

AFT Fathom™ Finds Optimization Opportunities in Hydrocarbon Separation Process

CASE STUDY

Hydrocarbon Separation Plant
Oil & Gas Industry



Sasol Sasolburg, South Africa Platinum Pipe Award Winner - Software Features and Model Creativity

Nelius Joubert, senior operations specialist at Sasol, used AFT Fathom to model a complicated hydrocarbon separation plant in South Africa. The plant utilizes liquid extractants to separate the components of a liquid stream into separate pure components. This is done through a series of separation and purification steps in the plant, using extraction and distillation processes.

The process streams of the entire plant were simulated in AFT Fathom. The model contains 335 pipes and includes process feed streams from the storage tanks to the plant, all the streams in the plant that are used during plant operation, including internal recycle

“...the model will be used on a continuous basis for troubleshooting and evaluation of the plant’s hydraulic health.”

streams and product streams to the product storage tanks. Major pieces of equipment that are included in the simulation include:

- storage tanks
- a liquid-liquid extraction column
- distillation columns
- a flash vessel
- reboilers
- vapor condensers
- reflux drums
- pumps
- control valves
- inline mixers

Model creativity is demonstrated by the manner in which the liquid extraction and distillation columns

are included in the model. Separate tanks were used to specify the different boundary conditions (fluid properties, pressures and elevations) for each tie-off or tie-in to these columns (see Figure 1).

AFT Fathom’s capability to simulate both vapor and liquid streams was used to create a continuous pressure envelope from the top of two of the distillation columns (vapor flow), through the vapor condensers and (liquid flow) into the reflux drums.

Another software feature that was used extensively was AFT Fathom’s ability to predict the percentage opening of control valves. These percentages were key in calibrating the model and identifying the fouled up exchangers (see Figure 2).

After completion of the model, it was calibrated to match the measured plant data. During this process, various plant problems (e.g. fouled heat exchangers, etc.) were identified that were listed for investigation or cleaning during the next plant shut down. The model was also used to propose improved control philosophies and other plant modifications to enhance its performance. Finally, the model was used to identify key pieces of equipment that would need to be upgraded should the plant want to increase production rates. In the future, the model will be used on a continuous basis for troubleshooting and evaluation of the plant’s hydraulic health.

Sasol is an international integrated energy and chemicals company that leverages the talent and expertise of more than 31,000 people working in 37 countries. They develop and commercialize technologies and build and operate world-scale facilities to produce a range of high-value product streams, including liquid fuels, chemicals and low-carbon electricity.

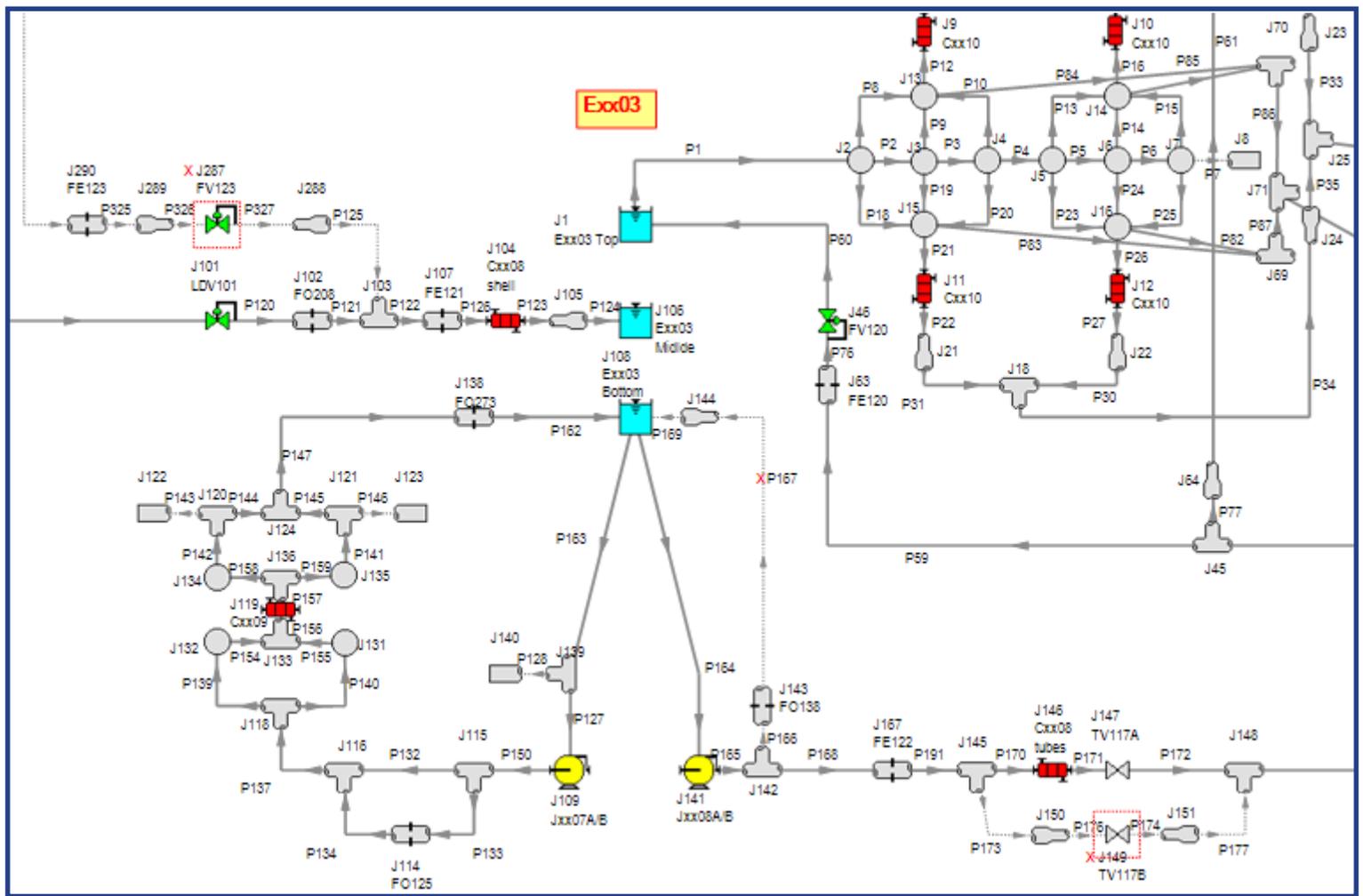


Figure 1 - Liquid extraction and distillation portion of the AFT Fathom model

Jct	Name	Valve Type	Vol. Flow (m3/hr)	Mass Flow (kg/hr)	dP Stag. (kPa)	dH (meters)	P Static In (kPa (g))	Open Percentage (Percent)	Cv	K	Valve State
46	FV120	FCV	11.48700	11,073.47	45.82861	4.847734	629.726	57.64	19.26886	43.768	Open
55	FV132	FCV	1.82900	1,572.94	288.72192	34.234224	713.071	32.44	1.15452	808.733	Open
86	FV101	FCV	8.20800	7,978.18	129.90501	13.628211	840.145	63.10	8.21177	88.703	Open
94	PV101	FCV	41.47200	28,781.57	87.04546	12.789861	404.570	29.59	42.82931	42.998	Open
101	LDV101	FCV	13.36500	13,765.95	17.52388	1.734891	430.365	76.68	37.47588	11.571	Open
154	PV130	FCV	9.74110	9,473.32	15.63351	1.639237	6.545	100.00	28.10000	7.575	Failed Open
164	FV141	FCV	4.03000	4,175.08	92.13175	9.068361	160.037	51.71	4.94265	44.126	Open
173	FV143	FCV	3.81600	3,953.38	20.85707	2.052923	242.355	82.01	9.83651	11.141	Open
209	FV146	FCV	0.11700	108.34	746.75073	82.232565	877.983	27.66	0.04765	474,727.300	Open
X240	PSV013	PSV	0.00000	0.00	N/A	N/A	496.735	N/A	N/A	N/A	Closed By User
244	PV148	PSV	0.11700	108.34	53.73000	5.916775	39.000	17.53	0.17765	40,851.700	Open

Figure 2 - AFT Fathom output for valves