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PD-PLUS CHEMICAL PROCESS SIMULATOR

Absorber dummy problem; includes test of "generate data file" facility.


COLUMN BLOCK ABSORBER   First test of column in the simulator
    COLUMN HAS   5 THEORETICAL STAGES
    FEED STREAM WETGAS  , STAGE   1
    FEED STREAM LEANOIL , STAGE   5
    OVERHEAD VAPOR , STREAM OVHD    , LABEL OVHDRATE
    BOTTOMS, STREAM BTMS    , LABEL BTMSRATE
    PRESSURE=   1.0000 BARA, STAGE   1
    VAPOR FROM STAGE   1 EST.FLOW=  0.8000 OF FEED WETGAS    , MOL BASIS
        LABEL =VAPSTG1
    TRACE CONVERGENCE AT LEVEL 1
    PRINT COMPOSITIONS FOR ALL STAGES
  VARIABLES:
   NONE
  SPECS:
   NONE


COMPONENT DEFINITION

Retrieving from library: DIPPR.DB
  1 METHANE              LIBRARY NO.    2
  2 ETHANE               LIBRARY NO.    3
  3 PROPANE              LIBRARY NO.    4
  4 n-DECANE             LIBRARY NO.   14


STREAM WETGAS
    TEMPERATURE=   20.0 C
    PRESSURE=    1.100 BARA
    TOTAL FLOW=     300.0 KGMOL/HR
    COMPONENT FLOWS:
      100.0000     100.0000     100.0000


STREAM LEANOIL
    TEMPERATURE=   30.0 C
    PRESSURE=    1.100 BARA
    TOTAL FLOW=     100.0 KGMOL/HR
    COMPONENT FLOWS:
    0.0000       0.0000       0.0000         100.0000


K VALUE DATA SET 1
    SOAVE VAPOR FUGACITY
    SOAVE LIQUID FUGACITY


ENTHALPY DATA SET 1
    SOAVE DEPARTURE FROM IDEAL GAS


MIXTURE PROPERTY CALCULATIONS
    PROPERTIES TO BE CALCULATED USING DEFAULT METHODS
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 STREAM NAMES:
  WETGAS    Wet Gas Entering the Absorber

  LEANOIL   Lean Oil Entering the Absorber

  OVHD      Overhead Vapor

  BTMS      Rich Oil Leaving the Bottom of the Absorber



 FILES GENERATED AFTER SOLUTION

   FILE COLINFO
     FILE CONTAINS COLUMN DATA, FORMAT IS SPREADSHEET
     WRITE DATA FOR COLUMNS: ABSORBER


 DEFAULT INPUT UNITS - TEMP=F, PRESS=PSIA, HEAT=BTU/HR, FLOW=LBMOL/HR
 OUTPUT UNITS - TEMP=C, PRESS=PSIA, HEAT=KCAL/HR, FLOW=KG/HR, KGMOL/HR




 FLOWSHEET SUMMARY/ STREAM CONNECTIONS:

 OPERATION   BLOCK ID  INPUT STREAMS      OUTPUT STREAMS     Description
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 Column      ABSORBER  WETGAS   LEANOIL   OVHD     BTMS      First test of column in
the simulator


□--CALCULATION HISTORY--
 COLUMN BLOCK ABSORBER
     AVG. HEAT/SPEC. ERROR=  0.05780
 Calculating new matrix
 Inverting the matrix
     AVG. HEAT/SPEC. ERROR=  0.00400  DISTANCE FACTOR=  1.0000
 ITER.  1 ERRORS: HEAT/SPECS=0.00400, VOLATILITY=0.03201, ENTHALPY=0.00018
     AVG. HEAT/SPEC. ERROR=  0.00395
     AVG. HEAT/SPEC. ERROR=  0.00113  DISTANCE FACTOR=  1.0000
     AVG. HEAT/SPEC. ERROR=  0.00005  DISTANCE FACTOR=  1.0000
 ITER.  2 ERRORS: HEAT/SPECS=0.00005, VOLATILITY=0.02866, ENTHALPY=0.00003
     AVG. HEAT/SPEC. ERROR=  0.00004
     AVG. HEAT/SPEC. ERROR=  0.00001  DISTANCE FACTOR=  1.0000
 ITER.  3 ERRORS: HEAT/SPECS=0.00001, VOLATILITY=0.00039, ENTHALPY=0.00001
     AVG. HEAT/SPEC. ERROR=  0.00001
 ITER.  4 ERRORS: HEAT/SPECS=0.00001, VOLATILITY=0.00001, ENTHALPY=0.00000
 SOLUTION TIME=   0 MIN.,  0.00 SEC.
□--OUTPUT REPORT--


□
 COLUMN BLOCK ABSORBER   First test of column in the simulator

 COLUMN SUMMARY.  FLOWS ARE IN KGMOL/HR
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STAGE	TEMP C	PRESS PSIA	FLOW FROM STAGE VAPOR	LIQUID	FEED	PRODUCT
5	31.9	14.504		104.7	100.0	295.4 VAP
4	31.3	14.504	300.0	104.7		
3	30.2	14.504	300.1	104.7		
2	28.3	14.504	300.1	104.8		
1	24.9	14.504	300.2		300.0	104.6 LIQ

FEED STREAM WETGAS TO STAGE 1 = 300.0 KGMOL/HR
FEED STREAM LEANOIL TO STAGE 5 = 100.0 KGMOL/HR
VAPOR STREAM OVHD FROM STAGE 5 = 295.4 KGMOL/HR
BOTTOMS STREAM BTMS = 104.6 KGMOL/HR

	VAPOR				LIQUID			
STAGE	WT FLOW KG/HR	MW	VOL FLOW M3/HR	DENSITY KG/M3	WT FLOW KG/HR	MW	VOL FLOW M3/HR	DENSITY KG/M3
5	8920.3	30.2	7441.70	1.1987	14412.1	137.7	20.29	710.4
4	9103.9	30.3	7542.69	1.2070	14409.2	137.6	20.28	710.7
3	9101.0	30.3	7515.99	1.2109	14400.7	137.5	20.24	711.3
2	9092.5	30.3	7468.06	1.2175	14389.4	137.3	20.20	712.5
1	9081.2	30.3	7384.90	1.2297	14329.1	136.9	20.06	714.4

	VAPOR		LIQUID		
STAGE	VISCOSITY CENTIPOISE	THERM.COND. KCAL/M-HR-C	VISCOSITY CENTIPOISE	THERM.COND. KCAL/M-HR-C	SURF.TENSION DYNE/CM
5	0.00956	0.02048	0.703	0.11099	22.29
4	0.00953	0.02035	0.708	0.11111	22.34
3	0.00950	0.02024	0.717	0.11134	22.45
2	0.00945	0.02004	0.734	0.11173	22.62
1	0.00936	0.01970	0.764	0.11241	22.91

STAGE 5 TEMPERATURE = 31.9 C PRESSURE = 14.504 PSIA

	VAPOR FROM STAGE KGMOL/HR	MOL.FR	LIQUID FROM STAGE KGMOL/HR	MOL.FR	K VALUE
1 METHANE	99.8	0.3379	0.2	0.1820E-02	185.6660
2 ETHANE	98.9	0.3347	1.0	0.9852E-02	33.9713
3 PROPANE	95.9	0.3245	3.5	0.3309E-01	9.8089
4 n-DECANE	0.8	0.2846E-02	100.0	0.9552	0.0030
TOTAL	295.4 KGMOL/HR		104.7 KGMOL/HR		
	8920.3 KG/HR		14412.1 KG/HR		
AVG.MOL.WT	30.2		137.7		
ENTHALPY	1.2723 MM KCAL/HR		0.7233 MM KCAL/HR		
VOL.FLOW	7441.7 CU.M/HR		20.29 CU.M/HR, SP.GR.=0.711		
COMPRESSIBILITY	0.9933				
HEAT CAPACITY	0.4378 KCAL/KG-C		0.5126 KCAL/KG-C		
VISCOSITY	0.00956 CENTIPOISE		0.703 CENTIPOISE		
THERM.COND.	0.02048 KCAL/M-HR-C		0.11099 KCAL/M-HR-C		
SURF.TENSION			22.29 DYNE/CM		

STAGE 4 TEMPERATURE = 31.3 C PRESSURE = 14.504 PSIA

	VAPOR FROM STAGE		LIQUID FROM STAGE		
	KGMOL/HR	MOL.FR	KGMOL/HR	MOL.FR	K VALUE
1 METHANE	100.0	0.3333	0.2	0.1802E-02	184.9512
2 ETHANE	99.9	0.3329	1.0	0.9895E-02	33.6481
3 PROPANE	99.3	0.3310	3.6	0.3421E-01	9.6760
4 n-DECANE	0.8	0.2728E-02	99.9	0.9541	0.0029
TOTAL	300.0	KGMOL/HR	104.7	KGMOL/HR	
	9103.9	KG/HR	14409.2	KG/HR	
AVG.MOL.WT	30.3		137.6		
ENTHALPY	1.2949	MM KCAL/HR	0.7185	MM KCAL/HR	
VOL.FLOW	7542.7	CU.M/HR	20.28	CU.M/HR, SP.GR.=0.711	
COMPRESSIBILITY	0.9932				
HEAT CAPACITY	0.4367	KCAL/KG-C	0.5119	KCAL/KG-C	
VISCOSITY	0.00953	CENTIPOISE	0.708	CENTIPOISE	
THERM.COND.	0.02035	KCAL/M-HR-C	0.11111	KCAL/M-HR-C	
SURF.TENSION			22.34	DYNE/CM	

STAGE 3 TEMPERATURE = 30.2 C PRESSURE = 14.504 PSIA

	VAPOR FROM STAGE		LIQUID FROM STAGE		
	KGMOL/HR	MOL.FR	KGMOL/HR	MOL.FR	K VALUE
1 METHANE	100.0	0.3332	0.2	0.1814E-02	183.6980
2 ETHANE	99.9	0.3329	1.1	0.1006E-01	33.0784
3 PROPANE	99.4	0.3314	3.7	0.3509E-01	9.4424
4 n-DECANE	0.8	0.2532E-02	99.8	0.9530	0.0027
TOTAL	300.1	KGMOL/HR	104.7	KGMOL/HR	
	9101.0	KG/HR	14400.7	KG/HR	
AVG.MOL.WT	30.3		137.5		
ENTHALPY	1.2901	MM KCAL/HR	0.7098	MM KCAL/HR	
VOL.FLOW	7516.0	CU.M/HR	20.24	CU.M/HR, SP.GR.=0.712	
COMPRESSIBILITY	0.9931				
HEAT CAPACITY	0.4356	KCAL/KG-C	0.5106	KCAL/KG-C	
VISCOSITY	0.00950	CENTIPOISE	0.717	CENTIPOISE	
THERM.COND.	0.02024	KCAL/M-HR-C	0.11134	KCAL/M-HR-C	
SURF.TENSION			22.45	DYNE/CM	

STAGE 2 TEMPERATURE = 28.3 C PRESSURE = 14.504 PSIA

	VAPOR FROM STAGE		LIQUID FROM STAGE		
	KGMOL/HR	MOL.FR	KGMOL/HR	MOL.FR	K VALUE
1 METHANE	100.0	0.3332	0.2	0.1835E-02	181.5350
2 ETHANE	99.9	0.3329	1.1	0.1037E-01	32.1132
3 PROPANE	99.5	0.3317	3.8	0.3664E-01	9.0509
4 n-DECANE	0.7	0.2224E-02	99.7	0.9512	0.0023
TOTAL	300.1	KGMOL/HR	104.8	KGMOL/HR	
	9092.5	KG/HR	14389.4	KG/HR	
AVG.MOL.WT	30.3		137.3		
ENTHALPY	1.2814	MM KCAL/HR	0.6951	MM KCAL/HR	
VOL.FLOW	7468.1	CU.M/HR	20.20	CU.M/HR, SP.GR.=0.713	
COMPRESSIBILITY	0.9930				
HEAT CAPACITY	0.4337	KCAL/KG-C	0.5085	KCAL/KG-C	
VISCOSITY	0.00945	CENTIPOISE	0.734	CENTIPOISE	
THERM.COND.	0.02004	KCAL/M-HR-C	0.11173	KCAL/M-HR-C	

SURF.TENSION 22.62 DYNE/CM

STAGE 1 TEMPERATURE = 24.9 C PRESSURE = 14.504 PSIA

	VAPOR FROM STAGE KGMOL/HR	MOL.FR	LIQUID FROM STAGE KGMOL/HR	MOL.FR	K VALUE
1 METHANE	100.0	0.3331	0.2	0.1875E-02	177.6929
2 ETHANE	99.9	0.3330	1.1	0.1093E-01	30.4541
3 PROPANE	99.7	0.3321	4.1	0.3958E-01	8.3908
4 n-DECANE	0.5	0.1764E-02	99.2	0.9476	0.0019
TOTAL	300.2 KGMOL/HR		104.6 KGMOL/HR		
	9081.2 KG/HR		14329.1 KG/HR		
AVG.MOL.WT	30.3		136.9		
ENTHALPY	1.2668 MM KCAL/HR		0.6678 MM KCAL/HR		
VOL.FLOW	7384.9 CU.M/HR		20.06 CU.M/HR, SP.GR.=0.715		
COMPRESSIBILITY	0.9928				
HEAT CAPACITY	0.4303 KCAL/KG-C		0.5049 KCAL/KG-C		
VISCOSITY	0.00936 CENTIPOISE		0.764 CENTIPOISE		
THERM.COND.	0.01970 KCAL/M-HR-C		0.11241 KCAL/M-HR-C		
SURF.TENSION			22.91 DYNE/CM		

STREAM WETGAS Wet Gas Entering the Absorber

	KGMOL/HR	MOL FR.	KG/HR	WT.FR.
1 METHANE	100.000	0.3333	1604.28	0.1778
2 ETHANE	100.000	0.3333	3006.96	0.3333
3 PROPANE	100.000	0.3333	4409.65	0.4888
4 n-DECANE	0.000	0.000E+00	0.00	0.000E+00
	300.000		9020.89	

TEMPERATURE 20.0 C PRESSURE 15.954 PSIA
FRACTION LIQUID 0.0000 ENTHALPY 1.239 MMKCAL/HR
AVERAGE MOL.WT. 30.07 DENSITY 1.368 KG/M3
VOLUME 6591.96 CU.M/HR COMPRESSIBILITY 0.9917
HEAT CAPACITY 0.4260 KCAL/KG-C VISCOSITY 0.00924 CENTIPOISE
THERM.COND 0.01933 KCAL/M-HR-C

STREAM LEANOIL Lean Oil Entering the Absorber

	KGMOL/HR	MOL FR.	KG/HR	WT.FR.
1 METHANE	0.000	0.000E+00	0.00	0.000E+00
2 ETHANE	0.000	0.000E+00	0.00	0.000E+00
3 PROPANE	0.000	0.000E+00	0.00	0.000E+00
4 n-DECANE	100.000	1.0000	14228.50	1.0000
	100.000		14228.50	

TEMPERATURE 30.0 C PRESSURE 15.954 PSIA
FRACTION LIQUID 1.0000 ENTHALPY 0.701 MMKCAL/HR
AVERAGE MOL.WT. 142.29
VOLUME 19.78 CU.M/HR SPECIFIC GRAVITY 0.7199 (30.0 C)
19.50 CU.M/HR 0.7305 (15.6 C)
HEAT CAPACITY 0.5089 KCAL/KG-C VISCOSITY 0.811 CENTIPOISE
SURFACE TENSION 22.91 DYNE/CM THERM.COND 0.11222 KCAL/M-HR-C

STREAM OVHD Overhead Vapor

		KGMOL/HR	MOL FR.	KG/HR	WT.FR.
1	METHANE	99.804	0.3379	1601.14	0.1795
2	ETHANE	98.856	0.3347	2972.56	0.3332
3	PROPANE	95.858	0.3245	4226.99	0.4739
4	n-DECANE	0.841	0.285E-02	119.60	0.0134
		295.359		8920.29	

TEMPERATURE 31.9 C
FRACTION LIQUID 0.0000
AVERAGE MOL.WT. 30.20
VOLUME 7441.72 CU.M/HR
HEAT CAPACITY 0.4378 KCAL/KG-C
THERM.COND 0.02048 KCAL/M-HR-C

PRESSURE 14.504 PSIA
ENTHALPY 1.272 MMKCAL/HR
DENSITY 1.199 KG/M3
COMPRESSIBILITY 0.9933
VISCOSITY 0.00956 CENTIPOISE

STREAM BTMS Rich Oil Leaving the Bottom of the Absorber

		KGMOL/HR	MOL FR.	KG/HR	WT.FR.
1	METHANE	0.196	0.187E-02	3.15	0.220E-03
2	ETHANE	1.144	0.0109	34.40	0.240E-02
3	PROPANE	4.142	0.0396	182.65	0.0127
4	n-DECANE	99.159	0.9476	14108.90	0.9846
		104.642		14329.10	

TEMPERATURE 24.9 C
FRACTION LIQUID 1.0000
AVERAGE MOL.WT. 136.93
VOLUME 20.06 CU.M/HR
19.87 CU.M/HR
HEAT CAPACITY 0.5049 KCAL/KG-C
SURFACE TENSION 22.91 DYNE/CM

PRESSURE 14.504 PSIA
ENTHALPY 0.668 MMKCAL/HR
SPECIFIC GRAVITY 0.7151 (24.9 C)
0.7219 (15.6 C)
VISCOSITY 0.764 CENTIPOISE
THERM.COND 0.11241 KCAL/M-HR-C