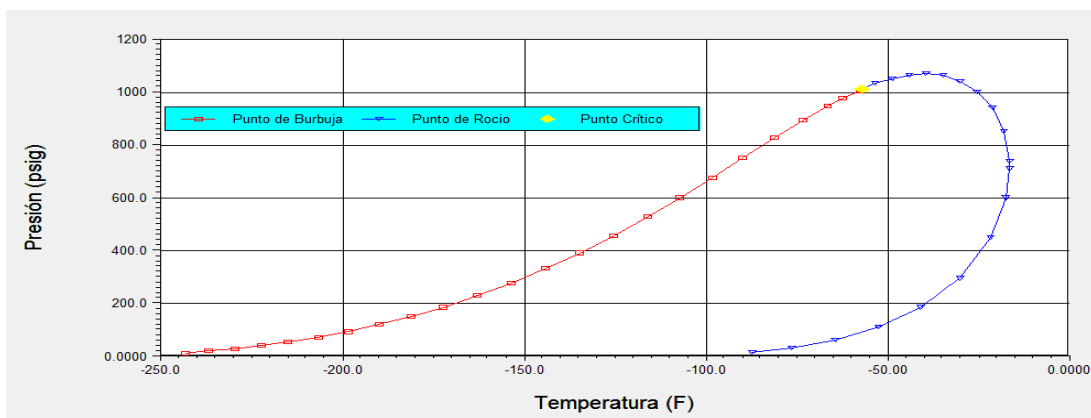
4.1. COMPOSICIÓN Y CARACTERIZACIÓN DEL GAS

Previo al desarrollo de las simulaciones, se consideraron dos tipos gas, uno con la composición descrita en la tabla 2.1 (cromatografía dada para el gas de cusiana con una cantidad de agua correspondiente a las condiciones RUT) y otro un gas completamente saturado con agua. El objeto de esto, es analizar los diagramas de fases y de formación de hidratos, con el fin de delimitar las condiciones de operación.

En la figura 4.2 se encuentra el diagrama de fases y en la figura 4.3 se encuentra el diagrama de formación de hidratos, calculados en el simulador, del gas cusiana. A partir del diagrama de hidratos se concluye que se deben evitar temperaturas por debajo de los 30 °F, para evitar la formación de hidratos.

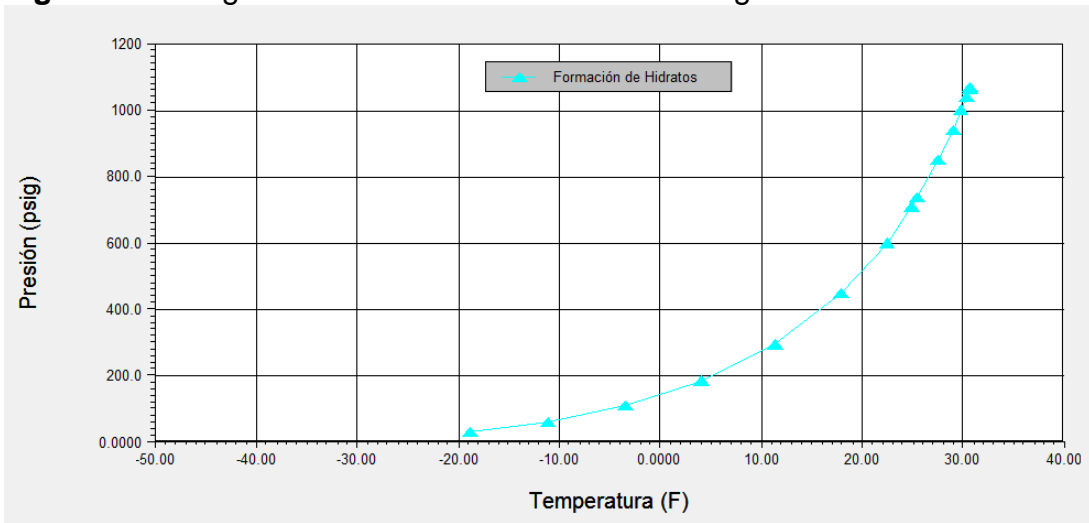
En las figuras 4.4 y 4.5 se encuentran los diagramas de fases y de formación de hidratos, respectivamente, para el gas cusiana saturado de agua, se observa que la formación de hidratos tiene lugar a temperaturas cercanas a los 70 °F.

Figura 4.1. Diagrama de fases del gas cusiana.



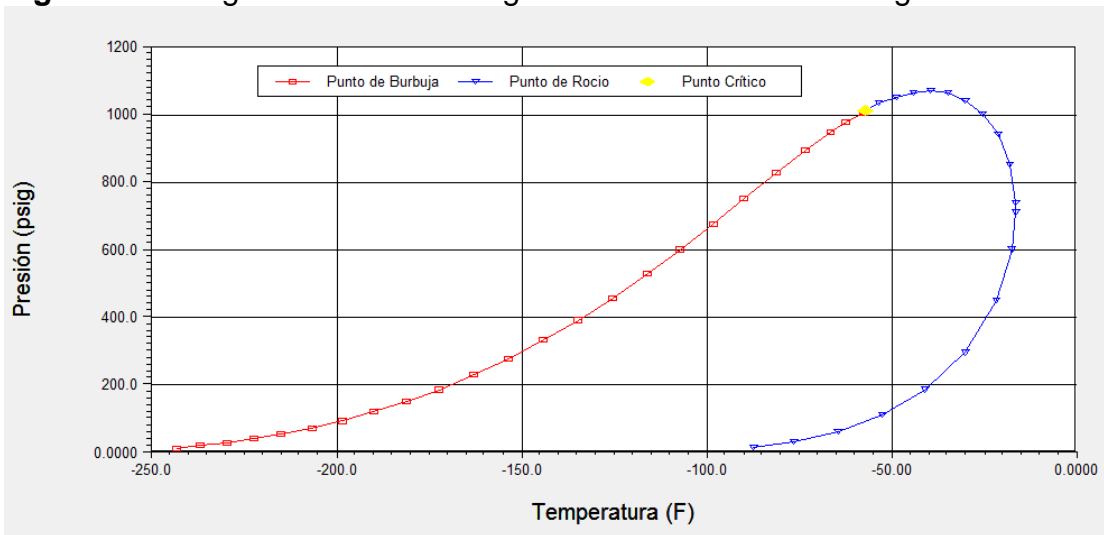
Fuente: El autor

Figura 4.2. Diagrama de formación de hidratos del gas cusiana.



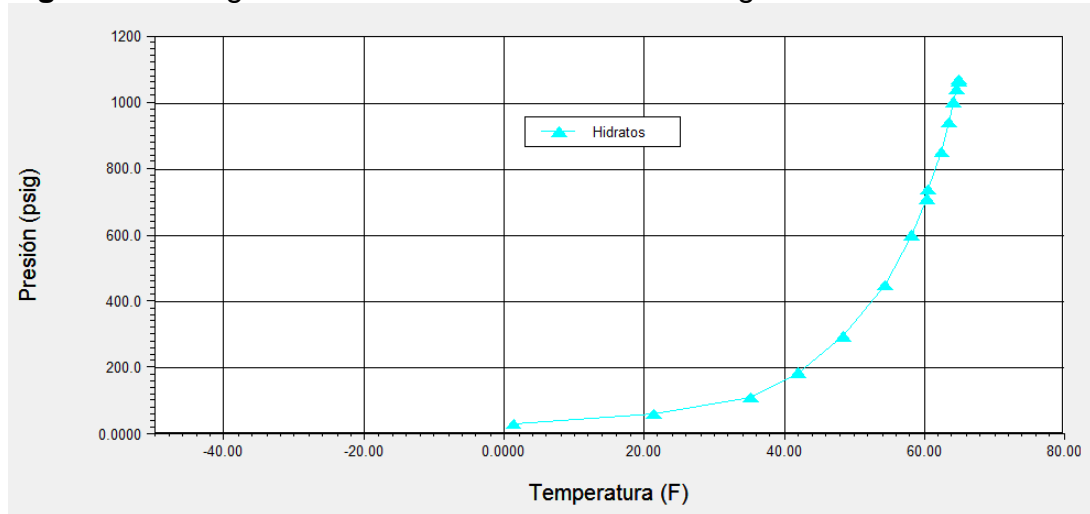
Fuente: El autor

Figura 4.3. Diagrama de fases del gas cusiana saturado con agua.



Fuente: El autor

Figura 4.4. Diagrama de formación de hidratos del gas cusiana saturado con agua



Fuente: El autor

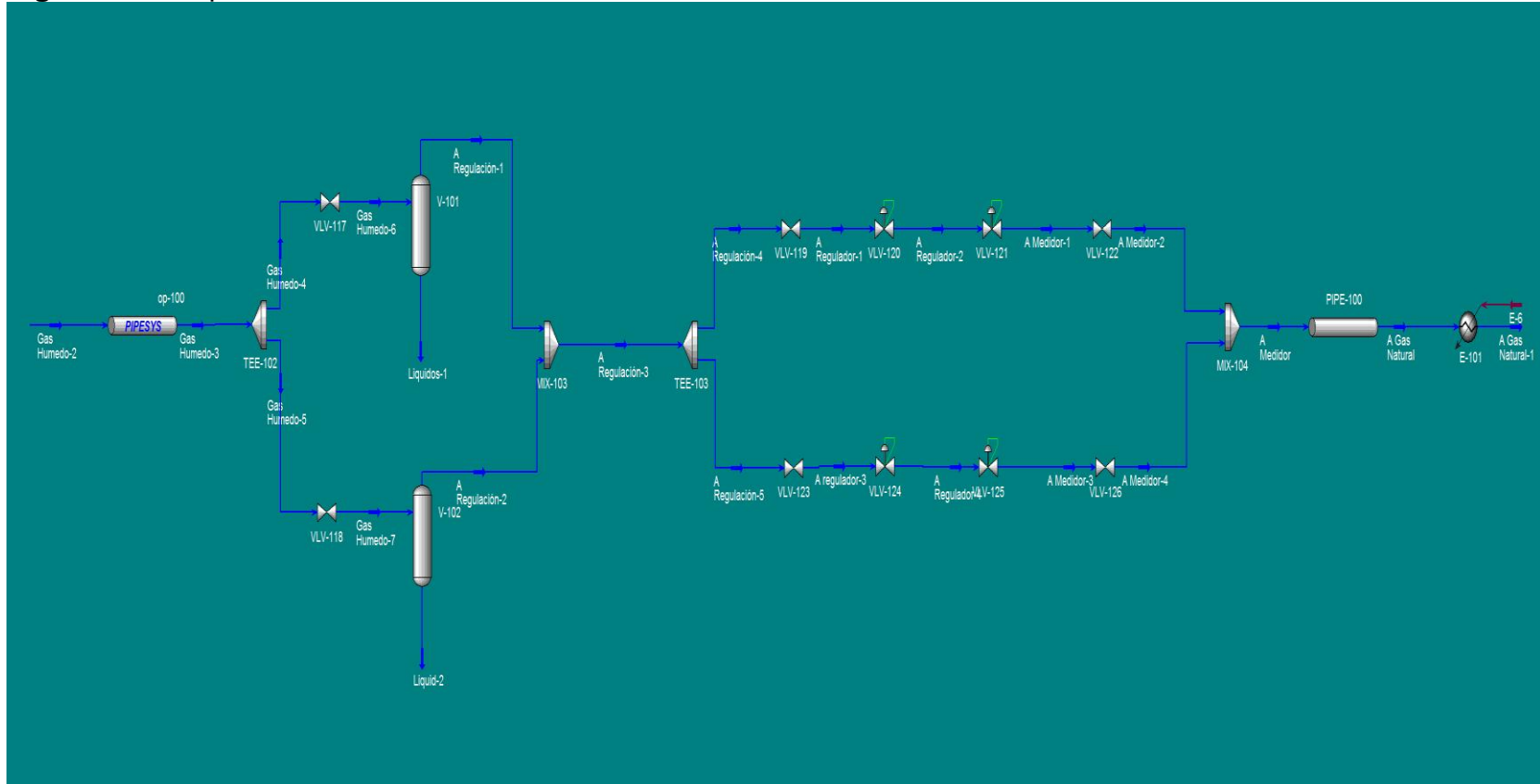
Cabe anotar que el gas utilizado para el desarrollo de las simulaciones es aquel que corresponde al mencionado en la tabla 2.1 y que el análisis con gas saturado se desarrolló con la intención de estimar condensados.

4.2. SIMULACIÓN DEL CASO BASE (FLUJO DE 140 MMSCFD)

En la figura 4.6 se muestra el esquema general de la simulación en HYSYS v 7.2 de la estación de regulación y medición de Cogua. En primer lugar, se encuentra un segmento de tubería (PIPESYS) que representa el tramo que va desde la estación de compresión de Puente Guillermo hasta la entrada de la ERM de Cogua. Los 140 MMSCFD de gas se comprimen en Puente Guillermo a una presión de 900 psi con una temperatura de 90 °F. Cuando el gas arriba a la ERM de cogua, llega con una presión de 730 psig y 47 °F de temperatura, lo cual indica que hay una caída de presión por efectos de fricción, equivalente a 170 psig. Al llegar a la estación de Cogua, el gas se hace pasar por una etapa de filtración

para retirar los líquidos remanentes, la cual cuenta con dos filtros coalescentes, uno en stand-by y el otro en operación; después, el gas entra a la etapa de regulación, en donde se disminuye la presión del gas hasta 500 psig, gracias a la acción de dos válvulas reguladoras en serie. La temperatura después de la etapa de regulación cae, por efecto Joule-Thomson, hasta 29 °F, indicando una fuerte tendencia a la producción de hidratos (ver figura 4.3). Una vez el gas sale de la etapa de regulación, este se hace pasar por un medidor, que para el caso de la simulación, este se representa con un segmento de tubería que calcula la caída de presión por efectos de la medición. Después de la medición, se realiza la transferencia de custodia a Gas Natural ESP S.A. que recibe el gas y lo calienta con un intercambiador de calor hasta una temperatura de 62 °F y cuyo duty constante es de 5.5 MMBTU/h.

Figura 4.5. Esquema de la simulación.



Fuente: El autor

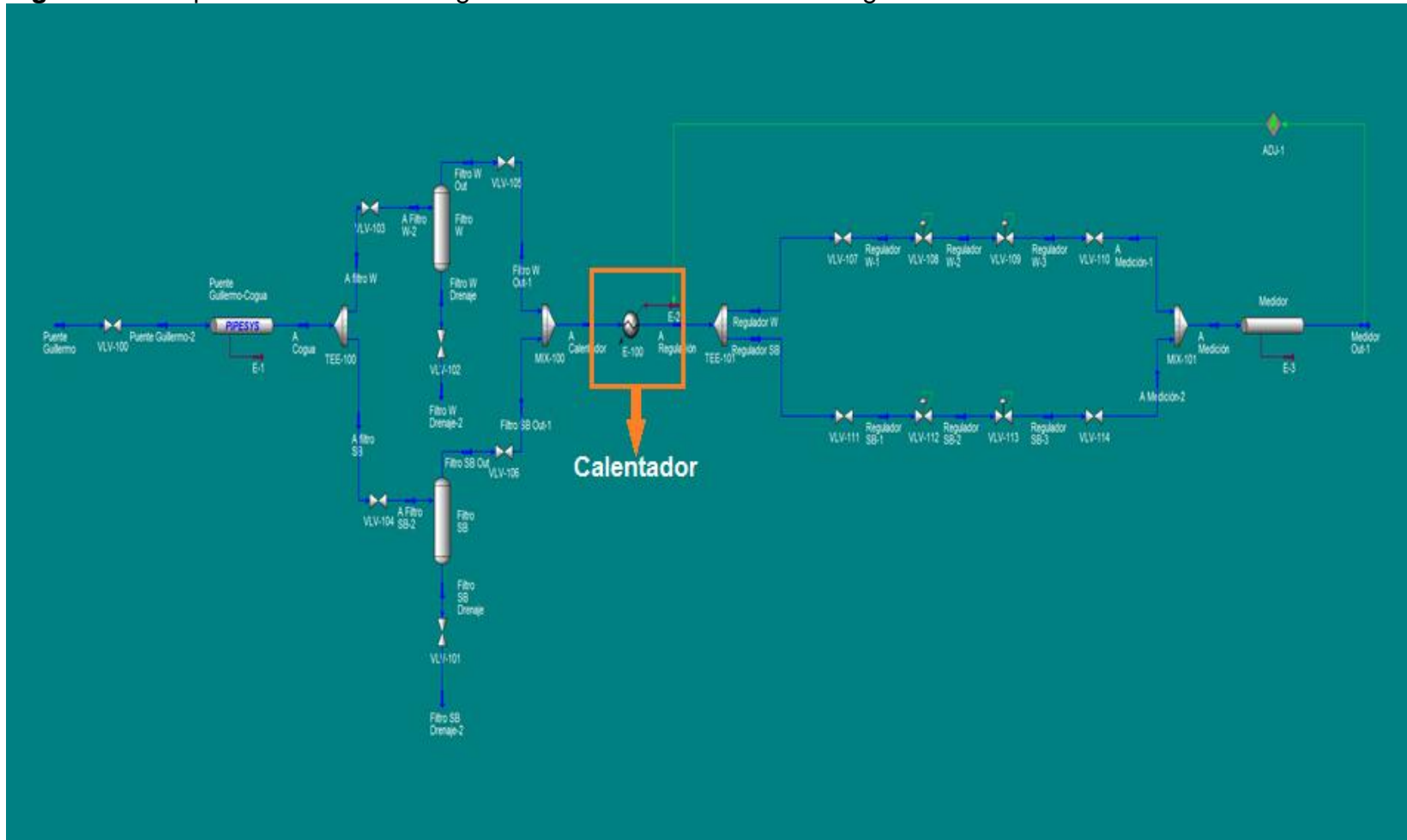
4.3. SIMULACIÓN DEL CASO FUTURO (FLUJO DE 270 MMSCFD)

El diagrama de proceso para este caso es el mismo que para el caso base, por lo tanto, en la figura 4.6, se muestra el diagrama del caso a analizar. A diferencia del caso base, se bombean 270 MMSCFD de gas desde Puente Guillermo hasta la ERM de Cogua, a 1100 psi y 110 °F. Cuando el gas arriba a la ERM de Cogua, llega a una presión de 546 psig y 41 °F, indicando una fuerte caída de presión y de temperatura (616 psi y 69 °F respectivamente), debido a la fricción y al perfil de elevación de la tubería. Al llegar el gas a la etapa de regulación, lo hace a una temperatura de 41 °F, la cual, se encuentra por debajo de la recomendada (45 °F, temperatura mínima recomendada para el ingreso al sistema de regulación según la CREG). Después de la regulación y medición el gas se entrega a una temperatura de 36 °F y una presión de 492 psig. Ya en propiedad de Gas Natural ESP S.A., el gas se calienta en su intercambiador de calor hasta una temperatura de 53 °F, con un duty constante de 5.5 MMBTU/h.

4.4. SIMULACIÓN DEL CASO FUTURO CON CALENTADOR ANTES DE LA REGULACIÓN

Dado que la temperatura del gas a la entrada de la etapa de regulación es más baja que la recomendada (ver tabla 2.1), se decidió implementar un calentador aguas arriba de la regulación con intención de aumentar la temperatura por encima de los 45 °F y evitar la posible formación de hidratos. El esquema de la simulación se observa en la figura 4.7, en donde se indica la posición del calentador.

Figura 4.6. Esquema de ERM de Cogua con calentador antes de la regulación



Fuente: El autor

En este esquema, el gas se calienta a una temperatura de 70 °F antes de la regulación, resultando que la cantidad de energía consumida durante la operación es de 9.4 MMBTU/h. Finalmente el gas se entrega a Gas Natural ESP S.A. a una temperatura de 67 °F y a una presión de 492 psig.

4.5. ANÁLISIS DE LAS FACILIDADES EXISTENTES EN LA ERM COGUA PARA EL CASO FUTURO (270 MMSCFD)

En la figura 4.8 se encuentra el pfd utilizado para desarrollar los análisis de las facilidades existentes en la ERM Cogua. Se observa que este pfd es similar al pfd ilustrado en la figura 4.7, sin embargo, se han adicionado unas unidades de operaciones, las cuales corresponden a la extensión de PIPESYS, para la simulación y análisis de flujo de fluidos en ductos; cabe mencionar que en la etapa de regulación, las válvulas de regulación fueron remplazadas por extensiones de PIPESYS, ya que estas permiten agregar diversos elementos de análisis y simulación de flujo de fluidos, como son, a saber: tuberías, compresores, bombas, válvulas reguladoras, entre otros. Estas unidades de operación PIPESYS, fueron agregadas en las etapas de filtración, regulación y medición. A continuación se indican los análisis desarrollados etapa por etapa:

4.5.1. Sistema de Filtración

- **Caso Actual (140 MMSCFD)**

En este caso solo uno de los filtros esta en funcionamiento y el otro en stand-by, sin embargo, ambos filtros tienen una entrada de 12 in que para efectos de las condiciones actuales (140 MMSCFD) funciona, ya que la velocidad del gas a la entrada del filtro es de 10 m/s (33 ft/s), la cual se encuentra por debajo del rango permisible de 20 m/s.

- **Caso Futuro (270 MMSCFD)**

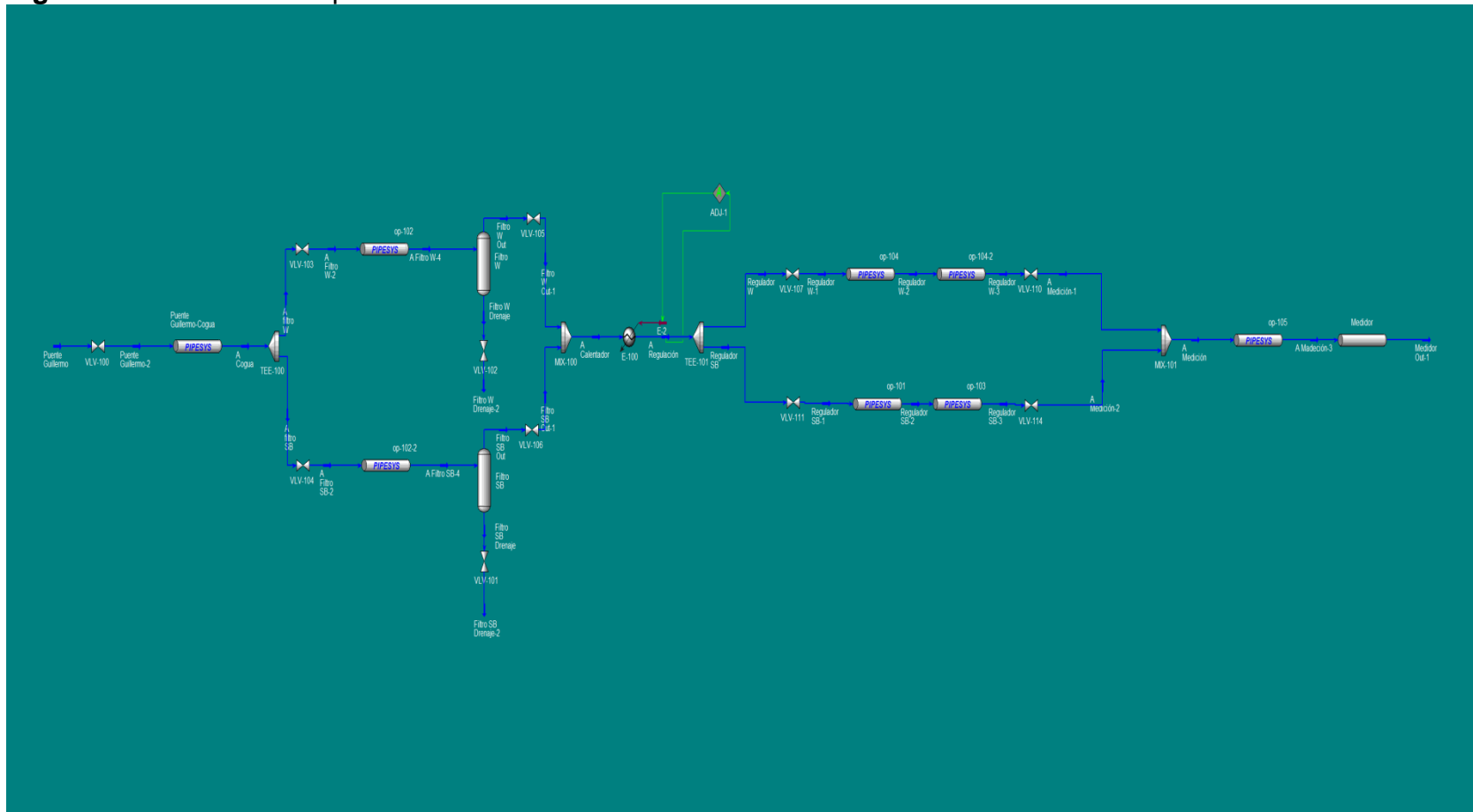
Inicialmente, se evaluó si las circunstancias actuales de la estación soportarían el nuevo flujo, más aún, se encontró que la velocidad del gas a la entrada del filtro en operación era de 26 m/s (87 ft/s), lo cual indica que esta por encima del límite permitido por la norma (20 m/s); de acuerdo a lo mencionado, se probó una alternativa que consiste en operar los dos filtros al mismo tiempo, revelando que de esta manera se logra disminuir la velocidad del gas a la entrada de los filtros, la cual alcanza el valor 13 m/s (43 ft/s). Es preciso aclarar que a los dos filtros les debe llegar la misma cantidad de gas, lo cual se asegura abriendo las válvulas de ingreso en igual porcentaje. Sin embargo, la utilización simultánea de los dos filtros implica la necesidad de implementar un tercer filtro en stand-by, de manera que, cuando uno de los dos (o los dos) filtros en uso esté en mantenimiento, el gas pueda seguir siendo filtrado mediante el uso de este tercer filtro.

4.5.2. Sistema de Regulación

- **Caso Actual (140 MMSCFD)**

Actualmente la estación de Cogua cuenta con dos brazos de regulación en paralelo de 8 in cada uno, en donde la velocidad del gas es de 12 m/s (40 ft/s), inferior a la velocidad sugerida (20 m/s). En cuanto a las válvulas de regulación, el simulador señala un Cv de 275 para la primera válvula y 339 para la segunda.

Figura 4.7. PFD utilizado para el análisis de facilidades.



Fuente: El autor

- **Caso Futuro (270 MMSCFD)**

En primer lugar, se analizaron las repercusiones del nuevo flujo en el sistema existente, resultando que para cada brazo de regulación de 8 in (transportando cada uno 135 MMSCFD) la velocidad del fluido está en el orden de 33 m/s (107.5 ft/s), evidenciando que es preciso cambiar los brazos de regulación. Con base a lo anterior, se modeló cambiar el diámetro de los brazos de regulación a 10 in, más aún, la velocidad, la cual fue de 21 m/s (68 ft/s), continuaba por encima de lo recomendado; sin embargo, al cambiar el diámetro de la tubería a 12 in, los resultados indican que la velocidad se disminuye por debajo del valor recomendado (20 m/s) hasta llegar a los 14.5 m/s (47.6 ft/s). Por otro lado, se evidencia que las válvulas existentes no sirven ya que tienen un C_v muy bajo (275 y 339 para la primera y segunda, respectivamente), por tanto es necesario reemplazar estas válvulas que, según resultados del simulador para un tamaño de 12 in, se requiere un C_v de 1394 para la primera válvula de regulación y 1453 para la segunda.

4.5.3. Sistema de Medición

- **Caso Actual (140 MMSCFD)**

La estación, actualmente cuenta con un medidor ultrasónico instalado en una línea de 16 in de diámetro, en la cual la velocidad de flujo de gas es de 9.6 m/s (32 ft/s), indicando que es inferior a la recomendada (20 m/s).

- **Caso Futuro (270 MMSCFD)**

Al desarrollar la simulación para el nuevo flujo se encontró que la velocidad de flujo de gas que se encuentra en derredor de 19.5 m/s (63.7 ft/s) está muy cerca del límite recomendado (20 m/s), por tanto es necesario reemplazar la línea de

regulación por una de diámetro mayor, que según la simulación puede ser de 18 in ya que con este diámetro se logra disminuir la velocidad a 15 m/s (50 ft/s).por otra parte, el medidor actual de 16 in de diámetro podría ofrecer una mayor incertidumbre en la medición del flujo futuro de gas, ya que este fue seleccionado para medir un rango diferente de flujo.

5. CONCLUSIONES

Después del análisis desarrollado a través de la simulación en HYSYS V. 7.2, se encontraron los siguientes aspectos a saber y que para efectos de orden, se agruparon en concordancia con los diferentes sistemas encontrados en la estación:

- **Sistema de Filtración**

En este sistema se encontró que los filtros existentes podrían ser utilizados simultáneamente para el nuevo caudal (270 MMSCFD), sin embargo, es preciso que por ambos filtros pase la misma cantidad de flujo, equivalente a la mitad del nuevo caudal (es decir: 135 MMSCFD por cada filtro), para que se cumpla la norma de la velocidad en ductos. Por otro lado, la utilización simultánea de los dos filtros induce la necesidad de utilizar un tercer filtro en stand-by, que se habilitaría durante el mantenimiento de los dos filtros existentes.

- **Sistema de Regulación**

En primer lugar, se encontró que es necesario instalar un calentador antes de la regulación, ya que el gas disminuye su temperatura por efectos del transporte lo que puede provocar la formación de hidratos antes y después de la regulación. En segundo lugar, se evidenció que las facilidades existentes no cumplen con los requerimientos del nuevo flujo a tratar, pues las dimensiones actuales de los ductos y válvulas no ofrecen el tamaño apropiado para el flujo seguro del gas. Los resultados revelan que para el nuevo flujo las líneas y válvulas de regulación se podrían cambiar de 8 a 12 in, de tal manera que se cumpla con lo establecido en la norma.

- **Sistema de Medición**

Actualmente, el tramo de medición cuenta con un medidor de flujo ultrasónico de 16 in de diámetro instalado en una línea de igual dimensión, que por efectos del flujo actual funciona bien, sin embargo, al simular el nuevo flujo se encontró que la velocidad estaba cerca del límite permitido, por lo que se ensayó con una línea de 18 in, para la cual, los resultados fueron apropiados. Cabe anotar, que el medidor de flujo ultrasónico actual ofrecería una mayor incertidumbre durante la medición del nuevo caudal (270 MMSCFD), ya que este fue seleccionado considerando el caudal actual (140 MMSCFD).

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7. ANEXOS


Anexo A. Reportes de Simulaciones


1	LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5			Fluid Package: Basis-1	
6	Material Stream: Puente Guillermo-1-2		Property Package: Peng Robinson	
7				
8	CONDITIONS			
9				
10		Overall	Vapour Phase	
11				
12	Vapour / Phase Fraction	1.0000	1.0000	
13	Temperature: (F)	109.7	109.7	
14	Pressure: (psig)	1095	1095	
15	Molar Flow (MMSCFD)	270.0	270.0	
16	Mass Flow (lb/hr)	5.680e+005	5.680e+005	
17	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005	
18	Molar Enthalpy (Btu/lbmole)	-3.603e+004	-3.603e+004	
19	Molar Entropy (Btu/lbmole-F)	36.10	36.10	
20	Heat Flow (Btu/hr)	-1.068e+009	-1.068e+009	
21	Liq Vol Flow @Std Cond (barrel/day)	---	---	
22	PROPERTIES			
23				
24		Overall	Vapour Phase	
25	Molecular Weight	19.15	19.15	
26	Molar Density (lbmole/ft3)	0.2170	0.2170	
27	Mass Density (lb/ft3)	4.156	4.156	
28	Act. Volume Flow (barrel/day)	5.841e+005	5.841e+005	
29	Mass Enthalpy (Btu/lb)	-1881	-1881	
30	Mass Entropy (Btu/lb-F)	1.885	1.885	
31	Heat Capacity (Btu/lbmole-F)	12.26	12.26	
32	Mass Heat Capacity (Btu/lb-F)	0.6403	0.6403	
33	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
34	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
35	Phase Fraction [Vol. Basis]	1.000	1.000	
36	Phase Fraction [Mass Basis]	1.000	1.000	
37	Partial Pressure of CO2 (psig)	6.578	---	
38	Cost Based on Flow (Cost/s)	4.118	4.118	
39	Act. Gas Flow (ACFM)	2278	2278	
40	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
41	Specific Heat (Btu/lbmole-F)	12.26	12.26	
42	Std. Gas Flow (MMSCFD)	270.0	270.0	
43	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
44	Act. Liq. Flow (USGPM)	---	---	
45	Z Factor	0.8369	0.8369	
46	Watson K	18.38	18.38	
47	User Property	---	---	
48	Partial Pressure of H2S (psig)	-14.70	---	
49	Cp/(Cp - R)	1.193	1.193	
50	Cp/Cv	1.557	1.557	
51	Heat of Vap. (Btu/lbmole)	2234	---	
52	Kinematic Viscosity (cSt)	0.2122	0.2122	
53	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
54	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
55	Liquid Fraction	0.0000	0.0000	
56	Molar Volume (ft3/lbmole)	4.609	4.609	
57	Mass Heat of Vap. (Btu/lb)	116.7	---	
58	Phase Fraction [Molar Basis]	1.0000	1.0000	
59	Surface Tension (dyne/cm)	---	---	
60	Thermal Conductivity (Btu/hr-ft-F)	2.379e-002	2.379e-002	
61	Viscosity (cP)	1.413e-002	1.413e-002	
62	Cv (Semi-Ideal) (Btu/lbmole-F)	10.28	10.28	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	


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* Specified by user.

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC					
2			Unit Set: Field1					
3			Date/Time: Fri Apr 13 12:13:26 2012					
4								
5			Fluid Package: Basis-1					
6	Material Stream: Puente Guillermo-1-2 (contin		Property Package: Peng Robinson					
7	PROPERTIES							
8		Overall	Vapour Phase					
9	12	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.5366	0.5366				
10	13	Cv (Btu/lbmole-F)	7.876	7.876				
11	14	Mass Cv (Btu/lb-F)	0.4112	0.4112				
12	15	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
13	16	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
14	17	Cp/Cv (Ent. Method)	---	---				
15	18	Reid VP at 37.8 C (psig)	---	---				
16	19	True VP at 37.8 C (psig)	---	---				
17	20	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000				
18	21	Viscosity Index	-53.10	-53.10				
19	22	COMPOSITION						
20	Overall Phase				Vapour Fraction	1.0000		
21	26	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
22	28	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
23	29	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
24	30	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
25	31	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
26	32	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
27	33	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
28	34	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
29	35	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
30	36	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
31	37	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
32	38	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
33	39	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
34	40	Vapour Phase				Phase Fraction	1.0000	
35	42	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
36	44	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
37	45	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
38	46	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
39	47	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
40	48	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
41	49	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
42	50	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
43	51	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
44	52	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
45	53	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
46	54	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
47	55	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
48	56	UNIT OPERATIONS						
49	58	FEED TO	PRODUCT FROM			LOGICAL CONNECTION		
50	59	PIPESYS Extension: Puente Guillermo-Cogua-2	Valve:	VLV-Puente Guillermo-2				
51	60	UTILITIES						
52	62	(No utilities reference this stream)						
53	63	Aspen Technology Inc.	Aspen HYSYS Version 7.2 (24.0.0.7263)				Page 2 of 102	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: Puente Guillermo-1-2 (contin		Fluid Package: Basis-1	
7			Property Package: Peng Robinson	
8	PROCESS UTILITY			
9				
10	Material Stream: A Cogua-2		Fluid Package: Basis-1	
11			Property Package: Peng Robinson	
12	CONDITIONS			
13				
14				
15				
16				
17		Overall	Vapour Phase	
18	Vapour / Phase Fraction	1.0000	1.0000	
19	Temperature: (F)	40.32	40.32	
20	Pressure: (psig)	535.1	535.1	
21	Molar Flow (MMSCFD)	270.0	270.0	
22	Mass Flow (lb/hr)	5.680e+005	5.680e+005	
23	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005	
24	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	
25	Molar Entropy (Btu/lbmole-F)	36.56	36.56	
26	Heat Flow (Btu/hr)	-1.080e+009	-1.080e+009	
27	Liq Vol Flow@Std Cond (barrel/day)	---	---	
28	PROPERTIES			
29				
30		Overall	Vapour Phase	
31	Molecular Weight	19.15	19.15	
32	Molar Density (lbmole/ft3)	0.1192	0.1192	
33	Mass Density (lb/ft3)	2.282	2.282	
34	Act. Volume Flow (barrel/day)	1.064e+006	1.064e+006	
35	Mass Enthalpy (Btu/lb)	-1901	-1901	
36	Mass Entropy (Btu/lb-F)	1.908	1.908	
37	Heat Capacity (Btu/lbmole-F)	10.91	10.91	
38	Mass Heat Capacity (Btu/lb-F)	0.5696	0.5696	
39	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
40	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
41	Phase Fraction [Vol. Basis]	1.000	1.000	
42	Phase Fraction [Mass Basis]	1.000	1.000	
43	Partial Pressure of CO2 (psig)	-4.156	---	
44	Cost Based on Flow (Cost/s)	0.0000	0.0000	
45	Act. Gas Flow (ACFM)	4147	4147	
46	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
47	Specific Heat (Btu/lbmole-F)	10.91	10.91	
48	Std. Gas Flow (MMSCFD)	270.0	270.0	
49	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
50	Act. Liq. Flow (USGPM)	---	---	
51	Z Factor	0.8599	0.8599	
52	Watson K	18.38	18.38	
53	User Property	---	---	
54	Partial Pressure of H2S (psig)	-14.70	---	
55	Cp/(Cp - R)	1.222	1.222	
56	Cp/Cv	1.494	1.494	
57	Heat of Vap. (Btu/lbmole)	3789	---	
58	Kinematic Viscosity (cSt)	0.3161	0.3161	
59	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
60	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
61	Liquid Fraction	0.0000	0.0000	
62	Molar Volume (ft3/lbmole)	8.392	8.392	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6	Material Stream: A Cogua-2 (continued)		Property Package: Peng Robinson				
7	PROPERTIES						
8		Overall	Vapour Phase				
9	Mass Heat of Vap. (Btu/lb)	198.3	---				
10	Phase Fraction [Molar Basis]	1.0000	1.0000				
11	Surface Tension (dyne/cm)	---	---				
12	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	1.858e-002				
13	Viscosity (cP)	1.156e-002	1.156e-002				
14	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	8.925				
15	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.4660				
16	Cv (Btu/lbmole-F)	7.304	7.304				
17	Mass Cv (Btu/lb-F)	0.3813	0.3813				
18	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
19	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
20	Cp/Cv (Ent. Method)	---	---				
21	Reid VP at 37.8 C (psig)	---	---				
22	True VP at 37.8 C (psig)	---	---				
23	Liq. Vol. Flow - Sum(Std. Cond) (bbl/day)	0.0000	0.0000				
24	Viscosity Index	-21.13	-21.13				
25	COMPOSITION						
26	Overall Phase						
27				Vapour Fraction	1.0000		
28	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
29	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
30	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
31	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
32	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
33	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
34	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
35	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
36	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
37	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
38	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
39	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
40	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
41	Vapour Phase						
42					Phase Fraction	1.0000	
43	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
44	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
45	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
46	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
47	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
48	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
49	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
50	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
51	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
52	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
53	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
54	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
55	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
56	Aspen Technology Inc. Aspen HYSYS Version 7.2 (24.0.0.7263) Page 4 of 102						
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: A Cogua-2 (continued)			Fluid Package: Basis-1
7				Property Package: Peng Robinson
8	UNIT OPERATIONS			
9				
10	FEED TO		PRODUCT FROM	
11	LOGICAL CONNECTION			
12	Separator	FS-101-2	PIPESYS Extension:	'uente Guillermo-Cogua-2
13	UTILITIES			
14	(No utilities reference this stream)			
15	PROCESS UTILITY			
16				
17				
18				
19	Material Stream: A regulación-2			Fluid Package: Basis-1
20				Property Package: Peng Robinson
21				
22	CONDITIONS			
23				
24		Overall	Vapour Phase	Aqueous Phase
25	Vapour / Phase Fraction	1.0000	1.0000	0.0000
26	Temperature: (F)	40.32	40.32	40.32
27	Pressure: (psig)	535.1	535.1	535.1
28	Molar Flow (MMSCFD)	270.0	270.0	0.0000
29	Mass Flow (lb/hr)	5.680e+005	5.680e+005	0.0000
30	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005	0.0000
31	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	-1.238e+005
32	Molar Entropy (Btu/lbmole-F)	36.56	36.56	11.53
33	Heat Flow (Btu/hr)	-1.080e+009	-1.080e+009	0.0000
34	Liq Vol Flow @Std Cond (barrel/day)	---	---	0.0000
35	PROPERTIES			
36				
37		Overall	Vapour Phase	Aqueous Phase
38	Molecular Weight	19.15	19.15	18.04
39	Molar Density (lbmole/ft3)	0.1192	0.1192	2.980
40	Mass Density (lb/ft3)	2.282	2.282	53.76
41	Act. Volume Flow (barrel/day)	1.064e+006	1.064e+006	0.0000
42	Mass Enthalpy (Btu/lb)	-1901	-1901	-6860
43	Mass Entropy (Btu/lb-F)	1.908	1.908	0.6389
44	Heat Capacity (Btu/lbmole-F)	10.91	10.91	18.58
45	Mass Heat Capacity (Btu/lb-F)	0.5696	0.5696	1.030
46	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	2.903e-002
47	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	1.609e-003
48	Phase Fraction [Vol. Basis]	1.000	1.000	---
49	Phase Fraction [Mass Basis]	1.000	1.000	0.0000
50	Partial Pressure of CO2 (psig)	-4.156	---	---
51	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000
52	Act. Gas Flow (ACFM)	4147	4147	---
53	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	3.452
54	Specific Heat (Btu/lbmole-F)	10.91	10.91	18.58
55	Std. Gas Flow (MMSCFD)	270.0	270.0	0.0000
56	Std. Ideal Liq. Mass Density (lb/ft3)	20.88	20.88	62.27
57	Act. Liq. Flow (USGPM)	0.0000	---	0.0000
58	Z Factor	---	0.8599	3.438e-002
59	Watson K	18.38	18.38	8.512
60	User Property	---	---	---
61	Partial Pressure of H2S (psig)	-14.70	---	---
62	Cp/(Cp - R)	1.222	1.222	1.120
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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			* Specified by user.	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6	Material Stream: A regulación-2 (continued)		Property Package: Peng Robinson				
7	PROPERTIES						
8		Overall	Vapour Phase	Aqueous Phase			
9							
10							
11	Cp/Cv	1.494	1.494	1.133			
12	Heat of Vap. (Btu/lbmole)	3799	---	---			
13	Kinematic Viscosity (cSt)	0.3161	0.3161	1.441			
14	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	63.38			
15	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	0.0000			
16	Liquid Fraction	0.0000	0.0000	1.000			
17	Molar Volume (ft3/lbmole)	8.392	8.392	0.3356			
18	Mass Heat of Vap. (Btu/lb)	198.3	---	---			
19	Phase Fraction [Molar Basis]	1.0000	1.0000	0.0000			
20	Surface Tension (dyne/cm)	---	---	75.53			
21	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	1.858e-002	0.3344			
22	Viscosity (cP)	1.156e-002	1.156e-002	1.241			
23	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	8.925	16.60			
24	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.4660	0.9199			
25	Cv (Btu/lbmole-F)	7.304	7.304	16.41			
26	Mass Cv (Btu/lb-F)	0.3813	0.3813	0.9094			
27	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---			
28	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---			
29	Cp/Cv (Ent. Method)	---	---	---			
30	Reid VP at 37.8 C (psig)	---	---	---			
31	True VP at 37.8 C (psig)	---	---	42.65			
32	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	0.0000			
33	Viscosity Index	-21.13	-21.13	7.855			
34							
35	COMPOSITION						
36	Overall Phase						
37				Vapour Fraction	1.0000		
38							
39	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
40							
41	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
42	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
43	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
44	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
45	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
46	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
47	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
48	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
49	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
50	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
51	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
52	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
53	Vapour Phase						
54				Phase Fraction	1.000		
55	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
56							
57	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
58	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
59	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
60	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
61	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
62	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 6 of 102	


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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2				Unit Set: Field1			
3				Date/Time: Fri Apr 13 12:13:26 2012			
4							
5				Fluid Package: Basis-1			
6	Material Stream: A regulación-2 (continued)			Property Package: Peng Robinson			
7							
8	COMPOSITION						
9							
10	Vapour Phase (continued)						
11						Phase Fraction 1.000	
12							
13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
14							
15	n-Butane	11.8685	0.0004	678.2193	0.0012	79.6258	0.0007
16	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
17	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
18	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
19	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
20	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
21							
22	Aqueous Phase						
23						Phase Fraction 0.0000	
24	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
25	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
26	CO2	0.0000	0.0010	0.0000	0.0024	0.0000	0.0029
27	Methane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
28	Ethane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	Propane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
30	i-Butane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	n-Butane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
32	i-Pentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
33	n-Pentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
34	n-Hexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
35	H2O	0.0000	0.9990	0.0000	0.9975	0.0000	0.9970
36	Total	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000
37							
38	UNIT OPERATIONS						
39	FEED TO		PRODUCT FROM		LOGICAL CONNECTION		
40	Tee:	TEE-100-2	Separator:	FS-101-2			
41							
42	UTILITIES						
43	(No utilities reference this stream)						
44							
45	PROCESS UTILITY						
46							
47				Fluid Package: Basis-1			
48	Material Stream: A drenaje-2			Property Package: Peng Robinson			
49							
50	CONDITIONS						
51							
52		Overall	Vapour Phase	Aqueous Phase			
53	Vapour / Phase Fraction	0.0000	0.0000	1.0000			
54	Temperature: (F)	40.32	40.32	40.32			
55	Pressure: (psig)	535.1	535.1	535.1			
56	Molar Flow (MMSCFD)	0.0000	0.0000	0.0000			
57	Mass Flow (lb/hr)	0.0000	0.0000	0.0000			
58	Std Ideal Liq Vol Flow (barrel/day)	0.0000	0.0000	0.0000			
59	Molar Enthalpy (Btu/lbmole)	-1.238e+005	-3.641e+004	-1.238e+005			
60	Molar Entropy (Btu/lbmole-F)	11.53	36.56	11.53			
61	Heat Flow (Btu/hr)	0.0000	0.0000	0.0000			
62	Liq Vol Flow @Std Cond (barrel/day)	0.0000 *	0.0000	0.0000			
63	Aspen Technology Inc.			Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 7 of 102	


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5			Fluid Package: Basis-1	
6	Material Stream: A drenaje-2 (continued)		Property Package: Peng Robinson	
7				
8				
9	PROPERTIES			
10				
11		Overall	Vapour Phase	Aqueous Phase
12	Molecular Weight	18.04	19.15	18.04
13	Molar Density (lbmole/ft3)	2.980	0.1192	2.980
14	Mass Density (lb/ft3)	53.76	2.282	53.76
15	Act. Volume Flow (barrel/day)	0.0000	0.0000	0.0000
16	Mass Enthalpy (Btu/lb)	-6860	-1901	-6860
17	Mass Entropy (Btu/lb-F)	0.6389	1.908	0.6389
18	Heat Capacity (Btu/lbmole-F)	18.58	10.91	18.58
19	Mass Heat Capacity (Btu/lb-F)	1.030	0.5696	1.030
20	LHV Vol Basis (Std) (Btu/lbmole)	2.903e-002	3.844e+005	2.903e-002
21	LHV Mass Basis (Std) (Btu/lb)	1.609e-003	2.007e+004	1.609e-003
22	Phase Fraction [Vol. Basis]	---	---	1.000
23	Phase Fraction [Mass Basis]	0.0000	0.0000	1.000
24	Partial Pressure of CO2 (psig)	-14.70	---	---
25	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000
26	Act. Gas Flow (ACFM)	---	---	---
27	Avg. Liq. Density (lbmole/ft3)	---	---	---
28	Specific Heat (Btu/lbmole-F)	18.58	10.91	18.58
29	Std. Gas Flow (MMSCFD)	0.0000	0.0000	0.0000
30	Std. Ideal Liq. Mass Density (lb/ft3)	62.27	20.68	62.27
31	Act. Liq. Flow (USGPM)	0.0000	---	0.0000
32	Z Factor	---	0.8599	3.438e-002
33	Watson K	8.512	18.38	8.512
34	User Property	---	---	---
35	Partial Pressure of H2S (psig)	-14.70	---	---
36	Cp/(Cp - R)	1.120	1.222	1.120
37	Cp/Cv	1.133	1.494	1.133
38	Heat of Vap. (Btu/lbmole)	1.404e+004	---	---
39	Kinematic Viscosity (cSt)	1.441	0.3161	1.441
40	Liq. Mass Density (Std. Cond) (lb/ft3)	63.38	---	63.38
41	Liq. Vol. Flow (Std. Cond) (barrel/day)	0.0000	0.0000	0.0000
42	Liquid Fraction	1.000	0.0000	1.000
43	Molar Volume (ft3/lbmole)	0.3356	8.392	0.3356
44	Mass Heat of Vap. (Btu/lb)	778.1	---	---
45	Phase Fraction [Molar Basis]	0.0000	0.0000	1.0000
46	Surface Tension (dyne/cm)	75.53	---	75.53
47	Thermal Conductivity (Btu/hr-ft-F)	0.3344	1.858e-002	0.3344
48	Viscosity (cP)	1.241	1.156e-002	1.241
49	Cv (Semi-Ideal) (Btu/lbmole-F)	16.60	8.925	16.60
50	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.9199	0.4660	0.9199
51	Cv (Btu/lbmole-F)	16.41	7.304	16.41
52	Mass Cv (Btu/lb-F)	0.9094	0.3813	0.9094
53	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---
54	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---
55	Cp/Cv (Ent. Method)	---	---	---
56	Reid VP at 37.8 C (psig)	---	---	---
57	True VP at 37.8 C (psig)	42.65	---	42.65
58	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	0.0000
59	Viscosity Index	7.178	-18.18	7.178
60				
61				
62				
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2				Unit Set: Field1		
3				Date/Time: Fri Apr 13 12:13:26 2012		
4						
5				Fluid Package: Basis-1		
6	Material Stream: A drenaje-2 (continued)			Property Package: Peng Robinson		
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5			Fluid Package: Basis-1	
6	Material Stream: A drenaje-2 (continued)		Property Package: Peng Robinson	
7	UTILITIES			
8	(No utilities reference this stream)			
9	PROCESS UTILITY			
10				
11			Fluid Package: Basis-1	
12	Material Stream: A Segunda Regulación-3		Property Package: Peng Robinson	
13				
14	CONDITIONS			
15		Overall	Vapour Phase	
16	Vapour / Phase Fraction	1.0000	1.0000	
17	Temperature: (F)	49.27	49.27	
18	Pressure: (psig)	650.0 *	650.0	
19	Molar Flow (MMSCFD)	135.0	135.0	
20	Mass Flow (lb/hr)	2.840e+005	2.840e+005	
21	Std Ideal Liq Vol Flow (barrel/day)	5.869e+004	5.869e+004	
22	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	
23	Molar Entropy (Btu/lbmole-F)	36.24	36.24	
24	Heat Flow (Btu/hr)	-5.398e+008	-5.398e+008	
25	Liq Vol Flow @Std Cond (barrel/day)	---	---	
26	PROPERTIES			
27		Overall	Vapour Phase	
28	Molecular Weight	19.15	19.15	
29	Molar Density (lbmole/ft3)	0.1446	0.1446	
30	Mass Density (lb/ft3)	2.769	2.769	
31	Act. Volume Flow (barrel/day)	4.384e+005	4.384e+005	
32	Mass Enthalpy (Btu/lb)	-1901	-1901	
33	Mass Entropy (Btu/lb-F)	1.892	1.892	
34	Heat Capacity (Btu/lbmole-F)	11.34	11.34	
35	Mass Heat Capacity (Btu/lb-F)	0.5920	0.5920	
36	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
37	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
38	Phase Fraction [Vol. Basis]	1.000	1.000	
39	Phase Fraction [Mass Basis]	1.000	1.000	
40	Partial Pressure of CO2 (psig)	-1.953	---	
41	Cost Based on Flow (Cost/s)	0.0000	0.0000	
42	Act. Gas Flow (ACFM)	1709	1709	
43	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
44	Specific Heat (Btu/lbmole-F)	11.34	11.34	
45	Std. Gas Flow (MMSCFD)	135.0	135.0	
46	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
47	Act. Liq. Flow (USGPM)	---	---	
48	Z Factor	0.8419	0.8419	
49	Watson K	18.38	18.38	
50	User Property	---	---	
51	Partial Pressure of H2S (psig)	-14.70	---	
52	Cp/(Cp - R)	1.212	1.212	
53	Cp/Cv	1.534	1.534	
54	Heat of Vap. (Btu/lbmole)	9432	---	
55	Kinematic Viscosity (cSt)	0.2710	0.2710	
56	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
57	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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59			* Specified by user.	


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6			Property Package: Peng Robinson				
7	Material Stream: A Segunda Regulación-3 (co						
8	PROPERTIES						
9		Overall	Vapour Phase				
10							
11	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---				
12	Liquid Fraction	0.0000	0.0000				
13	Molar Volume (ft ³ /lbmole)	6.918	6.918				
14	Mass Heat of Vap. (Btu/lb)	179.2	---				
15	Phase Fraction [Molar Basis]	1.0000	1.0000				
16	Surface Tension (dyne/cm)	---	---				
17	Thermal Conductivity (Btu/hr-ft-F)	1.950e-002	1.950e-002				
18	Viscosity (cP)	1.202e-002	1.202e-002				
19	Cv (Semi-Ideal) (Btu/lbmole-F)	9.354	9.354				
20	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4884	0.4884				
21	Cv (Btu/lbmole-F)	7.392	7.392				
22	Mass Cv (Btu/lb-F)	0.3859	0.3859				
23	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
24	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
25	Cp/Cv (Ent. Method)	---	---				
26	Reid VP at 37.8 C (psig)	---	---				
27	True VP at 37.8 C (psig)	---	---				
28	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000				
29	Viscosity Index	-27.97	-27.97				
30							
31	COMPOSITION						
32	Overall Phase						
33				Vapour Fraction	1.0000		
34							
35	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
36							
37	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
38	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
39	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
40	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
41	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
42	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
43	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
44	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
45	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
46	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
47	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
48	Total	14825.5068	1.0000	283976.9165	1.0000	58689.4327	1.0000
49							
50	Vapour Phase						
51					Phase Fraction	1.000	
52	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
53							
53	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
54	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
55	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
56	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
57	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
58	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
59	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
60	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
61	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
62	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
63							


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4			Fluid Package: Basis-1				
5			Property Package: Peng Robinson				
6	Material Stream: A Segunda Regulación-3 (co						
7	COMPOSITION						
8	Vapour Phase (continued)						
9	Phase Fraction 1.000						
10							
11	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
12	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
13	Total	14825.5068	1.0000	283976.9165	1.0000	56689.4327	1.0000
14	UNIT OPERATIONS						
15	FEED TO		PRODUCT FROM		LOGICAL CONNECTION		
16	Valve:	PCV-102-3	Valve:	PCV-101-3			
17	UTILITIES						
18	(No utilities reference this stream.)						
19	PROCESS UTILITY						
20							
21	Material Stream: A Medición-3					Fluid Package: Basis-1	
22						Property Package: Peng Robinson	
23	CONDITIONS						
24		Overall	Vapour Phase				
25	Vapour / Phase Fraction	1.0000	1.0000				
26	Temperature: (F)	37.48	37.48				
27	Pressure: (psig)	500.0*	500.0				
28	Molar Flow (MMSCFD)	135.0	135.0				
29	Mass Flow (lb/hr)	2.840e+005	2.840e+005				
30	Std Ideal Liq Vol Flow (barrel/day)	5.869e+004	5.869e+004				
31	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004				
32	Molar Entropy (Btu/lbmole-F)	36.67	36.67				
33	Heat Flow (Btu/hr)	-5.398e+008	-5.398e+008				
34	Liq Vol Flow @Std Cond (barrel/day)	---	---				
35	PROPERTIES						
36		Overall	Vapour Phase				
37	Molecular Weight	19.15	19.15				
38	Molar Density (lbmole/ft3)	0.1114	0.1114				
39	Mass Density (lb/ft3)	2.134	2.134				
40	Act. Volume Flow (barrel/day)	5.689e+005	5.689e+005				
41	Mass Enthalpy (Btu/lb)	-1901	-1901				
42	Mass Entropy (Btu/lb-F)	1.914	1.914				
43	Heat Capacity (Btu/lbmole-F)	10.78	10.78				
44	Mass Heat Capacity (Btu/lb-F)	0.5627	0.5627				
45	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005				
46	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004				
47	Phase Fraction [Vol. Basis]	1.000	1.000				
48	Phase Fraction [Mass Basis]	1.000	1.000				
49	Partial Pressure of CO2 (psig)	-4.829	---				
50	Cost Based on Flow (Cost/s)	0.0000	0.0000				
51	Act. Gas Flow (ACFM)	2218	2218				
52	Avg. Liq. Density (lbmole/ft3)	1.080	1.080				
53	Specific Heat (Btu/lbmole-F)	10.78	10.78				
54	Aspen Technology Inc. Aspen HYSYS Version 7.2 (24.0.0.7263)						
55	Licensed to: LEGENDS Page 12 of 102						
56	* Specified by user.						

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC					
2			Unit Set: Field1					
3			Date/Time: Fri Apr 13 12:13:26 2012					
4								
5	Material Stream: A Medición-3 (continued)					Fluid Package: Basis-1		
6						Property Package: Peng Robinson		
7	PROPERTIES							
8		Overall	Vapour Phase					
9	12	Std. Gas Flow (MMSCFD)	135.0	135.0				
10	13	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68				
11	14	Act. Liq. Flow (USGPM)	---	---				
12	15	Z Factor	0.8660	0.8660				
13	16	Watson K	18.38	18.38				
14	17	User Property	---	---				
15	18	Partial Pressure of H2S (psig)	-14.70	---				
16	19	Cp/(Cp - R)	1.226	1.226				
17	20	Cp/Cv	1.481	1.481				
18	21	Heat of Vap. (Btu/lbmole)	3910	---				
19	22	Kinematic Viscosity (cSt)	0.3340	0.3340				
20	23	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---				
21	24	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---				
22	25	Liquid Fraction	0.0000	0.0000				
23	26	Molar Volume (ft3/lbmole)	8.976	8.976				
24	27	Mass Heat of Vap. (Btu/lb)	204.1	---				
25	28	Phase Fraction [Molar Basis]	1.0000	1.0000				
26	29	Surface Tension (dyne/cm)	---	---				
27	30	Thermal Conductivity (Btu/hr-ft-F)	1.830e-002	1.830e-002				
28	31	Viscosity (cP)	1.142e-002	1.142e-002				
29	32	Cv (Semi-Ideal) (Btu/lbmole-F)	8.792	8.792				
30	33	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4590	0.4590				
31	34	Cv (Btu/lbmole-F)	7.277	7.277				
32	35	Mass Cv (Btu/lb-F)	0.3799	0.3799				
33	36	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
34	37	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
35	38	Cp/Cv (Ent. Method)	---	---				
36	39	Reid VP at 37.8 C (psig)	---	---				
37	40	True VP at 37.8 C (psig)	---	---				
38	41	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000				
39	42	Viscosity Index	-19.16	-19.16				
40	COMPOSITION							
41	Overall Phase							
42						Vapour Fraction 1.0000		
43	47	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION		
44	48				LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION		
45	49	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
46	50	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
47	51	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
48	52	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
49	53	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
50	54	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
51	55	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
52	56	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
53	57	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
54	58	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
55	59	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
56	60	Total	14825.5068	1.0000	283976.9165	1.0000	58689.4327	1.0000
57								
58								
59	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)				Page 13 of 102	
60	Licensed to: LEGENDS						* Specified by user.	

1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2				Unit Set: Field1		
3				Date/Time: Fri Apr 13 12:13:26 2012		
4						
5				Fluid Package: Basis-1		
6	Material Stream: A Medición-3 (continued)			Property Package: Peng Robinson		
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2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6	Material Stream: A ECGSB-2 (continued)		Property Package: Peng Robinson				
7	PROPERTIES						
8		Overall	Vapour Phase				
9							
10							
11	Mass Heat Capacity (Btu/lb-F)	0.5625	0.5625				
12	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005				
13	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004				
14	Phase Fraction [Vol. Basis]	1.000	1.000				
15	Phase Fraction [Mass Basis]	1.000	1.000				
16	Partial Pressure of CO2 (psig)	-4.829	---				
17	Cost Based on Flow (Cost/s)	0.0000	0.0000				
18	Act. Gas Flow (ACFM)	4444	4444				
19	Avg. Liq. Density (lbmole/ft3)	1.080	1.080				
20	Specific Heat (Btu/lbmole-F)	10.77	10.77				
21	Std. Gas Flow (MMSCFD)	270.0	270.0				
22	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68				
23	Act. Liq. Flow (USGPM)	---	---				
24	Z Factor	0.8665	0.8665				
25	Watson K	18.38	18.38				
26	User Property	---	---				
27	Partial Pressure of H2S (psig)	-14.70	---				
28	Cp/(Cp - R)	1.226	1.226				
29	Cp/Cv	1.480	1.480				
30	Heat of Vap. (Btu/lbmole)	3910	---				
31	Kinematic Viscosity (cSt)	0.3349	0.3349				
32	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---				
33	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---				
34	Liquid Fraction	0.0000	0.0000				
35	Molar Volume (ft3/lbmole)	8.993	8.993				
36	Mass Heat of Vap. (Btu/lb)	204.1	---				
37	Phase Fraction [Molar Basis]	1.0000	1.0000				
38	Surface Tension (dyne/cm)	---	---				
39	Thermal Conductivity (Btu/hr-ft-F)	1.832e-002	1.832e-002				
40	Viscosity (cP)	1.143e-002	1.143e-002				
41	Cv (Semi-Ideal) (Btu/lbmole-F)	8.788	8.788				
42	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4588	0.4588				
43	Cv (Btu/lbmole-F)	7.280	7.280				
44	Mass Cv (Btu/lb-F)	0.3801	0.3801				
45	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
46	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
47	Cp/Cv (Ent. Method)	---	---				
48	Reid VP at 37.8 C (psig)	---	---				
49	True VP at 37.8 C (psig)	---	---				
50	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000				
51	Viscosity Index	-19.07	-19.07				
52							
53	COMPOSITION						
54							
55	Overall Phase			Vapour Fraction 1.0000			
56							
57	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
58							
59	Nitrogen	186.8846	0.0056	4869.3365	0.0082	396.4943	0.0034
60	CO2	588.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
61	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7786
62	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 15 of 102	
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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2				Unit Set: Field1			
3				Date/Time: Fri Apr 13 12:13:26 2012			
4							
5				Fluid Package: Basis-1			
6	Material Stream: A ECGSB-2 (continued)			Property Package: Peng Robinson			
7							
8							
9							
10	COMPOSITION						
11	Overall Phase (continued)			Vapour Fraction 1.0000			
12							
13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
14							
15	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
16	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
17	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
18	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
19	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
20	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
21	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
22	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
23							
24	Vapour Phase			Phase Fraction 1.000			
25	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
26							
27	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
28	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
29	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
30	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
31	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
32	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
33	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
34	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
35	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
36	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
37	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
38	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
39							
40	UNIT OPERATIONS						
41	FEED TO	PRODUCT FROM		LOGICAL CONNECTION			
42	PIPESYS Extension:	Cagua-ECGSB-2	Heater:	E-101-2			
43							
44	UTILITIES						
45	Envelope Utility:			Envelope Utility-1			
46							
47	PROCESS UTILITY						
48							
49							
50	Material Stream: A Succión-2			Fluid Package: Basis-1			
51				Property Package: Peng Robinson			
52							
53	CONDITIONS						
54		Overall	Vapour Phase				
55	Vapour / Phase Fraction	1.0000	1.0000				
56	Temperature: (F)	30.88	30.88				
57	Pressure: (psig)	337.5	337.5				
58	Molar Flow (MMSCFD)	270.0	270.0				
59	Mass Flow (lb/hr)	5.680e+005	5.680e+005				
60	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005				
61	Molar Enthalpy (Btu/lbmole)	-3.634e+004	-3.634e+004				
62	Molar Entropy (Btu/lbmole-F)	37.49	37.49				
63	Aspen Technology Inc.			Aspen HYSYS Version 7.2 (24.0.0.7263)	Page 16 of 102		
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: A Succión-2 (continued)		Fluid Package: Basis-1	
7			Property Package: Peng Robinson	
8				
9	CONDITIONS			
10		Overall	Vapour Phase	
11	Heat Flow (Btu/hr)	-1.077e+009	-1.077e+009	
12	Liq Vol Flow@Std Cond (barrel/day)	---	---	
13				
14	PROPERTIES			
15		Overall	Vapour Phase	
16	Molecular Weight	19.15	19.15	
17	Molar Density (lbmole/ft3)	7.404e-002	7.404e-002	
18	Mass Density (lb/ft3)	1.418	1.418	
19	Act. Volume Flow (barrel/day)	1.712e+006	1.712e+006	
20	Mass Enthalpy (Btu/lb)	-1897	-1897	
21	Mass Entropy (Btu/lb-F)	1.957	1.957	
22	Heat Capacity (Btu/lbmole-F)	10.14	10.14	
23	Mass Heat Capacity (Btu/lb-F)	0.5295	0.5295	
24	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
25	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
26	Phase Fraction [Vol. Basis]	1.000	1.000	
27	Phase Fraction [Mass Basis]	1.000	1.000	
28	Partial Pressure of CO2 (psig)	-7.943	---	
29	Cost Based on Flow (Cost/s)	0.0000	0.0000	
30	Act. Gas Flow (ACFM)	6675	6675	
31	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
32	Specific Heat (Btu/lbmole-F)	10.14	10.14	
33	Std. Gas Flow (MMSCFD)	270.0	270.0	
34	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
35	Act. Liq. Flow (USGPM)	---	---	
36	Z Factor	0.9037	0.9037	
37	Watson K	18.38	18.38	
38	User Property	---	---	
39	Partial Pressure of H2S (psig)	-14.70	---	
40	Cp/(Cp - R)	1.243	1.243	
41	Cp/Cv	1.411	1.411	
42	Heat of Vap. (Btu/lbmole)	4429	---	
43	Kinematic Viscosity (cSt)	0.4802	0.4802	
44	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
45	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
46	Liquid Fraction	0.0000	0.0000	
47	Molar Volume (ft3/lbmole)	13.51	13.51	
48	Mass Heat of Vap. (Btu/lb)	231.2	---	
49	Phase Fraction [Molar Basis]	1.0000	1.0000	
50	Surface Tension (dyne/cm)	---	---	
51	Thermal Conductivity (Btu/hr-ft-F)	1.727e-002	1.727e-002	
52	Viscosity (cP)	1.091e-002	1.091e-002	
53	Cv (Semi-Ideal) (Btu/lbmole-F)	8.156	8.156	
54	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4258	0.4258	
55	Cv (Btu/lbmole-F)	7.187	7.187	
56	Mass Cv (Btu/lb-F)	0.3752	0.3752	
57	Cv (Ent. Method) (Btu/lbmole-F)	---	---	
58	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	
59	Cp/Cv (Ent. Method)	---	---	
60	Reid VP at 37.8 C (psig)	---	---	
61	True VP at 37.8 C (psig)	---	---	
62				
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110-HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5					Fluid Package: Basis-1		
6	Material Stream: A Succión-2 (continued)				Property Package: Peng Robinson		
7							
8	PROPERTIES						
9		Overall	Vapour Phase				
10							
11	Liq. Vol. Flow - Sum(Std. Coeff)	0.0000	0.0000				
12	Viscosity Index	-9.352	-9.352				
13	COMPOSITION						
14	Overall Phase						
15				Vapour Fraction	1.0000		
16	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
17	18	19	20	21	22	23	24
18	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
19	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
20	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
21	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
22	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
23	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
24	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
25	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
26	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
27	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
28	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
29	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
30	Vapour Phase						
31				Phase Fraction	1.000		
32	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
33	34	35	36	37	38	39	40
34	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
35	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
36	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
37	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
38	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
39	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
40	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
41	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
42	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
43	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
44	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
45	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
46	UNIT OPERATIONS						
47	FEED TO		PRODUCT FROM		LOGICAL CONNECTION		
48	50	51	52	53	54		
50	Valve:	VLV-A Succión-2	PIPESYS Extension:	Cogua-ECGSB-2			
51	UTILITIES						
52	(No utilities reference this stream)						
53	PROCESS UTILITY						
54							
55							
56							
57							
58							
59							
60							
61							
62							
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 18 of 102		


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: A Segunda Regulación-2-2		Fluid Package: Basis-1	
7			Property Package: Peng Robinson	
8				
9	CONDITIONS			
10		Overall	Vapour Phase	
11				
12	Vapour / Phase Fraction	1.0000	1.0000	
13	Temperature: (F)	49.27	49.27	
14	Pressure: (psig)	650.0 *	650.0	
15	Molar Flow (MSCFD)	135.0	135.0	
16	Mass Flow (lb/hr)	2.840e+005	2.840e+005	
17	Std Ideal Liq Vol Flow (barrel/day)	5.869e+004	5.869e+004	
18	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	
19	Molar Entropy (Btu/lbmole-F)	36.24	36.24	
20	Heat Flow (Btu/hr)	-5.398e+008	-5.398e+008	
21	Liq Vol Flow @Std Cond (barrel/day)	---	---	
22	PROPERTIES			
23		Overall	Vapour Phase	
24				
25	Molecular Weight	19.15	19.15	
26	Molar Density (lbmole/ft3)	0.1446	0.1446	
27	Mass Density (lb/ft3)	2.769	2.769	
28	Act. Volume Flow (barrel/day)	4.384e+005	4.384e+005	
29	Mass Enthalpy (Btu/lb)	-1901	-1901	
30	Mass Entropy (Btu/lb-F)	1.892	1.892	
31	Heat Capacity (Btu/lbmole-F)	11.34	11.34	
32	Mass Heat Capacity (Btu/lb-F)	0.5920	0.5920	
33	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
34	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
35	Phase Fraction [Vol. Basis]	1.000	1.000	
36	Phase Fraction [Mass Basis]	1.000	1.000	
37	Partial Pressure of CO2 (psig)	-1.953	---	
38	Cost Based on Flow (Cost/s)	0.0000	0.0000	
39	Act. Gas Flow (ACFM)	1709	1709	
40	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
41	Specific Heat (Btu/lbmole-F)	11.34	11.34	
42	Std. Gas Flow (MSCFD)	135.0	135.0	
43	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
44	Act. Liq. Flow (USGPM)	---	---	
45	Z Factor	0.8419	0.8419	
46	Watson K	18.38	18.38	
47	User Property	---	---	
48	Partial Pressure of H2S (psig)	-14.70	---	
49	Cp/(Cp - R)	1.212	1.212	
50	Cp/Cv	1.534	1.534	
51	Heat of Vap. (Btu/lbmole)	3432	---	
52	Kinematic Viscosity (cSt)	0.2710	0.2710	
53	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
54	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
55	Liquid Fraction	0.0000	0.0000	
56	Molar Volume (ft3/lbmole)	6.918	6.918	
57	Mass Heat of Vap. (Btu/lb)	179.2	---	
58	Phase Fraction [Molar Basis]	1.0000	1.0000	
59	Surface Tension (dyne/cm)	---	---	
60	Thermal Conductivity (Btu/hr-ft-F)	1.950e-002	1.950e-002	
61	Viscosity (cP)	1.202e-002	1.202e-002	
62	Cv (Semi-Ideal) (Btu/lbmole-F)	9.354	9.354	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110-HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6			Property Package: Peng Robinson				
7	Material Stream: A Segunda Regulación-2-2 (c						
8							
9	PROPERTIES						
10		Overall	Vapour Phase				
11							
12	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4884	0.4884				
13	Cv (Btu/lbmole-F)	7.392	7.392				
14	Mass Cv (Btu/lb-F)	0.3859	0.3859				
15	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
16	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
17	Cp/Cv (Ent. Method)	---	---				
18	Reid VP at 37.8 C (psig)	---	---				
19	True VP at 37.8 C (psig)	---	---				
20	Liq. Vol. Flow - Sum(Std. Cond.) (barrel/day)	0.0000	0.0000				
21	Viscosity Index	-27.97	-27.97				
22	COMPOSITION						
23							
24	Overall Phase						
25				Vapour Fraction	1.0000		
26	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
27							
28	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
29	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
30	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
31	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
32	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
33	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
34	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
35	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
36	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
37	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
38	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
39	Total	14825.5068	1.0000	283976.9165	1.0000	56869.4327	1.0000
40	Vapour Phase						
41				Phase Fraction	1.000		
42	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
43							
44	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
45	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
46	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
47	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
48	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
49	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
50	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
51	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
52	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
53	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
54	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
55	Total	14825.5068	1.0000	283976.9165	1.0000	56869.4327	1.0000
56	UNIT OPERATIONS						
57							
58	FEED TO	PRODUCT FROM		LOGICAL CONNECTION			
59	Valve: PCV-102-2-2	Valve: PCV-101-2-2					
60							
61	UTILITIES						
62	(No utilities reference this stream)						
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 20 of 102		

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: A Segunda Regulación-2-2 (c		Fluid Package: Basis-1	
7			Property Package: Peng Robinson	
8	PROCESS UTILITY			
9				
10	Material Stream: A Medición-2-2		Fluid Package: Basis-1	
11			Property Package: Peng Robinson	
12	CONDITIONS			
13		Overall	Vapour Phase	
14				
15	Vapour / Phase Fraction	1.0000	1.0000	
16	Temperature (F)	37.48	37.48	
17	Pressure (psig)	500.0 *	500.0	
18	Molar Flow (MMSCFD)	135.0	135.0	
19	Mass Flow (lb/hr)	2.840e+005	2.840e+005	
20	Std Ideal Liq Vol Flow (barrel/day)	5.889e+004	5.889e+004	
21	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	
22	Molar Entropy (Btu/lbmole-F)	36.67	36.67	
23	Heat Flow (Btu/hr)	-5.398e+008	-5.398e+008	
24	Liq Vol Flow @Std Cond (barrel/day)	---	---	
25	PROPERTIES			
26		Overall	Vapour Phase	
27				
28	Molecular Weight	19.15	19.15	
29	Molar Density (lbmole/ft3)	0.1114	0.1114	
30	Mass Density (lb/ft3)	2.134	2.134	
31	Act. Volume Flow (barrel/day)	5.889e+005	5.889e+005	
32	Mass Enthalpy (Btu/lb)	-1901	-1901	
33	Mass Entropy (Btu/lb-F)	1.914	1.914	
34	Heat Capacity (Btu/lbmole-F)	10.78	10.78	
35	Mass Heat Capacity (Btu/lb-F)	0.5627	0.5627	
36	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
37	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
38	Phase Fraction [Vol. Basis]	1.000	1.000	
39	Phase Fraction [Mass Basis]	1.000	1.000	
40	Partial Pressure of CO2 (psig)	-4.829	---	
41	Cost Based on Flow (Cost/s)	0.0000	0.0000	
42	Act. Gas Flow (ACFM)	2218	2218	
43	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
44	Specific Heat (Btu/lbmole-F)	10.78	10.78	
45	Std. Gas Flow (MMSCFD)	135.0	135.0	
46	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
47	Act. Liq. Flow (USGPM)	---	---	
48	Z Factor	0.8660	0.8660	
49	Watson K	18.38	18.38	
50	User Property	---	---	
51	Partial Pressure of H2S (psig)	-14.70	---	
52	Cp/(Cp - R)	1.226	1.226	
53	Cp/Cv	1.481	1.481	
54	Heat of Vap. (Btu/lbmole)	3910	---	
55	Kinematic Viscosity (cSt)	0.3340	0.3340	
56	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
57	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
58	Liquid Fraction	0.0000	0.0000	
59	Molar Volume (ft3/lbmole)	8.976	8.976	
60	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
61	Licensed to: LEGENDS		Page 21 of 102	
62			* Specified by user.	


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC					
2			Unit Set: Field1					
3			Date/Time: Fri Apr 13 12:13:26 2012					
4								
5			Fluid Package: Basis-1					
6	Material Stream: A Medición-2-2 (continued)		Property Package: Peng Robinson					
7	PROPERTIES							
8		Overall	Vapour Phase					
9	12	Mass Heat of Vap. (Btu/lb)	204.1	---				
10	13	Phase Fraction [Molar Basis]	1.0000	1.0000				
11	14	Surface Tension (dyne/cm)	---	---				
12	15	Thermal Conductivity (Btu/hr-ft-F)	1.830e-002	1.830e-002				
13	16	Viscosity (cP)	1.142e-002	1.142e-002				
14	17	Cv (Semi-Ideal) (Btu/lbmole-F)	8.792	8.792				
15	18	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4590	0.4590				
16	19	Cv (Btu/lbmole-F)	7.277	7.277				
17	20	Mass Cv (Btu/lb-F)	0.3799	0.3799				
18	21	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
19	22	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
20	23	Cp/Cv (Ent. Method)	---	---				
21	24	Reid VP at 37.8 C (psig)	---	---				
22	25	True VP at 37.8 C (psig)	---	---				
23	26	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000				
24	27	Viscosity Index	-19.16	-19.16				
25	COMPOSITION							
26	Overall Phase							
27					Vapour Fraction	1.0000		
28	32	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
29	33	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
30	34	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
31	35	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
32	36	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
33	37	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
34	38	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
35	39	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
36	40	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
37	41	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
38	42	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
39	43	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
40	44	Total	14825.5068	1.0000	283976.9165	1.0000	58689.4327	1.0000
41	Vapour Phase					Phase Fraction	1.0000	
42	48	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
43	49	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
44	50	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
45	51	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
46	52	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
47	53	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
48	54	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
49	55	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
50	56	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
51	57	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
52	58	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
53	59	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
54	60	Total	14825.5068	1.0000	283976.9165	1.0000	58689.4327	1.0000
55	Aspen Technology Inc. Aspen HYSYS Version 7.2 (24.0.0.7263) Page 22 of 102							
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5					
6	Material Stream: A Medición-2-2 (continued)			Fluid Package: Basis-1	
7				Property Package: Peng Robinson	
8					
9	UNIT OPERATIONS				
10	FEED TO		PRODUCT FROM		LOGICAL CONNECTION
11	Mixer:	MIX-101-2	Valve:	PCV-102-2-2	
12					
13	UTILITIES				
14	(No utilities reference this stream)				
15					
16	PROCESS UTILITY				
17					
18					
19	Material Stream: A Brazo 1-2			Fluid Package: Basis-1	
20				Property Package: Peng Robinson	
21					
22	CONDITIONS				
23					
24		Overall	Vapour Phase	Aqueous Phase	
25	Vapour / Phase Fraction	1.0000	1.0000	0.0000	
26	Temperature: (F)	40.32	40.32	40.32	
27	Pressure: (psig)	535.1	535.1	535.1	
28	Molar Flow (MMSCFD)	135.0	135.0	0.0000	
29	Mass Flow (lb/hr)	2.840e+005	2.840e+005	0.0000	
30	Std Ideal Liq Vol Flow (barrel/day)	5.869e+004	5.869e+004	0.0000	
31	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	-1.238e+005	
32	Molar Entropy (Btu/lbmole-F)	36.56	36.56	11.53	
33	Heat Flow (Btu/hr)	-5.398e+008	-5.398e+008	0.0000	
34	Liq Vol Flow @Std Cond (barrel/day)	---	---	0.0000	
35	PROPERTIES				
36					
37		Overall	Vapour Phase	Aqueous Phase	
38	Molecular Weight	19.15	19.15	18.04	
39	Molar Density (lbmole/ft3)	0.1192	0.1192	2.980	
40	Mass Density (lb/ft3)	2.282	2.282	53.76	
41	Act. Volume Flow (barrel/day)	5.318e+005	5.318e+005	0.0000	
42	Mass Enthalpy (Btu/lb)	-1901	-1901	-6860	
43	Mass Entropy (Btu/lb-F)	1.908	1.908	0.6389	
44	Heat Capacity (Btu/lbmole-F)	10.91	10.91	18.58	
45	Mass Heat Capacity (Btu/lb-F)	0.5696	0.5696	1.030	
46	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	2.903e-002	
47	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	1.609e-003	
48	Phase Fraction [Vol. Basis]	1.000	1.000	---	
49	Phase Fraction [Mass Basis]	1.000	1.000	0.0000	
50	Partial Pressure of CO2 (psig)	-4.156	---	---	
51	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
52	Act. Gas Flow (ACFM)	2074	2074	---	
53	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	3.452	
54	Specific Heat (Btu/lbmole-F)	10.91	10.91	18.58	
55	Std. Gas Flow (MMSCFD)	135.0	135.0	0.0000	
56	Std. Ideal Liq. Mass Density (lb/ft3)	20.88	20.88	62.27	
57	Act. Liq. Flow (USGPM)	0.0000	---	0.0000	
58	Z Factor	---	0.8599	3.438e-002	
59	Watson K	18.38	18.38	8.512	
60	User Property	---	---	---	
61	Partial Pressure of H2S (psig)	-14.70	---	---	
62	Cp/(Cp - R)	1.222	1.222	1.120	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 23 of 102

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6	Material Stream: A Brazo 1-2 (continued)		Property Package: Peng Robinson				
7	PROPERTIES						
8		Overall	Vapour Phase	Aqueous Phase			
9							
10							
11	Cp/Cv	1.494	1.494	1.133			
12	Heat of Vap. (Btu/lbmole)	3799	---	---			
13	Kinematic Viscosity (cSt)	0.3161	0.3161	1.441			
14	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	63.38			
15	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	0.0000			
16	Liquid Fraction	0.0000	0.0000	1.000			
17	Molar Volume (ft3/lbmole)	8.392	8.392	0.3356			
18	Mass Heat of Vap. (Btu/lb)	198.3	---	---			
19	Phase Fraction [Molar Basis]	1.0000	1.0000	0.0000			
20	Surface Tension (dyne/cm)	---	---	75.53			
21	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	1.858e-002	0.3344			
22	Viscosity (cP)	1.156e-002	1.156e-002	1.241			
23	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	8.925	16.60			
24	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.4660	0.9199			
25	Cv (Btu/lbmole-F)	7.304	7.304	16.41			
26	Mass Cv (Btu/lb-F)	0.3813	0.3813	0.9094			
27	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---			
28	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---			
29	Cp/Cv (Ent. Method)	---	---	---			
30	Reid VP at 37.8 C (psig)	---	---	---			
31	True VP at 37.8 C (psig)	---	---	42.65			
32	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	0.0000			
33	Viscosity Index	-21.13	-21.13	7.855			
34							
35	COMPOSITION						
36	Overall Phase						
37				Vapour Fraction	1.0000		
38							
39	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
40							
41	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
42	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
43	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
44	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
45	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
46	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
47	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
48	i-Pentane	10.4358	0.0007	752.9563	0.0027	82.6974	0.0014
49	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
50	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
51	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
52	Total	14825.5068	1.0000	283976.9165	1.0000	56689.4327	1.0000
53	Vapour Phase						
54				Phase Fraction	1.000		
55	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
56							
57	Nitrogen	83.3423	0.0056	2334.6683	0.0082	198.2471	0.0034
58	CO2	284.2226	0.0192	12508.5494	0.0440	1037.7553	0.0177
59	Methane	12470.7719	0.8412	200067.3476	0.7045	45756.3505	0.7796
60	Ethane	1418.9720	0.0957	42668.3467	0.1503	8214.1185	0.1400
61	Propane	481.9586	0.0325	21252.9302	0.0748	2872.1362	0.0489
62	i-Butane	65.0863	0.0044	3783.0757	0.0133	460.9494	0.0079
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 24 of 102		

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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110 HSC				
2				Unit Set: Field1				
3				Date/Time: Fri Apr 13 12:13:26 2012				
4								
5	Material Stream: A Brazo 1-2 (continued)			Fluid Package: Basis-1				
6				Property Package: Peng Robinson				
7	COMPOSITION							
8	Vapour Phase (continued)							
9						Phase Fraction	1.000	
10								
11	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
12	13	n-Butane	5.8342	0.0004	339.1096	0.0012	39.8129	0.0007
13	14	i-Pentane	10.4358	0.0007	752.9583	0.0027	82.6974	0.0014
14	15	n-Pentane	1.6536	0.0001	119.3113	0.0004	12.9732	0.0002
15	16	n-Hexane	1.3562	0.0001	116.8756	0.0004	12.0767	0.0002
16	17	H2O	1.8732	0.0001	33.7459	0.0001	2.3153	0.0000
17	18	Total	14825.5068	1.0000	283976.9165	1.0000	58689.4327	1.0000
18								
19	Aqueous Phase						Phase Fraction	0.0000
20								
21	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
22	23	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	
23	24	CO2	0.0000	0.0010	0.0000	0.0024	0.0029	
24	25	Methane	0.0000	0.0000	0.0000	0.0000	0.0000	
25	26	Ethane	0.0000	0.0000	0.0000	0.0000	0.0000	
26	27	Propane	0.0000	0.0000	0.0000	0.0000	0.0000	
27	28	i-Butane	0.0000	0.0000	0.0000	0.0000	0.0000	
28	29	n-Butane	0.0000	0.0000	0.0000	0.0000	0.0000	
29	30	i-Pentane	0.0000	0.0000	0.0000	0.0000	0.0000	
30	31	n-Pentane	0.0000	0.0000	0.0000	0.0000	0.0000	
31	32	n-Hexane	0.0000	0.0000	0.0000	0.0000	0.0000	
32	33	H2O	0.0000	0.9990	0.0000	0.9975	0.9970	
33	34	Total	0.0000	1.0000	0.0000	1.0000	1.0000	
34								
35	UNIT OPERATIONS							
36	FEED TO		PRODUCT FROM		LOGICAL CONNECTION			
37	38	Valve:	PCV-101-3	Tee:	TEE-100-2			
38								
39	UTILITIES							
40	(No utilities reference this stream)							
41								
42	PROCESS UTILITY							
43								
44	Material Stream: A Brazo 2-2			Fluid Package: Basis-1				
45				Property Package: Peng Robinson				
46	CONDITIONS							
47								
48		Overall	Vapour Phase	Aqueous Phase				
49	53	Vapour / Phase Fraction	1.0000	1.0000	0.0000			
50	54	Temperature: (F)	40.32	40.32	40.32			
51	55	Pressure: (psig)	535.1	535.1	535.1			
52	56	Molar Flow (MMSCFD)	135.0	135.0	0.0000			
53	57	Mass Flow (lb/hr)	2.840e+005	2.840e+005	0.0000			
54	58	Std Ideal Liq Vol Flow (barrel/day)	5.869e+004	5.869e+004	0.0000			
55	59	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	-1.238e+005			
56	60	Molar Entropy (Btu/lbmole-F)	36.56	36.56	11.53			
57	61	Heat Flow (Btu/hr)	-5.398e+008	-5.398e+008	0.0000			
58	62	Liq Vol Flow @Std Cond (barrel/day)	---	---	0.0000			
59	Aspen Technology Inc.						Page 25 of 102	
60	Aspen HYSYS Version 7.2 (24.0.0.7263)						* Specified by user.	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5			Fluid Package: Basis-1	
6	Material Stream: A Brazo 2-2 (continued)		Property Package: Peng Robinson	
7				
8	PROPERTIES			
9				
10				
11		Overall	Vapour Phase	Aqueous Phase
12	Molecular Weight	19.15	19.15	18.04
13	Molar Density (lbmole/ft3)	0.1192	0.1192	2.960
14	Mass Density (lb/ft3)	2.282	2.282	53.76
15	Act. Volume Flow (barrel/day)	5.318e+005	5.318e+005	0.0000
16	Mass Enthalpy (Btu/lb)	-1901	-1901	-6860
17	Mass Entropy (Btu/lb-F)	1.908	1.908	0.6389
18	Heat Capacity (Btu/lbmole-F)	10.91	10.91	18.58
19	Mass Heat Capacity (Btu/lb-F)	0.5696	0.5696	1.030
20	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	2.903e-002
21	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	1.609e-003
22	Phase Fraction [Vol. Basis]	1.000	1.000	---
23	Phase Fraction [Mass Basis]	1.000	1.000	0.0000
24	Partial Pressure of CO2 (psig)	-4.156	---	---
25	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000
26	Act. Gas Flow (ACFM)	2074	2074	---
27	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	3.452
28	Specific Heat (Btu/lbmole-F)	10.91	10.91	18.58
29	Std. Gas Flow (MMSCFD)	135.0	135.0	0.0000
30	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	62.27
31	Act. Liq. Flow (USGPM)	0.0000	---	0.0000
32	Z Factor	---	0.8599	3.438e-002
33	Watson K	18.38	18.38	8.512
34	User Property	---	---	---
35	Partial Pressure of H2S (psig)	-14.70	---	---
36	Cp/(Cp - R)	1.222	1.222	1.120
37	Cp/Cv	1.494	1.494	1.133
38	Heat of Vap. (Btu/lbmole)	3799	---	---
39	Kinematic Viscosity (cSt)	0.3161	0.3161	1.441
40	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	63.38
41	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	0.0000
42	Liquid Fraction	0.0000	0.0000	1.000
43	Molar Volume (ft3/lbmole)	8.392	8.392	0.3356
44	Mass Heat of Vap. (Btu/lb)	198.3	---	---
45	Phase Fraction [Molar Basis]	1.0000	1.0000	0.0000
46	Surface Tension (dyne/cm)	---	---	75.53
47	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	1.858e-002	0.3344
48	Viscosity (cP)	1.156e-002	1.156e-002	1.241
49	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	8.925	16.60
50	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.4660	0.9199
51	Cv (Btu/lbmole-F)	7.304	7.304	16.41
52	Mass Cv (Btu/lb-F)	0.3813	0.3813	0.9094
53	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---
54	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---
55	Cp/Cv (Ent. Method)	---	---	---
56	Reid VP at 37.8 C (psig)	---	---	---
57	True VP at 37.8 C (psig)	---	---	42.65
58	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	0.0000
59	Viscosity Index	-21.13	-21.13	7.855
60				
61				
62				
63	Aspen Technology Inc.	Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 26 of 102


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5				
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7			Property Package: Peng Robinson	
8	UTILITIES			
9	(No utilities reference this stream)			
10	PROCESS UTILITY			
11				
12	Material Stream: A Calentador-2		Fluid Package: Basis-1	
13			Property Package: Peng Robinson	
14	CONDITIONS			
15		Overall	Vapour Phase	
16	Vapour / Phase Fraction	1.0000	1.0000	
17	Temperature (F)	37.48	37.48	
18	Pressure (psig)	500.0	500.0	
19	Molar Flow (MMSCFD)	270.0	270.0	
20	Mass Flow (lb/hr)	5.680e+005	5.680e+005	
21	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005	
22	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	
23	Molar Entropy (Btu/lbmole-F)	36.67	36.67	
24	Heat Flow (Btu/hr)	-1.080e+009	-1.080e+009	
25	Liq Vol Flow @Std Cond (barrel/day)	---	---	
26	PROPERTIES			
27		Overall	Vapour Phase	
28	Molecular Weight	19.15	19.15	
29	Molar Density (lbmole/ft3)	0.1114	0.1114	
30	Mass Density (lb/ft3)	2.134	2.134	
31	Act. Volume Flow (barrel/day)	1.138e+006	1.138e+006	
32	Mass Enthalpy (Btu/lb)	-1901	-1901	
33	Mass Entropy (Btu/lb-F)	1.914	1.914	
34	Heat Capacity (Btu/lbmole-F)	10.78	10.78	
35	Mass Heat Capacity (Btu/lb-F)	0.5627	0.5627	
36	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
37	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
38	Phase Fraction [Vol. Basis]	1.000	1.000	
39	Phase Fraction [Mass Basis]	1.000	1.000	
40	Partial Pressure of CO2 (psig)	-4.829	---	
41	Cost Based on Flow (Cost/s)	0.0000	0.0000	
42	Act. Gas Flow (ACFM)	4436	4436	
43	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
44	Specific Heat (Btu/lbmole-F)	10.78	10.78	
45	Std. Gas Flow (MMSCFD)	270.0	270.0	
46	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
47	Act. Liq. Flow (USGPM)	---	---	
48	Z Factor	0.8660	0.8660	
49	Watson K	18.38	18.38	
50	User Property	---	---	
51	Partial Pressure of H2S (psig)	-14.70	---	
52	Cp/(Cp - R)	1.226	1.226	
53	Cp/Cv	1.481	1.481	
54	Heat of Vap. (Btu/lbmole)	3910	---	
55	Kinematic Viscosity (cSt)	0.3340	0.3340	
56	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
57	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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59			* Specified by user.	


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6	Material Stream: A Calentador-2 (continued)		Property Package: Peng Robinson				
7	PROPERTIES						
8		Overall	Vapour Phase				
9	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---				
10	Liquid Fraction	0.0000	0.0000				
11	Molar Volume (ft ³ /lbmole)	8.976	8.976				
12	Mass Heat of Vap. (Btu/lb)	204.1	---				
13	Phase Fraction [Molar Basis]	1.0000	1.0000				
14	Surface Tension (dyne/cm)	---	---				
15	Thermal Conductivity (Btu/hr-ft-F)	1.830e-002	1.830e-002				
16	Viscosity (cP)	1.142e-002	1.142e-002				
17	Cv (Semi-Ideal) (Btu/lbmole-F)	8.792	8.792				
18	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4590	0.4590				
19	Cv (Btu/lbmole-F)	7.277	7.277				
20	Mass Cv (Btu/lb-F)	0.3799	0.3799				
21	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
22	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
23	Cp/Cv (Ent. Method)	---	---				
24	Reid VP at 37.8 C (psig)	---	---				
25	True VP at 37.8 C (psig)	---	---				
26	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000				
27	Viscosity Index	-19.16	-19.16				
28	COMPOSITION						
29	Overall Phase						
30				Vapour Fraction	1.0000		
31	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
32	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
33	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
34	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
35	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
36	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
37	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
38	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
39	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
40	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
41	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
42	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
43	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
44	Vapour Phase						
45				Phase Fraction	1.0000		
46	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
47	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
48	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
49	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
50	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
51	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
52	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
53	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
54	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
55	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
56	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5			Fluid Package: Basis-1			
6	Material Stream: A Calentador-2 (continued)		Property Package: Peng Robinson			
7	COMPOSITION					
8	Vapour Phase (continued)					Phase Fraction 1.000
9						
10						
11	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)
12						LIQUID VOLUME FRACTION
13	H2O	3.7464	0.0001	67.4918	0.0001	4.6307
14	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653
15						
16	UNIT OPERATIONS					
17	FEED TO		PRODUCT FROM		LOGICAL CONNECTION	
18	Heater:	E-101-2	Mixer:	MIX-101-2		
19						
20	UTILITIES					
21	(No utilities reference this stream)					
22						
23	PROCESS UTILITY					
24						
25			Fluid Package: Basis-1			
26	Material Stream: A Succión-1-2		Property Package: Peng Robinson			
27						
28	CONDITIONS					
29						
30		Overall	Vapour Phase			
31	Vapour / Phase Fraction	1.0000	1.0000			
32	Temperature: (F)	30.45	30.45			
33	Pressure: (psig)	332.5	332.5			
34	Molar Flow (MMSCFD)	270.0	270.0			
35	Mass Flow (lb/hr)	5.680e+005	5.680e+005			
36	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005			
37	Molar Enthalpy (Btu/lbmole)	-3.634e+004	-3.634e+004			
38	Molar Entropy (Btu/lbmole-F)	37.51	37.51			
39	Heat Flow (Btu/hr)	-1.077e+009	-1.077e+009			
40	Liq Vol Flow @Std Cond (barrel/day)	---	---			
41						
42	PROPERTIES					
43						
44		Overall	Vapour Phase			
45	Molecular Weight	19.15	19.15			
46	Molar Density (lbmole/ft3)	7.296e-002	7.296e-002			
47	Mass Density (lb/ft3)	1.398	1.398			
48	Act. Volume Flow (barrel/day)	1.737e+006	1.737e+006			
49	Mass Enthalpy (Btu/lb)	-1897	-1897			
50	Mass Entropy (Btu/lb-F)	1.958	1.958			
51	Heat Capacity (Btu/lbmole-F)	10.12	10.12			
52	Mass Heat Capacity (Btu/lb-F)	0.5285	0.5285			
53	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005			
54	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004			
55	Phase Fraction [Vol. Basis]	1.000	1.000			
56	Phase Fraction [Mass Basis]	1.000	1.000			
57	Partial Pressure of CO2 (psig)	-8.039	---			
58	Cost Based on Flow (Cost/s)	0.0000	0.0000			
59	Act. Gas Flow (ACFM)	6773	6773			
60	Avg. Liq. Density (lbmole/ft3)	1.080	1.080			
61	Specific Heat (Btu/lbmole-F)	10.12	10.12			
62						
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5			Fluid Package: Basis-1	
6			Property Package: Peng Robinson	
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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2				Unit Set: Field1			
3				Date/Time: Fri Apr 13 12:13:26 2012			
4							
5				Fluid Package: Basis-1			
6	Material Stream: A Succión-1-2 (continued)			Property Package: Peng Robinson			
7							
8							
9	COMPOSITION						
10	Vapour Phase						
11					Phase Fraction 1.000		
12							
13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
14							
15	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
16	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
17	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
18	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
19	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
20	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
21	n-Butane	11.8685	0.0004	678.2193	0.0012	79.6258	0.0007
22	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
23	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
24	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
25	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
26	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
27	UNIT OPERATIONS						
28							
29	FEED TO		PRODUCT FROM		LOGICAL CONNECTION		
30	Compressor:	MOFICO-01	Valve:	VLV-A Succión-2			
31	UTILITIES						
32							
33	Envelope Utility: Envelope Utility-2						
34	PROCESS UTILITY						
35							
36							
37	Material Stream: Puente Guillermo-2			Fluid Package: Basis-1			
38				Property Package: Peng Robinson			
39							
40	CONDITIONS						
41							
42		Overall	Vapour Phase				
43	Vapour / Phase Fraction	1.0000	1.0000				
44	Temperature: (F)	110.0 *	110.0				
45	Pressure: (psig)	1100 *	1100				
46	Molar Flow (MMSCFD)	270.0 *	270.0				
47	Mass Flow (lb/hr)	5.680e+005	5.680e+005				
48	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005				
49	Molar Enthalpy (Btu/lbmole-F)	-3.603e+004	-3.603e+004				
50	Molar Entropy (Btu/lbmole-F)	36.09	36.09				
51	Heat Flow (Btu/hr)	-1.068e+009	-1.068e+009				
52	Liq Vol Flow @Std Cond (barrel/day)	---	---				
53	PROPERTIES						
54							
55		Overall	Vapour Phase				
56	Molecular Weight	19.15	19.15				
57	Molar Density (lbmole/ft3)	0.2179	0.2179				
58	Mass Density (lb/ft3)	4.174	4.174				
59	Act. Volume Flow (barrel/day)	5.816e+005	5.816e+005				
60	Mass Enthalpy (Btu/lb)	-1881	-1881				
61	Mass Entropy (Btu/lb-F)	1.884	1.884				
62	Heat Capacity (Btu/lbmole-F)	12.28	12.28				
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5			Fluid Package: Basis-1				
6	Material Stream: Puente Guillermo-2 (continuo)		Property Package: Peng Robinson				
7	PROPERTIES						
8		Overall	Vapour Phase				
9							
10							
11	Mass Heat Capacity (Btu/lb-F)	0.6409	0.6409				
12	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005				
13	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004				
14	Phase Fraction [Vol. Basis]	1.000	1.000				
15	Phase Fraction [Mass Basis]	1.000	1.000				
16	Partial Pressure of CO2 (psig)	8.674	---				
17	Cost Based on Flow (Cost/s)	0.0000	0.0000				
18	Act. Gas Flow (ACFM)	2268	2268				
19	Avg. Liq. Density (lbmole/ft3)	1.080	1.080				
20	Specific Heat (Btu/lbmole-F)	12.28	12.28				
21	Std. Gas Flow (MMSCFD)	270.0	270.0				
22	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68				
23	Act. Liq. Flow (USGPM)	---	---				
24	Z Factor	0.8367	0.8367				
25	Watson K	18.38	18.38				
26	User Property	---	---				
27	Partial Pressure of H2S (psig)	-14.70	---				
28	Cp/(Cp - R)	1.193	1.193				
29	Cp/Cv	1.558	1.558				
30	Heat of Vap. (Btu/lbmole)	2227	---				
31	Kinematic Viscosity (cSt)	0.2116	0.2116				
32	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---				
33	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---				
34	Liquid Fraction	0.0000	0.0000				
35	Molar Volume (ft3/lbmole)	4.589	4.589				
36	Mass Heat of Vap. (Btu/lb)	116.3	---				
37	Phase Fraction [Molar Basis]	1.0000	1.0000				
38	Surface Tension (dyne/cm)	---	---				
39	Thermal Conductivity (Btu/hr-ft-F)	2.382e-002	2.382e-002				
40	Viscosity (cP)	1.415e-002	1.415e-002				
41	Cv (Semi-Ideal) (Btu/lbmole-F)	10.29	10.29				
42	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.5372	0.5372				
43	Cv (Btu/lbmole-F)	7.879	7.879				
44	Mass Cv (Btu/lb-F)	0.4113	0.4113				
45	Cv (Ent. Method) (Btu/lbmole-F)	---	---				
46	Mass Cv (Ent. Method) (Btu/lb-F)	---	---				
47	Cp/Cv (Ent. Method)	---	---				
48	Reid VP at 37.8 C (psig)	---	---				
49	True VP at 37.8 C (psig)	---	---				
50	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000				
51	Viscosity Index	-53.90	-53.90				
52							
53	COMPOSITION						
54							
55	Overall Phase			Vapour Fraction 1.0000			
56							
57	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
58							
59	Nitrogen	186.8846 *	0.0056 *	4869.3365 *	0.0082 *	396.4943 *	0.0034 *
60	CO2	568.4451 *	0.0192 *	25017.0989 *	0.0440 *	2075.5106 *	0.0177 *
61	Methane	24941.5438 *	0.8412 *	400134.6951 *	0.7045 *	91512.7011 *	0.7798 *
62	Ethane	2837.9440 *	0.0957 *	85336.6934 *	0.1503 *	16428.2370 *	0.1400 *
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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2				Unit Set: Field1		
3				Date/Time: Fri Apr 13 12:13:26 2012		
4						
5				Fluid Package: Basis-1		
6	Material Stream: Puente Guillermo-2 (continuo)			Property Package: Peng Robinson		
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: A Cooler (continued)		Fluid Package: Basis-1	
7			Property Package: Peng Robinson	
8				
9	CONDITIONS			
10		Overall	Vapour Phase	
11	Heat Flow (Btu/hr)	-1.063e+009	-1.063e+009	
12	Liq Vol Flow@Std Cond (barrel/day)	---	---	
13				
14	PROPERTIES			
15		Overall	Vapour Phase	
16	Molecular Weight	19.15	19.15	
17	Molar Density (lbmole/ft3)	9.650e-002	9.650e-002	
18	Mass Density (lb/ft3)	1.848	1.848	
19	Act. Volume Flow (barrel/day)	1.313e+006	1.313e+006	
20	Mass Enthalpy (Btu/lb)	-1872	-1872	
21	Mass Entropy (Btu/lb-F)	1.970	1.970	
22	Heat Capacity (Btu/lbmole-F)	10.65	10.65	
23	Mass Heat Capacity (Btu/lb-F)	0.5560	0.5560	
24	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
25	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
26	Phase Fraction [Vol. Basis]	1.000	1.000	
27	Phase Fraction [Mass Basis]	1.000	1.000	
28	Partial Pressure of CO2 (psig)	-4.829	---	
29	Cost Based on Flow (Cost/s)	0.0000	0.0000	
30	Act. Gas Flow (ACFM)	5121	5121	
31	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
32	Specific Heat (Btu/lbmole-F)	10.65	10.65	
33	Std. Gas Flow (MMSCFD)	270.0	270.0	
34	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
35	Act. Liq. Flow (USGPM)	---	---	
36	Z Factor	0.9050	0.9050	
37	Watson K	18.38	18.38	
38	User Property	---	---	
39	Partial Pressure of H2S (psig)	-14.70	---	
40	Cp/(Cp - R)	1.229	1.229	
41	Cp/Cv	1.402	1.402	
42	Heat of Vap. (Btu/lbmole)	3910	---	
43	Kinematic Viscosity (cSt)	0.4146	0.4146	
44	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
45	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
46	Liquid Fraction	0.0000	0.0000	
47	Molar Volume (ft3/lbmole)	10.36	10.36	
48	Mass Heat of Vap. (Btu/lb)	204.1	---	
49	Phase Fraction [Molar Basis]	1.0000	1.0000	
50	Surface Tension (dyne/cm)	---	---	
51	Thermal Conductivity (Btu/hr-ft-F)	2.030e-002	2.030e-002	
52	Viscosity (cP)	1.228e-002	1.228e-002	
53	Cv (Semi-Ideal) (Btu/lbmole-F)	8.663	8.663	
54	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4523	0.4523	
55	Cv (Btu/lbmole-F)	7.594	7.594	
56	Mass Cv (Btu/lb-F)	0.3965	0.3965	
57	Cv (Ent. Method) (Btu/lbmole-F)	---	---	
58	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	
59	Cp/Cv (Ent. Method)	---	---	
60	Reid VP at 37.8 C (psig)	---	---	
61	True VP at 37.8 C (psig)	---	---	
62				
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110-HSC				
2			Unit Set: Field1				
3			Date/Time: Fri Apr 13 12:13:26 2012				
4							
5					Fluid Package: Basis-1		
6	Material Stream: A Cooler (continued)				Property Package: Peng Robinson		
7	PROPERTIES						
8		Overall	Vapour Phase				
9	Liq. Vol. Flow - Sum(Std. Coeff)	0.0000	0.0000				
10	Viscosity Index	-12.83	-12.83				
11	COMPOSITION						
12	Overall Phase						
13					Vapour Fraction	1.0000	
14	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
15	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
16	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
17	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
18	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
19	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
20	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
21	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
22	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
23	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
24	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
25	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
26	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
27	Vapour Phase						
28					Phase Fraction	1.000	
29	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
30	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
31	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
32	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
33	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
34	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
35	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
36	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
37	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
38	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
39	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
40	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
41	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
42	UNIT OPERATIONS						
43		FEED TO		PRODUCT FROM		LOGICAL CONNECTION	
44	Cooler:	E-102	Compressor:	MOPICO-01			
45	UTILITIES						
46	(No utilities reference this stream)						
47	PROCESS UTILITY						
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: A Descarga		Fluid Package: Basis-1	
7			Property Package: Peng Robinson	
8				
9	CONDITIONS			
10		Overall	Vapour Phase	
11				
12	Vapour / Phase Fraction	1.0000	1.0000	
13	Temperature: (F)	120.0 *	120.0	
14	Pressure: (psig)	497.0	497.0	
15	Molar Flow (MMSCFD)	270.0	270.0	
16	Mass Flow (lb/hr)	5.680e+005	5.680e+005	
17	Std Ideal Liq Vol Flow (barrel/day)	1.174e+005	1.174e+005	
18	Molar Enthalpy (Btu/lbmole)	-3.553e+004	-3.553e+004	
19	Molar Entropy (Btu/lbmole-F)	38.32	38.32	
20	Heat Flow (Btu/hr)	-1.054e+009	-1.054e+009	
21	Liq Vol Flow @Std Cond (barrel/day)	---	---	
22	PROPERTIES			
23		Overall	Vapour Phase	
24				
25	Molecular Weight	19.15	19.15	
26	Molar Density (lbmole/ft3)	8.922e-002	8.922e-002	
27	Mass Density (lb/ft3)	1.709	1.709	
28	Act. Volume Flow (barrel/day)	1.421e+006	1.421e+006	
29	Mass Enthalpy (Btu/lb)	-1855	-1855	
30	Mass Entropy (Btu/lb-F)	2.001	2.001	
31	Heat Capacity (Btu/lbmole-F)	10.88	10.88	
32	Mass Heat Capacity (Btu/lb-F)	0.5575	0.5575	
33	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
34	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
35	Phase Fraction [Vol. Basis]	1.000	1.000	
36	Phase Fraction [Mass Basis]	1.000	1.000	
37	Partial Pressure of CO2 (psig)	-4.886	---	
38	Cost Based on Flow (Cost/s)	0.0000	0.0000	
39	Act. Gas Flow (ACFM)	5539	5539	
40	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
41	Specific Heat (Btu/lbmole-F)	10.88	10.88	
42	Std. Gas Flow (MMSCFD)	270.0	270.0	
43	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
44	Act. Liq. Flow (USGPM)	---	---	
45	Z Factor	0.9219	0.9219	
46	Watson K	18.38	18.38	
47	User Property	---	---	
48	Partial Pressure of H2S (psig)	-14.70	---	
49	Cp/(Cp - R)	1.228	1.228	
50	Cp/Cv	1.369	1.369	
51	Heat of Vap. (Btu/lbmole)	3919	---	
52	Kinematic Viscosity (cSt)	0.4667	0.4667	
53	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
54	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
55	Liquid Fraction	0.0000	0.0000	
56	Molar Volume (ft3/lbmole)	11.21	11.21	
57	Mass Heat of Vap. (Btu/lb)	204.6	---	
58	Phase Fraction [Molar Basis]	1.0000	1.0000	
59	Surface Tension (dyne/cm)	---	---	
60	Thermal Conductivity (Btu/hr-ft-F)	2.154e-002	2.154e-002	
61	Viscosity (cP)	1.278e-002	1.278e-002	
62	Cv (Semi-Ideal) (Btu/lbmole-F)	8.693	8.693	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110 HSC						
2			Unit Set: Field1						
3			Date/Time: Fri Apr 13 12:13:26 2012						
4									
5			Fluid Package: Basis-1						
6	Material Stream: A Descarga (continued)		Property Package: Peng Robinson						
7	PROPERTIES								
8		Overall	Vapour Phase						
9	12	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4538	0.4538					
10	13	Cv (Btu/lbmole-F)	7.799	7.799					
11	14	Mass Cv (Btu/lb-F)	0.4071	0.4071					
12	15	Cv (Ent. Method) (Btu/lbmole-F)	---	---					
13	16	Mass Cv (Ent. Method) (Btu/lb-F)	---	---					
14	17	Cp/Cv (Ent. Method)	---	---					
15	18	Reid VP at 37.8 C (psig)	---	---					
16	19	True VP at 37.8 C (psig)	---	---					
17	20	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000					
18	21	Viscosity Index	-9.986	-9.986					
19	22	COMPOSITION							
20	23	Overall Phase							
21	24				Vapour Fraction	1.0000			
22	25	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
23	26	28	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
24	27	29	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
25	28	30	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
26	29	31	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
27	30	32	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
28	31	33	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
29	32	34	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
30	33	35	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
31	34	36	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
32	35	37	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
33	36	38	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
34	37	39	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
35	38	Vapour Phase					Phase Fraction	1.000	
36	39	42	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
37	40	43	Nitrogen	166.6846	0.0056	4669.3365	0.0082	396.4943	0.0034
38	41	44	CO2	568.4451	0.0192	25017.0989	0.0440	2075.5106	0.0177
39	42	45	Methane	24941.5438	0.8412	400134.6951	0.7045	91512.7011	0.7796
40	43	46	Ethane	2837.9440	0.0957	85336.6934	0.1503	16428.2370	0.1400
41	44	47	Propane	963.9173	0.0325	42505.8603	0.0748	5744.2725	0.0489
42	45	48	i-Butane	130.1726	0.0044	7566.1514	0.0133	921.8988	0.0079
43	46	49	n-Butane	11.6685	0.0004	678.2193	0.0012	79.6258	0.0007
44	47	50	i-Pentane	20.8717	0.0007	1505.9126	0.0027	165.3948	0.0014
45	48	51	n-Pentane	3.3073	0.0001	238.6227	0.0004	25.9463	0.0002
46	49	52	n-Hexane	2.7124	0.0001	233.7511	0.0004	24.1534	0.0002
47	50	53	H2O	3.7464	0.0001	67.4918	0.0001	4.6307	0.0000
48	51	54	Total	29651.0136	1.0000	567953.8331	1.0000	117378.8653	1.0000
49	52	UNIT OPERATIONS							
50	53	FEED TO		PRODUCT FROM		LOGICAL CONNECTION			
51	54			Cooler:		E-102			
52	55	UTILITIES							
53	56	(No utilities reference this stream)							
54	57	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 38 of 102		
55	58	Licensed to: LEGENDS					* Specified by user.		


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Material Stream: A Descarga (continued)		Fluid Package: Basis-1	
7			Property Package: Peng Robinson	
8	PROCESS UTILITY			
9				
10	Energy Stream: Duty heater-2		Fluid Package: Refinery	
11			Property Package: Peng Robinson	
12	CONDITIONS			
13	Duty Type:	Direct Q	Duty Calculation Operation:	E-101-2
14	Duty SP:	1.867e+005 Btu/hr	Minimum Available Duty:	---
15			Maximum Available Duty:	---
16	COMPOSITION			
17	(Not a material stream - No compositions exist)			
18	UNIT OPERATIONS			
19		FEED TO	PRODUCT FROM	LOGICAL CONNECTION
20	Heater:	E-101-2		
21	UTILITIES			
22	(No utilities reference this stream)			
23	PROCESS UTILITY			
24				
25	DYNAMICS			
26	Pressure Specification	(Inactive)	---	
27	Flow Specification	(Inactive)	Molar: ---	Mass: ---
28				Std Ideal Liq Volume: ---
29	User Variables			
30				
31	NOTES			
32				
33	Description			
34				
35	Energy Stream: q1-2-5		Fluid Package: Refinery	
36			Property Package: Peng Robinson	
37	CONDITIONS			
38	Duty Type:	Direct Q	Duty Calculation Operation:	uente Guillermo-Cagua-2
39	Duty SP:	1.048e+007 Btu/hr	Minimum Available Duty:	---
40			Maximum Available Duty:	---
41	COMPOSITION			
42	(Not a material stream - No compositions exist)			
43	UNIT OPERATIONS			
44		FEED TO	PRODUCT FROM	LOGICAL CONNECTION
45			PIPESYS Extension: 'uente Guillermo-Cagua-2	
46	UTILITIES			
47	(No utilities reference this stream)			
48				
49	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Energy Stream: q1-2-5 (continued)		Fluid Package: Refinery	
7			Property Package: Peng Robinson	
8	PROCESS UTILITY			
9				
10	DYNAMICS			
11				
12				
13				
14	Pressure Specification	(Inactive)	---	
15	Flow Specification	(Inactive)	Molar: ---	Mass: --- Std Ideal Liq Volume: ---
16	User Variables			
17				
18	NOTES			
19				
20				
21	Description			
22				
23				
24	Energy Stream: q1-2-4-2		Fluid Package: Refinery	
25			Property Package: Peng Robinson	
26				
27	CONDITIONS			
28				
29	Duty Type:	Direct Q	Duty Calculation Operation:	Cogua-ECGSB-2
30	Duty SP:	-2.921e+006 Btu/hr	Minimum Available Duty:	---
31				
32	COMPOSITION			
33	(Not a material stream - No compositions exist)			
34				
35	UNIT OPERATIONS			
36	FEED TO		PRODUCT FROM	
37			PIPESYS Extension: Cogua-ECGSB-2	
38				
39	UTILITIES			
40	(No utilities reference this stream)			
41				
42	PROCESS UTILITY			
43				
44	DYNAMICS			
45				
46	Pressure Specification	(Inactive)	---	
47	Flow Specification	(Inactive)	Molar: ---	Mass: --- Std Ideal Liq Volume: ---
48	User Variables			
49				
50	NOTES			
51				
52				
53	Description			
54				
55				
56	Energy Stream: Potencia		Fluid Package: Refinery	
57			Property Package: Peng Robinson	
58				
59	CONDITIONS			
60				
61	Duty Type:	Direct Q	Duty Calculation Operation:	MOPICO-01
62	Duty SP:	1.430e+007 Btu/hr	Minimum Available Duty:	---
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Energy Stream: Potencia (continued)		Fluid Package: Refinery	
7			Property Package: Peng Robinson	
8				
9	COMPOSITION			
10	(Not a material stream - No compositions exist)			
11				
12	UNIT OPERATIONS			
13				
14	FEED TO	PRODUCT FROM	LOGICAL CONNECTION	
15	Compressor: MOPICO-01			
16	UTILITIES			
17	(No utilities reference this stream)			
18				
19	PROCESS UTILITY			
20				
21				
22	DYNAMICS			
23				
24	Pressure Specification (Inactive)	---		
25	Flow Specification (Inactive)	Molar: ---	Mass: ---	Std Ideal Liq Volume: ---
26	User Variables			
27				
28	NOTES			
29				
30				
31	Description			
32				
33				
34	Energy Stream: Duty Cooler		Fluid Package: Refinery	
35			Property Package: Peng Robinson	
36				
37	CONDITIONS			
38				
39	Duty Type: Direct Q	Duty Calculation Operation: E-102		
40	Duty SP: -9.692e+006 Btu/hr	Minimum Available Duty: ---	Maximum Available Duty: ---	
41	COMPOSITION			
42	(Not a material stream - No compositions exist)			
43				
44	UNIT OPERATIONS			
45				
46	FEED TO	PRODUCT FROM	LOGICAL CONNECTION	
47		Cooler: E-102		
48	UTILITIES			
49	(No utilities reference this stream)			
50				
51	PROCESS UTILITY			
52				
53				
54	DYNAMICS			
55				
56	Pressure Specification (Inactive)	---		
57	Flow Specification (Inactive)	Molar: ---	Mass: ---	Std Ideal Liq Volume: ---
58	User Variables			
59				
60	NOTES			
61				
62				
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Energy Stream: Duty Cooler (continued)		Fluid Package: Refinery	
7			Property Package: Peng Robinson	
8				
9	Description			
10				
11	Compressor: MOPICO-01			
12				
13	DESIGN			
14				
15	Connections			
16				
17	Inlet Stream			
18				
19	Outlet Stream			
20				
21	STREAM NAME		FROM UNIT OPERATION	
22	A Succión-1-2	Valve		VLV-A Succión-2
23				
24	Energy Stream			
25	STREAM NAME		TO UNIT OPERATION	
26	A Cooler	Cooler		E-102
27				
28	Energy Stream			
29	STREAM NAME		FROM UNIT OPERATION	
30	Potencia			
31				
32	Parameters			
33	Speed:	---	Duty:	5.6215e+03 hp
34	Adiabatic Eff.:	75.00	PolyTropic Eff.:	76.10
35	Adiabatic Head:	4.480 km	Polytropic Head:	4.546 km
36	Adiabatic Fluid Head:	1.470e+004 lbf-ft/lbm	Polytropic Fluid Head:	1.491e+004 lbf-ft/lbm
37	Polytropic Exp.	1.408	Isentropic Exp.	1.276
38			Poly Head Factor	1.000
39				
40	User Variables			
41				
42	RATING			
43				
44	Compressor Speed: ---		Efficiency: Adiabatic	
45	Head Offset:	0.0000 km	Efficiency Offset:	0.0000
46	Speed:			
47	Flow	Head	Efficiency (%)	
48				
49	Flow Limits			
50	Surge Curve: Inactive			
51	Speed	Flow	Speed	Flow
52	Stone Wall Curve: Inactive			
53	Speed	Flow	Speed	Flow
54	Surge Flow Rate	---	Field Flow Rate	6773 ACFM
55			Stone Wall Flow	---
56			Compressor Volume	0.0000 ft3
57				
58	Nozzle Paramaters			
59	Base Elevation Relative to Ground Level 0.0000 km *			
60		A Succión-1-2	A Cooler	
61	Diameter (km)	5.000e-005	5.000e-005	
62	Elevation (Base) (km)	0.0000	0.0000	
63	Elevation (Ground) (km)	0.0000	0.0000	
64	Inertia			
65	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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67			* Specified by user.	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1 100-110 HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Compressor: MOPICO-01 (continued)			
7				
8				
9	Inertia			
10	Rotational inertia (lb-ft ²)	142.4	Radius of gyration (km)	2.000e-004
11	Mass (lb)	330.7	Friction loss factor (rad/min) (lb-ft ² /s)	0.1424
12				
13	WORKSHEET			
14				
15	Conditions			
16	Name	A Succión-1-2	A Cooler	Potencia
17	Vapour	1.0000	1.0000	---
18	Temperature (F)	30.4525	89.5198	---
19	Pressure (psig)	332.5453	500.0000 *	---
20	Molar Flow (MMSCFD)	270.0341	270.0341	---
21	Mass Flow (lb/hr)	567953.8331	567953.8331	---
22	Std. Ideal Liq. Vol. Flow (barrel/day)	117378.8653	117378.8653	---
23	Molar Enthalpy (Btu/lbmole)	-3.634e+004	-3.586e+004	---
24	Molar Entropy (Btu/lbmole-F)	37.51	37.73	---
25	Heat Flow (Btu/hr)	-1.0775e+09	-1.0632e+09	1.4304e+07
26				
27	Properties			
28	Name	A Succión-1-2	A Cooler	
29	Molecular Weight	19.15	19.15	
30	Molar Density (lbmole/ft ³)	7.296e-002	9.650e-002	
31	Mass Density (lb/ft ³)	1.398	1.848	
32	Act. Volume Flow (barrel/day)	1.737e+006	1.313e+006	
33	Mass Enthalpy (Btu/lb)	-1897	-1872	
34	Mass Entropy (Btu/lb-F)	1.958	1.970	
35	Heat Capacity (Btu/lbmole-F)	10.12	10.65	
36	Mass Heat Capacity (Btu/lb-F)	0.5285	0.5560	
37	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
38	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
39	Phase Fraction [Vol. Basis]	1.000	1.000	
40	Phase Fraction [Mass Basis]	1.000	1.000	
41	Partial Pressure of CO ₂ (psig)	-8.039	-4.829	
42	Cost Based on Flow (Cost/s)	0.0000	0.0000	
43	Act. Gas Flow (ACFM)	6773	5121	
44	Avg. Liq. Density (lbmole/ft ³)	1.080	1.080	
45	Specific Heat (Btu/lbmole-F)	10.12	10.65	
46	Std. Gas Flow (MMSCFD)	270.0	270.0	
47	Std. Ideal Liq. Mass Density (lb/ft ³)	20.68	20.68	
48	Act. Liq. Flow (USGPM)	---	---	
49	Z Factor	0.9048	0.9050	
50	Watson K	18.38	18.38	
51	User Property	---	---	
52	Partial Pressure of H ₂ S (psig)	-14.70	-14.70	
53	Cp/(Cp - R)	1.244	1.229	
54	Cp/Cv	1.409	1.402	
55	Heat of Vap. (Btu/lbmole)	4445	3910	
56	Kinematic Viscosity (cSt)	0.4864	0.4146	
57	Liq. Mass Density (Std. Cond) (lb/ft ³)	---	---	
58	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
59	Liquid Fraction	0.0000	0.0000	
60	Molar Volume (ft ³ /lbmole)	13.71	10.36	
61	Mass Heat of Vap. (Btu/lb)	232.1	204.1	
62	Phase Fraction [Molar Basis]	1.0000	1.0000	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	

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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5						
6	Compressor: MOPICO-01 (continued)					
7	Properties					
8						
9						
10						
11	Name	A Succión-1-2	A Cooler			
12	Surface Tension (dyne/cm)	---	---			
13	Thermal Conductivity (Btu/hr-ft-F)	1.723e-002	2.030e-002			
14	Viscosity (cP)	1.089e-002	1.228e-002			
15	Cv (Semi-Ideal) (Btu/lbmole-F)	8.138	8.663			
16	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4249	0.4523			
17	Cv (Btu/lbmole-F)	7.183	7.594			
18	Mass Cv (Btu/lb-F)	0.3750	0.3865			
19	Cv (Ent. Method) (Btu/lbmole-F)	---	---			
20	Mass Cv (Ent. Method) (Btu/lb-F)	---	---			
21	Cp/Cv (Ent. Method)	---	---			
22	Reid VP at 37.8 C (psig)	---	---			
23	True VP at 37.8 C (psig)	---	---			
24	Liq. Vol. Flow - Sum(Std. Cond) (bbl/day)	0.0000	0.0000			
25	Viscosity Index	-9.069	-12.83			
26	PERFORMANCE					
27						
28	Results					
29						
30	Adiabatic Head (km)	4.480	Power Consumed (hp)	5622		
31	Polytropic Head (km)	4.546	Polytropic Head Factor	1.000		
32	Adiabatic Fluid Head (lbf-ft/lbm)	1.470e+004	Polytropic Exponent	1.408		
33	Polytropic Fluid Head (lbf-ft/lbm)	1.491e+004	Isentropic Exponent	1.276		
34	Adiabatic Efficiency	75	Speed (rpm)	---		
35	Polytropic Efficiency	76		---		
36	Power/Torque					
37						
38	Total Rotor Power (hp)	5622	Total Rotor Torque (lbf-ft)	---		
39	Transient Rotor Power (hp)	0.0000	Transient Rotor Torque (lbf-ft)	---		
40	Friction Power Loss (hp)	0.0000	Friction Torque Loss (lbf-ft)	---		
41	Fluid Power (hp)	5622	Fluid Torque (lbf-ft)	---		
42	DYNAMICS					
43						
44	Dynamic Specifications					
45						
46	Duty (Btu/hr)	1.430e+007	Active	Head (km)	4.546	Not Active
47	Adiabatic Efficiency	75	Not Active	Fluid Head (lbf-ft/lbm)	1.491e+004	Not Active
48	Polytropic Efficiency	76	Active	Capacity (ACFM)	6773	Not Active
49	Pressure Increase (psi)	167.5	Not Active	Speed (rpm)	---	Not Active
50		---		Use Characteristic Curves		No
51	Holdup Details					
52						
53	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)		
54						
55	Vapour	0.0000	0.0000	*	0.0000	
56	Liquid	0.0000	0.0000	*	0.0000	
57	Aqueous	0.0000	0.0000	*	0.0000	
58	Total	0.0000	0.0000		0.0000	
59	NOTES					
60						
61						
62						
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 44 of 102	

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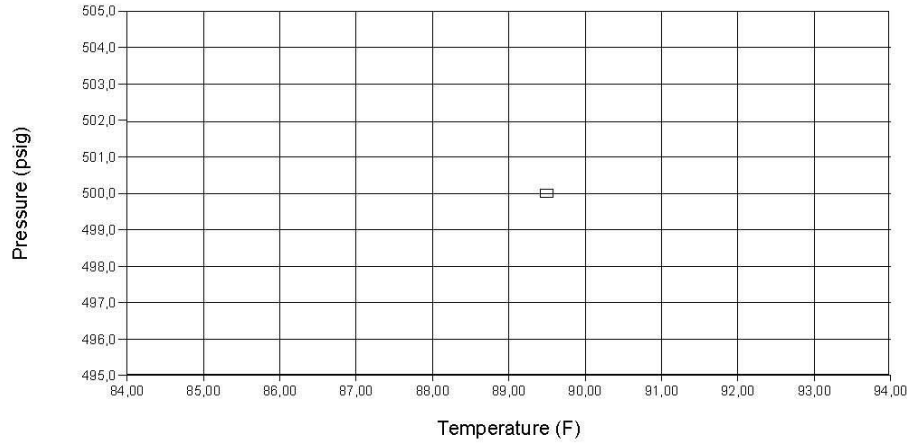
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110-HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Cooler: E-102			
7				
8				
9	CONNECTIONS			
10				
11	Inlet Stream			
12				
13	STREAM NAME	FROM UNIT OPERATION		
14	A Cooler	Compressor		MOPICO-01
15				
16	Outlet Stream			
17				
18	STREAM NAME	TO UNIT OPERATION		
19	A Descarga			
20				
21	Energy Stream			
22				
23				
24	PARAMETERS			
25	Pressure Drop:	3.000 psi *	Duty:	-9.692e+008 Btu/hr
26	Function:	Not Selected	Zones:	1
27				
28	User Variables			
29				
30	NOZZLE PARAMETERS			
31				
32	Base Elevation Relative to Ground Level			0.0000 km *
33	Diameter (km)	A Cooler	A Descarga	
34	Elevation (Base) (km)	5.000e-005	5.000e-005	
35	Elevation (Ground) (km)	0.0000	0.0000	
36				
37	CONDITIONS			
38				
39	Name	A Cooler	A Descarga	Duty Cooler
40	Vapour	1.0000	1.0000	---
41	Temperature (F)	89.5198	120.0000 *	---
42	Pressure (psig)	500.0000 *	497.0000	---
43	Molar Flow (MMSCFD)	270.0341	270.0341	---
44	Mass Flow (lb/hr)	567953.8331	567953.8331	---
45	Std Ideal Liq Vol Flow (barrel/day)	117378.8653	117378.8653	---
46	Molar Enthalpy (Btu/lbmole)	-3.586e+004	-3.553e+004	---
47	Molar Entropy (Btu/lbmole-F)	37.73	38.32	---
48	Heat Flow (Btu/hr)	-1.0632e+09	-1.0535e+09	-9.6921e+06
49				
50	PROPERTIES			
51				
52	Name	A Cooler	A Descarga	
53	Molecular Weight	19.15	19.15	
54	Molar Density (lbmole/ft3)	9.650e-002	8.922e-002	
55	Mass Density (lb/ft3)	1.848	1.709	
56	Act. Volume Flow (barrel/day)	1.313e+006	1.421e+006	
57	Mass Enthalpy (Btu/lb)	-1872	-1855	
58	Mass Entropy (Btu/lb-F)	1.970	2.001	
59	Heat Capacity (Btu/lbmole-F)	10.65	10.68	
60	Mass Heat Capacity (Btu/lb-F)	0.5580	0.5575	
61	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
62	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
63	Phase Fraction [Vol. Basis]	1.000	1.000	
64	Phase Fraction [Mass Basis]	1.000	1.000	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Cooler: E-102 (continued)				
6	PROPERTIES				
7					
8					
9					
10					
11	Name	A Cooler	A Descarga		
12	Partial Pressure of CO2 (psig)	-4.829	-4.886		
13	Cost Based on Flow (Cost/s)	0.0000	0.0000		
14	Act. Gas Flow (ACFM)	5121	5539		
15	Avg. Liq. Density (lbmole/ft3)	1.080	1.080		
16	Specific Heat (Btu/lbmole-F)	10.65	10.68		
17	Std. Gas Flow (MMSCFD)	270.0	270.0		
18	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68		
19	Act. Liq. Flow (USGPM)	---	---		
20	Z Factor	0.9050	0.9219		
21	Watson K	18.38	18.38		
22	User Property	---	---		
23	Partial Pressure of H2S (psig)	-14.70	-14.70		
24	Cp/(Cp - R)	1.229	1.228		
25	Cp/Cv	1.402	1.389		
26	Heat of Vap. (Btu/lbmole)	3910	3919		
27	Kinematic Viscosity (cSt)	0.4146	0.4667		
28	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---		
29	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---		
30	Liquid Fraction	0.0000	0.0000		
31	Molar Volume (ft3/lbmole)	10.36	11.21		
32	Mass Heat of Vap. (Btu/lb)	204.1	204.6		
33	Phase Fraction [Molar Basis]	1.0000	1.0000		
34	Surface Tension (dyne/cm)	---	---		
35	Thermal Conductivity (Btu/hr-ft-F)	2.030e-002	2.154e-002		
36	Viscosity (cP)	1.228e-002	1.278e-002		
37	Cv (Semi-Ideal) (Btu/lbmole-F)	8.663	8.693		
38	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4523	0.4538		
39	Cv (Btu/lbmole-F)	7.594	7.799		
40	Mass Cv (Btu/lb-F)	0.3965	0.4071		
41	Cv (Ent. Method) (Btu/lbmole-F)	---	---		
42	Mass Cv (Ent. Method) (Btu/lb-F)	---	---		
43	Cp/Cv (Ent. Method)	---	---		
44	Reid VP at 37.8 C (psig)	---	---		
45	True VP at 37.8 C (psig)	---	---		
46	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000		
47	Viscosity Index	-12.83	-9.986		
48	PERFORMANCE PROFILES				
49					
50	Zone	Pressure (psig)	Temperature (F)	Vapour Fraction	Enthalpy (Btu/lbmole)
51	Inlet	500.00	89.52	1.0000	-35856.63
52	0	497.00	120.00	1.0000	-35529.76
53					
54	PERFORMANCE PLOT				
55					
56					
57					
58					
59					
60					
61					
62					
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 46 of 102


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5	Cooler: E-102 (continued)					
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
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26						
27						
28						
29						
30						
31						
32	PERFORMANCE TABLE					
33	Overall Phase					
34						
35						
36	Temperature (F)	Pressure (psig)	Heat Flow (Btu/hr)	Enthalpy (Btu/lbmole)	Vapour Fraction	
37	89.52	500.00	0.00	-35856.63	1.0000	
38	89.52	500.00	-0.00	-35856.63	1.0000	
39	89.52	500.00	-0.00	-35856.63	1.0000	
40	Vapour Phase					
41						
42	Mass Flow (lb/hr)	Molecular Weight	Density (lb/ft3)	Mass Specific Heat (Btu/lb-F)	Viscosity (cP)	Thermal Conductivity (Btu/hr-ft-F)
43	567953.83	19.15	1.85	0.56	---	---
44	567953.83	19.15	1.85	0.56	0.01	0.02
45	567953.83	19.15	1.85	0.56	0.01	0.02
46	Light Liquid Phase					
47						
48	Mass Flow (lb/hr)	Density (lb/ft3)	Mass Specific Heat (Btu/lb-F)	Viscosity (cP)	Thermal Conductivity (Btu/hr-ft-F)	Surface Tension (dyne/cm)
49	---	---	---	---	---	---
50	---	---	---	---	---	---
51	---	---	---	---	---	---
52	Heavy Liquid Phase					
53						
54	Mass Flow (lb/hr)	Density (lb/ft3)	Mass Specific Heat (Btu/lb-F)	Viscosity (cP)	Thermal Conductivity (Btu/hr-ft-F)	Surface Tension (dyne/cm)
55	---	---	---	---	---	---
56	---	---	---	---	---	---
57	---	---	---	---	---	---
58	DYNAMICS					
59						
60	Model Details: Supplied Duty					
61						
62	Zone	1 * Delta P		(psi)	3.000 *	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 47 of 102	


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Cooler: E-102 (continued)			
7				
8				
9	Volume (ft3)	3.531 *	Overall K (lb/hr/sqrt(psia-lb/ft3))	2.417e+005 *
10	Duty (Btu/hr)	-9.692e+006		
11	Holdup Details			
12				
13	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)
14	Vapour	0.0000	0.0000	0.0000
15	Liquid	0.0000	0.0000	0.0000
16	Aqueous	0.0000	0.0000	0.0000
17	Total	0.0000	0.0000	0.0000
18				
19	Individual Zone Holdups: Zone 0			
20				
21	Delta P Specs and Duties			
22				
23	Zone	dP Value (psi)	dP Option	Duty (Btu/hr)
24	0 *	3.000 *	not specified	-4.358e+007 *
25				
26	Zone Conductance Specifications			
27				
28	Zone	k (lb/hr/sqrt(psia-lb/ft3))	Specification	
29	0 *	2.417e+005	Disabled	
30				
31	NOTES			
32				
33				
34	Heater: E-101-2			
35				
36				
37	CONNECTIONS			
38				
39	Inlet Stream			
40				
41	STREAM NAME	FROM UNIT OPERATION		
42	A Calentador-2	Mixer	MIX-101-2	
43				
44	Outlet Stream			
45	STREAM NAME	TO UNIT OPERATION		
46	A EGSB-2	PIPESYS Extension	Cogua-EGSB-2	
47				
48	Energy Stream			
49	STREAM NAME	FROM UNIT OPERATION		
50	Duty heater-2			
51				
52	PARAMETERS			
53	Pressure Drop: 0.0000 psi *	Duty: 1.867e+005 Btu/hr	Volume: 3.531 ft3	
54	Function: Not Selected	Zones: 1		
55				
56	User Variables			
57				
58	RATING			
59				
60	NOZZLE PARAMETERS			
61	Base Elevation Relative to Ground Level	0.0000 km *		
62		A Calentador-2	A EGSB-2	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5					
6	Heater: E-101-2 (continued)				
7					
8					
9	Diameter	(km)	5.000e-005	5.000e-005	
10	Elevation (Base)	(km)	0.0000	0.0000	
11	Elevation (Ground)	(km)	0.0000	0.0000	
12	CONDITIONS				
13					
14	Name		A Calentador-2	A ECGSB-2	Duty heater-2
15	Vapour		1.0000	1.0000	---
16	Temperature	(F)	37.4758	38.0600 *	---
17	Pressure	(psig)	500.0000	500.0000	---
18	Molar Flow	(MMSCFD)	270.0341	270.0341	---
19	Mass Flow	(lb/hr)	567953.8331	567953.8331	---
20	Std Ideal Liq Vol Flow	(barrel/day)	117378.8653	117378.8653	---
21	Molar Enthalpy	(Btu/lbmole)	-3.641e+004	-3.641e+004	---
22	Molar Entropy	(Btu/lbmole-F)	36.67	36.68	---
23	Heat Flow	(Btu/hr)	-1.0797e+09	-1.0795e+09	1.8667e+05
24	PROPERTIES				
25					
26	Name		A Calentador-2	A ECGSB-2	
27	Molecular Weight		19.15	19.15	
28	Molar Density	(lbmole/ft3)	0.1114	0.1112	
29	Mass Density	(lb/ft3)	2.134	2.130	
30	Act. Volume Flow	(barrel/day)	1.138e+006	1.140e+006	
31	Mass Enthalpy	(Btu/lb)	-1901	-1901	
32	Mass Entropy	(Btu/lb-F)	1.914	1.915	
33	Heat Capacity	(Btu/lbmole-F)	10.78	10.77	
34	Mass Heat Capacity	(Btu/lb-F)	0.5627	0.5625	
35	LHV Vol Basis (Std)		3.844e+005	3.844e+005	
36	LHV Mass Basis (Std)	(Btu/lb)	2.007e+004	2.007e+004	
37	Phase Fraction [Vol. Basis]		1.000	1.000	
38	Phase Fraction [Mass Basis]		1.000	1.000	
39	Partial Pressure of CO2	(psig)	-4.829	-4.829	
40	Cost Based on Flow	(Cost/s)	0.0000	0.0000	
41	Act. Gas Flow	(ACFM)	4436	4444	
42	Avg. Liq. Density	(lbmole/ft3)	1.080	1.080	
43	Specific Heat	(Btu/lbmole-F)	10.78	10.77	
44	Std. Gas Flow	(MMSCFD)	270.0	270.0	
45	Std. Ideal Liq. Mass Density	(lb/ft3)	20.68	20.68	
46	Act. Liq. Flow	(USGPM)	---	---	
47	Z Factor		0.8660	0.8665	
48	Watson K		18.38	18.38	
49	User Property		---	---	
50	Partial Pressure of H2S	(psig)	-14.70	-14.70	
51	Cp/(Cp - R)		1.226	1.226	
52	Cp/Cv		1.481	1.480	
53	Heat of Vap.	(Btu/lbmole)	3910	3910	
54	Kinematic Viscosity	(cSt)	0.3340	0.3349	
55	Liq. Mass Density (Std. Cond)	(lb/ft3)	---	---	
56	Liq. Vol. Flow (Std. Cond)	(barrel/day)	---	---	
57	Liquid Fraction		0.0000	0.0000	
58	Molar Volume	(ft3/lbmole)	8.976	8.993	
59	Mass Heat of Vap.	(Btu/lb)	204.1	204.1	
60	Phase Fraction [Molar Basis]		1.0000	1.0000	
61	Surface Tension	(dyne/cm)	---	---	
62	Thermal Conductivity	(Btu/hr-ft-F)	1.830e-002	1.832e-002	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 49 of 102
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5					
6	Heater: E-101-2 (continued)				
7	PROPERTIES				
8					
9					
10					
11	Name	A Calentador-2	A ECGSB-2		
12	Viscosity (cP)	1.142e-002	1.143e-002		
13	Cv (Semi-Ideal) (Btu/lbmole-F)	8.782	8.788		
14	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4590	0.4588		
15	Cv (Btu/lbmole-F)	7.277	7.280		
16	Mass Cv (Btu/lb-F)	0.3799	0.3801		
17	Cv (Ent. Method) (Btu/lbmole-F)	---	---		
18	Mass Cv (Ent. Method) (Btu/lb-F)	---	---		
19	Cp/Cv (Ent. Method)	---	---		
20	Reid VP at 37.8 C (psig)	---	---		
21	True VP at 37.8 C (psig)	---	---		
22	Liq. Vol. Flow - Sum(Std. Cond.) (bbl/day)	0.0000	0.0000		
23	Viscosity Index	-19.16	-19.07		
24	PERFORMANCE PROFILES				
25					
26	Zone	Pressure (psig)	Temperature (F)	Vapour Fraction	Enthalpy (Btu/lbmole)
27					
28	Inlet	500.00	37.48	1.0000	-36412.87
29	0	500.00	38.06	1.0000	-36406.57
30	PERFORMANCE PLOT				
31					
32					
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52					
53					
54					
55	PERFORMANCE TABLE				
56					
57	Overall Phase				
58					
59	Temperature (F)	Pressure (psig)	Heat Flow (Btu/hr)	Enthalpy (Btu/lbmole)	Vapour Fraction
60	37.48	500.00	0.00	-36412.87	1.0000
61	37.48	500.00	0.00	-36412.87	1.0000
62	37.48	500.00	0.00	-36412.87	1.0000
63	Aspen Technology Inc. Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 50 of 102	


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5						
6	Heater: E-101-2 (continued)					
7	PERFORMANCE TABLE					
8	Vapour Phase					
9						
10						
11						
12						
13	Mass Flow (lb/hr)	Molecular Weight	Density (lb/ft3)	Mass Specific Heat (Btu/lb-F)	Viscosity (cP)	Thermal Conductivity (Btu/hr-ft-F)
14	567953.83	19.15	2.13	0.56	---	---
15	567953.83	19.15	2.13	0.56	0.01	0.02
16						
17	Light Liquid Phase					
18						
19	Mass Flow (lb/hr)	Density (lb/ft3)	Mass Specific Heat (Btu/lb-F)	Viscosity (cP)	Thermal Conductivity (Btu/hr-ft-F)	Surface Tension (dyne/cm)
20	---	---	---	---	---	---
21	---	---	---	---	---	---
22	---	---	---	---	---	---
23	Heavy Liquid Phase					
24						
25	Mass Flow (lb/hr)	Density (lb/ft3)	Mass Specific Heat (Btu/lb-F)	Viscosity (cP)	Thermal Conductivity (Btu/hr-ft-F)	Surface Tension (dyne/cm)
26	---	---	---	---	---	---
27	---	---	---	---	---	---
28	---	---	---	---	---	---
29	DYNAMICS					
30	Model Details: Supplied Duty					
31						
32	Zone	1 *	Delta P (psi)	0.0000 *		
33	Volume (ft3)	3.531 *	Overall K (lb/hr/sqrt(psia-lb/ft3))	2.249e+005 *		
34	Duty (Btu/hr)	1.867e+005				
35	Holdup Details					
36						
37	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)		
38	Vapour	0.0000	0.0000	0.0000		
39	Liquid	0.0000	0.0000	0.0000		
40	Aqueous	0.0000	0.0000	0.0000		
41	Total	0.0000	0.0000	0.0000		
42	Individual Zone Holdups: Zone 0					
43	Delta P Specs and Duties					
44						
45	Zone	dP Value (psi)	dP Option	Duty (Btu/hr)		
46	0 *	0.0000 *	not specified	0.0000 *		
47	Zone Conductance Specifications					
48						
49	Zone	k (lb/hr/sqrt(psia-lb/ft3))	Specification			
50	0 *	2.249e+005 *	Enabled			
51	NOTES					
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 51 of 102	

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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5					
6	Mixer: MIX-101-2				
7	CONNECTIONS				
8	Inlet Stream				
9					
10	Outlet Stream				
11					
12	PARAMETERS				
13	User Variables				
14	NOZZLE PARAMETERS				
15	Base Elevation Relative to Ground Level 0.0000 km *				
16		A Medición-3	A Medición-2-2	A Calentador-2	
17	Diameter (km)	5.000e-005	5.000e-005	5.000e-005	
18	Elevation (Base) (km)	0.0000	0.0000	0.0000	
19	Elevation (Ground) (km)	0.0000	0.0000	0.0000	
20	CONDITIONS				
21	Name	A Medición-3	A Medición-2-2	A Calentador-2	
22	Vapour	1.0000	1.0000	1.0000	
23	Temperature (F)	37.4758	37.4758	37.4758	
24	Pressure (psig)	500.0000 *	500.0000 *	500.0000	
25	Molar Flow (MMSCFD)	135.0171	135.0171	270.0341	
26	Mass Flow (lb/hr)	283976.9165	283976.9165	567953.8331	
27	Std Ideal Liq Vol Flow (barrel/day)	58689.4327	58689.4327	117378.8653	
28	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	-3.641e+004	
29	Molar Entropy (Btu/lbmole-F)	36.67	36.67	36.67	
30	Heat Flow (Btu/hr)	-5.3984e+08	-5.3984e+08	-1.0797e+09	
31	PROPERTIES				
32	Name	A Medición-3	A Medición-2-2	A Calentador-2	
33	Molecular Weight	19.15	19.15	19.15	
34	Molar Density (lbmole/ft3)	0.1114	0.1114	0.1114	
35	Mass Density (lb/ft3)	2.134	2.134	2.134	
36	Act. Volume Flow (barrel/day)	5.689e+005	5.689e+005	1.138e+006	
37	Mass Enthalpy (Btu/lb)	-1901	-1901	-1901	
38	Mass Entropy (Btu/lb-F)	1.914	1.914	1.914	
39	Heat Capacity (Btu/lbmole-F)	10.78	10.78	10.78	
40	Mass Heat Capacity (Btu/lb-F)	0.5627	0.5627	0.5627	
41	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	3.844e+005	
42	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	2.007e+004	
43	Phase Fraction [Vol. Basis]	1.000	1.000	1.000	
44	Phase Fraction [Mass Basis]	1.000	1.000	1.000	
45	Partial Pressure of CO2 (psig)	-4.829	-4.829	-4.829	
46	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
47	Act. Gas Flow (ACFM)	2218	2218	4436	
48	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	1.080	
49	Specific Heat (Btu/lbmole-F)	10.78	10.78	10.78	
50	Aspen Technology Inc. Aspen HYSYS Version 7.2 (24.0.0.7263) Page 52 of 102				
51	Licensed to: LEGENDS * Specified by user.				

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Mixer: MIX-101-2 (continued)				
6	PROPERTIES				
7					
8					
9					
10					
11	Name	A Medición-3	A Medición-2-2	A Calentador-2	
12	Std. Gas Flow (MMSCFD)	135.0	135.0	270.0	
13	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	20.68	
14	Act. Liq. Flow (USGPM)	---	---	---	
15	Z Factor	0.8660	0.8660	0.8660	
16	Watson K	18.38	18.38	18.38	
17	User Property	---	---	---	
18	Partial Pressure of H2S (psig)	-14.70	-14.70	-14.70	
19	Cp/(Cp - R)	1.226	1.226	1.226	
20	Cp/Cv	1.481	1.481	1.481	
21	Heat of Vap. (Btu/lbmole)	3910	3910	3910	
22	Kinematic Viscosity (cSt)	0.3340	0.3340	0.3340	
23	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	---	
24	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	---	
25	Liquid Fraction	0.0000	0.0000	0.0000	
26	Molar Volume (ft3/lbmole)	8.976	8.976	8.976	
27	Mass Heat of Vap. (Btu/lb)	204.1	204.1	204.1	
28	Phase Fraction [Molar Basis]	1.0000	1.0000	1.0000	
29	Surface Tension (dyne/cm)	---	---	---	
30	Thermal Conductivity (Btu/hr-ft-F)	1.830e-002	1.830e-002	1.830e-002	
31	Viscosity (cP)	1.142e-002	1.142e-002	1.142e-002	
32	Cv (Semi-Ideal) (Btu/lbmole-F)	8.792	8.792	8.792	
33	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4590	0.4590	0.4590	
34	Cv (Btu/lbmole-F)	7.277	7.277	7.277	
35	Mass Cv (Btu/lb-F)	0.3799	0.3799	0.3799	
36	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---	
37	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---	
38	Cp/Cv (Ent. Method)	---	---	---	
39	Reid VP at 37.8 C (psig)	---	---	---	
40	True VP at 37.8 C (psig)	---	---	---	
41	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	0.0000	
42	Viscosity Index	-19.16	-19.16	-19.16	
43	DYNAMICS				
44					
45	Pressure Specification: Equalize All				
46	Holdup Details				
47					
48	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)	
49	Vapour	0.0000	0.0000	0.0000	*
50	Liquid	0.0000	0.0000	0.0000	*
51	Aqueous	0.0000	0.0000	0.0000	*
52	Total	0.0000	0.0000	0.0000	
53	NOTES				
54					
55					
56					
57					
58					
59					
60					
61					
62					
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 53 of 102


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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2				Unit Set: Field1	
3				Date/Time: Fri Apr 13 12:13:26 2012	
4					
5					
6					
7	NeotecPIPESYS v2.5.77.0:			FLUJO MAXIMO 270-1100-110.HSC	
8					
9	Puente Guillermo-Cogua-2				
10					
11	Connections				
12					
13	Inlet		Outlet		Energy
14					
15	NAME	FROM OPER	NAME	TO OPER	NAME
16					TO OPER
17	Puente Guillermo-1-2	Va	A Cogua-2	Separator	FS-101-2
18					q1-2-5
19					
20	Calculation Procedures				
21					
22	Multiphase Horizontal Flow		Multiphase Vertical Upflow		
23					
24	Overall Selection: Gas based default *		Overall Selection: Gas based default *		
25	Flow Regime Prediction: Taitel and Dukler *		Flow Regime Prediction: Govier, and Aziz *		
26	Liquid Holdup: Eaton et al *		Liquid Holdup: Aziz, Govier, and Fogarasi *		
27	Frictional Pressure Loss: Oliemans *		Frictional Pressure Loss: Aziz, Govier and Fogarasi *		
28	Uphill Correction: No Correction *				
29	Downhill Recovery: Recovery Based on Gas Density *				
30			Multiphase Vertical Downflow		
31					
32	Single Phase Flow		Overall Selection: Gas based default *		
33			Flow Regime Prediction: Beggs and Brill Revised *		
34			Liquid Holdup: Beggs and Brill Revised *		
35	Overall Selection: Fanning Equation *		Frictional Pressure Loss: Beggs and Brill *		
36					
37					
38					
39					
40	Stepsizes and Tolerances				
41					
42	Pipe Lengths		Pressure Convergence		
43					
44	Initial stepsize: 0.03 km *		Initial dP Guess: -10.00 psi *		
45	Minimum stepsize: 0.000 km *		Minimum dP/step: 3.00 psi *		
46	Maximum stepsize: ---		Maximum dP/step: 10.00 psi *		
47			Convergence Tolerance: 0.010 psi *		
48					
49					
50	Temperature Convergence		Enthalpy Convergence		
51					
52	Initial dT Guess: -2.00 F *		Minimum dH/step: 0.60 Btu/lb *		
53	Minimum dT/step: 1.50 F *		Maximum dH/step: 2.00 Btu/lb *		
54	Maximum dT/step: 5.00 F *		Convergence Tolerance: 0.010 Btu/lb *		
55	Convergence Tolerance: 0.050 F *				
56					
57					
58					
59	Overall Settings		Overall Pipeline Pressure Convergence		
60					
61	Stepsize and Tolerances: Set to Program Defaults *		Minimum allowed pressure: -0.046 psig *		
62					
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 54 of 102


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC					
2			Unit Set: Field1					
3			Date/Time: Fri Apr 13 12:13:26 2012					
4								
5								
6	NeotecPIPESYS v2.5.77.0: FLUJO MAXIMO 270-1100-110.HSC							
7								
8								
9								
10	Puente Guillermo-Cogua-2							
11								
12								
13	Stepsizes and Tolerances							
14								
15								
16	Overall Settings				Overall Pipeline Pressure Convergence			
17	Force Enthalpy Convergence: Disabled *				Downstream press. conv. tolerance: 0.010 psi *			
18	Optimize Stepsize: Enabled *							
19								
20								
21	Emulsion							
22								
23								
24	Emulsion Viscosity Option: Normal blended viscosity calculation							
25								
26								
27	Pipeline Units Profile							
28								
29	Distance at Pipeline Origin: 0.00 km *				Elevation at Pipeline Origin: 2.20 km *			
30								
31	Pipeline unit	Distance (km)	Elevation (km)	Run (km)	Rise (km)	Length (km)	Angle (deg)	Label
32								
33	Pipe *	8.00 *	2.30 *	8.00	0.10	8.00	0.716	Pipe #1 *
34	Pipe *	18.00 *	2.40 *	10.00	0.10	10.00	0.573	Pipe #2 *
35	Pipe *	27.00 *	2.50 *	9.00	0.10	9.00	0.637	Pipe #3 *
36	Pipe *	35.00 *	2.60 *	8.00	0.10	8.00	0.716	Pipe #4 *
37	Pipe *	37.50 *	2.65 *	2.50	0.05	2.50	1.146	Pipe #5 *
38	Pipe *	50.00 *	2.70 *	12.50	0.05	12.50	0.229	Pipe #6 *
39	Pipe *	70.00 *	2.80 *	20.00	0.10	20.00	0.286	Pipe #7 *
40	Pipe *	92.20 *	2.92 *	22.20	0.12	22.20	0.310	Pipe #8 *
41	Pipe *	98.00 *	2.80 *	5.80	-0.12	5.80	-1.185	Pipe #9 *
42	Pipe *	103.00 *	2.70 *	5.00	-0.10	5.00	-1.146	Pipe #10 *
43	Pipe *	105.75 *	2.62 *	2.75	-0.09	2.75	-1.770	Pipe #11 *
44	Pipe *	105.82 *	2.62 *	0.07	0.00	0.07	0.000	Pipe #17 *
45								
46	Surroundings Temperature Profile							
47								
48	Surroundings Temperature at Pipeline Origin: 68.00 F *							
49								
50	Distance (km)	Elevation (km)	Cum. Length (km)	Label	Surroundings T (F)	Surroundings Type		
51								
52	8.00	2.30	8.00	Pipe #1	50.00 *	Buried		
53	18.00	2.40	18.00	Pipe #2	49.35 *	Buried		
54	27.00	2.50	27.00	Pipe #3	48.70 *	Buried		
55	35.00	2.60	35.00	Pipe #4	48.00 *	Buried		
56	37.50	2.65	37.50	Pipe #5	47.73 *	Buried		
57	50.00	2.70	50.00	Pipe #6	47.41 *	Buried		
58	70.00	2.80	70.00	Pipe #7	46.74 *	Buried		
59	92.20	2.92	92.20	Pipe #8	46.09 *	Buried		
60	98.00	2.80	98.00	Pipe #9	46.74 *	Buried		
61	103.00	2.70	103.01	Pipe #10	47.41 *	Buried		
62	105.75	2.61	105.76	Pipe #11	48.09 *	Buried		
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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2				Unit Set: Field1		
3				Date/Time: Fri Apr 13 12:13:26 2012		
4						
5						
6						
7	NeotecPIPESYS v2.5.77.0:			FLUJO MAXIMO 270-1100-110.HSC		
8						
9						
10	Puente Guillermo-Cogua-2					
11						
12	Surroundings Temperature Profile					
13						
14						
15	Distance	Elevation	Cum. Length	Label	Surroundings T	Surroundings Type
16	(km)	(km)	(km)		(F)	
17	105.82	2.61	105.83	Pipe #17	48.09 *	Buried
18						
19	Pipe Dimensions at Pipeline Origin					
20						
21	Name: Pipe #1					
22						
23	Unit Location					
24						
25	Distance: 0.00 km		Elevation: 2.20 km		Distance From Origin: 0.00 km	
26						
27						
28	Nominal Diameter: 20 Inches		*		Outside Diameter: 20.000 in	
29	Pipe Schedule: Standard		*		Wall Thickness: 0.375 in	
30						
31						
32	Default Roughness: Default: Steel (bare, average field conditions) *					
33						
34	Absolute Roughness: 0.00180 in			Relative Roughness: 0.000094		
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
51						
52						
53						
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59						
60						
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62						
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 56 of 102	


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	NeotecPIPESYS v2.5.77.0:		FLUJO MAXIMO 270-1100-110.HSC	
7	Puente Guillermo-Cogua-2			
8				
9	Heat Transfer Data at Pipeline Origin			
10				
11	Name: Pipe #1			
12	Unit Location			
13	Distance: 0.00 km Elevation: 2.20 km Distance From Origin: 0.00 km			
14				
15	Heat Transfer Environment		Soil Parameters	
16	Buried *		Centre Line Depth: 0.001 km *	
17	Overall Heat Transfer Coefficient		Buried Fraction: --- *	
18			Type: Default *	
19	Specified Coefficient: ---		Conductivity: 0.500 Btu/hr-ft-F	
20	Inside Film Coefficient		Water Parameters	
21			Density: ---	
22			Viscosity: ---	
23	Type: Calculated *		Conductivity: ---	
24	Specified Coefficient: ---		Velocity: ---	
25	Pipe Parameters		Heat Capacity: ---	
26			Air Parameters	
27	Default Conductivities: Default: Steel *		Density: ---	
28	Pipe Conductivity: 28.000 Btu/hr-ft-F		Viscosity: ---	
29			Conductivity: ---	
30			Velocity: ---	
31				
32	Pipe Coatings Data at Pipeline Origin			
33				
34	Name: Pipe #1			
35	Unit Location			
36	Distance: 0.00 km Elevation: 2.20 km Distance From Origin: 0.00 km			
37				
38	Layer	Coating	Thickness (in)	Conductivity (Btu/hr-ft-F)
39	---	<empty> *	---	---
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC					
2			Unit Set: Field1					
3			Date/Time: Fri Apr 13 12:13:26 2012					
4								
5								
6								
7	NeotecPIPESYS v2.5.77.0:			FLUJO MAXIMO 270-1100-110.HSC				
8								
9								
10	Puente Guillermo-Cogua-2							
11								
12	Calculation Messages							
13								
14								
15								
16	Error Messages							
17								
18								
19	No calculation errors encountered, PIPESYS has converged.							
20								
21								
22	Warning Messages							
23								
24								
25	No calculation warnings encountered.							
26								
27								
28	Pressure Temperature Summary							
29								
30	Pipeline Unit	Cum. Length (km)	Pressure (psig)	Temperature (F)	DeltaP (psi)	DeltaT (F)	Label	
31								
32	Pipe	8.00	1054.30	101.52	40.70	-8.22	Pipe #1	
33	Pipe	18.00	1005.20	91.37	49.10	-10.15	Pipe #2	
34	Pipe	27.00	959.42	83.04	45.77	-8.32	Pipe #3	
35	Pipe	35.00	917.06	76.15	42.37	-8.90	Pipe #4	
36	Pipe	37.50	902.05	73.88	15.01	-2.27	Pipe #5	
37	Pipe	50.00	842.59	65.61	59.46	-8.26	Pipe #6	
38	Pipe	70.00	739.02	53.98	103.57	-11.63	Pipe #7	
39	Pipe	92.20	607.58	42.63	131.44	-11.35	Pipe #8	
40	Pipe	98.00	577.94	41.57	29.64	-1.07	Pipe #9	
41	Pipe	103.01	550.16	40.57	27.78	-1.00	Pipe #10	
42	Pipe	105.76	535.56	40.35	14.60	-0.22	Pipe #11	
43	Pipe	105.83	535.06	40.32	0.49	-0.03	Pipe #17	
44								
45	Pressure Temperature Profile							
46								
47	Cumulative Length (km)	Inside Diameter (in)	Pressure (psig)	Temperature (F)	DeltaP Friction (psi)	DeltaP Head (psi)	Liquid Volume Fraction	Pressure Gradient (inH2O/ft)
48								
49								
50	0.03	19.250	1094.85	109.71	0.12	0.04	0.0000	-0.0427
51	0.81	19.250	1090.89	108.97	3.03	0.92	0.0000	-0.0427
52	1.59	19.250	1088.93	108.21	3.04	0.92	0.0000	-0.0428
53	2.37	19.250	1082.96	107.44	3.04	0.92	0.0000	-0.0428
54	3.16	19.250	1079.00	106.65	3.05	0.92	0.0000	-0.0429
55	3.94	19.250	1075.02	105.86	3.05	0.92	0.0000	-0.0429
56	4.72	19.250	1071.05	105.05	3.06	0.92	0.0000	-0.0429
57	5.50	19.250	1067.07	104.23	3.06	0.91	0.0000	-0.0430
58	6.28	19.250	1063.09	103.40	3.07	0.91	0.0000	-0.0430
59	7.06	19.250	1059.10	102.55	3.07	0.91	0.0000	-0.0431
60	7.84	19.250	1055.11	101.70	3.08	0.91	0.0000	-0.0431
61	8.00	19.250	1054.30	101.52	0.63	0.18	0.0000	-0.0431
62	8.78	19.250	1050.49	100.69	3.08	0.73	0.0000	-0.0412
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 58 of 102		
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1	 LEGENDS Burlington, MA USA				Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2					Unit Set: Field1			
3					Date/Time: Fri Apr 13 12:13:26 2012			
4								
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6	NeotecPIPESYS v2.5.77.0:				FLUJO MAXIMO 270-1100-110.HSC			
7	Puente Guillermo-Cogua-2							
8	Pressure Temperature Profile							
9								
10								
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12								
13								
14								
15	Cumulative	Inside	Pressure	Temperature	DeltaP	DeltaP	Liquid Volume	Pressure
16	Length	Diameter	(psig)	(F)	Friction	Head	Fraction	Gradient
17	(km)	(in)			(psi)	(psi)		(inH2O/ft)
18	9.56	19.250	1046.67	99.86	3.09	0.73	0.0000	-0.0412
19	10.34	19.250	1042.85	99.04	3.09	0.72	0.0000	-0.0413
20	11.13	19.250	1039.03	98.22	3.10	0.72	0.0000	-0.0413
21	11.91	19.250	1035.20	97.42	3.10	0.72	0.0000	-0.0413
22	12.69	19.250	1031.37	96.62	3.11	0.72	0.0000	-0.0414
23	13.47	19.250	1027.54	95.83	3.11	0.72	0.0000	-0.0414
24	14.25	19.250	1023.70	95.04	3.12	0.72	0.0000	-0.0415
25	15.03	19.250	1019.85	94.26	3.13	0.72	0.0000	-0.0415
26	15.81	19.250	1016.00	93.49	3.13	0.72	0.0000	-0.0416
27	16.59	19.250	1012.15	92.73	3.14	0.71	0.0000	-0.0416
28	17.37	19.250	1008.29	91.97	3.14	0.71	0.0000	-0.0417
29	18.00	19.250	1005.20	91.37	2.53	0.57	0.0000	-0.0417
30	18.78	19.250	1001.25	90.61	3.15	0.79	0.0000	-0.0426
31	19.56	19.250	997.30	89.86	3.16	0.79	0.0000	-0.0427
32	20.34	19.250	993.35	89.12	3.17	0.79	0.0000	-0.0427
33	21.13	19.250	989.39	88.39	3.17	0.78	0.0000	-0.0428
34	21.91	19.250	985.42	87.66	3.18	0.78	0.0000	-0.0428
35	22.69	19.250	981.45	86.93	3.19	0.78	0.0000	-0.0429
36	23.47	19.250	977.48	86.21	3.20	0.78	0.0000	-0.0429
37	24.25	19.250	973.49	85.50	3.20	0.78	0.0000	-0.0430
38	25.03	19.250	969.51	84.80	3.21	0.77	0.0000	-0.0431
39	25.81	19.250	965.51	84.10	3.22	0.77	0.0000	-0.0431
40	26.59	19.250	961.51	83.40	3.23	0.77	0.0000	-0.0432
41	27.00	19.250	959.42	83.04	1.69	0.40	0.0000	-0.0433
42	27.78	19.250	955.32	82.35	3.24	0.86	0.0000	-0.0443
43	28.56	19.250	951.21	81.65	3.25	0.86	0.0000	-0.0444
44	29.35	19.250	947.09	80.97	3.26	0.86	0.0000	-0.0445
45	30.13	19.250	942.96	80.28	3.27	0.86	0.0000	-0.0446
46	30.91	19.250	938.83	79.61	3.28	0.85	0.0000	-0.0446
47	31.69	19.250	934.69	78.94	3.29	0.85	0.0000	-0.0447
48	32.47	19.250	930.55	78.27	3.29	0.85	0.0000	-0.0448
49	33.25	19.250	926.39	77.61	3.30	0.85	0.0000	-0.0449
50	34.03	19.250	922.23	76.95	3.31	0.84	0.0000	-0.0449
51	34.81	19.250	918.07	76.30	3.32	0.84	0.0000	-0.0450
52	35.00	19.250	917.06	76.15	0.81	0.20	0.0000	-0.0451
53	35.78	19.250	912.38	75.43	3.34	1.34	0.0000	-0.0506
54	36.56	19.250	907.69	74.72	3.35	1.34	0.0000	-0.0506
55	37.35	19.250	902.99	74.02	3.36	1.33	0.0000	-0.0507
56	37.50	19.250	902.05	73.88	0.68	0.27	0.0000	-0.0508
57	38.28	19.250	898.41	73.33	3.38	0.27	0.0000	-0.0393
58	39.07	19.250	894.76	72.78	3.39	0.26	0.0000	-0.0394
59	39.85	19.250	891.10	72.24	3.39	0.26	0.0000	-0.0395
60	40.63	19.250	887.43	71.71	3.41	0.26	0.0000	-0.0396
61	41.41	19.250	883.75	71.18	3.42	0.26	0.0000	-0.0397
62	42.19	19.250	880.06	70.65	3.43	0.26	0.0000	-0.0398
63	Aspen Technology Inc.				Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 59 of 102	
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1	 LEGENDS Burlington, MA USA				Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2					Unit Set: Field1				
3					Date/Time: Fri Apr 13 12:13:26 2012				
4									
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6									
7	NeotecPIPESYS v2.5.77.0:				FLUJO MAXIMO 270-1100-110.HSC				
8									
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11									
12									
13									
14									
15	Pressure Temperature Profile								
16	Cumulative	Inside	Pressure	Temperature	DeltaP	DeltaP	Liquid Volume	Pressure	
17	Length	Diameter	(psig)	(F)	Friction	Head	Fraction	Gradient	
18	(km)	(in)			(psi)	(psi)		(inH2O/ft)	
19	42.97	19.250	876.36	70.13	3.44	0.26	0.0000	-0.0399	
20	43.75	19.250	872.65	69.61	3.45	0.26	0.0000	-0.0401	
21	44.53	19.250	868.93	69.10	3.46	0.26	0.0000	-0.0402	
22	45.31	19.250	865.20	68.59	3.47	0.26	0.0000	-0.0403	
23	46.10	19.250	861.46	68.08	3.48	0.26	0.0000	-0.0404	
24	46.88	19.250	857.71	67.58	3.49	0.26	0.0000	-0.0405	
25	47.66	19.250	853.95	67.08	3.50	0.26	0.0000	-0.0406	
26	48.44	19.250	850.18	66.59	3.52	0.25	0.0000	-0.0408	
27	49.22	19.250	846.39	66.10	3.53	0.25	0.0000	-0.0409	
28	50.00	19.250	842.60	65.61	3.54	0.25	0.0000	-0.0410	
29	50.00	19.250	842.59	65.61	0.01	0.00	0.0000	-0.0411	
30	50.78	19.250	838.72	65.12	3.55	0.31	0.0000	-0.0418	
31	51.57	19.250	834.84	64.63	3.57	0.31	0.0000	-0.0419	
32	52.35	19.250	830.94	64.14	3.58	0.31	0.0000	-0.0421	
33	53.13	19.250	827.03	63.66	3.60	0.31	0.0000	-0.0422	
34	53.91	19.250	823.11	63.18	3.61	0.31	0.0000	-0.0423	
35	54.69	19.250	819.18	62.71	3.62	0.31	0.0000	-0.0425	
36	55.47	19.250	815.23	62.23	3.64	0.31	0.0000	-0.0428	
37	56.25	19.250	811.27	61.77	3.65	0.31	0.0000	-0.0428	
38	57.03	19.250	807.30	61.30	3.67	0.31	0.0000	-0.0429	
39	57.81	19.250	803.31	60.84	3.68	0.30	0.0000	-0.0431	
40	58.60	19.250	799.30	60.38	3.70	0.30	0.0000	-0.0432	
41	59.38	19.250	795.29	59.92	3.71	0.30	0.0000	-0.0434	
42	60.16	19.250	791.25	59.47	3.73	0.30	0.0000	-0.0436	
43	60.94	19.250	787.21	59.02	3.75	0.30	0.0000	-0.0437	
44	61.72	19.250	783.14	58.57	3.76	0.30	0.0000	-0.0439	
45	62.50	19.250	779.06	58.12	3.78	0.30	0.0000	-0.0441	
46	63.28	19.250	774.97	57.68	3.80	0.29	0.0000	-0.0442	
47	64.06	19.250	770.86	57.24	3.82	0.29	0.0000	-0.0444	
48	64.85	19.250	766.73	56.80	3.83	0.29	0.0000	-0.0446	
49	65.63	19.250	762.58	56.37	3.85	0.29	0.0000	-0.0448	
50	66.41	19.250	758.42	55.94	3.87	0.29	0.0000	-0.0450	
51	67.19	19.250	754.24	55.51	3.89	0.29	0.0000	-0.0452	
52	67.97	19.250	750.04	55.08	3.91	0.29	0.0000	-0.0454	
53	68.75	19.250	745.82	54.66	3.93	0.28	0.0000	-0.0456	
54	69.53	19.250	741.59	54.23	3.95	0.28	0.0000	-0.0458	
55	70.00	19.250	739.02	53.98	2.39	0.17	0.0000	-0.0459	
56	70.78	19.250	734.73	53.56	3.98	0.30	0.0000	-0.0463	
57	71.57	19.250	730.42	53.14	4.01	0.30	0.0000	-0.0466	
58	72.35	19.250	726.09	52.72	4.03	0.30	0.0000	-0.0468	
59	73.13	19.250	721.74	52.30	4.05	0.30	0.0000	-0.0470	
60	73.91	19.250	717.37	51.89	4.07	0.30	0.0000	-0.0472	
61	74.69	19.250	712.97	51.48	4.10	0.30	0.0000	-0.0475	
62	75.47	19.250	708.56	51.07	4.12	0.29	0.0000	-0.0477	
63	76.25	19.250	704.12	50.66	4.14	0.29	0.0000	-0.0479	
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1	 LEGENDS Burlington, MA USA				Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2					Unit Set: Field1			
3					Date/Time: Fri Apr 13 12:13:26 2012			
4								
5								
6	NeotecPIPESYS v2.5.77.0:				FLUJO MAXIMO 270-1100-110.HSC			
7	Puente Guillermo-Cogua-2							
8								
9								
10	Pressure Temperature Profile							
11								
12								
13								
14								
15	Cumulative	Inside	Pressure	Temperature	DeltaP	DeltaP	Liquid Volume	Pressure
16	Length	Diameter	(psig)	(F)	Friction	Head	Fraction	Gradient
17	(km)	(in)			(psi)	(psi)		(inH2O/ft)
18	77.03	19.250	699.66	50.25	4.17	0.29	0.0000	-0.0482
19	77.81	19.250	695.17	49.85	4.19	0.29	0.0000	-0.0484
20	78.60	19.250	690.66	49.44	4.22	0.29	0.0000	-0.0487
21	79.38	19.250	686.13	49.04	4.25	0.28	0.0000	-0.0490
22	80.16	19.250	681.57	48.64	4.27	0.28	0.0000	-0.0492
23	80.94	19.250	676.98	48.24	4.30	0.28	0.0000	-0.0495
24	81.72	19.250	672.37	47.85	4.33	0.28	0.0000	-0.0498
25	82.50	19.250	667.73	47.45	4.36	0.28	0.0000	-0.0501
26	83.28	19.250	663.06	47.06	4.39	0.28	0.0000	-0.0504
27	84.06	19.250	658.37	46.67	4.42	0.27	0.0000	-0.0507
28	84.85	19.250	653.64	46.27	4.45	0.27	0.0000	-0.0510
29	85.63	19.250	648.89	45.88	4.48	0.27	0.0000	-0.0513
30	86.41	19.250	644.11	45.49	4.51	0.27	0.0000	-0.0517
31	87.19	19.250	639.29	45.11	4.55	0.27	0.0000	-0.0520
32	87.97	19.250	634.44	44.72	4.58	0.26	0.0000	-0.0524
33	88.75	19.250	629.56	44.33	4.61	0.26	0.0000	-0.0527
34	89.53	19.250	624.65	43.95	4.65	0.26	0.0000	-0.0531
35	90.31	19.250	619.70	43.56	4.69	0.26	0.0000	-0.0534
36	91.09	19.250	614.72	43.18	4.72	0.26	0.0000	-0.0538
37	91.88	19.250	609.70	42.79	4.76	0.25	0.0000	-0.0542
38	92.20	19.250	607.58	42.63	2.01	0.11	0.0000	-0.0545
39	92.98	19.250	603.72	42.49	4.81	-0.96	0.0000	-0.0417
40	93.77	19.250	599.83	42.35	4.85	-0.95	0.0000	-0.0421
41	94.55	19.250	595.89	42.21	4.88	-0.95	0.0000	-0.0425
42	95.33	19.250	591.91	42.06	4.92	-0.94	0.0000	-0.0430
43	96.11	19.250	587.89	41.92	4.95	-0.93	0.0000	-0.0434
44	96.89	19.250	583.82	41.77	4.99	-0.93	0.0000	-0.0439
45	97.67	19.250	579.71	41.63	5.03	-0.92	0.0000	-0.0444
46	98.00	19.250	577.94	41.57	2.16	-0.39	0.0000	-0.0448
47	98.79	19.250	573.73	41.41	5.08	-0.88	0.0000	-0.0454
48	99.57	19.250	569.48	41.26	5.12	-0.87	0.0000	-0.0460
49	100.35	19.250	565.18	41.10	5.16	-0.87	0.0000	-0.0465
50	101.13	19.250	560.82	40.95	5.21	-0.86	0.0000	-0.0470
51	101.91	19.250	556.42	40.79	5.25	-0.85	0.0000	-0.0476
52	102.69	19.250	551.96	40.63	5.30	-0.84	0.0000	-0.0481
53	103.01	19.250	550.16	40.57	2.14	-0.34	0.0000	-0.0485
54	103.79	19.250	546.08	40.51	5.36	-1.29	0.0000	-0.0440
55	104.57	19.250	541.95	40.45	5.40	-1.28	0.0000	-0.0446
56	105.35	19.250	537.77	40.38	5.45	-1.27	0.0000	-0.0452
57	105.76	19.250	535.56	40.35	2.86	-0.66	0.0000	-0.0457
58	105.83	19.250	535.06	40.32	0.49	0.00	0.0000	-0.0585
59								
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63	Aspen Technology Inc.			Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 61 of 102	
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1	 LEGENDS Burlington, MA USA						Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2							Unit Set: Field1				
3							Date/Time: Fri Apr 13 12:13:26 2012				
4											
5											
6											
7	NeotecPIPESYS v2.5.77.0:						FLUJO MAXIMO 270-1100-110.HSC				
8											
9											
10	Puente Guillermo-Cogua-2										
11											
12	Fluid Transport Properties										
13											
14											
15	Cumulative		Gas	Liquid	Gas	Liquid					Surface
16	Length	Iterations	Density	Density	Viscosity	Viscosity	Vsg	Vsl	Flow Pattern	Surface	Tension
17	(km)		(lb/ft3)	(lb/ft3)	(cP)	(cP)	(ft/s)	(ft/s)		(dyne/cm)	
18	0.03	4	4.156	---	0.014	---	18.782	---	SP-Turbulent	---	
19	0.81	3	4.152	---	0.014	---	18.800	---	SP-Turbulent	---	
20	1.59	3	4.145	---	0.014	---	18.834	---	SP-Turbulent	---	
21	2.37	3	4.137	---	0.014	---	18.867	---	SP-Turbulent	---	
22	3.16	3	4.130	---	0.014	---	18.901	---	SP-Turbulent	---	
23	3.94	3	4.123	---	0.014	---	18.934	---	SP-Turbulent	---	
24	4.72	3	4.116	---	0.014	---	18.966	---	SP-Turbulent	---	
25	5.50	3	4.109	---	0.014	---	18.999	---	SP-Turbulent	---	
26	6.28	3	4.102	---	0.014	---	19.030	---	SP-Turbulent	---	
27	7.06	3	4.095	---	0.014	---	19.062	---	SP-Turbulent	---	
28	7.84	3	4.088	---	0.014	---	19.093	---	SP-Turbulent	---	
29	8.00	3	4.084	---	0.014	---	19.112	---	SP-Turbulent	---	
30	8.78	3	4.081	---	0.014	---	19.130	---	SP-Turbulent	---	
31	9.56	3	4.074	---	0.014	---	19.159	---	SP-Turbulent	---	
32	10.34	3	4.068	---	0.014	---	19.189	---	SP-Turbulent	---	
33	11.13	3	4.061	---	0.014	---	19.220	---	SP-Turbulent	---	
34	11.91	3	4.055	---	0.014	---	19.252	---	SP-Turbulent	---	
35	12.69	3	4.048	---	0.014	---	19.284	---	SP-Turbulent	---	
36	13.47	3	4.041	---	0.014	---	19.317	---	SP-Turbulent	---	
37	14.25	3	4.034	---	0.014	---	19.352	---	SP-Turbulent	---	
38	15.03	3	4.026	---	0.014	---	19.387	---	SP-Turbulent	---	
39	15.81	3	4.019	---	0.014	---	19.422	---	SP-Turbulent	---	
40	16.59	3	4.011	---	0.014	---	19.459	---	SP-Turbulent	---	
41	17.37	3	4.004	---	0.014	---	19.497	---	SP-Turbulent	---	
42	18.00	3	3.997	---	0.014	---	19.531	---	SP-Turbulent	---	
43	18.78	3	3.989	---	0.014	---	19.567	---	SP-Turbulent	---	
44	19.56	3	3.981	---	0.014	---	19.608	---	SP-Turbulent	---	
45	20.34	3	3.972	---	0.014	---	19.651	---	SP-Turbulent	---	
46	21.13	3	3.964	---	0.014	---	19.694	---	SP-Turbulent	---	
47	21.91	3	3.955	---	0.014	---	19.738	---	SP-Turbulent	---	
48	22.69	3	3.946	---	0.014	---	19.783	---	SP-Turbulent	---	
49	23.47	3	3.937	---	0.014	---	19.829	---	SP-Turbulent	---	
50	24.25	3	3.927	---	0.014	---	19.875	---	SP-Turbulent	---	
51	25.03	3	3.918	---	0.013	---	19.923	---	SP-Turbulent	---	
52	25.81	3	3.908	---	0.013	---	19.972	---	SP-Turbulent	---	
53	26.59	3	3.899	---	0.013	---	20.022	---	SP-Turbulent	---	
54	27.00	3	3.891	---	0.013	---	20.061	---	SP-Turbulent	---	
55	27.78	3	3.883	---	0.013	---	20.101	---	SP-Turbulent	---	
56	28.56	3	3.873	---	0.013	---	20.155	---	SP-Turbulent	---	
57	29.35	3	3.862	---	0.013	---	20.210	---	SP-Turbulent	---	
58	30.13	3	3.852	---	0.013	---	20.266	---	SP-Turbulent	---	
59	30.91	3	3.841	---	0.013	---	20.323	---	SP-Turbulent	---	
60	31.69	3	3.830	---	0.013	---	20.382	---	SP-Turbulent	---	
61	32.47	3	3.819	---	0.013	---	20.441	---	SP-Turbulent	---	
62	33.25	3	3.807	---	0.013	---	20.502	---	SP-Turbulent	---	
63	Aspen Technology Inc.				Aspen HYSYS Version 7.2 (24.0.0.7263)				Page 62 of 102		
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1	 LEGENDS Burlington, MA USA						Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2							Unit Set: Field1				
3							Date/Time: Fri Apr 13 12:13:26 2012				
4											
5											
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7	NeotecPIPESYS v2.5.77.0:						FLUJO MAXIMO 270-1100-110.HSC				
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9											
10	Puente Guillermo-Cogua-2										
11											
12	Fluid Transport Properties										
13											
14											
15	Cumulative		Gas	Liquid	Gas	Liquid					Surface
16	Length	Iterations	Density	Density	Viscosity	Viscosity	Vsg	Vsl	Flow Pattern	Tension	
17	(km)		(lb/ft ³)	(lb/ft ³)	(cP)	(cP)	(ft/s)	(ft/s)		(dyne/cm)	
18	34.03	3	3.786	---	0.013	---	20.564	---	SP-Turbulent	---	
19	34.81	3	3.784	---	0.013	---	20.627	---	SP-Turbulent	---	
20	35.00	3	3.777	---	0.013	---	20.667	---	SP-Turbulent	---	
21	35.78	4	3.769	---	0.013	---	20.711	---	SP-Turbulent	---	
22	36.56	3	3.755	---	0.013	---	20.766	---	SP-Turbulent	---	
23	37.35	3	3.742	---	0.013	---	20.862	---	SP-Turbulent	---	
24	37.50	3	3.734	---	0.013	---	20.908	---	SP-Turbulent	---	
25	38.28	4	3.727	---	0.013	---	20.945	---	SP-Turbulent	---	
26	39.07	3	3.716	---	0.013	---	21.006	---	SP-Turbulent	---	
27	39.85	3	3.705	---	0.013	---	21.068	---	SP-Turbulent	---	
28	40.63	3	3.694	---	0.013	---	21.131	---	SP-Turbulent	---	
29	41.41	3	3.683	---	0.013	---	21.195	---	SP-Turbulent	---	
30	42.19	3	3.672	---	0.013	---	21.260	---	SP-Turbulent	---	
31	42.97	3	3.660	---	0.013	---	21.327	---	SP-Turbulent	---	
32	43.75	3	3.649	---	0.013	---	21.395	---	SP-Turbulent	---	
33	44.53	3	3.637	---	0.013	---	21.464	---	SP-Turbulent	---	
34	45.31	3	3.625	---	0.013	---	21.534	---	SP-Turbulent	---	
35	46.10	3	3.613	---	0.013	---	21.605	---	SP-Turbulent	---	
36	46.88	3	3.601	---	0.013	---	21.678	---	SP-Turbulent	---	
37	47.66	3	3.589	---	0.013	---	21.753	---	SP-Turbulent	---	
38	48.44	3	3.576	---	0.013	---	21.828	---	SP-Turbulent	---	
39	49.22	3	3.564	---	0.013	---	21.905	---	SP-Turbulent	---	
40	50.00	3	3.551	---	0.013	---	21.984	---	SP-Turbulent	---	
41	50.00	3	3.544	---	0.013	---	22.023	---	SP-Turbulent	---	
42	50.78	3	3.538	---	0.013	---	22.064	---	SP-Turbulent	---	
43	51.57	3	3.525	---	0.013	---	22.147	---	SP-Turbulent	---	
44	52.35	3	3.511	---	0.013	---	22.231	---	SP-Turbulent	---	
45	53.13	3	3.498	---	0.013	---	22.316	---	SP-Turbulent	---	
46	53.91	3	3.484	---	0.013	---	22.404	---	SP-Turbulent	---	
47	54.69	3	3.470	---	0.013	---	22.492	---	SP-Turbulent	---	
48	55.47	3	3.457	---	0.013	---	22.583	---	SP-Turbulent	---	
49	56.25	3	3.443	---	0.013	---	22.675	---	SP-Turbulent	---	
50	57.03	3	3.429	---	0.013	---	22.769	---	SP-Turbulent	---	
51	57.81	3	3.414	---	0.013	---	22.864	---	SP-Turbulent	---	
52	58.60	3	3.400	---	0.013	---	22.962	---	SP-Turbulent	---	
53	59.38	3	3.385	---	0.013	---	23.061	---	SP-Turbulent	---	
54	60.16	3	3.370	---	0.013	---	23.162	---	SP-Turbulent	---	
55	60.94	3	3.355	---	0.013	---	23.265	---	SP-Turbulent	---	
56	61.72	3	3.340	---	0.013	---	23.369	---	SP-Turbulent	---	
57	62.50	3	3.325	---	0.013	---	23.476	---	SP-Turbulent	---	
58	63.28	3	3.310	---	0.013	---	23.585	---	SP-Turbulent	---	
59	64.06	3	3.294	---	0.013	---	23.696	---	SP-Turbulent	---	
60	64.85	3	3.279	---	0.012	---	23.809	---	SP-Turbulent	---	
61	65.63	3	3.263	---	0.012	---	23.924	---	SP-Turbulent	---	
62	66.41	3	3.247	---	0.012	---	24.041	---	SP-Turbulent	---	
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1	 LEGENDS Burlington, MA USA						Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2							Unit Set: Field1				
3							Date/Time: Fri Apr 13 12:13:26 2012				
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12	Fluid Transport Properties										
13											
14											
15	Cumulative		Gas	Liquid	Gas	Liquid					Surface
16	Length	Iterations	Density	Density	Viscosity	Viscosity	Vsg	Vsl	Flow Pattern	Flow Pattern	Tension
17	(km)		(lb/ft ³)	(lb/ft ³)	(cP)	(cP)	(ft/s)	(ft/s)			(dyne/cm)
18	67.19	3	3.231	---	0.012	---	24.161	---	SP-Turbulent	---	---
19	67.97	3	3.215	---	0.012	---	24.283	---	SP-Turbulent	---	---
20	68.75	3	3.198	---	0.012	---	24.407	---	SP-Turbulent	---	---
21	69.53	3	3.182	---	0.012	---	24.534	---	SP-Turbulent	---	---
22	70.00	3	3.168	---	0.012	---	24.637	---	SP-Turbulent	---	---
23	70.78	3	3.155	---	0.012	---	24.743	---	SP-Turbulent	---	---
24	71.57	3	3.138	---	0.012	---	24.877	---	SP-Turbulent	---	---
25	72.35	3	3.121	---	0.012	---	25.013	---	SP-Turbulent	---	---
26	73.13	3	3.103	---	0.012	---	25.153	---	SP-Turbulent	---	---
27	73.91	3	3.086	---	0.012	---	25.295	---	SP-Turbulent	---	---
28	74.69	3	3.069	---	0.012	---	25.440	---	SP-Turbulent	---	---
29	75.47	3	3.051	---	0.012	---	25.589	---	SP-Turbulent	---	---
30	76.25	3	3.033	---	0.012	---	25.740	---	SP-Turbulent	---	---
31	77.03	3	3.015	---	0.012	---	25.895	---	SP-Turbulent	---	---
32	77.81	3	2.996	---	0.012	---	26.052	---	SP-Turbulent	---	---
33	78.60	3	2.978	---	0.012	---	26.214	---	SP-Turbulent	---	---
34	79.38	3	2.959	---	0.012	---	26.378	---	SP-Turbulent	---	---
35	80.16	3	2.941	---	0.012	---	26.546	---	SP-Turbulent	---	---
36	80.94	3	2.922	---	0.012	---	26.718	---	SP-Turbulent	---	---
37	81.72	3	2.902	---	0.012	---	26.894	---	SP-Turbulent	---	---
38	82.50	3	2.883	---	0.012	---	27.074	---	SP-Turbulent	---	---
39	83.28	3	2.864	---	0.012	---	27.257	---	SP-Turbulent	---	---
40	84.06	3	2.844	---	0.012	---	27.445	---	SP-Turbulent	---	---
41	84.85	3	2.824	---	0.012	---	27.637	---	SP-Turbulent	---	---
42	85.63	3	2.804	---	0.012	---	27.834	---	SP-Turbulent	---	---
43	86.41	3	2.784	---	0.012	---	28.035	---	SP-Turbulent	---	---
44	87.19	3	2.764	---	0.012	---	28.241	---	SP-Turbulent	---	---
45	87.97	3	2.744	---	0.012	---	28.452	---	SP-Turbulent	---	---
46	88.75	3	2.723	---	0.012	---	28.668	---	SP-Turbulent	---	---
47	89.53	3	2.702	---	0.012	---	28.890	---	SP-Turbulent	---	---
48	90.31	3	2.681	---	0.012	---	29.117	---	SP-Turbulent	---	---
49	91.09	3	2.660	---	0.012	---	29.349	---	SP-Turbulent	---	---
50	91.88	3	2.639	---	0.012	---	29.588	---	SP-Turbulent	---	---
51	92.20	3	2.623	---	0.012	---	29.761	---	SP-Turbulent	---	---
52	92.98	4	2.609	---	0.012	---	29.915	---	SP-Turbulent	---	---
53	93.77	3	2.591	---	0.012	---	30.122	---	SP-Turbulent	---	---
54	94.55	3	2.573	---	0.012	---	30.335	---	SP-Turbulent	---	---
55	95.33	3	2.555	---	0.012	---	30.552	---	SP-Turbulent	---	---
56	96.11	3	2.536	---	0.012	---	30.775	---	SP-Turbulent	---	---
57	96.89	3	2.518	---	0.012	---	31.004	---	SP-Turbulent	---	---
58	97.67	3	2.499	---	0.012	---	31.238	---	SP-Turbulent	---	---
59	98.00	3	2.485	---	0.012	---	31.409	---	SP-Turbulent	---	---
60	98.79	3	2.471	---	0.012	---	31.584	---	SP-Turbulent	---	---
61	99.57	3	2.452	---	0.012	---	31.835	---	SP-Turbulent	---	---
62	100.35	3	2.432	---	0.012	---	32.092	---	SP-Turbulent	---	---
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8										
9										
10	Puente Guillermo-Cogua-2									
11										
12	Fluid Transport Properties									
13										
14										
15	Cumulative		Gas	Liquid	Gas	Liquid	Vsg	Vsl	Flow Pattern	Surface
16	Length	Iterations	Density	Density	Viscosity	Viscosity	(ft/s)	(ft/s)		Tension
17	(km)		(lb/ft3)	(lb/ft3)	(cP)	(cP)				(dyne/cm)
18	101.13	3	2.412	---	0.012	---	32.357	---	SP-Turbulent	---
19	101.91	3	2.392	---	0.012	---	32.629	---	SP-Turbulent	---
20	102.69	3	2.372	---	0.012	---	32.909	---	SP-Turbulent	---
21	103.01	3	2.358	---	0.012	---	33.109	---	SP-Turbulent	---
22	103.79	4	2.344	---	0.012	---	33.304	---	SP-Turbulent	---
23	104.57	3	2.324	---	0.012	---	33.581	---	SP-Turbulent	---
24	105.35	3	2.305	---	0.012	---	33.867	---	SP-Turbulent	---
25	105.76	3	2.290	---	0.012	---	34.090	---	SP-Turbulent	---
26	105.83	3	2.294	---	0.012	---	34.184	---	SP-Turbulent	---
27										
28	Miscellaneous									
29										
30	Cumulative		Cumulative	Cumulative Liquid		Cumulative		Cumulative Gas		
31	Length		Liquid Holdup	Transit Time		Line Pack @STD		Transit Time		
32	(km)		(ft3)	(hours)		(ft3)		(hours)		
33	0.00		0.0	0.000		0.0		0.000		
34	8.00		0.0	0.000		4328233.3		0.385		
35	18.00		0.0	0.000		9635258.7		0.857		
36	27.00		0.0	0.000		14295907.5		1.271		
37	35.00		0.0	0.000		18323975.2		1.629		
38	37.50		0.0	0.000		19558824.8		1.738		
39	50.00		0.0	0.000		25534713.7		2.270		
40	70.00		0.0	0.000		34365276.6		3.055		
41	92.20		0.0	0.000		42827641.4		3.807		
42	98.00		0.0	0.000		44770980.0		3.980		
43	103.01		0.0	0.000		46359196.8		4.121		
44	105.76		0.0	0.000		47197263.2		4.196		
45	105.83		0.0	0.000		47218257.0		4.197		
46										
47	Heat Transfer									
48										
49	Cumulative	Superficial Gas	Superficial Liquid	Mixture	Inside	Overall Heat				
50	Length	Reynold's Number	Reynold's Number	Reynold's Number	Film Coefficient	Transfer Coefficient				
51	(km)				(Btu/hr-ft2-F)	(Btu/hr-ft2-F)				
52	0.03	13187844	---	13187844	164.7771	0.3063				
53	0.81	13197496	---	13197496	164.7238	0.3063				
54	1.59	13216206	---	13216206	164.6209	0.3063				
55	2.37	13235124	---	13235124	164.5172	0.3063				
56	3.16	13254256	---	13254256	164.4129	0.3063				
57	3.94	13273602	---	13273602	164.3079	0.3063				
58	4.72	13293162	---	13293162	164.2024	0.3063				
59	5.50	13312939	---	13312939	164.0962	0.3063				
60	6.28	13332929	---	13332929	163.9894	0.3063				
61	7.06	13353138	---	13353138	163.8820	0.3063				
62	7.84	13373566	---	13373566	163.7741	0.3063				
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2				Unit Set: Field1		
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8						
9						
10	Puente Guillermo-Cogua-2					
11						
12	Heat Transfer					
13						
14						
15	Cumulative	Superficial Gas	Superficial Liquid	Mixture	Inside	Overall Heat
16	Length	Reynold's Number	Reynold's Number	Reynold's Number	Film Coefficient	Transfer Coefficient
17	(km)				(Btu/hr-ft ² -F)	(Btu/hr-ft ² -F)
18	8.00	13385943	---	13385943	163.7090	0.3063
19	9.78	13397991	---	13397991	163.8460	0.3063
20	9.56	13417928	---	13417928	163.5419	0.3063
21	10.34	13437894	---	13437894	163.4379	0.3063
22	11.13	13457864	---	13457864	163.3340	0.3063
23	11.91	13477904	---	13477904	163.2300	0.3063
24	12.69	13497953	---	13497953	163.1261	0.3063
25	13.47	13518034	---	13518034	163.0221	0.3063
26	14.25	13538145	---	13538145	162.9181	0.3063
27	15.03	13558290	---	13558290	162.8140	0.3063
28	15.81	13578469	---	13578469	162.7098	0.3063
29	16.59	13598683	---	13598683	162.6055	0.3063
30	17.37	13618934	---	13618934	162.5011	0.3063
31	18.00	13637213	---	13637213	162.4068	0.3063
32	18.78	13655701	---	13655701	162.3115	0.3063
33	19.56	13676423	---	13676423	162.2045	0.3063
34	20.34	13697192	---	13697192	162.0973	0.3063
35	21.13	13718004	---	13718004	161.9899	0.3063
36	21.91	13738860	---	13738860	161.8823	0.3063
37	22.69	13759764	---	13759764	161.7743	0.3063
38	23.47	13780718	---	13780718	161.6661	0.3063
39	24.25	13801717	---	13801717	161.5575	0.3063
40	25.03	13822770	---	13822770	161.4486	0.3063
41	25.81	13843870	---	13843870	161.3394	0.3063
42	26.59	13865024	---	13865024	161.2298	0.3063
43	27.00	13881162	---	13881162	161.1461	0.3063
44	27.78	13897558	---	13897558	161.0609	0.3063
45	28.56	13919323	---	13919323	160.9477	0.3063
46	29.35	13941147	---	13941147	160.8341	0.3063
47	30.13	13963035	---	13963035	160.7199	0.3063
48	30.91	13984982	---	13984982	160.6053	0.3063
49	31.69	14006995	---	14006995	160.4902	0.3063
50	32.47	14029071	---	14029071	160.3746	0.3063
51	33.25	14051214	---	14051214	160.2584	0.3063
52	34.03	14073423	---	14073423	160.1417	0.3063
53	34.81	14095700	---	14095700	160.0244	0.3063
54	35.00	14109571	---	14109571	159.9513	0.3063
55	35.78	14124770	---	14124770	159.8709	0.3063
56	36.56	14149829	---	14149829	159.7380	0.3063
57	37.35	14174978	---	14174978	159.6045	0.3063
58	37.50	14190128	---	14190128	159.5239	0.3063
59	38.28	14202490	---	14202490	159.4582	0.3063
60	39.07	14222183	---	14222183	159.3535	0.3063
61	39.85	14241929	---	14241929	159.2483	0.3063
62	40.63	14261730	---	14261730	159.1424	0.3063
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12	Heat Transfer					
13						
14						
15	Cumulative	Superficial Gas	Superficial Liquid	Mixture	Inside	Overall Heat
16	Length	Reynold's Number	Reynold's Number	Reynold's Number	Film Coefficient	Transfer Coefficient
17	(km)				(Btu/hr-ft ² -F)	(Btu/hr-ft ² -F)
18	41.41	14281583	---	14281583	159.0360	0.3063
19	42.19	14301496	---	14301496	158.9290	0.3063
20	42.97	14321463	---	14321463	158.8214	0.3063
21	43.75	14341491	---	14341491	158.7132	0.3063
22	44.53	14361579	---	14361579	158.6043	0.3063
23	45.31	14381726	---	14381726	158.4948	0.3063
24	46.10	14401937	---	14401937	158.3847	0.3063
25	46.88	14422208	---	14422208	158.2739	0.3063
26	47.66	14442544	---	14442544	158.1624	0.3063
27	48.44	14462947	---	14462947	158.0503	0.3063
28	49.22	14483413	---	14483413	157.9374	0.3063
29	50.00	14503947	---	14503947	157.8238	0.3063
30	50.00	14514260	---	14514260	157.7687	0.3063
31	50.78	14524769	---	14524769	157.7084	0.3063
32	51.57	14545806	---	14545806	157.5914	0.3063
33	52.35	14566912	---	14566912	157.4737	0.3063
34	53.13	14588097	---	14588097	157.3552	0.3063
35	53.91	14609357	---	14609357	157.2359	0.3063
36	54.69	14630692	---	14630692	157.1158	0.3063
37	55.47	14652107	---	14652107	156.9949	0.3063
38	56.25	14673600	---	14673600	156.8732	0.3063
39	57.03	14695173	---	14695173	156.7507	0.3063
40	57.81	14716827	---	14716827	156.6273	0.3063
41	58.60	14738564	---	14738564	156.5031	0.3063
42	59.38	14760387	---	14760387	156.3780	0.3063
43	60.16	14782296	---	14782296	156.2520	0.3063
44	60.94	14804290	---	14804290	156.1251	0.3063
45	61.72	14826373	---	14826373	155.9974	0.3063
46	62.50	14848549	---	14848549	155.8687	0.3063
47	63.28	14870815	---	14870815	155.7391	0.3063
48	64.06	14893170	---	14893170	155.6085	0.3063
49	64.85	14915625	---	14915625	155.4771	0.3063
50	65.63	14938173	---	14938173	155.3446	0.3063
51	66.41	14960817	---	14960817	155.2112	0.3063
52	67.19	14983563	---	14983563	155.0768	0.3063
53	67.97	15006409	---	15006409	154.9414	0.3063
54	68.75	15029357	---	15029357	154.8049	0.3063
55	69.53	15052411	---	15052411	154.6675	0.3063
56	70.00	15070962	---	15070962	154.5566	0.3063
57	70.78	15089660	---	15089660	154.4446	0.3063
58	71.57	15113143	---	15113143	154.3096	0.3063
59	72.35	15136738	---	15136738	154.1616	0.3063
60	73.13	15160444	---	15160444	154.0184	0.3063
61	73.91	15184264	---	15184264	153.8742	0.3063
62	74.69	15208203	---	15208203	153.7288	0.3063
63	Aspen Technology Inc.			Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 67 of 102
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1	 LEGENDS Burlington, MA USA			Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2				Unit Set: Field1		
3				Date/Time: Fri Apr 13 12:13:26 2012		
4						
5						
6	NeotecPIPESYS v2.5.77.0:			FLUJO MAXIMO 270-1100-110.HSC		
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18	Cumulative Length (km)	Superficial Gas Reynold's Number	Superficial Liquid Reynold's Number	Mixture Reynold's Number	Inside Film Coefficient (Btu/hr-ft2-F)	Overall Heat Transfer Coefficient (Btu/hr-ft2-F)
19	75.47	15232259	---	15232259	153.5823	0.3063
20	76.25	15258438	---	15258438	153.4347	0.3063
21	77.03	15280740	---	15280740	153.2858	0.3063
22	77.81	15305168	---	15305168	153.1358	0.3063
23	78.60	15329725	---	15329725	152.9846	0.3063
24	79.38	15354412	---	15354412	152.8322	0.3063
25	80.16	15379233	---	15379233	152.6786	0.3063
26	80.94	15404189	---	15404189	152.5236	0.3063
27	81.72	15429284	---	15429284	152.3675	0.3063
28	82.50	15454521	---	15454521	152.2100	0.3063
29	83.28	15479904	---	15479904	152.0512	0.3063
30	84.06	15505433	---	15505433	151.8911	0.3063
31	84.85	15531114	---	15531114	151.7297	0.3063
32	85.63	15556948	---	15556948	151.5669	0.3063
33	86.41	15582940	---	15582940	151.4027	0.3063
34	87.19	15609095	---	15609095	151.2370	0.3063
35	87.97	15635414	---	15635414	151.0700	0.3063
36	88.75	15661902	---	15661902	150.9015	0.3063
37	89.53	15688561	---	15688561	150.7314	0.3063
38	90.31	15715400	---	15715400	150.5599	0.3063
39	91.09	15742418	---	15742418	150.3888	0.3063
40	91.88	15769624	---	15769624	150.2122	0.3063
41	92.20	15789031	---	15789031	150.0874	0.3063
42	92.98	15803770	---	15803770	149.9664	0.3063
43	93.77	15821816	---	15821816	149.8579	0.3063
44	94.55	15840020	---	15840020	149.7280	0.3063
45	95.33	15858394	---	15858394	149.5967	0.3063
46	96.11	15876941	---	15876941	149.4641	0.3063
47	96.89	15895667	---	15895667	149.3301	0.3063
48	97.67	15914574	---	15914574	149.1947	0.3063
49	98.00	15928152	---	15928152	149.0974	0.3063
50	98.79	15941992	---	15941992	148.9984	0.3063
51	99.57	15961608	---	15961608	148.8581	0.3063
52	100.35	15981418	---	15981418	148.7162	0.3063
53	101.13	16001430	---	16001430	148.5728	0.3063
54	101.91	16021647	---	16021647	148.4278	0.3063
55	102.69	16042079	---	16042079	148.2811	0.3063
56	103.01	16056504	---	16056504	148.1774	0.3063
57	103.79	16069142	---	16069142	148.0827	0.3063
58	104.57	16086187	---	16086187	147.9521	0.3063
59	105.35	16103437	---	16103437	147.8200	0.3063
60	105.76	16118688	---	16118688	147.7185	0.3063
61	105.93	16122540	---	16122540	147.6749	0.3063
62						
63	Aspen Technology Inc.			Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 68 of 102
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1	 LEGENDS Burlington, MA USA				Case Name: FLUJO MAXIMO 270-1100-110.HSC					
2					Unit Set: Field1					
3					Date/Time: Fri Apr 13 12:13:26 2012					
4										
5										
6	NeotecPIPESYS v2.5.77.0: FLUJO MAXIMO 270-1100-110.HSC									
7	Puente Guillermo-Cogua-2									
8										
9										
10	Cooldown									
11										
12	Option									
13	No pipeline fluid cooldown calculations will be performed									
14										
15	Basis									
16	n/a									
17										
18	Thermal Conductivity of Fluid									
19	n/a									
20										
21	Heat Transfer Parameters					Transient Cooldown Parameters				
22	Overall Heat Transfer Coefficient: ---					Maximum Time Since Shutdown: ---				
23	Inside Film Coefficient: ---					First Intermediate Time: ---				
24	Thermal Conductivity of Fluid: ---					Second Intermediate Time: ---				
25	Heat Capacity of Pipe Material: ---					Third Intermediate Time: ---				
26	Density of Pipe Material: ---					Minimum Cooldown Temperature: ---				
27						Calculation Time Step: ---				
28	Results									
29	Cumulative	Overall Heat	Inside	Fluid	First	Second	Third	Temperature for	Time to Reach	
30	Length	Transfer	Film	Thermal	Intermediate	Intermediate	Intermediate	Max Time Since	Min Cooldown	
31		Coefficient	Coefficient	Conductivity	Temperature	Temperature	Temperature	Shutdown	Temperature	
32	(km)	(Btu/hr-ft ² -F)	(Btu/hr-ft ² -F)	(Btu/hr-ft-F)	(F)	(F)	(F)	(F)	(hours)	
33										
34										
35										
36										
37	Inlet Properties : Puente Guillermo-1-2									
38										
39										
40										
41										
42										
43										
44										
45		Overall	Vapour Phase							
46	Vapour/Phase Fraction	1.0000	1.0000							
47	Temperature: (F)	109.74	109.74							
48	Pressure: (psig)	1095.00	1095.00							
49	Molar Flow (MMSCFD)	270.03	270.03							
50	Mass Flow (lb/hr)	567953.83	567953.83							
51	Liquid Volume Flow (barrel/day)	117378.87	117378.87							
52	Std Gas Flow (MMSCFD)	269.53	269.53							
53	Molar Enthalpy (Btu/lbmole)	-3.603e+004	-3.603e+004							
54	Mass Enthalpy (Btu/lb)	-1881	-1881							
55	Heat Flow (Btu/hr)	-1.068e+009	-1.068e+009							
56	Molar Density (lbmole/ft ³)	0.2170	0.2170							
57	Mass Density (lb/ft ³)	4.156	4.156							
58	Std Liquid Mass Density (lb/ft ³)	---	---							
59	Molar Heat Capacity (Btu/lbmole-F)	12.285	12.285							
60	Mass Heat Capacity (Btu/lb-F)	0.640	0.640							
61	Molar Entropy (Btu/lbmole-F)	36.101	36.101							
62	Mass Entropy (Btu/lb-F)	1.885	1.885							
63	Aspen Technology Inc.				Aspen HYSYS Version 7.2 (24.0.0.7263)				Page 69 of 102	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	NeotecPIPESYS v2.5.77.0: FLUJO MAXIMO 270-1100-110.HSC			
7	Puente Guillermo-Cogua-2			
8				
9				
10	Inlet Properties : Puente Guillermo-1-2			
11				
12				
13				
14				
15		Overall	Vapour Phase	
16	Thermal Conductivity (Btu/hr-ft-F)	0.024	0.024	
17	Viscosity (cP)	0.014	0.014	
18	Surface Tension (dyne/cm)	---	---	
19	Molecular Weight	19.155	19.155	
20	Z Factor	0.837	0.837	
21				
22	Outlet Properties : A Cogua-2			
23				
24		Overall	Vapour Phase	
25	Vapour/Phase Fraction	1.0000	1.0000	
26	Temperature (F)	40.32	40.32	
27	Pressure (psig)	535.06	535.06	
28	Molar Flow (MMSCFD)	270.03	270.03	
29	Mass Flow (lb/hr)	567953.83	567953.83	
30	Liquid Volume Flow (barrel/day)	117378.87	117378.87	
31	Std Gas Flow (MMSCFD)	269.53	269.53	
32	Molar Enthalpy (Btu/lbmole)	-3.841e+004	-3.841e+004	
33	Mass Enthalpy (Btu/lb)	-1901	-1901	
34	Heat Flow (Btu/hr)	-1.080e+009	-1.080e+009	
35	Molar Density (lbmole/ft3)	0.1192	0.1192	
36	Mass Density (lb/ft3)	2.282	2.282	
37	Std Liquid Mass Density (lb/ft3)	---	---	
38	Molar Heat Capacity (Btu/lbmole-F)	10.911	10.911	
39	Mass Heat Capacity	0.570	0.570	
40	Molar Entropy (Btu/lbmole-F)	36.556	36.556	
41	Mass Entropy (Btu/lb-F)	1.908	1.908	
42	Thermal Conductivity (Btu/hr-ft-F)	0.019	0.019	
43	Viscosity (cP)	0.012	0.012	
44	Surface Tension (dyne/cm)	---	---	
45	Molecular Weight	19.155	19.155	
46	Z Factor	0.860	0.860	
47				
48	Stream Compositions			
49				
50	Component	Inlet Mole Fraction		Outlet Mole Fraction
51	Methane	0.00562		0.00562
52	Ethane	0.01917		0.01917
53	Propane	0.84117		0.84117
54	i-Butane	0.09571		0.09571
55	n-Butane	0.03251		0.03251
56	i-Pentane	0.00439		0.00439
57	n-Pentane	0.00039		0.00039
58	n-Hexane	0.00070		0.00070
59	C7+*	0.00011		0.00011
60	n-Heptane	0.00009		0.00009
61	H2O	0.00013		0.00013
62	Nitrogen			
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5						
6	NeotecPIPESYS v2.5.77.0: FLUJO MAXIMO 270-1100-110.HSC					
7	Puente Guillermo-Cogua-2					
8	Stream Compositions					
9						
10	Component		Inlet Mole Fraction		Outlet Mole Fraction	
11	CO2					
12	H2S					
13						
14	Summary					
15						
16	Upstream Pressure: 1095.00 psig					
17	Upstream Temperature: 109.74 F					
18						
19	Downstream Pressure: 535.06 psig					
20	Downstream Temperature: 40.32 F					
21						
22	Predicted Pressure Loss: 559.94 psi					
23						
24	Friction Loss: 516.29 psi					
25	Hydrostatic Loss: 43.35 psi					
26	Kinetic Loss: 0.293 psi					
27	Inline Facilities Loss: 0.00 psi					
28						
29	Average Pressure Gradient: -0.0446 inH2O/ft					
30						
31	Total Liquid Holdup: 0.0 ft3					
32	Total Line Pack @STD: 47218257.0 ft3					
33						
34	Pipe Volume: 701730.9 ft3					
35						
36	Net Heat Loss to the Surroundings: 1.048e+007 Btu/hr					
37						
38						
39						
40						
41						
42						
43						
44	NeotecPIPESYS v2.5.77.0: FLUJO MAXIMO 270-1100-110.HSC					
45	Cogua-ECGSB-2					
46	Connections					
47						
48	Inlet		Outlet		Energy	
49	NAME	FROM OPER	NAME	TO OPER	NAME	TO OPER
50	A ECGSB-2	Heater: E-101-2	A Succión-2	Valve: VLV-A Succión-2	q1-2-4-2	
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 71 of 102	


1			Case Name: FLUJO MAXIMO 270-1100-110.HSC
2	 LEGENDS Burlington, MA USA		Unit Set: Field1
3			Date/Time: Fri Apr 13 12:13:26 2012
4			
5			
6			
7	NeotecPIPESYS v2.5.77.0:		FLUJO MAXIMO 270-1100-110.HSC
8			
9			
10	Cogua-ECGSB-2		
11			
12	Calculation Procedures		
13			
14			
15			
16	Multiphase Horizontal Flow		Multiphase Vertical Upflow
17			
18	Overall Selection: Gas based default	*	Overall Selection: Gas based default
19	Flow Regime Prediction: Taitel and Dukler	*	Flow Regime Prediction: Govier, and Aziz
20	Liquid Holdup: Eaton et al	*	Liquid Holdup: Aziz, Govier, and Fogarasi
21	Frictional Pressure Loss: Oliemans	*	Frictional Pressure Loss: Aziz, Govier and Fogarasi
22	Uphill Correction: No Correction	*	
23	Downhill Recovery: Recovery Based on Gas Density	*	
24			Multiphase Vertical Downflow
25			
26	Single Phase Flow		
27			Overall Selection: Gas based default
28			Flow Regime Prediction: Beggs and Brill Revised
29			Liquid Holdup: Beggs and Brill Revised
30	Overall Selection: Fanning Equation	*	Frictional Pressure Loss: Beggs and Brill
31			
32	Stepsizes and Tolerances		
33			
34			
35			
36	Pipe Lengths		Pressure Convergence
37			
38	Initial stepsize: 0.03 km	*	Initial dP Guess: -10.00 psi
39	Minimum stepsize: 0.000 km	*	Minimum dP/step: 3.00 psi
40	Maximum stepsize: ---	*	Maximum dP/step: 10.00 psi
41			Convergence Tolerance: 0.010 psi
42			
43			
44	Temperature Convergence		Enthalpy Convergence
45			
46	Initial dT Guess: -2.00 F	*	Minimum dH/step: 0.60 Btu/lb
47	Minimum dT/step: 1.50 F	*	Maximum dH/step: 2.00 Btu/lb
48	Maximum dT/step: 5.00 F	*	Convergence Tolerance: 0.010 Btu/lb
49	Convergence Tolerance: 0.050 F	*	
50			
51			
52	Overall Settings		Overall Pipeline Pressure Convergence
53			
54	Stepsize and Tolerances: Set to Program Defaults	*	Minimum allowed pressure: -0.048 psig
55	Force Enthalpy Convergence: Disabled	*	Downstream press. conv. tolerance: 0.010 psi
56	Optimize Stepsize: Enabled	*	
57			
58			
59	Emulsion		
60			
61			
62	Emulsion Viscosity Option: Normal blended viscosity calculation		
63	Aspen Technology Inc.	Aspen HYSYS Version 7.2 (24.0.0.7263)	Page 72 of 102


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC					
2			Unit Set: Field1					
3			Date/Time: Fri Apr 13 12:13:26 2012					
4								
5								
6	NeotecPIPESYS v2.5.77.0: FLUJO MAXIMO 270-1100-110.HSC							
7								
8								
9								
10	Cogua-ECGSB-2							
11								
12	Emulsion							
13								
14								
15	Emulsion Viscosity Option: Normal blended viscosity calculation							
16								
17	Pipeline Units Profile							
18								
19	Distance at Pipeline Origin: 109.00 km			Elevation at Pipeline Origin: 2.20 km				
20								
21	Pipeline unit	Distance (km)	Elevation (km)	Run (km)	Rise (km)	Length (km)	Angle (deg)	Label
22	Pipe *	109.00 *	2.65 *	0.00	0.45	0.45	90.000	Pipe #12 *
23	Pipe *	114.00 *	2.68 *	5.00	0.03	5.00	0.344	Pipe #13 *
24	Pipe *	120.00 *	2.60 *	6.00	-0.08	6.00	-0.764	Pipe #14 *
25	Pipe *	124.00 *	2.58 *	4.00	-0.02	4.00	-0.286	Pipe #15 *
26	Erosion Velocity C	124.00	2.58	0.00	0.00	0.00	0.000	ErosionVelocityCheck#1 *
27								
28	Surroundings Temperature Profile							
29								
30								
31	Surroundings Temperature at Pipeline Origin: 68.00 F							
32								
33	Distance (km)	Elevation (km)	Cum. Length (km)	Label		Surroundings T (F)	Surroundings Type	
34	109.00	2.65	0.45	Pipe #12		68.00 *	Buried	
35	114.00	2.68	5.45	Pipe #13		68.00 *	Buried	
36	120.00	2.60	11.45	Pipe #14		68.00 *	Buried	
37	124.00	2.58	15.45	Pipe #15		68.00 *	Buried	
38								
39	Pipe Dimensions at Pipeline Origin							
40								
41								
42	Name: Pipe #12							
43								
44	Unit Location							
45								
46	Distance: 109.00 km		Elevation: 2.20 km		Distance From Origin: 0.00 km			
47								
48	Nominal Diameter: 20 Inches				Outside Diameter: 20.000 in			
49	Pipe Schedule: Standard				Wall Thickness: 0.375 in			
50					Inside Diameter: 19.250 in			
51								
52								
53	Default Roughness: Default: Steel (bare, average field conditions)							
54								
55	Absolute Roughness: 0.00180 in				Relative Roughness: 0.000094			
56								
57								
58								
59								
60								
61								
62								
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)				Page 73 of 102	

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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	NeotecPIPESYS v2.5.77.0:		FLUJO MAXIMO 270-1100-110.HSC	
7	Cogua-ECGSB-2			
8	Heat Transfer Data at Pipeline Origin			
9				
10	Heat Transfer Data at Pipeline Origin			
11				
12	Heat Transfer Data at Pipeline Origin			
13				
14				
15	Name: Pipe #12			
16	Unit Location			
17				
18	Distance: 109.00 km		Elevation: 2.20 km	
19			Distance From Origin: 0.00 km	
20				
21	Heat Transfer Environment		Soil Parameters	
22	Buried *		Centre Line Depth: 0.001 km *	
23			Buried Fraction: --- *	
24	Overall Heat Transfer Coefficient		Type: Default *	
25			Conductivity: 0.500 Btu/hr-ft-F *	
26	Specified Coefficient: ---		Water Parameters	
27			Density: --- Viscosity: --- Conductivity: --- Velocity: --- Heat Capacity: ---	
28	Inside Film Coefficient			
29	Type: Calculated *			
30	Specified Coefficient: ---			
31	Pipe Parameters		Air Parameters	
32			Density: --- Viscosity: --- Conductivity: --- Velocity: ---	
33	Default Conductivities: Default: Steel *			
34	Pipe Conductivity: 28.000 Btu/hr-ft-F			
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47	Pipe Coatings Data at Pipeline Origin			
48				
49	Name: Pipe #12			
50	Unit Location			
51				
52	Distance: 109.00 km		Elevation: 2.20 km	
53			Distance From Origin: 0.00 km	
54				
55	Layer	Coating	Thickness (in)	Conductivity (Btu/hr-ft-F)
56	---	<empty>	---	---
57				
58				
59				
60				
61				
62				
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC					
2			Unit Set: Field1					
3			Date/Time: Fri Apr 13 12:13:26 2012					
4								
5								
6								
7	NeotecPIPESYS v2.5.77.0:			FLUJO MAXIMO 270-1100-110.HSC				
8								
9								
10	Cogua-ECGSB-2							
11								
12	Calculation Messages							
13								
14								
15	Error Messages							
16								
17	Error Messages							
18								
19	No calculation errors encountered, PIPESYS has converged.							
20								
21								
22	Warning Messages							
23								
24								
25	No calculation warnings encountered.							
26								
27								
28	Pressure Temperature Summary							
29								
30	Pipeline Unit	Cum. Length (km)	Pressure (psig)	Temperature (F)	DeltaP (psi)	DeltaT (F)	Label	
31	Pipe	0.45	475.10	32.85	24.90	-5.21	Pipe #12	
32	Pipe	5.45	432.39	31.99	42.71	-0.86	Pipe #13	
33	Pipe	11.45	379.51	31.79	52.87	-0.20	Pipe #14	
34	Pipe	15.45	337.54	30.88	41.97	-0.91	Pipe #15	
35	Erosion Velocity C	15.45	337.54	30.88	0.00	0.00	ErosionVelocityCheck #1	
36								
37								
38	Pressure Temperature Profile							
39								
40	Cumulative Length (km)	Inside Diameter (in)	Pressure (psig)	Temperature (F)	DeltaP Friction (psi)	DeltaP Head (psi)	Liquid Volume Fraction	Pressure Gradient (inH2O/ft)
41	0.03	19.250	498.29	37.71	0.23	1.48	0.0000	-0.4732
42	0.10	19.250	494.46	36.91	0.52	3.31	0.0000	-0.4717
43	0.17	19.250	490.64	36.12	0.52	3.29	0.0000	-0.4696
44	0.24	19.250	486.84	35.32	0.53	3.27	0.0000	-0.4675
45	0.30	19.250	483.06	34.53	0.53	3.25	0.0000	-0.4654
46	0.37	19.250	479.29	33.74	0.53	3.23	0.0000	-0.4633
47	0.44	19.250	475.54	32.95	0.54	3.21	0.0000	-0.4612
48	0.45	19.250	475.10	32.85	0.06	0.37	0.0000	-0.4601
49	0.52	19.250	474.54	32.84	0.54	0.02	0.0000	-0.0688
50	1.04	19.250	470.27	32.76	4.12	0.14	0.0000	-0.0692
51	1.56	19.250	465.96	32.68	4.16	0.14	0.0000	-0.0698
52	2.08	19.250	461.61	32.60	4.20	0.14	0.0000	-0.0705
53	2.60	19.250	457.22	32.51	4.25	0.14	0.0000	-0.0712
54	3.12	19.250	452.78	32.43	4.29	0.14	0.0000	-0.0719
55	3.64	19.250	448.30	32.33	4.34	0.14	0.0000	-0.0726
56	4.16	19.250	443.77	32.24	4.38	0.14	0.0000	-0.0733
57	4.68	19.250	439.20	32.14	4.43	0.13	0.0000	-0.0741
58	5.21	19.250	434.58	32.04	4.48	0.13	0.0000	-0.0749
59	5.45	19.250	432.39	31.99	2.12	0.06	0.0000	-0.0755
60	5.97	19.250	428.12	32.00	4.56	-0.29	0.0000	-0.0692
61								
62								
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 75 of 102		
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC							
2			Unit Set: Field1							
3			Date/Time: Fri Apr 13 12:13:26 2012							
4										
5										
6										
7	NeotecPIPESYS v2.5.77.0:				FLUJO MAXIMO 270-1100-110.HSC					
8										
9										
10	Cogua-ECGSB-2									
11										
12	Pressure Temperature Profile									
13										
14										
15	Cumulative	Inside	Pressure	Temperature	DeltaP	DeltaP	Liquid Volume	Pressure		
16	Length	Diameter	(psig)	(F)	Friction	Head	Fraction	Gradient		
17	(km)	(in)			(psi)	(psi)		(inH2O/ft)		
18	6.49	19.250	423.79	32.00	4.61	-0.29	0.0000	-0.0701		
19	7.01	19.250	419.40	32.00	4.66	-0.28	0.0000	-0.0710		
20	7.53	19.250	414.96	32.00	4.71	-0.28	0.0000	-0.0719		
21	8.05	19.250	410.46	31.99	4.77	-0.28	0.0000	-0.0729		
22	8.57	19.250	405.90	31.97	4.83	-0.27	0.0000	-0.0739		
23	9.10	19.250	401.28	31.95	4.89	-0.27	0.0000	-0.0749		
24	9.62	19.250	396.59	31.92	4.95	-0.27	0.0000	-0.0760		
25	10.14	19.250	391.83	31.89	5.01	-0.26	0.0000	-0.0771		
26	10.66	19.250	387.00	31.86	5.08	-0.26	0.0000	-0.0782		
27	11.18	19.250	382.10	31.82	5.15	-0.26	0.0000	-0.0794		
28	11.45	19.250	379.51	31.79	2.72	-0.13	0.0000	-0.0803		
29	11.97	19.250	374.34	31.70	5.26	-0.09	0.0000	-0.0838		
30	12.49	19.250	369.09	31.59	5.34	-0.09	0.0000	-0.0851		
31	13.01	19.250	363.75	31.48	5.42	-0.09	0.0000	-0.0865		
32	13.53	19.250	358.32	31.37	5.50	-0.09	0.0000	-0.0879		
33	14.05	19.250	352.81	31.25	5.58	-0.09	0.0000	-0.0893		
34	14.58	19.250	347.20	31.12	5.68	-0.09	0.0000	-0.0909		
35	15.10	19.250	341.49	30.98	5.78	-0.09	0.0000	-0.0925		
36	15.45	19.250	337.54	30.88	3.99	-0.06	0.0000	-0.0939		
37										
38	Fluid Transport Properties									
39										
40	Cumulative		Gas	Liquid	Gas	Liquid	Vsg	Vsl	Flow Pattern	Surface
41	Length	Iterations	Density	Density	Viscosity	Viscosity	(ft/s)	(ft/s)		Tension
42	(km)		(lb/ft3)	(lb/ft3)	(cP)	(cP)				(dyne/cm)
43	0.03	4	2.127	---	0.011	---	36.697	---	SP-Turbulent	---
44	0.10	3	2.118	---	0.011	---	36.661	---	SP-Turbulent	---
45	0.17	3	2.105	---	0.011	---	37.091	---	SP-Turbulent	---
46	0.24	3	2.091	---	0.011	---	37.322	---	SP-Turbulent	---
47	0.30	3	2.078	---	0.011	---	37.557	---	SP-Turbulent	---
48	0.37	3	2.065	---	0.011	---	37.793	---	SP-Turbulent	---
49	0.44	3	2.052	---	0.011	---	38.032	---	SP-Turbulent	---
50	0.45	3	2.045	---	0.011	---	38.167	---	SP-Turbulent	---
51	0.52	4	2.043	---	0.011	---	38.206	---	SP-Turbulent	---
52	1.04	3	2.032	---	0.011	---	38.418	---	SP-Turbulent	---
53	1.56	3	2.012	---	0.011	---	38.801	---	SP-Turbulent	---
54	2.08	3	1.992	---	0.011	---	39.194	---	SP-Turbulent	---
55	2.60	3	1.971	---	0.011	---	39.599	---	SP-Turbulent	---
56	3.12	3	1.951	---	0.011	---	40.014	---	SP-Turbulent	---
57	3.64	3	1.930	---	0.011	---	40.442	---	SP-Turbulent	---
58	4.16	3	1.909	---	0.011	---	40.882	---	SP-Turbulent	---
59	4.68	3	1.888	---	0.011	---	41.335	---	SP-Turbulent	---
60	5.21	3	1.867	---	0.011	---	41.802	---	SP-Turbulent	---
61	5.45	3	1.852	---	0.011	---	42.154	---	SP-Turbulent	---
62	5.97	4	1.837	---	0.011	---	42.500	---	SP-Turbulent	---
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)				Page 76 of 102			


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1	 LEGENDS Burlington, MA USA						Case Name: FLUJO MAXIMO 270-1100-110.HSC				
2							Unit Set: Field1				
3							Date/Time: Fri Apr 13 12:13:26 2012				
4											
5											
6											
7	NeotecPIPESYS v2.5.77.0:						FLUJO MAXIMO 270-1100-110.HSC				
8											
9											
10	Cogua-ECGSB-2										
11											
12	Fluid Transport Properties										
13											
14											
15	Cumulative		Gas	Liquid	Gas	Liquid					Surface
16	Length	Iterations	Density	Density	Viscosity	Viscosity	Vsg	Vsl	Flow Pattern		Tension
17	(km)		(lb/ft3)	(lb/ft3)	(cP)	(cP)	(ft/s)	(ft/s)			(dyne/cm)
18	6.49	3	1.817	---	0.011	---	42.972	---	SP-Turbulent		---
19	7.01	3	1.796	---	0.011	---	43.458	---	SP-Turbulent		---
20	7.53	3	1.776	---	0.011	---	43.961	---	SP-Turbulent		---
21	8.05	3	1.755	---	0.011	---	44.480	---	SP-Turbulent		---
22	8.57	3	1.734	---	0.011	---	45.017	---	SP-Turbulent		---
23	9.10	3	1.713	---	0.011	---	45.572	---	SP-Turbulent		---
24	9.62	3	1.692	---	0.011	---	46.148	---	SP-Turbulent		---
25	10.14	3	1.670	---	0.011	---	46.744	---	SP-Turbulent		---
26	10.66	3	1.648	---	0.011	---	47.362	---	SP-Turbulent		---
27	11.18	3	1.626	---	0.011	---	48.005	---	SP-Turbulent		---
28	11.45	3	1.609	---	0.011	---	48.510	---	SP-Turbulent		---
29	11.97	3	1.592	---	0.011	---	49.040	---	SP-Turbulent		---
30	12.49	3	1.569	---	0.011	---	49.768	---	SP-Turbulent		---
31	13.01	3	1.545	---	0.011	---	50.523	---	SP-Turbulent		---
32	13.53	3	1.521	---	0.011	---	51.313	---	SP-Turbulent		---
33	14.05	3	1.497	---	0.011	---	52.140	---	SP-Turbulent		---
34	14.58	3	1.473	---	0.011	---	53.006	---	SP-Turbulent		---
35	15.10	3	1.449	---	0.011	---	53.913	---	SP-Turbulent		---
36	15.45	3	1.427	---	0.011	---	54.710	---	SP-Turbulent		---
37											
38	Miscellaneous										
39											
40	Cumulative		Cumulative	Cumulative Liquid		Cumulative		Cumulative Gas			
41	Length		Liquid Holdup	Transit Time		Line Pack @STD		Transit Time			
42	(km)		(ft3)	(hours)		(ft3)		(hours)			
43		0.00	0.0	0.000		0.0		0.000			
44		0.45	0.0	0.000		123354.0		0.011			
45		5.45	0.0	0.000		1401774.0		0.125			
46		11.45	0.0	0.000		2763079.8		0.248			
47		15.45	0.0	0.000		3557584.9		0.318			
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63	Aspen Technology Inc.			Aspen HYSYS Version 7.2 (24.0.0.7263)					Page 77 of 102		
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5						
6	NeotecPIPESYS v2.5.77.0: FLUJO MAXIMO 270-1100-110.HSC					
7	Cogua-ECGSB-2					
8	Erosion Velocity Checks					
9						
10						
11	Erosion Velocity Checks					
12						
13	Erosion Velocity Checks					
14						
15	Name: ErosionVelocityCheck #1					
16	Unit Location					
17						
18						
19	Distance: 124.00 km		Elevation: 2.58 km		Distance From Origin: 15.45 km	
20						
21	Fluid Conditions		Allowable Velocity			
22	Actual Gas Velocity: 54.71 ft/s		Sand Production	C = 100	C = 300	
23	Mixture Velocity: 54.71 ft/s		(lb/month)	(ft/s)	(ft/s)	
24	Mixture Density: 1.427 lb/ft3		0.0	---	---	
25	Effective C Value: 65.4		500.0	105.86	105.86	
26			1000.0	74.85	74.85	
27			2000.0	52.93	52.93	
28			5000.0	33.48	33.48	
29			10000.0	23.67	23.67	
30	Heat Transfer					
31						
32						
33	Cumulative	Superficial Gas	Superficial Liquid	Mixture	Inside	Overall Heat
34	Length	Reynold's Number	Reynold's Number	Reynold's Number	Film Coefficient	Transfer Coefficient
35	(km)				(Btu/hr-ft2-F)	(Btu/hr-ft2-F)
36	0.03	16315283	---	16315283	146.3990	0.3063
37	0.10	16339124	---	16339124	146.2732	0.3063
38	0.17	16372216	---	16372216	146.0989	0.3063
39	0.24	16405390	---	16405390	145.9244	0.3063
40	0.30	16438648	---	16438648	145.7499	0.3063
41	0.37	16471989	---	16471989	145.5752	0.3063
42	0.44	16505415	---	16505415	145.4005	0.3063
43	0.45	16524131	---	16524131	145.3028	0.3063
44	0.52	16527297	---	16527297	145.2634	0.3063
45	1.04	16537664	---	16537664	145.2043	0.3063
46	1.56	16556080	---	16556080	145.0639	0.3063
47	2.08	16574680	---	16574680	144.9223	0.3062
48	2.60	16593472	---	16593472	144.7794	0.3062
49	3.12	16612458	---	16612458	144.6352	0.3062
50	3.64	16631647	---	16631647	144.4897	0.3062
51	4.16	16651044	---	16651044	144.3428	0.3062
52	4.68	16670659	---	16670659	144.1945	0.3062
53	5.21	16690499	---	16690499	144.0447	0.3062
54	5.45	16705197	---	16705197	143.9339	0.3062
55	5.97	16717852	---	16717852	143.8330	0.3062
56	6.49	16733825	---	16733825	143.7017	0.3062
57	7.01	16750048	---	16750048	143.5688	0.3062
58	7.53	16766540	---	16766540	143.4342	0.3062
59	8.05	16783311	---	16783311	143.2979	0.3062
60	8.57	16800366	---	16800366	143.1598	0.3062
61	9.10	16817719	---	16817719	143.0198	0.3062
62	9.62	16835381	---	16835381	142.8779	0.3062
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 79 of 102	
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1	 LEGENDS Burlington, MA USA					Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2						Unit Set: Field1			
3						Date/Time: Fri Apr 13 12:13:26 2012			
4									
5									
6									
7	NeotecPIPESYS v2.5.77.0:					FLUJO MAXIMO 270-1100-110.HSC			
8									
9									
10	Cogua-ECGSB-2								
11									
12	Heat Transfer								
13									
14									
15	Cumulative	Superficial Gas	Superficial Liquid	Mixture	Inside	Overall Heat			
16	Length	Reynold's Number	Reynold's Number	Reynold's Number	Film Coefficient	Transfer Coefficient			
17	(km)				(Btu/hr-ft2-F)	(Btu/hr-ft2-F)			
18	10.14	16853358	---	16853358	142.7339	0.3062			
19	10.66	16871671	---	16871671	142.5878	0.3062			
20	11.18	16890328	---	16890328	142.4395	0.3062			
21	11.45	16904730	---	16904730	142.3254	0.3062			
22	11.97	16920348	---	16920348	142.2048	0.3062			
23	12.49	16941789	---	16941789	142.0413	0.3062			
24	13.01	16963629	---	16963629	141.8752	0.3062			
25	13.53	16985888	---	16985888	141.7064	0.3062			
26	14.05	17008585	---	17008585	141.5347	0.3062			
27	14.58	17031744	---	17031744	141.3601	0.3062			
28	15.10	17055390	---	17055390	141.1822	0.3062			
29	15.45	17075618	---	17075618	141.0305	0.3062			
30	Cooldown								
31									
32	Option								
33									
34	No pipeline fluid cooldown calculations will be performed								
35									
36	Basis								
37									
38	n/a								
39									
40	Thermal Conductivity of Fluid								
41									
42	n/a								
43									
44									
45	Heat Transfer Parameters					Transient Cooldown Parameters			
46									
47	Overall Heat Transfer Coefficient: ---					Maximum Time Since Shutdown: ---			
48	Inside Film Coefficient: ---					First Intermediate Time: ---			
49	Thermal Conductivity of Fluid: ---					Second Intermediate Time: ---			
50	Heat Capacity of Pipe Material: ---					Third Intermediate Time: ---			
51	Density of Pipe Material: ---					Minimum Cooldown Temperature: ---			
52						Calculation Time Step: ---			
53	Results								
54									
55	Cumulative	Overall Heat	Inside	Fluid	First	Second	Third	Temperature for	Time to Reach
56	Length	Transfer	Film	Thermal	Intermediate	Intermediate	Intermediate	Max Time Since	Min Cooldown
57		Coefficient	Coefficient	Conductivity	Temperature	Temperature	Temperature	Shutdown	Temperature
58	(km)	(Btu/hr-ft2-F)	(Btu/hr-ft2-F)	(Btu/hr-ft-F)	(F)	(F)	(F)	(F)	(hours)
59									
60									
61									
62									
63	Aspen Technology Inc.			Aspen HYSYS Version 7.2 (24.0.0.7263)			Page 79 of 102		
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	NeotecPIPESYS v2.5.77.0:		FLUJO MAXIMO 270-1100-110.HSC	
7	Cogua-ECGSB-2			
8				
9				
10	Inlet Properties : A ECGSB-2			
11				
12				
13				
14				
15		Overall	Vapour Phase	
16	Vapour/Phase Fraction	1.0000	1.0000	
17	Temperature: (F)	38.06 *	38.06	
18	Pressure: (psig)	500.00	500.00	
19	Molar Flow (MMSCFD)	270.03	270.03	
20	Mass Flow (lb/hr)	567953.83	567953.83	
21	Liquid Volume Flow (barrel/day)	117378.87	117378.87	
22	Std Gas Flow (MMSCFD)	269.53	269.53	
23	Molar Enthalpy (Btu/lbmole)	-3.841e+004	-3.841e+004	
24	Mass Enthalpy (Btu/lb)	-1901	-1901	
25	Heat Flow (Btu/hr)	-1.080e+009	-1.080e+009	
26	Molar Density (lbmole/ft3)	0.1112	0.1112	
27	Mass Density (lb/ft3)	2.130	2.130	
28	Std Liquid Mass Density (lb/ft3)	---	---	
29	Molar Heat Capacity (Btu/lbmole-F)	10.774	10.774	
30	Mass Heat Capacity (Btu/lb-F)	0.582	0.582	
31	Molar Entropy (Btu/lbmole-F)	36.682	36.682	
32	Mass Entropy (Btu/lb-F)	1.915	1.915	
33	ThermalConductivity (Btu/hr-ft-F)	0.018	0.018	
34	Viscosity (cP)	0.011	0.011	
35	Surface Tension (dyne/cm)	---	---	
36	Molecular Weight	19.155	19.155	
37	Z Factor	0.887	0.887	
38				
39	Outlet Properties : A Succión-2			
40				
41		Overall	Vapour Phase	
42	Vapour/Phase Fraction	1.0000	1.0000	
43	Temperature: (F)	30.88	30.88	
44	Pressure: (psig)	337.54	337.54	
45	Molar Flow (MMSCFD)	270.03	270.03	
46	Mass Flow (lb/hr)	567953.83	567953.83	
47	Liquid Volume Flow (barrel/day)	117378.87	117378.87	
48	Std Gas Flow (MMSCFD)	269.53	269.53	
49	Molar Enthalpy (Btu/lbmole)	-3.834e+004	-3.834e+004	
50	Mass Enthalpy (Btu/lb)	-1897	-1897	
51	Heat Flow (Btu/hr)	-1.077e+009	-1.077e+009	
52	Molar Density (lbmole/ft3)	0.0740	0.0740	
53	Mass Density (lb/ft3)	1.418	1.418	
54	Std Liquid Mass Density (lb/ft3)	---	---	
55	Molar Heat Capacity (Btu/lbmole-F)	10.142	10.142	
56	Mass Heat Capacity (Btu/lb-F)	0.529	0.529	
57	Molar Entropy (Btu/lbmole-F)	37.486	37.486	
58	Mass Entropy (Btu/lb-F)	1.957	1.957	
59	ThermalConductivity (Btu/hr-ft-F)	0.017	0.017	
60	Viscosity (cP)	0.011	0.011	
61	Surface Tension (dyne/cm)	---	---	
62	Molecular Weight	19.155	19.155	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	

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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	NeotecPIPESYS v2.5.77.0:		FLUJO MAXIMO 270-1100-110.HSC	
7				
8	Cogua-ECGSB-2			
9				
10	Outlet Properties : A Succión-2			
11				
12				
13				
14				
15		Overall	Vapour Phase	
16	Z Factor	0.904	0.904	
17	Stream Compositions			
18				
19				
20	Component	Inlet Mole Fraction	Outlet Mole Fraction	
21	Methane	0.00562	0.00562	
22	Ethane	0.01917	0.01917	
23	Propane	0.84117	0.84117	
24	i-Butane	0.09571	0.09571	
25	n-Butane	0.03251	0.03251	
26	i-Pentane	0.00439	0.00439	
27	n-Pentane	0.00039	0.00039	
28	n-Hexane	0.00070	0.00070	
29	C7+*	0.00011	0.00011	
30	n-Heptane	0.00009	0.00009	
31	H2O	0.00013	0.00013	
32	Nitrogen			
33	CO2			
34	H2S			
35	Summary			
36				
37				
38				
39	Upstream Pressure: 500.00 psig			
40	Upstream Temperature: 38.06 F			
41				
42	Downstream Pressure: 337.54 psig			
43	Downstream Temperature: 30.88 F			
44				
45	Predicted Pressure Loss: 162.46 psi			
46				
47	Friction Loss: 143.28 psi			
48	Hydrostatic Loss: 18.89 psi			
49	Kinetic Loss: 0.288 psi			
50	Inline Facilities Loss: 0.00 psi			
51				
52	Average Pressure Gradient: -0.0887 inH2O/ft			
53				
54	Total Liquid Holdup: 0.0 ft3			
55	Total Line Pack @STD: 3557564.9 ft3			
56				
57	Pipe Volume: 102452.2 ft3			
58				
59	Net Heat Loss to the Surroundings: -2.921e+006 Btu/hr			
60				
61				
62				
63	Aspen Technology Inc.	Aspen HYSYS Version 7.2 (24.0.0.7263)	Page 81 of 102	

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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Separator: FS-101-2			
7	CONNECTIONS			
8	Inlet Stream			
9				
10	Outlet Stream			
11				
12	Energy Stream			
13				
14	Stream Name		From Unit Operation	
15	A Coqua-2		PIPESYS Extension: Puente Guillermo-Cogua-2	
16	Energy Stream			
17	Stream Name		To Unit Operation	
18	A regulación-2		Tee: TEE-100-2	
19	A drenaje-2			
20	PARAMETERS			
21				
22	Stream Name		From Unit Operation	
23				
24	PARAMETERS			
25	Vessel Volume:	4175 ft3 *	Level SP:	60.00 %
26	Liquid Volume:	2087 ft3		
27	Vessel Pressure:	535.1 psig	Pressure Drop:	0.0000 psi
28	Duty:	0.0000 Btu/hr	Heat Transfer Mode:	Heating
29	User Variables			
30	RATING			
31	Sizing			
32				
33	Stream Name		From Unit Operation	
34	Cylinder		Vertical	
35	Volume:	4175 ft3 *	Diameter:	4.647e-003 km
36	Height:	6.971e-003 km	Separator has a Boot:	No
37	Nozzles			
38	Base Elevation Relative to Ground Level	0.0000 km *	Diameter:	4.647e-003 km
39	Height:	6.971e-003 km		
40	Diameter	(km)	A Coqua-2	A regulación-2
41	Elevation (Base)	(km)	3.485e-004	3.485e-004
42	Elevation (Ground)	(km)	3.485e-003	6.971e-003
43	Elevation (% of Height)	(%)	50.00	100.00
44	Level Taps: Level Tap Specification			
45	Level Tap	PV High	PV Low	OP High
46				OP Low
47	Level Taps: Calculated Level Tap Values			
48	Level Tap	Liquid Level	Aqueous Level	
49				
50	Options			
51	PV Work Term Contribution	(%)	100.00 *	
52				
53	CONDITIONS			
54				
55	Name	A Coqua-2	A drenaje-2	A regulación-2
56	Vapour	1.0000	0.0000	1.0000
57	Temperature (F)	40.3199	40.3199	40.3199
58	Pressure (psig)	535.0646	535.0646	535.0646
59	Molar Flow (MMSCFD)	270.0341	0.0000	270.0341
60	Mass Flow (lb/hr)	567953.8331	0.0000	567953.8331
61	Std Ideal Liq Vol Flow (barrel/day)	117378.8653	0.0000	117378.8653
62	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-1.238e+005	-3.641e+004
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
64	Licensed to: LEGENDS		Page 82 of 102	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Separator: FS-101-2 (continued)				
6	CONDITIONS				
7	Molar Entropy (Btu/lbmole-F)	36.56	11.53	36.56	
8	Heat Flow (Btu/hr)	-1.0797e+09	0.0000e-01	-1.0797e+09	
9	PROPERTIES				
10	Name	A Cogua-2	A drenaje-2	A regulaci3n-2	
11	Molecular Weight	19.15	18.04	19.15	
12	Molar Density (lbmole/ft3)	0.1192	2.980	0.1192	
13	Mass Density (lb/ft3)	2.282	53.76	2.282	
14	Act. Volume Flow (barrel/day)	1.064e+006	0.0000	1.064e+006	
15	Mass Enthalpy (Btu/lb)	-1901	-6860	-1901	
16	Mass Entropy (Btu/lb-F)	1.908	0.6399	1.908	
17	Heat Capacity (Btu/lbmole-F)	10.91	18.58	10.91	
18	Mass Heat Capacity (Btu/lb-F)	0.5696	1.030	0.5696	
19	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	2.903e-002	3.844e+005	
20	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	1.609e-003	2.007e+004	
21	Phase Fraction [Vol. Basis]	1.000	---	1.000	
22	Phase Fraction [Mass Basis]	1.000	0.0000	1.000	
23	Partial Pressure of CO2 (psig)	-4.156	-14.70	-4.156	
24	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
25	Act. Gas Flow (ACFM)	4147	---	4147	
26	Avg. Liq. Density (lbmole/ft3)	1.080	---	1.080	
27	Specific Heat (Btu/lbmole-F)	10.91	18.58	10.91	
28	Std. Gas Flow (MMSCFD)	270.0	0.0000	270.0	
29	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	62.27	20.68	
30	Act. Liq. Flow (USGPM)	---	0.0000	0.0000	
31	Z Factor	0.8599	---	---	
32	Watson K	18.38	8.512	18.38	
33	User Property	---	---	---	
34	Partial Pressure of H2S (psig)	-14.70	-14.70	-14.70	
35	Cp/(Cp - R)	1.222	1.120	1.222	
36	Cp/Cv	1.494	1.133	1.494	
37	Heat of Vap. (Btu/lbmole)	3799	1.404e+004	3799	
38	Kinematic Viscosity (cSt)	0.3161	1.441	0.3161	
39	Liq. Mass Density (Std. Cond) (lb/ft3)	---	63.38	---	
40	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	0.0000	---	
41	Liquid Fraction	0.0000	1.000	0.0000	
42	Molar Volume (ft3/lbmole)	8.392	0.3356	8.392	
43	Mass Heat of Vap. (Btu/lb)	198.3	778.1	198.3	
44	Phase Fraction [Molar Basis]	1.0000	0.0000	1.0000	
45	Surface Tension (dyne/cm)	---	75.53	---	
46	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	0.3344	1.858e-002	
47	Viscosity (cP)	1.156e-002	1.241	1.156e-002	
48	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	16.60	8.925	
49	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.9199	0.4660	
50	Cv (Btu/lbmole-F)	7.304	16.41	7.304	
51	Mass Cv (Btu/lb-F)	0.3813	0.9094	0.3813	
52	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---	
53	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---	
54	Cp/Cv (Ent. Method)	---	---	---	
55	Reid VP at 37.8 C (psig)	---	---	---	
56	True VP at 37.8 C (psig)	---	42.65	---	
57	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	0.0000	
58	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 83 of 102
59	Licensed to: LEGENDS				* Specified by user.

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5	Separator: FS-101-2 (continued)			
6	PROPERTIES			
7	Name	A Cogua-2	A drenaje-2	A regulaci3n-2
8	Viscosity Index	-21.13	7.178	-21.13
9	DYNAMICS			
10	Vessel Parameters: Initialize from Product			
11	Vessel Volume (ft3)	4175 *	Level Calculator	Vertical cylinder
12	Vessel Diameter (km)	4.647e-003	Fraction Calculator	Use levels and nozzles
13	Vessel Height (km)	6.971e-003	Feed Delta P (psi)	0.0000
14	Liquid Level Percent (%)	50.00	Vessel Pressure (psig)	535.1
15	Holdup: Vessel Levels			
16	Phase	Level (km)	Percent (%)	Volume (ft3)
17	Vapour	---	---	0.0000
18	Liquid	---	---	0.0000
19	Aqueous	---	---	0.0000
20	Holdup: Details			
21	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)
22	Vapour	0.0000	0.0000 *	0.0000
23	Liquid	0.0000	0.0000 *	0.0000
24	Aqueous	0.0000	0.0000 *	0.0000
25	Total	0.0000	0.0000	0.0000
26	NOTES			
27	Tee: TEE-100-2			
28	CONNECTIONS			
29	Inlet Stream			
30	STREAM NAME	FROM UNIT OPERATION		
31	A regulaci3n-2	Separator	FS-101-2	
32	Outlet Stream			
33	STREAM NAME	TO UNIT OPERATION		
34	A Brazo 1-2	Valve	PCV-101-3	
35	A Brazo 2-2	Valve	PCV-101-2-2	
36	PARAMETERS			
37		Flow Ratios	Dynamic Valve Openings	
38	A Brazo 1-2	0.5000 *	50.00	
39	A Brazo 2-2	0.5000	50.00	
40	Valve Control: Multiple Stream			
41	User Variables			
42	RATING			
43	Aspen Technology Inc.	Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 84 of 102


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Tee: TEE-100-2 (continued)				
6	RATING				
7	Nozzle Parameters				
8					
9	RATING				
10	Nozzle Parameters				
11					
12	Base Elevation Relative to Ground Level				0.0000 km *
13		A regulaci3n-2	A Brazo 1-2	A Brazo 2-2	
14	Diameter (km)	5.000e-005	5.000e-005	5.000e-005	
15	Elevation (Base) (km)	0.0000	0.0000	0.0000	
16	Elevation (Ground) (km)	0.0000	0.0000	0.0000	
17	CONDITIONS				
18					
19	Name	A regulaci3n-2	A Brazo 1-2	A Brazo 2-2	
20	Vapour	1.0000	1.0000	1.0000	
21	Temperature (F)	40.3199	40.3199	40.3199	
22	Pressure (psig)	535.0646	535.0646	535.0646	
23	Molar Flow (MMSCFD)	270.0341	135.0171	135.0171	
24	Mass Flow (lb/hr)	567953.8331	283976.9165	283976.9165	
25	Std Ideal Liq Vol Flow (barrel/day)	117378.8653	58689.4327	58689.4327	
26	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	-3.641e+004	
27	Molar Entropy (Btu/lbmole-F)	36.56	36.56	36.56	
28	Heat Flow (Btu/hr)	-1.0797e+09	-5.3984e+08	-5.3984e+08	
29	PROPERTIES				
30					
31	Name	A regulaci3n-2	A Brazo 1-2	A Brazo 2-2	
32	Molecular Weight	19.15	19.15	19.15	
33	Molar Density (lbmole/ft3)	0.1192	0.1192	0.1192	
34	Mass Density (lb/ft3)	2.282	2.282	2.282	
35	Act. Volume Flow (barrel/day)	1.064e+006	5.318e+005	5.318e+005	
36	Mass Enthalpy (Btu/lb)	-1901	-1901	-1901	
37	Mass Entropy (Btu/lb-F)	1.908	1.908	1.908	
38	Heat Capacity (Btu/lbmole-F)	10.91	10.91	10.91	
39	Mass Heat Capacity (Btu/lb-F)	0.5696	0.5696	0.5696	
40	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	3.844e+005	
41	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	2.007e+004	
42	Phase Fraction [Vol. Basis]	1.000	1.000	1.000	
43	Phase Fraction [Mass Basis]	1.000	1.000	1.000	
44	Partial Pressure of CO2 (psig)	-4.156	-4.156	-4.156	
45	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
46	Act. Gas Flow (ACFM)	4147	2074	2074	
47	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	1.080	
48	Specific Heat (Btu/lbmole-F)	10.91	10.91	10.91	
49	Std. Gas Flow (MMSCFD)	270.0	135.0	135.0	
50	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	20.68	
51	Act. Liq. Flow (USGPM)	0.0000	0.0000	0.0000	
52	Z Factor	---	---	---	
53	Watson K	18.38	18.38	18.38	
54	User Property	---	---	---	
55	Partial Pressure of H2S (psig)	-14.70	-14.70	-14.70	
56	Cp/(Cp - R)	1.222	1.222	1.222	
57	Cp/Cv	1.494	1.494	1.494	
58	Heat of Vap. (Btu/lbmole)	3799	3799	3799	
59	Kinematic Viscosity (cSt)	0.3161	0.3161	0.3161	
60	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	---	
61	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	---	
62	Liquid Fraction	0.0000	0.0000	0.0000	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 85 of 102


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Tee: TEE-100-2 (continued)				
6	PROPERTIES				
7					
8					
9					
10					
11	Name	A regulaci3n-2	A Brazo 1-2	A Brazo 2-2	
12	Molar Volume (ft3/lbmole)	8.392	8.392	8.392	
13	Mass Heat of Vap. (Btu/lb)	198.3	198.3	198.3	
14	Phase Fraction [Molar Basis]	1.0000	1.0000	1.0000	
15	Surface Tension (dyne/cm)	---	---	---	
16	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	1.858e-002	1.858e-002	
17	Viscosity (cP)	1.156e-002	1.156e-002	1.156e-002	
18	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	8.925	8.925	
19	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.4660	0.4660	
20	Cv (Btu/lbmole-F)	7.304	7.304	7.304	
21	Mass Cv (Btu/lb-F)	0.3813	0.3813	0.3813	
22	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---	
23	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---	
24	Cp/Cv (Ent. Method)	---	---	---	
25	Reid VP at 37.8 C (psig)	---	---	---	
26	True VP at 37.8 C (psig)	---	---	---	
27	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	0.0000	
28	Viscosity Index	-21.13	-21.13	-21.13	
29	DYNAMICS				
30					
31	Holdup Details				
32					
33	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)	
34	Vapour	0.0000	0.0000	0.0000	*
35	Liquid	0.0000	0.0000	0.0000	*
36	Aqueous	0.0000	0.0000	0.0000	*
37	Total	0.0000	0.0000	0.0000	
38	NOTES				
39					
40					
41	Valve: PCV-101-3				
42					
43					
44	CONNECTIONS				
45					
46	Inlet Stream				
47					
48					
49	STREAM NAME	FROM UNIT OPERATION			
50	A Brazo 1-2	Tee		TEE-100-2	
51	Outlet Stream				
52					
53	STREAM NAME	TO UNIT OPERATION			
54	A Segunda Regulaci3n-3	Valve		PCV-102-3	
55	PARAMETERS				
56					
57	Physical Properties				
58					
59	Pressure Drop:	-114.9 psi			
60					
61	User Variables				
62					
63	RATING				
64	Aspen Technology Inc.	Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 86 of 102	


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5	Valve: PCV-101-3 (continued)			
6	RATING			
7	Sizing			
8	Sizing Conditions			
9	Inlet Pressure	535.1 psig	Molecular Weight	19.15
10	Valve Opening	50.00 % *	Delta P	-114.9 psi
11			Flow Rate	2.840e+005 lb/hr
12	Valve Manufacturer and Valve Type			
13	Manufacturer:	Universal Gas Sizing	Type:	---
14	Valve Operating Characteristic and Sizing Method			
15	Linear		Sizing Method: Cv (standard) cal/min.sqrt(psi)	
16	C1	25.00 Km	0.9000 Cv	USGPM(60F,1psi) * Cg 3399
17	Nozzle Parameters			
18	Base Elevation Relative to Ground Level			0.0000 km *
19		A Brazo 1-2	A Segunda Regulación-3	
20	Diameter (km)	5.000e-005	2.032e-004	*
21	Elevation (Base) (km)	0.0000	0.0000	
22	Elevation (Ground) (km)	0.0000	0.0000	
23	Elevation (% of Height) (%)			
24	CONDITIONS			
25	Name	A Brazo 1-2	A Segunda Regulación-3	
26	Vapour	1.0000	1.0000	
27	Temperature (F)	40.3199	49.2700	
28	Pressure (psig)	535.0646	650.0000 *	
29	Molar Flow (MMSCFD)	135.0171	135.0171	
30	Mass Flow (lb/hr)	283976.9165	283976.9165	
31	Std Ideal Liq Vol Flow (barrel/day)	58689.4327	58689.4327	
32	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	
33	Molar Entropy (Btu/lbmole-F)	36.56	36.24	
34	Heat Flow (Btu/hr)	-5.3984e+08	-5.3984e+08	
35	PROPERTIES			
36	Name	A Brazo 1-2	A Segunda Regulación-3	
37	Molecular Weight	19.15	19.15	
38	Molar Density (lbmole/ft3)	0.1192	0.1446	
39	Mass Density (lb/ft3)	2.282	2.769	
40	Act. Volume Flow (barrel/day)	5.318e+005	4.384e+005	
41	Mass Enthalpy (Btu/lb)	-1901	-1901	
42	Mass Entropy (Btu/lb-F)	1.908	1.892	
43	Heat Capacity (Btu/lbmole-F)	10.91	11.34	
44	Mass Heat Capacity (Btu/lb-F)	0.5696	0.5920	
45	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
46	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
47	Phase Fraction [Vol. Basis]	1.000	1.000	
48	Phase Fraction [Mass Basis]	1.000	1.000	
49	Partial Pressure of CO2 (psig)	-4.156	-1.953	
50	Cost Based on Flow (Cost/s)	0.0000	0.0000	
51	Act. Gas Flow (ACFM)	2074	1709	
52	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
53	Specific Heat (Btu/lbmole-F)	10.91	11.34	
54	Std. Gas Flow (MMSCFD)	135.0	135.0	
55	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
56	Act. Liq. Flow (USGPM)	0.0000	---	
57	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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59			* Specified by user.	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5	Valve: PCV-101-3 (continued)			
6	PROPERTIES			
7				
8				
9				
10				
11	Name	A Brazo 1-2	A Segunda Regulación-3	
12	Z Factor	---	0.8419	
13	Watson K	18.38	18.38	
14	User Property	---	---	
15	Partial Pressure of H2S (psig)	-14.70	-14.70	
16	Cp/(Cp - R)	1.222	1.212	
17	Cp/Cv	1.494	1.534	
18	Heat of Vap. (Btu/lbmole)	3799	3432	
19	Kinematic Viscosity (cSt)	0.3161	0.2710	
20	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
21	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
22	Liquid Fraction	0.0000	0.0000	
23	Molar Volume (ft3/lbmole)	8.392	8.918	
24	Mass Heat of Vap. (Btu/lb)	198.3	179.2	
25	Phase Fraction [Molar Basis]	1.0000	1.0000	
26	Surface Tension (dyne/cm)	---	---	
27	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	1.950e-002	
28	Viscosity (cP)	1.156e-002	1.202e-002	
29	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	9.354	
30	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.4884	
31	Cv (Btu/lbmole-F)	7.304	7.392	
32	Mass Cv (Btu/lb-F)	0.3813	0.3859	
33	Cv (Ent. Method) (Btu/lbmole-F)	---	---	
34	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	
35	Cp/Cv (Ent. Method)	---	---	
36	Reid VP at 37.8 C (psig)	---	---	
37	True VP at 37.8 C (psig)	---	---	
38	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	
39	Viscosity Index	-21.13	-27.97	
40	DYNAMICS			
41				
42	Dynamic Specifications			
43				
44	Total Delta P (psi)		-114.9	Not Active
45	Pressure Flow Relation			Active
46	Dynamic Parameters			
47				
48	Valve Opening (%)	50.00 *	Mass Flow (lb/hr)	2.840e+005
49	Conductance (USGPM(60F,1psi))	135.9 *	Friction Delta P (psi)	239.5
50	Pipe Model Parameters			
51				
52	Material	Cast Iron	Darcy Friction Factor	---
53	Roughness (km)	2.590e-007	Pipe k (lb/hr/sqrt(psia-lb/ft3))	0.0000
54	Pipe Length (km)	0.0000 *	Velocity (ft/s)	1635 *
55	Feed Diameter (km)	5.000e-005	Reynolds Number	7.884e+007 *
56	Hold-Up Volume: 0.0000 ft3			
57				
58	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)
59	Vapour	0.0000	0.0000 *	0.0000
60	Liquid	0.0000	0.0000 *	0.0000
61	Aqueous	0.0000	0.0000 *	0.0000
62				
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
64	Licensed to: LEGENDS		Page 88 of 102	
65			* Specified by user.	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Valve: PCV-101-3 (continued)				
6	Total				
7			0.0000		0.0000
8	0.0000				
9	Actuator Parameters				
10	Parameters Mode: Instantaneous				
11	Actuator Time Constant	(seconds)	1.000 *	Actuator Linear Rate	1.000e-002 *
12	Valve Stickiness Time Constant	(seconds)	---		
13	Actuator Position				
14	Fail Position: None				
15					
16					
17					
18					
19					
20					
21					
22	Valve	Min (%)	Max (%)	Current (%)	Desired (%)
23	Actuator	0.00 *	100.00 *	50.00 *	50.00 *
24					
25					
26	Valve: PCV-102-3				
27	CONNECTIONS				
28	Inlet Stream				
29	STREAM NAME				
30	A Segunda Regulación-3		FROM UNIT OPERATION		
31	Valve		PCV-101-3		
32	Outlet Stream				
33	STREAM NAME				
34	A Medición-3		TO UNIT OPERATION		
35	Mixer		MIX-101-2		
36	PARAMETERS				
37	Physical Properties				
38	Pressure Drop	150.0 psi			
39	User Variables				
40	RATING				
41	Sizing				
42	Sizing Conditions				
43	Inlet Pressure	650.0 psig *	Molecular Weight	19.15	Current
44	Valve Opening	50.00 % *	Delta P	150.0 psi	Flow Rate
45	2.840e+005 lb/hr				
46	Valve Manufacturer and Valve Type				
47	Manufacturer	Universal Gas Sizing		Type	---
48	Valve Operating Characteristic and Sizing Method				
49	Linear	Sizing Method: Cv (standard) cal/min sqrt(psi)			
50	C1	25.00	Km	0.9000	Cv
51	Elevation (Base)	(km)	0.0000	USGPM(60F,1psi) *	Cg
52	4791				
53	Nozzle Parameters				
54	Base Elevation Relative to Ground Level				0.0000 km *
55		A Segunda Regulación-3	A Medición-3		
56	Diameter	(km)	2.032e-004 *	2.032e-004 *	
57	Elevation (Base)	(km)	0.0000	0.0000	
58	Aspen Technology Inc. Aspen HYSYS Version 7.2 (24.0.0.7263) Page 89 of 102				
59	Licensed to: LEGENDS * Specified by user.				


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Valve: PCV-102-3 (continued)			
7				
8				
9	Elevation (Ground)	(km)	0.0000	0.0000
10	Elevation (% of Height)	(%)		
11	CONDITIONS			
12				
13	Name	A Segunda Regulación-3	A Medición-3	
14	Vapour	1.0000	1.0000	
15	Temperature	(F)	49.2700	37.4758
16	Pressure	(psig)	650.0000 *	500.0000 *
17	Molar Flow	(MMSCFD)	135.0171	135.0171
18	Mass Flow	(lb/hr)	283976.9165	283976.9165
19	Std. Ideal Liq. Vol. Flow	(barrel/day)	58689.4327	58689.4327
20	Molar Enthalpy	(Btu/lbmole)	-3.641e+004	-3.641e+004
21	Molar Entropy	(Btu/lbmole-F)	36.24	36.67
22	Heat Flow	(Btu/hr)	-5.3984e+08	-5.3984e+08
23	PROPERTIES			
24				
25	Name	A Segunda Regulación-3	A Medición-3	
26	Molecular Weight	19.15	19.15	
27	Molar Density	(lbmole/ft3)	0.1446	0.1114
28	Mass Density	(lb/ft3)	2.788	2.134
29	Act. Volume Flow	(barrel/day)	4.384e+005	5.689e+005
30	Mass Enthalpy	(Btu/lb)	-1901	-1901
31	Mass Entropy	(Btu/lb-F)	1.892	1.914
32	Heat Capacity	(Btu/lbmole-F)	11.34	10.78
33	Mass Heat Capacity	(Btu/lb-F)	0.5920	0.5627
34	LHV Vol Basis (Std)	(Btu/lbmole)	3.844e+005	3.844e+005
35	LHV Mass Basis (Std)	(Btu/lb)	2.007e+004	2.007e+004
36	Phase Fraction [Vol. Basis]	1.000	1.000	
37	Phase Fraction [Mass Basis]	1.000	1.000	
38	Partial Pressure of CO2	(psig)	-1.953	-4.829
39	Cost Based on Flow	(Cost/s)	0.0000	0.0000
40	Act. Gas Flow	(ACFM)	1709	2218
41	Avg. Liq. Density	(lbmole/ft3)	1.080	1.080
42	Specific Heat	(Btu/lbmole-F)	11.34	10.78
43	Std. Gas Flow	(MMSCFD)	135.0	135.0
44	Std. Ideal Liq. Mass Density	(lb/ft3)	20.68	20.68
45	Act. Liq. Flow	(USGPM)	---	---
46	Z Factor	0.8419	0.8660	
47	Watson K	18.38	18.38	
48	User Property	---	---	
49	Partial Pressure of H2S	(psig)	-14.70	-14.70
50	Cp/(Cp - R)	1.212	1.226	
51	Cp/Cv	1.534	1.481	
52	Heat of Vap.	(Btu/lbmole)	3432	3910
53	Kinematic Viscosity	(cSt)	0.2710	0.3340
54	Liq. Mass Density (Std. Cond)	(lb/ft3)	---	---
55	Liq. Vol. Flow (Std. Cond)	(barrel/day)	---	---
56	Liquid Fraction	0.0000	0.0000	
57	Molar Volume	(ft3/lbmole)	6.918	8.976
58	Mass Heat of Vap.	(Btu/lb)	179.2	204.1
59	Phase Fraction [Molar Basis]	1.0000	1.0000	
60	Surface Tension	(dyne/cm)	---	---
61	Thermal Conductivity	(Btu/hr-ft-F)	1.950e-002	1.830e-002
62	Viscosity	(cP)	1.202e-002	1.142e-002
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5	Valve: PCV-102-3 (continued)					
6	PROPERTIES					
7						
8						
9						
10						
11	Name	A Segunda Regulación-3	A Medición-3			
12	Cv (Semi-Ideal) (Btu/lbmole-F)	9.354	8.792			
13	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4884	0.4590			
14	Cv (Btu/lbmole-F)	7.392	7.277			
15	Mass Cv (Btu/lb-F)	0.3859	0.3799			
16	Cv (Ent. Method) (Btu/lbmole-F)	---	---			
17	Mass Cv (Ent. Method) (Btu/lb-F)	---	---			
18	Cp/Cv (Ent. Method)	---	---			
19	Reid VP at 37.8 C (psig)	---	---			
20	True VP at 37.8 C (psig)	---	---			
21	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000			
22	Viscosity Index	-27.97	-19.16			
23						
24	DYNAMICS					
25						
26	Dynamic Specifications					
27	Total Delta P (psi)	150.0		Not Active		
28	Pressure Flow Relation			Active		
29						
30	Dynamic Parameters					
31	Valve Opening (%)	50.00 *	Mass Flow (lb/hr)	2.840e+005		
32	Conductance (USGPM(60F,1psi))	191.6 *	Friction Delta P (psi)	150.0		
33						
34	Pipe Model Parameters					
35	Material	Cast Iron	Darcy Friction Factor	---		
36	Roughness (km)	2.590e-007	Pipe k (lb/hr/sqrt(psia-lb/ft3))	0.0000		
37	Pipe Length (km)	0.0000 *	Velocity (ft/s)	81.62 *		
38	Feed Diameter (km)	2.032e-004 *	Reynolds Number	1.865e+007 *		
39	Hold-Up Volume: 0.0000 ft3					
40						
41	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)		
42	Vapour	0.0000	0.0000 *	0.0000		
43	Liquid	0.0000	0.0000 *	0.0000		
44	Aqueous	0.0000	0.0000 *	0.0000		
45	Total	0.0000	0.0000	0.0000		
46						
47	Actuator Parameters					
48						
49	Parameters Mode: Instantaneous					
50						
51	Actuator Time Constant (seconds)	1.000 *	Actuator Linear Rate	1.000e-002 *		
52	Valve Stickiness Time Constant (seconds)	---				
53						
54	Actuator Position					
55						
56	Fail Position: None					
57		Min (%)	Max (%)	Current (%)	Desired (%)	Offset (%)
58						
59	Valve	0.00 *	100.00 *	50.00 *	---	0.00 *
60	Actuator	0.00 *	100.00 *	50.00 *	50.00 *	---
61						
62						
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 91 of 102	


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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5	Valve: PCV-101-2-2			
6	CONNECTIONS			
7	Inlet Stream			
8				
9	Outlet Stream			
10				
11	PARAMETERS			
12	Physical Properties			
13	Pressure Drop:		-114.9 psi	
14	User Variables			
15	RATING			
16	Sizing			
17	Sizing Conditions			
18	Inlet Pressure	535.1 psig	Molecular Weight	19.15
19	Valve Opening	50.00 % *	Delta P	-114.9 psi
20			Flow Rate	2.840e+005 lb/hr
21	Valve Manufacturer and Valve Type			
22	Manufacturer:	Universal Gas Sizing	Type:	---
23	Valve Operating Characteristic and Sizing Method			
24	Linear		Sizing Method: Cv (standard) cal/min sqrt(psi)	
25	C1	25.00 Km	0.9000 Cv	USGPM(60F,1psi) * Cg 3399
26	Nozzle Parameters			
27	Base Elevation Relative to Ground Level		0.0000 km *	
28	Diameter	(km)	A Brazo 2-2	A Segunda Regulación-2-2
29	Elevation (Base)	(km)	0.0000	0.0000
30	Elevation (Ground)	(km)	0.0000	0.0000
31	Elevation (% of Height)	(%)		
32	CONDITIONS			
33	Name	A Brazo 2-2	Segunda Regulación-2-2	
34	Vapour	1.0000	1.0000	
35	Temperature	(F)	40.3189	49.2700
36	Pressure	(psig)	535.0646	650.0000 *
37	Molar Flow	(MMSCFD)	135.0171	135.0171
38	Mass Flow	(lb/hr)	283976.9165	283976.9165
39	Std Ideal Liq Vol Flow	(barrel/day)	58889.4327	58889.4327
40	Molar Enthalpy	(Btu/lbmole)	-3.641e+004	-3.641e+004
41	Molar Entropy	(Btu/lbmole-F)	36.56	36.24
42	Heat Flow	(Btu/hr)	-5.3984e+08	-5.3984e+08
43	PROPERTIES			
44	Name	A Brazo 2-2	Segunda Regulación-2-2	
45	Molecular Weight	19.15	19.15	
46	Molar Density	(lbmole/ft3)	0.1192	0.1446
47	Aspen Technology Inc. Aspen HYSYS Version 7.2 (24.0.0.7263) Page 92 of 102			
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5	Valve: PCV-101-2-2 (continued)			
6	PROPERTIES			
7				
8				
9				
10				
11	Name	A Brazo 2-2	Segunda Regulación-2	
12	Mass Density (lb/ft3)	2.282	2.769	
13	Act. Volume Flow (barrel/day)	5.318e+005	4.384e+005	
14	Mass Enthalpy (Btu/lb)	-1901	-1901	
15	Mass Entropy (Btu/lb-F)	1.908	1.892	
16	Heat Capacity (Btu/lbmole-F)	10.91	11.34	
17	Mass Heat Capacity (Btu/lb-F)	0.5696	0.5920	
18	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
19	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
20	Phase Fraction [Vol. Basis]	1.000	1.000	
21	Phase Fraction [Mass Basis]	1.000	1.000	
22	Partial Pressure of CO2 (psig)	-4.156	-1.953	
23	Cost Based on Flow (Cost/s)	0.0000	0.0000	
24	Act. Gas Flow (ACFM)	2074	1709	
25	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
26	Specific Heat (Btu/lbmole-F)	10.91	11.34	
27	Std. Gas Flow (MMSCFD)	135.0	135.0	
28	Std. Ideal Liq. Mass Density (lb/ft3)	20.88	20.68	
29	Act. Liq. Flow (USGPM)	0.0000	---	
30	Z Factor	---	0.8419	
31	Watson K	18.38	18.38	
32	User Property	---	---	
33	Partial Pressure of H2S (psig)	-14.70	-14.70	
34	Cp/(Cp - R)	1.222	1.212	
35	Cp/Cv	1.494	1.534	
36	Heat of Vap. (Btu/lbmole)	3799	3432	
37	Kinematic Viscosity (cSt)	0.3161	0.2710	
38	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
39	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
40	Liquid Fraction	0.0000	0.0000	
41	Molar Volume (ft3/lbmole)	8.392	6.918	
42	Mass Heat of Vap. (Btu/lb)	198.3	179.2	
43	Phase Fraction [Molar Basis]	1.0000	1.0000	
44	Surface Tension (dyne/cm)	---	---	
45	Thermal Conductivity (Btu/hr-ft-F)	1.858e-002	1.950e-002	
46	Viscosity (cP)	1.156e-002	1.202e-002	
47	Cv (Semi-Ideal) (Btu/lbmole-F)	8.925	9.354	
48	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4660	0.4884	
49	Cv (Btu/lbmole-F)	7.304	7.392	
50	Mass Cv (Btu/lb-F)	0.3813	0.3859	
51	Cv (Ent. Method) (Btu/lbmole-F)	---	---	
52	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	
53	Cp/Cv (Ent. Method)	---	---	
54	Reid VP at 37.8 C (psig)	---	---	
55	True VP at 37.8 C (psig)	---	---	
56	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	
57	Viscosity Index	-21.13	-27.97	
58	DYNAMICS			
59				
60	Dynamic Specifications			
61				
62	Total Delta P (psi)		-114.9	Not Active
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Valve: PCV-101-2-2 (continued)				
6					
7	Pressure Flow Relation		Active		
8	Dynamic Parameters				
9					
10	Valve Opening (%)	50.00 *	Mass Flow (lb/hr)	2.840e+005	
11	Conductance (USGPM(60F,1psi))	135.9 *	Friction Delta P (psi)	239.5	
12	Pipe Model Parameters				
13					
14	Material	Cast Iron	Darcy Friction Factor	---	
15	Roughness (km)	2.590e-007	Pipe k (lb/hr/sqrt(psia-lb/ft3))	0.0000	
16	Pipe Length (km)	0.0000 *	Velocity (ft/s)	1635 *	
17	Feed Diameter (km)	5.000e-005	Reynolds Number	7.884e+007 *	
18	Hold-Up Volume: 0.0000 ft3				
19					
20	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)	
21	Vapour	0.0000	0.0000 *	0.0000	
22	Liquid	0.0000	0.0000 *	0.0000	
23	Aqueous	0.0000	0.0000 *	0.0000	
24	Total	0.0000	0.0000	0.0000	
25	Actuator Parameters				
26	Parameters Mode: Instantaneous				
27					
28	Actuator Time Constant (seconds)	1.000 *	Actuator Linear Rate	1.000e-002 *	
29	Valve Stickiness Time Constant (seconds)	---			
30	Actuator Position				
31	Fail Position: None				
32					
33		Min (%)	Max (%)	Current (%)	Desired (%)
34	Valve	0.00 *	100.00 *	50.00 *	---
35	Actuator	0.00 *	100.00 *	50.00 *	50.00 *
36					
37	Valve: PCV-102-2-2				
38					
39	CONNECTIONS				
40	Inlet Stream				
41	STREAM NAME		FROM UNIT OPERATION		
42	A Segunda Regulación-2-2	Valve	PCV-101-2-2		
43	Outlet Stream				
44	STREAM NAME		TO UNIT OPERATION		
45	A Medición-2-2	Mixer	MIX-101-2		
46	PARAMETERS				
47	Physical Properties				
48					
49	Pressure Drop	150.0 psi			
50	User Variables				
51					
52	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 94 of 102
53	Licensed to: LEGENDS				* Specified by user.


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Valve: PCV-102-2-2 (continued)			
7				
8	RATING			
9				
10	Sizing			
11				
12	Sizing Conditions			
13				
14	Inlet Pressure	650.0 psig *	Molecular Weight	19.15
15	Valve Opening	50.00 % *	Delta P	150.0 psi
16			Flow Rate	2.840e+005 lb/hr
17	Valve Manufacturer and Valve Type			
18	Manufacturer:	Universal Gas Sizing	Type:	---
19	Valve Operating Characteristic and Sizing Method			
20	Linear		Sizing Method: Cv (standard) cal/min sqrt(psi)	
21	C1	25.00 Km	Cv	USGPM(60F,1psi) * Cg 4791
22	Nozzle Parameters			
23	Base Elevation Relative to Ground Level 0.0000 km *			
24		A Segunda Regulación-2-2	A Medición-2-2	
25	Diameter (km)	2.032e-004 *	2.032e-004 *	
26	Elevation (Base) (km)	0.0000	0.0000	
27	Elevation (Ground) (km)	0.0000	0.0000	
28	Elevation (% of Height) (%)			
29	CONDITIONS			
30				
31	Name	Segunda Regulación-2-2	A Medición-2-2	
32	Vapour	1.0000	1.0000	
33	Temperature (F)	49.2700	37.4758	
34	Pressure (psig)	650.0000 *	500.0000 *	
35	Molar Flow (MMSCFD)	135.0171	135.0171	
36	Mass Flow (lb/hr)	283976.9165	283976.9165	
37	Std Ideal Liq Vol Flow (barrel/day)	58689.4327	58689.4327	
38	Molar Enthalpy (Btu/lbmole)	-3.641e+004	-3.641e+004	
39	Molar Entropy (Btu/lbmole-F)	36.24	36.67	
40	Heat Flow (Btu/hr)	-5.3984e+08	-5.3984e+08	
41	PROPERTIES			
42				
43	Name	Segunda Regulación-2-2	A Medición-2-2	
44	Molecular Weight	19.15	19.15	
45	Molar Density (lbmole/ft3)	0.1446	0.1114	
46	Mass Density (lb/ft3)	2.769	2.134	
47	Act. Volume Flow (barrel/day)	4.384e+005	5.689e+005	
48	Mass Enthalpy (Btu/lb)	-1901	-1901	
49	Mass Entropy (Btu/lb-F)	1.892	1.914	
50	Heat Capacity (Btu/lbmole-F)	11.34	10.78	
51	Mass Heat Capacity (Btu/lb-F)	0.5920	0.5627	
52	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
53	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
54	Phase Fraction [Vol. Basis]	1.000	1.000	
55	Phase Fraction [Mass Basis]	1.000	1.000	
56	Partial Pressure of CO2 (psig)	-1.953	-4.829	
57	Cost Based on Flow (Cost/s)	0.0000	0.0000	
58	Act. Gas Flow (ACFM)	1709	2218	
59	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
60	Specific Heat (Btu/lbmole-F)	11.34	10.78	
61	Std. Gas Flow (MMSCFD)	135.0	135.0	
62	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)	
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65			* Specified by user.	


1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5	Valve: PCV-102-2-2 (continued)			
6	PROPERTIES			
7				
8				
9				
10				
11	Name	Segunda Regulación-2	A Medición-2-2	
12	Act. Liq. Flow (USGPM)	---	---	
13	Z Factor	0.8419	0.8660	
14	Watson K	18.38	18.38	
15	User Property	---	---	
16	Partial Pressure of H2S (psig)	-14.70	-14.70	
17	Cp/(Cp - R)	1.212	1.226	
18	Cp/Cv	1.534	1.481	
19	Heat of Vap. (Btu/lbmole)	3432	3910	
20	Kinematic Viscosity (cSt)	0.2710	0.3340	
21	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
22	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
23	Liquid Fraction	0.0000	0.0000	
24	Molar Volume (ft3/lbmole)	6.918	8.976	
25	Mass Heat of Vap. (Btu/lb)	179.2	204.1	
26	Phase Fraction [Molar Basis]	1.0000	1.0000	
27	Surface Tension (dyne/cm)	---	---	
28	Thermal Conductivity (Btu/hr-ft-F)	1.950e-002	1.830e-002	
29	Viscosity (cP)	1.202e-002	1.142e-002	
30	Cv (Semi-Ideal) (Btu/lbmole-F)	9.354	8.792	
31	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4884	0.4590	
32	Cv (Btu/lbmole-F)	7.392	7.277	
33	Mass Cv (Btu/lb-F)	0.3859	0.3799	
34	Cv (Ent. Method) (Btu/lbmole-F)	---	---	
35	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	
36	Cp/Cv (Ent. Method)	---	---	
37	Reid VP at 37.8 C (psig)	---	---	
38	True VP at 37.8 C (psig)	---	---	
39	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	
40	Viscosity Index	-27.97	-19.16	
41	DYNAMICS			
42				
43	Dynamic Specifications			
44				
45	Total Delta P (psi)	150.0		Not Active
46	Pressure Flow Relation			Active
47	Dynamic Parameters			
48				
49	Valve Opening (%)	50.00 *	Mass Flow (lb/hr)	2.840e+005
50	Conductance (USGPM(60F,1psi))	191.6 *	Friction Delta P (psi)	150.0
51	Pipe Model Parameters			
52				
53	Material	Cast Iron	Darcy Friction Factor	---
54	Roughness (km)	2.590e-007	Pipe k (lb/hr/sqrt(psia-lb/ft3))	0.0000
55	Pipe Length (km)	0.0000 *	Velocity (ft/s)	81.62 *
56	Feed Diameter (km)	2.032e-004 *	Reynolds Number	1.865e+007 *
57	Hold-Up Volume: 0.0000 ft3			
58				
59	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)
60				
61	Vapour	0.0000	0.0000 *	0.0000
62	Liquid	0.0000	0.0000 *	0.0000
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65			* Specified by user.	

1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Valve: PCV-102-2-2 (continued)				
6					
7					
8					
9	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)	
10	Aqueous	0.0000	0.0000 *	0.0000	
11	Total	0.0000	0.0000	0.0000	
12	Actuator Parameters				
13	Parameters Mode: Instantaneous				
14					
15	Actuator Time Constant (seconds)	1.000 *	Actuator Linear Rate	1.000e-002 *	
16	Valve Stickiness Time Constant (seconds)	---			
17	Actuator Position				
18	Fail Position: None				
19					
20					
21					
22					
23		Min (%)	Max (%)	Current (%)	Desired (%)
24					Offset (%)
25	Valve	0.00 *	100.00 *	50.00 *	---
26	Actuator	0.00 *	100.00 *	50.00 *	50.00 *
27					
28	Valve: VLV-A Succión-2				
29					
30					
31	CONNECTIONS				
32					
33	Inlet Stream				
34					
35	STREAM NAME	FROM UNIT OPERATION			
36	A Succión-2	PIPESYS Extension		Cogua-ECGSB-2	
37					
38	Outlet Stream				
39					
40	STREAM NAME	TO UNIT OPERATION			
41	A Succión-1-2	Compressor		MOPICO-01	
42	PARAMETERS				
43	Physical Properties				
44					
45	Pressure Drop:	4.999 psi *			
46	User Variables				
47					
48	RATING				
49					
50	Sizing				
51					
52	Sizing Conditions				
53	Inlet Pressure	337.5 psig	Molecular Weight	19.15	Current
54	Valve Opening	50.00 % *	Delta P	4.999 psi *	Flow Rate 5.680e+005 lb/hr
55	Valve Manufacturer and Valve Type				
56	Manufacturer:	Universal Gas Sizing		Type:	---
57	Valve Operating Characteristic and Sizing Method				
58	Linear	Sizing Method:			Cv (standard) cal/min.sqrt(ksi)
59	C1	25.00 Km	0.9000 Cv	USGPM(60F,1psi) *	Cg 5.900e+004
60	Nozzle Parameters				
61					
62	Base Elevation Relative to Ground Level				0.0000 km *
63	Aspen Technology Inc.		Aspen HYSYS Version 7.2 (24.0.0.7263)		Page 97 of 102

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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Valve: VLV-A Succión-2 (continued)			
7				
8				
9		A Succión-2	A Succión-1-2	
10	Diameter (km)	5.000e-005	5.000e-005	
11	Elevation (Base) (km)	0.0000	0.0000	
12	Elevation (Ground) (km)	0.0000	0.0000	
13	Elevation (% of Height) (%)			
14	CONDITIONS			
15				
16	Name	A Succión-2	A Succión-1-2	
17	Vapour	1.0000	1.0000	
18	Temperature (F)	30.8837	30.4525	
19	Pressure (psig)	337.5447	332.5453	
20	Molar Flow (MMSCFD)	270.0341	270.0341	
21	Mass Flow (lb/hr)	567953.8331	567953.8331	
22	Std. Ideal Liq. Vol. Flow (barrel/day)	117378.8653	117378.8653	
23	Molar Enthalpy (Btu/lbmole)	-3.634e+004	-3.634e+004	
24	Molar Entropy (Btu/lbmole-F)	37.48	37.51	
25	Heat Flow (Btu/hr)	-1.0775e+09	-1.0775e+09	
26				
27	PROPERTIES			
28	Name	A Succión-2	A Succión-1-2	
29	Molecular Weight	19.15	19.15	
30	Molar Density (lbmole/ft3)	7.404e-002	7.296e-002	
31	Mass Density (lb/ft3)	1.418	1.398	
32	Act. Volume Flow (barrel/day)	1.712e+006	1.737e+006	
33	Mass Enthalpy (Btu/lb)	-1897	-1897	
34	Mass Entropy (Btu/lb-F)	1.957	1.958	
35	Heat Capacity (Btu/lbmole-F)	10.14	10.12	
36	Mass Heat Capacity (Btu/lb-F)	0.5295	0.5285	
37	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
38	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
39	Phase Fraction [Vol. Basis]	1.000	1.000	
40	Phase Fraction [Mass Basis]	1.000	1.000	
41	Partial Pressure of CO2 (psig)	-7.943	-8.039	
42	Cost Based on Flow (Cost/s)	0.0000	0.0000	
43	Act. Gas Flow (ACFM)	6675	6773	
44	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
45	Specific Heat (Btu/lbmole-F)	10.14	10.12	
46	Std. Gas Flow (MMSCFD)	270.0	270.0	
47	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
48	Act. Liq. Flow (USGPM)	---	---	
49	Z Factor	0.9037	0.9048	
50	Watson K	18.38	18.38	
51	User Property	---	---	
52	Partial Pressure of H2S (psig)	-14.70	-14.70	
53	Cp/(Cp - R)	1.243	1.244	
54	Cp/Cv	1.411	1.409	
55	Heat of Vap. (Btu/lbmole)	4429	4445	
56	Kinematic Viscosity (cSt)	0.4802	0.4864	
57	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
58	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
59	Liquid Fraction	0.0000	0.0000	
60	Molar Volume (ft3/lbmole)	13.51	13.71	
61	Mass Heat of Vap. (Btu/lb)	231.2	232.1	
62	Phase Fraction [Molar Basis]	1.0000	1.0000	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5	Valve: VLV-A Succión-2 (continued)					
6	PROPERTIES					
7						
8						
9						
10						
11	Name	A Succión-2	A Succión-1-2			
12	Surface Tension (dyne/cm)	---	---			
13	Thermal Conductivity (Btu/hr-ft-F)	1.727e-002	1.723e-002			
14	Viscosity (cP)	1.091e-002	1.089e-002			
15	Cv (Semi-Ideal) (Btu/lbmole-F)	8.156	8.138			
16	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4258	0.4249			
17	Cv (Btu/lbmole-F)	7.187	7.183			
18	Mass Cv (Btu/lb-F)	0.3752	0.3750			
19	Cv (Ent. Method) (Btu/lbmole-F)	---	---			
20	Mass Cv (Ent. Method) (Btu/lb-F)	---	---			
21	Cp/Cv (Ent. Method)	---	---			
22	Reid VP at 37.8 C (psig)	---	---			
23	True VP at 37.8 C (psig)	---	---			
24	Liq. Vol. Flow - Sum(Std. Coeff) (m ³ /day)	0.0000	0.0000			
25	Viscosity Index	-9.352	-9.069			
26	DYNAMICS					
27	Dynamic Specifications					
28						
29						
30	Total Delta P (psi)	4.999 *			Not Active	
31	Pressure Flow Relation				Active	
32	Dynamic Parameters					
33						
34	Valve Opening (%)	50.00 *	Mass Flow (lb/hr)	5.680e+005		
35	Conductance (USGPM(60F,1psi))	2360 *	Friction Delta P (psi)	4.999		
36	Pipe Model Parameters					
37						
38	Material	Cast Iron	Darcy Friction Factor	---		
39	Roughness (km)	2.590e-007	Pipe k (lb/hr/sqrt(psia-lb/ft ³))	0.0000		
40	Pipe Length (km)	0.0000 *	Velocity (ft/s)	5264 *		
41	Feed Diameter (km)	5.000e-005	Reynolds Number	1.671e+008 *		
42	Hold-Up Volume: 0.0000 ft³					
43						
44	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft ³)		
45	Vapour	0.0000	0.0000 *	0.0000		
46	Liquid	0.0000	0.0000 *	0.0000		
47	Aqueous	0.0000	0.0000 *	0.0000		
48	Total	0.0000	0.0000	0.0000		
49						
50	Actuator Parameters					
51						
52	Parameters Mode: Instantaneous					
53						
54	Actuator Time Constant (seconds)	1.000 *	Actuator Linear Rate	1.000e-002 *		
55	Valve Stickiness Time Constant (seconds)	---				
56	Actuator Position					
57						
58	Fail Position: None					
59						
60		Min (%)	Max (%)	Current (%)	Desired (%)	Offset (%)
61						
62	Valve	0.00 *	100.00 *	50.00 *	---	0.00 *
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC		
2			Unit Set: Field1		
3			Date/Time: Fri Apr 13 12:13:26 2012		
4					
5	Valve: VLV-A Succión-2 (continued)				
6					
7					
8					
9	Actuator	0.00 *	100.00 *	50.00 *	50.00 *
10					
11	Valve: VLV-Puente Guillermo-2				
12					
13	CONNECTIONS				
14	Inlet Stream				
15					
16	Outlet Stream				
17					
18	STREAM NAME		FROM UNIT OPERATION		
19	Puente Guillermo-2				
20	Outlet Stream				
21					
22	STREAM NAME		TO UNIT OPERATION		
23	Puente Guillermo-1-2		PIPESYS Extension	Puente Guillermo-Cogua-2	
24	PARAMETERS				
25					
26	Physical Properties				
27					
28	Pressure Drop:	4.999 psi *			
29					
30	User Variables				
31					
32	RATING				
33					
34	Sizing				
35	Sizing Conditions				
36	Inlet Pressure	1100 psig *	Molecular Weight	19.15	Current
37	Valve Opening	50.00 % *	Delta P	4.999 psi *	Flow Rate 5.680e+005 lb/hr
38	Valve Manufacturer and Valve Type				
39	Manufacturer: Universal Gas Sizing		Type: ---		
40	Valve Operating Characteristic and Sizing Method				
41	Linear		Sizing Method: Cg		
42	C1	25.00 Km	0.9000 Cv	USGPM(60F,1psi)	Cg 3.530e+004 *
43					
44	Nozzle Parameters				
45	Base Elevation Relative to Ground Level				0.0000 km *
46					
47	Diameter	(km)	Puente Guillermo-2	Puente Guillermo-1-2	
48	Elevation (Base)	(km)	5.000e-005	5.000e-005	
49	Elevation (Ground)	(km)	0.0000	0.0000	
50	Elevation (% of Height)	(%)	0.0000	0.0000	
51					
52	CONDITIONS				
53	Name	Puente Guillermo-2	Puente Guillermo-1-2		
54	Vapour	1.0000	1.0000		
55	Temperature	(F)	110.0000 *	109.7426	
56	Pressure	(psig)	1100.0000 *	1095.0006	
57	Molar Flow	(MMSCFD)	270.0341 *	270.0341	
58	Mass Flow	(lb/hr)	567953.8331	567953.8331	
59	Std Ideal Liq Vol Flow	(barrel/day)	117378.8853	117378.8853	
60	Molar Enthalpy	(Btu/lbmole)	-3.603e+004	-3.603e+004	
61	Molar Entropy	(Btu/lbmole-F)	36.09	36.10	
62	Heat Flow	(Btu/hr)	-1.0682e+09	-1.0682e+09	
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC	
2			Unit Set: Field1	
3			Date/Time: Fri Apr 13 12:13:26 2012	
4				
5				
6	Valve: VLV-Puente Guillermo-2 (continued)			
7	PROPERTIES			
8				
9				
10				
11	Name	Puente Guillermo-2	Puente Guillermo-1-2	
12	Molecular Weight	19.15	19.15	
13	Molar Density (lbmole/ft3)	0.2179	0.2170	
14	Mass Density (lb/ft3)	4.174	4.156	
15	Act. Volume Flow (barrel/day)	5.816e+005	5.841e+005	
16	Mass Enthalpy (Btu/lb)	-1881	-1881	
17	Mass Entropy (Btu/lb-F)	1.884	1.885	
18	Heat Capacity (Btu/lbmole-F)	12.28	12.28	
19	Mass Heat Capacity (Btu/lb-F)	0.6409	0.6403	
20	LHV Vol Basis (Std) (Btu/lbmole)	3.844e+005	3.844e+005	
21	LHV Mass Basis (Std) (Btu/lb)	2.007e+004	2.007e+004	
22	Phase Fraction [Vol. Basis]	1.000	1.000	
23	Phase Fraction [Mass Basis]	1.000	1.000	
24	Partial Pressure of CO2 (psig)	6.674	6.578	
25	Cost Based on Flow (Cost/s)	0.0000	4.118	
26	Act. Gas Flow (ACFM)	2268	2278	
27	Avg. Liq. Density (lbmole/ft3)	1.080	1.080	
28	Specific Heat (Btu/lbmole-F)	12.28	12.26	
29	Std. Gas Flow (MMSCFD)	270.0	270.0	
30	Std. Ideal Liq. Mass Density (lb/ft3)	20.68	20.68	
31	Act. Liq. Flow (USGPM)	---	---	
32	Z Factor	0.8367	0.8369	
33	Watson K	18.38	18.38	
34	User Property	---	---	
35	Partial Pressure of H2S (psig)	-14.70	-14.70	
36	Cp/(Cp - R)	1.193	1.193	
37	Cp/Cv	1.568	1.557	
38	Heat of Vap. (Btu/lbmole)	2227	2234	
39	Kinematic Viscosity (cSt)	0.2116	0.2122	
40	Liq. Mass Density (Std. Cond) (lb/ft3)	---	---	
41	Liq. Vol. Flow (Std. Cond) (barrel/day)	---	---	
42	Liquid Fraction	0.0000	0.0000	
43	Molar Volume (ft3/lbmole)	4.589	4.609	
44	Mass Heat of Vap. (Btu/lb)	116.3	116.7	
45	Phase Fraction [Molar Basis]	1.0000	1.0000	
46	Surface Tension (dyne/cm)	---	---	
47	Thermal Conductivity (Btu/hr-ft-F)	2.382e-002	2.379e-002	
48	Viscosity (cP)	1.415e-002	1.413e-002	
49	Cv (Semi-Ideal) (Btu/lbmole-F)	10.29	10.28	
50	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.5372	0.5366	
51	Cv (Btu/lbmole-F)	7.879	7.876	
52	Mass Cv (Btu/lb-F)	0.4113	0.4112	
53	Cv (Ent. Method) (Btu/lbmole-F)	---	---	
54	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	
55	Cp/Cv (Ent. Method)	---	---	
56	Reid VP at 37.8 C (psig)	---	---	
57	True VP at 37.8 C (psig)	---	---	
58	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	0.0000	0.0000	
59	Viscosity Index	-53.90	-53.10	
60	DYNAMICS			
61				
62	Dynamic Specifications			
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1	 LEGENDS Burlington, MA USA		Case Name: FLUJO MAXIMO 270-1100-110.HSC			
2			Unit Set: Field1			
3			Date/Time: Fri Apr 13 12:13:26 2012			
4						
5						
6	Valve: VLV-Puente Guillermo-2 (continued)					
7						
8						
9	Dynamic Specifications					
10	Total Delta P (psi)	4.999 *			Not Active	
11	Pressure Flow Relation					Active
12	Dynamic Parameters					
13						
14	Valve Opening (%)	50.00 *	Mass Flow (lb/hr)	5.680e+005		
15	Conductance (USGPM(60F,1psi))	1412	Friction Delta P (psi)	4.999		
16	Pipe Model Parameters					
17						
18	Material	Cast Iron	Darcy Friction Factor	---		
19	Roughness (km)	2.590e-007	Pipe k (lb/hr/sqrt(psia-lb/ft3))	0.0000		
20	Pipe Length (km)	0.0000 *	Velocity (ft/s)	1788 *		
21	Feed Diameter (km)	5.000e-005	Reynolds Number	1.288e+008 *		
22	Hold-Up Volume: 0.0000 ft3					
23						
24	Phase	Accumulation (MMSCFD)	Moles (lbmole)	Volume (ft3)		
25	Vapour	0.0000	0.0000 *	0.0000		
26	Liquid	0.0000	0.0000 *	0.0000		
27	Aqueous	0.0000	0.0000 *	0.0000		
28	Total	0.0000	0.0000	0.0000		
29						
30	Actuator Parameters					
31						
32	Parameters Mode: Instantaneous					
33						
34	Actuator Time Constant (seconds)	1.000 *	Actuator Linear Rate	1.000e-002 *		
35	Valve Stickiness Time Constant (seconds)	---				
36	Activator Position					
37						
38	Fail Position: Fail Shut					
39						
40		Min (%)	Max (%)	Current (%)	Desired (%)	Offset (%)
41						
42	Valve	0.00 *	100.00 *	50.00 *	---	0.00 *
43	Actuator	0.00 *	100.00 *	50.00 *	50.00 *	---
44						
45						
46						
47						
48						
49						
50						
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