Comprehensive Application of VMGSim in Refinery

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01 Sunbridge at a Glance

Sunbridge at a Glance

Brief Introduction

- Beijing Sunbridge Infotech Co., Ltd，a high-tech company in Haidian District Beijing，is invested by Daqing Petrochemical Complex of CNPC
- Business covers process simulation and optimization, OTS development, analysis and optimization for Water System of petrochemical enterprise, steam energy saving, etc
- Customers include PetroChina, Sinopec, CNOOC and overseas refineries
- More than 20 years’ experience in simulation applications
- Capable of building simulation models of chemical plants by using simulation software, such as VMGSim, Aspen Hysys, Aspen Plus, PRO/II, PetroSim etc.
- Built more than one hundred simulation models for plants such as Ethylene, Ammonia, Atmospheric and vacuum distillation, fluid catalytic cracking, delayed coking, etcetera, for troubleshooting, operation improvement and process optimization

圣金桥公司新址——金码大厦全景

Sunbridge and VMG

From 2013

EXCHANGE

TECHNICAL EXCHANGE

In the face of the technical challenges encountered, Sunbridge fully understands the technical advantages of VMG, understands what it can do, and how it works.

Starting in 2016

DEMONS TRATION

DEMONSTRATION MODELING

Commissioned VMG to establish urea model, butadiene extraction model, aromatics extraction model, and achieved economic benefits.

At the same time

TRAINING

EXTENSIVE TRAINING

VMG has conducted various trainings for technicians, researchers and project team members to ensure that VMGSim is mastered.

Continued until now

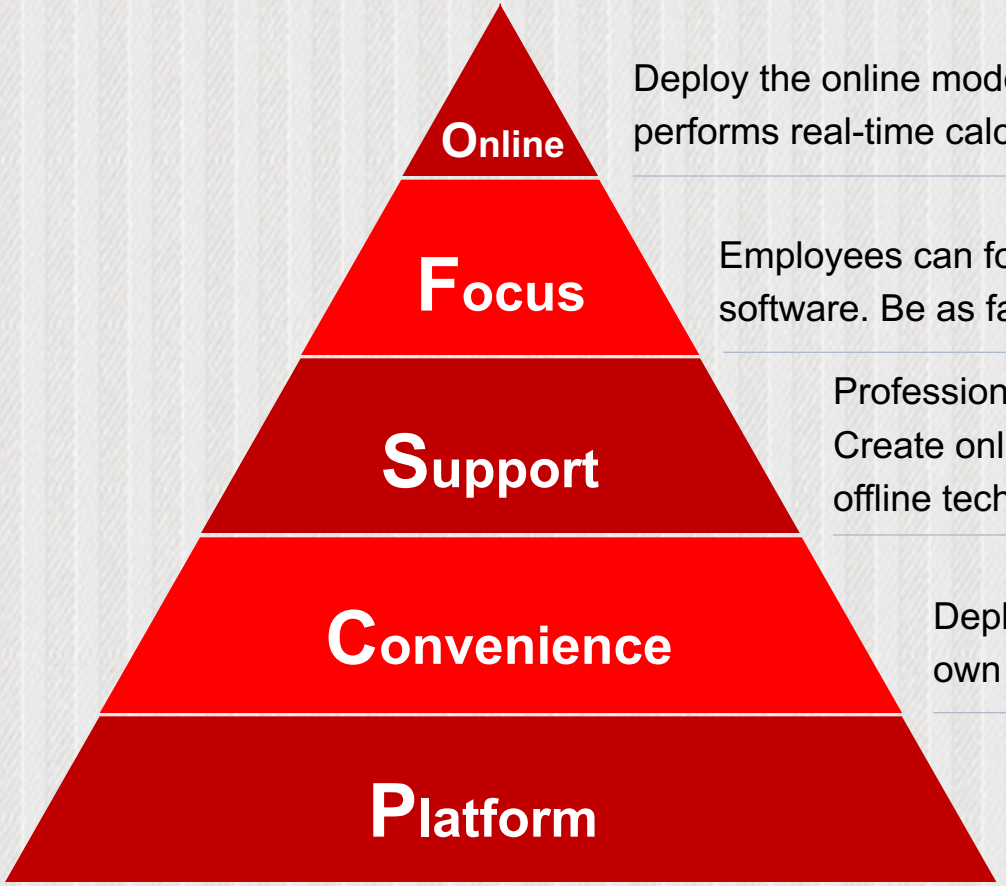
APPLIC ATIONS

DIFFERENT LEVELS OF APPLICATIONS

The VMGSim software fully used by engineers to solve various production problems encountered, which brings economic benefits to the enterprise.

02 Comprehensive Applications

Comprehensive Applications of VMGSim



Deploy the online model, the system links with MES and LIMS data in the background, performs real-time calculation, and realizes the "soft measurement" function

Employees can focus on using VMGSim to solve production problems, not just learning software. Be as fast and accurate as possible

Professional process simulation technical support team, 7x24 technical Q&A. Create online instructional videos that give employees access to online and offline technical assistance

Deploy complete plant models where employees can directly use their own models for learning, analysis and process optimization

Establish a process simulation platform, cloud deployment VMGSim, employees can use process simulation software anytime, anywhere

Typical Application on Sulfur Recovery Unit

Business Challenge & Objective

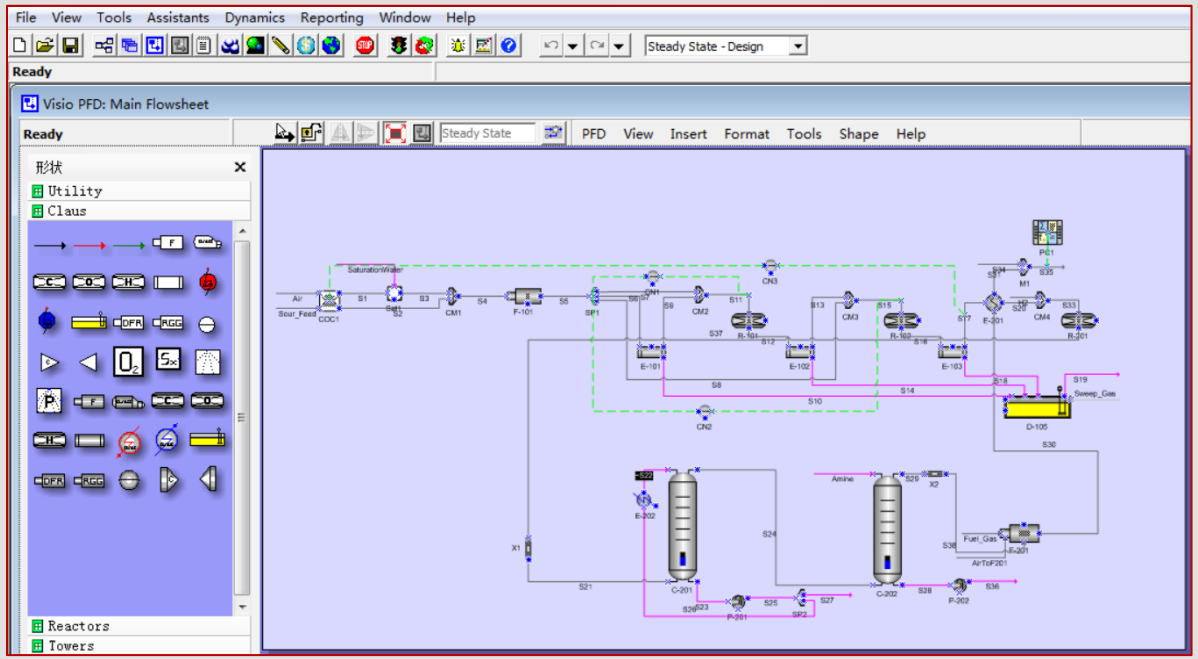
- The inlet temperatures of the primary and secondary reactors are too high
- The amount of amine solution in the absorption tower is too large
- Energy consumption is greater than design specifications
- Analyze the operating conditions

Solution Overview

- The sulfur recovery unit (SRU) is simulated by VMGSim
- The effects of five operating parameters on the total recovery of SRU and the recovery of H2S are analyzed, including inlet temperatures of the primary and secondary reactors, operating temperature of the condenser, amount of the lean amine circulation

Results & Benefits

- The reasons for the large energy consumption of the unit and the low recovery rate were found, and corresponding optimization measures were proposed and implemented
- Bringing $650,000/year economic benefits to the unit by retrofitting equipment and adjusting key operating parameters



Typical Application on Aromatics Extraction Unit

Business Challenge & Objective

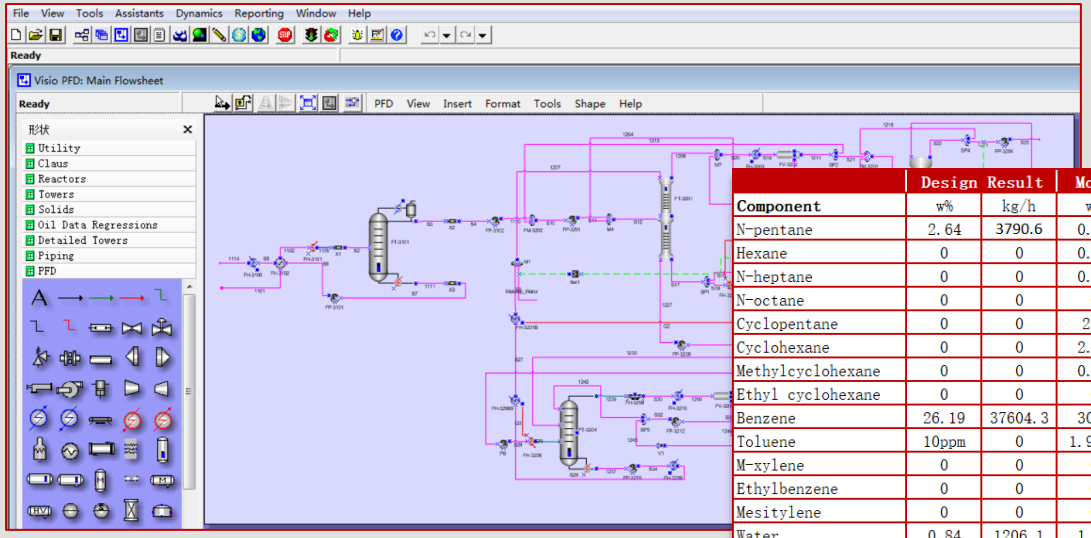
- Unit operation cannot meet design specifications
- Actual energy consumption is higher than design energy consumption
- The stripper is not operating properly
- Understand the impact of changing the amount of first solvent cycle and the amount of second solvent cycle on plant production

Solution Overview

- Modeling with design data
- Modeling with calibration data
- Analysis of the differences between the two models: composition, flow, temperature, pressure, etc.
- Use case study to analyze the effect of solvent circulation on production

Results & Benefits

- The biggest difference between the design model and the calibration model is the difference in non-aromatic content in the solvent. After the analysis, the design value is incorrect
- According to the calibration model calculation, the current operating conditions are normal and should not be matched to the design requirements
- The stripper needs to be modified to solve the design errors



	Design Result		Model Result	
Component	w%	kg/h	w%	kg/h
N-pentane	2.64	3790.6	0.31	510.5
Hexane	0	0	0.46	743
N-heptane	0	0	0.04	66.7
N-octane	0	0	0	0
Cyclopentane	0	0	2.6	4219.1
Cyclohexane	0	0	2.67	4342.7
Methylcyclohexane	0	0	0.01	13
Ethyl cyclohexane	0	0	0	0
Benzene	26.19	37604.3	30.8	50076.5
Toluene	10ppm	0	1.9ppm	0
M-xylene	0	0	0	0
Ethylbenzene	0	0	0	0
Mesitylene	0	0	0	0
Water	0.84	1206.1	1.02	1655.1
Sulfolane	70.33	100981.6	62.1	100959.5
TOTAL	100	143582.5	100	162586.2

Typical Application on Butadiene Extraction Unit

Business Challenge & Objective

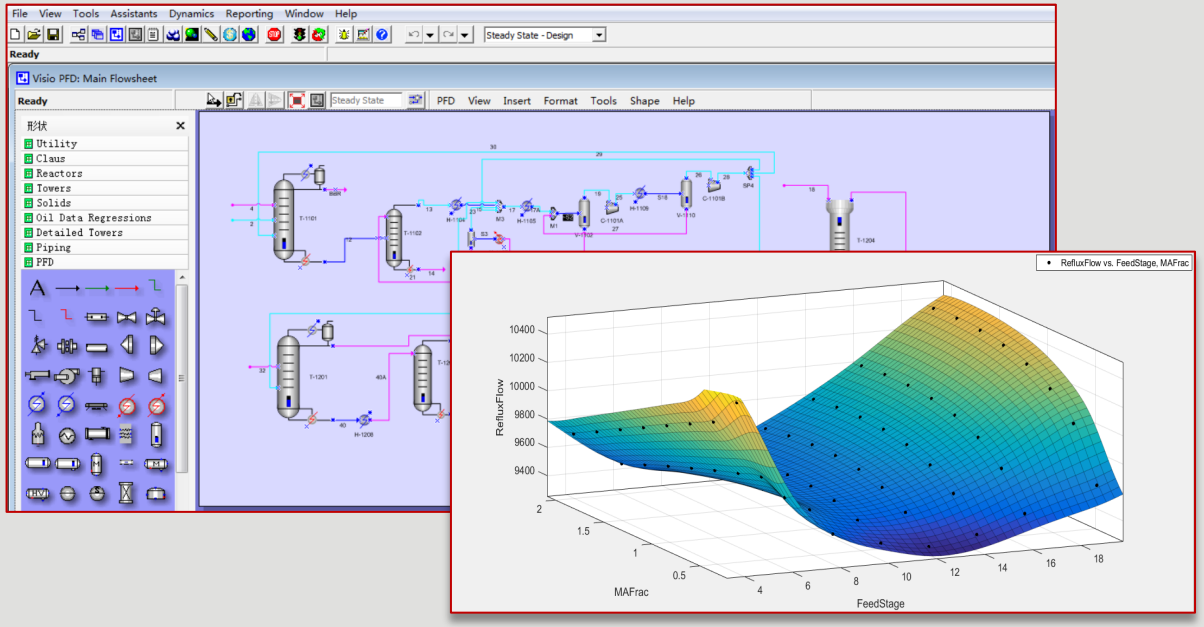
- How is the current operating level? Need improvement?
- Is the range of key process indicators reasonable when the feed composition changes?
- Can I change the operating conditions of the first distillation column?

Solution Overview

- Establish model according to the calibration data
- Compare the results of the model calculation with the data from MES and LIMS to confirm whether the current operating state is optimal
- Confirm whether the operation of the first distillation column needs adjustment by changing the feed composition, feed position and reflux flow rate, etc.

Results & Benefits

- The unit is operating very well and does not require additional adjustments
- The range of process parameters are reasonable and should be maintained
- The feed position and reflux ratio of the first distillation column do not need to be changed, and it is currently the best



Typical Application on Sour Water Stripper Unit

Business Challenge & Objective

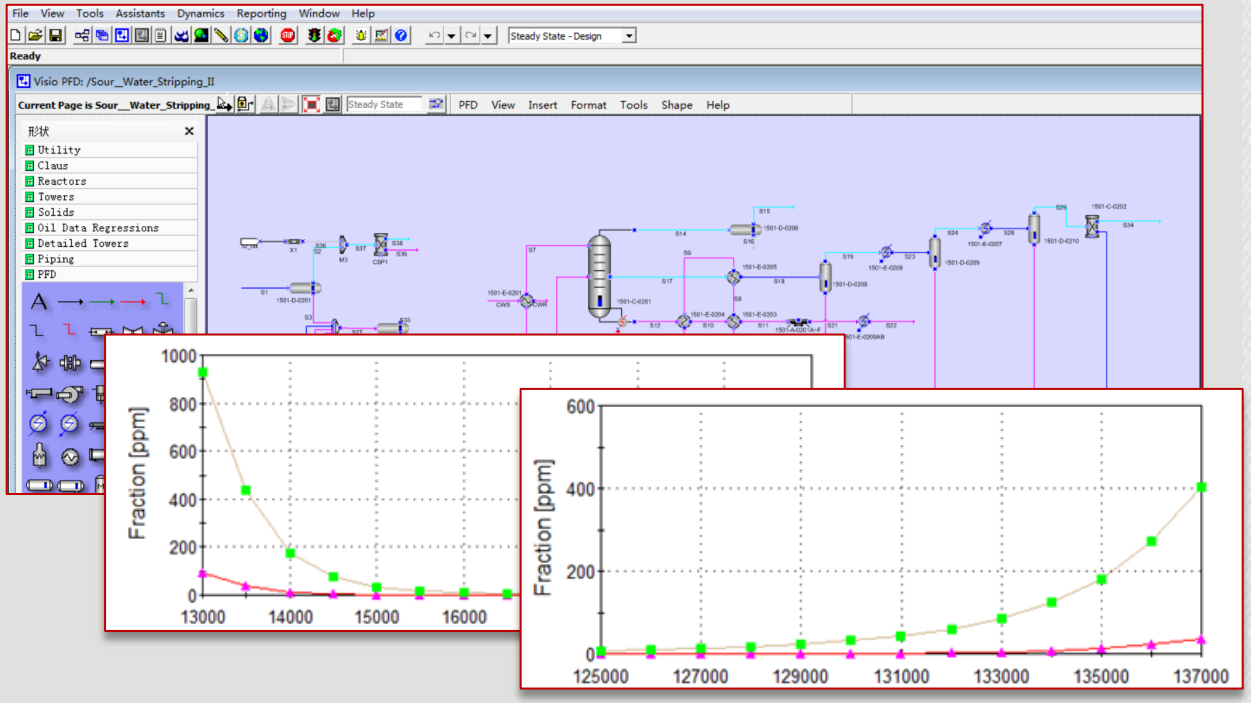
- The new chemical plant is put into production, and it is necessary to analyze the current operational level
- Where is the optimized operational boundary?
- How much energy can be saved?

Solution Overview

- Analysis of the ammonia draw amount of the stripper varies from 13,000 to 20,000 t/h, which affects the amount of steam and the quality of the purified water at the bottom of the tower
- Analysis of the effect of hot and cold feed ratio on energy consumption and water quality

Results & Benefits

- The current plant has a large energy saving space and needs to optimize operating conditions
- Determine the minimum amount of steam at the bottom of the tower and the optimum ratio of hot and cold feed
- Because its steam price is more expensive, the final annual income can increase by 820,000 USD



Typical Application on Amine Regeneration Unit

Business Challenge & Objective

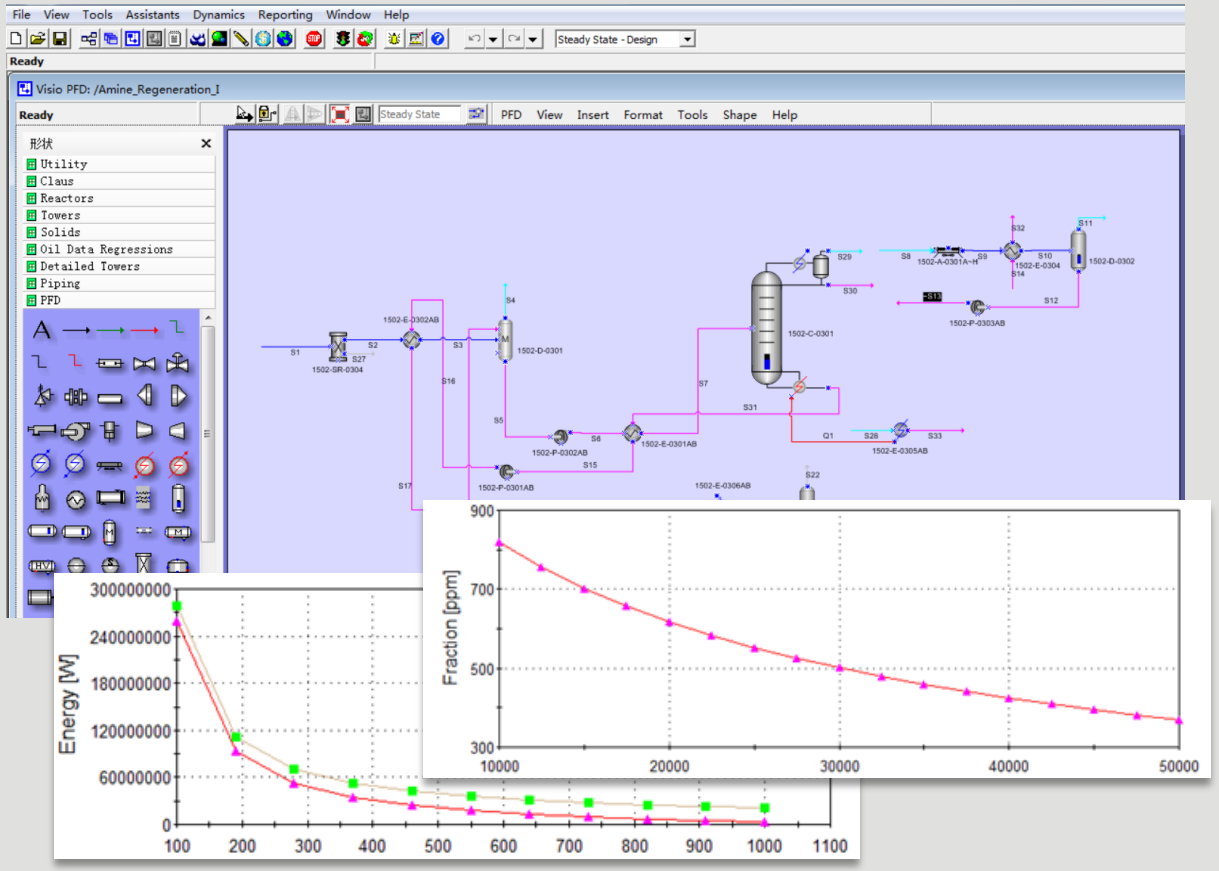
- The plant capacity is very large, and it is necessary to analyze the operation of the regenerator
- Is it possible to change some operating conditions to achieve energy saving goals, where are the boundaries of change?

Solution Overview

- Analysis of the feed temperature of the regenerator
- Analysis of the reflux flow of the regenerator
- Analysis of the control indicators of lean amine solution

Results & Benefits

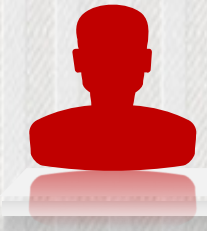
- The goal of optimizing process parameters is achieved
- Achieve annual economic benefits of approximately $2.55 million



Application Result

Wide Range of Applications

In the process simulation platform, a total of 77 VMGSim plant models have been deployed so far



Improve Skills

Further improve the ability of employees to use process simulation technology to better increase the profitability of plant operations

Considerable Economic Benefits

The project team and the VMG technical team have optimized the production processes of some refineries with a total economic benefit of approximately $10.66 million per year.

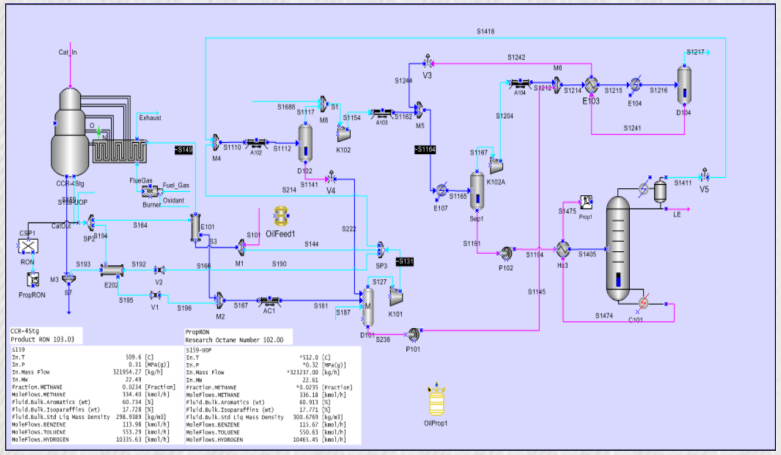
Great Technical Service

Always maintain technical communication with VMG, keep abreast of the latest developments, and get timely and effective professional support and services

Next Project Phase

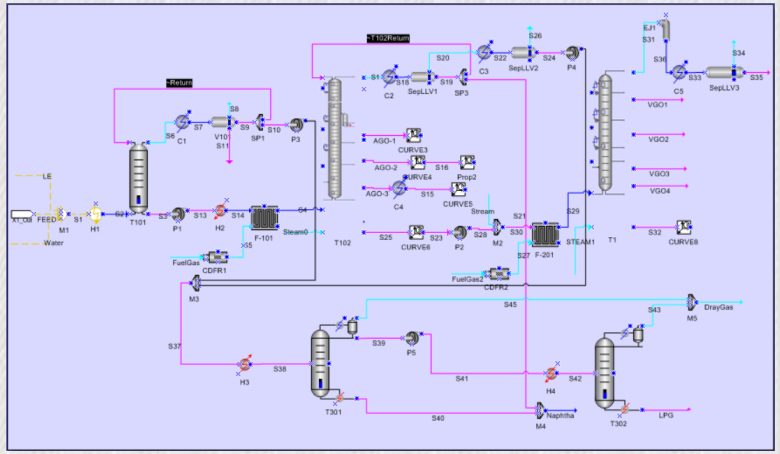
Application of CDU

Carry out the modeling and application of CDU, and apply the molecular characterization (PIONA) function of VMG



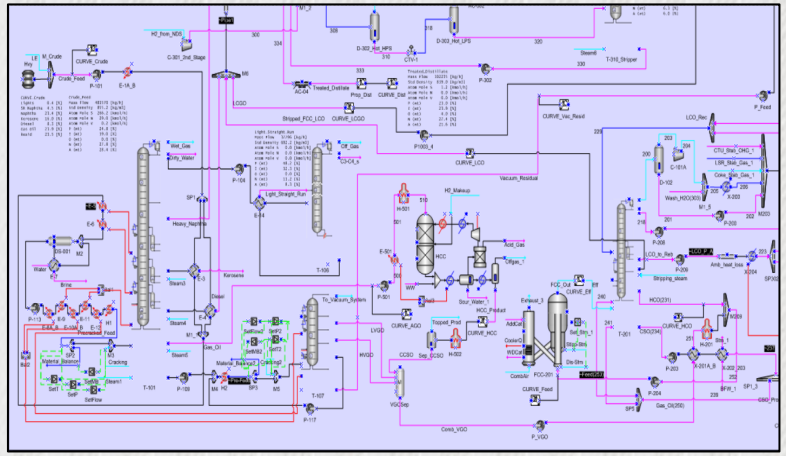
Refinery-Wide Optimization

Using VMG's molecular simulation technology to "track" and manage the molecules of the whole refinery, and optimize to the entire refinery



Refining Reactor Application

Modeling and application of core equipment for refinery such as fluid catalytic cracking, hydrocracking, reforming and delayed coking



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Welcome to Beijing Sunbridge