

Hydrodesulfurization Unit

What is a Hydrodesulfurization Unit (HDS)?

The OmegaLand Educator is a comprehensive training system composed of three main modules:

- Principle Module, which focuses on learning the fundamentals and operational principles,
- Basic Unit Module, designed to master unit operations, and
- Industry Module, which allows users to learn industry-specific processes.

The Industry Module features a Hydrodesulfurization Unit (HDS) model that operates within a dynamic simulation environment. It is designed to provide practical, hands-on training for plant operators.

The package includes (1) Realistic HDS process model for dynamic simulation and (2) detailed training manual covering key topics such as: Process Overview, Process Flow, Operation and Control, Steady-State Operation, Non-Steady-State Operation, Abnormal Situation Handling. The HDS model used in this product is based on a standard hydrodesulfurization unit and has been simplified for training purposes. It includes all major stages - from fresh vacuum gas oil from the storage tank to product draw-off - allowing trainees to gain a comprehensive understanding of HDS operations. While simplified, the model retains essential complexity to ensure effective training in realistic operational scenarios. This product is ideal for operator training programs in the refining industry, offering both foundational knowledge and situational practice in a safe, simulated environment.

Process Overview & Process Flow

■ Feedstock Options

Fresh vacuum gas oil (VGO) can be processed.

- Vacuum gas oil (VGO): 2.6 wt% sulfur content (SG: 0.92)
- Makeup hydrogen: 96.5 Mol%

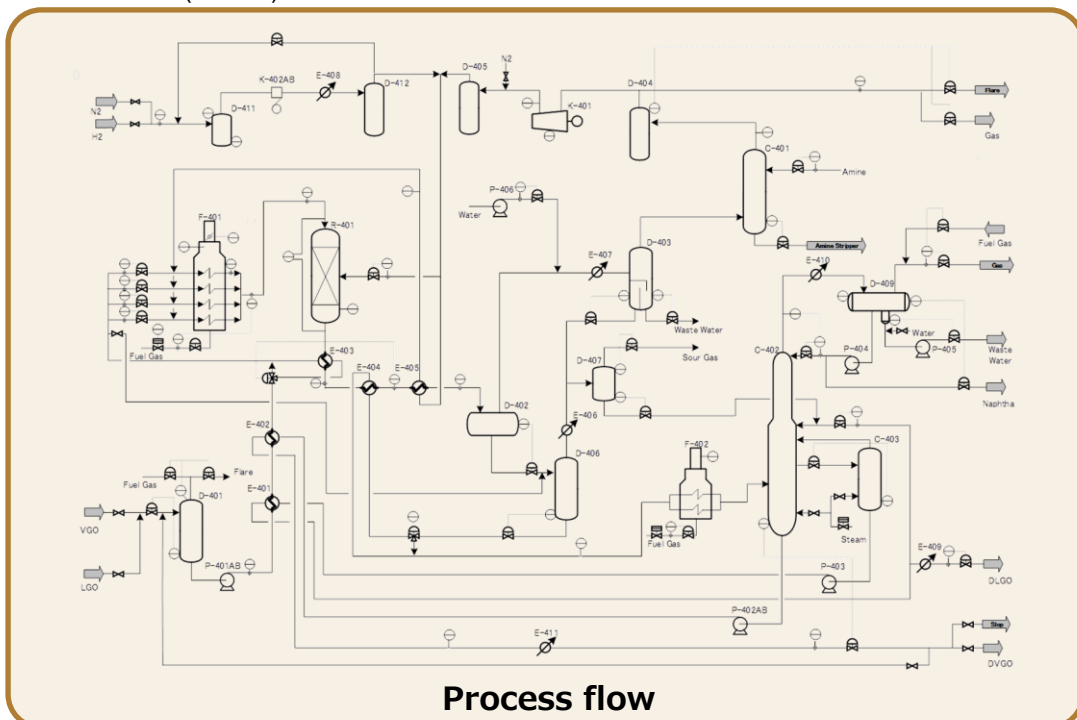
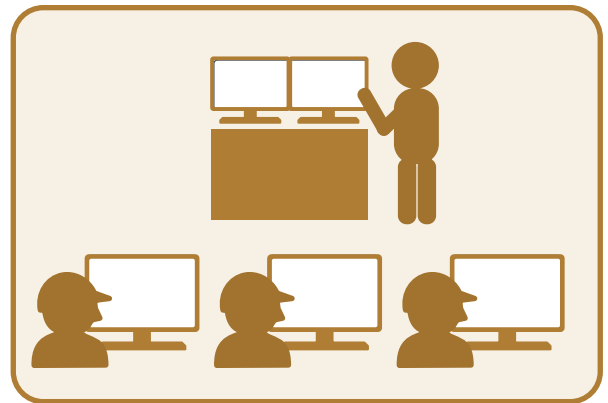
■ Production Capacity

It is designed to process 166 kl/h (25,000 BPSD) of vacuum gas oil (VGO).

■ Main Products

The products produced by this HDS are as follows:

- Off-gas (including LPG)
- Naphtha (Wild Naphtha)
- Desulfurized Light Gas Oil (DLGO)
- Desulfurized Vacuum Gas Oil (DVGO)



What Can Be Done

In this product, participants can learn three main operational tasks: 'steady-state operation', 'non-steady-state operation' and 'abnormal response operation'.

Class	Title	Summary
Steady-state operation	Production volume change	The goal is for participants to be able to independently perform operations on actual equipment, such as changing the raw material processing rate, understanding the changes in temperature, pressure, and analysis values that occur during the desulfurization reaction process from raw materials to products, and making judgments on the appropriateness of the operation results.
	DVGO sulfur value change	Participants will learn how to adjust the properties of DVGO to target values by understanding the operation items and quantities required to produce products according to the requested production plan.
	Verification of energy-saving operations and others	The operating costs of the HDS unit are primarily driven by hydrogen consumption. - Excessive sulfur service → Increase in hydrogen consumption loss - Reduce the amount of off-gas from D-404 as much as possible → Decrease in makeup H₂ - Lower the pressure of the recycle gas system → Reduction in dissolved H₂ loss - Low H₂/OIL ratio → Reduction in furnace fuel and power costs - Optimize amine circulation volume → Expected reduction in steam for amine regeneration
Non-steady-state operation	Startup	The startup of the HDS unit proceeds step by step. The goal of the training is to be able to operate efficiently and smoothly. To achieve this, Participants will learn the overall flow of the startup operations. Additionally, in the actual equipment, issues such as pump strainer clogging and pump cavitation may occur, making it less smooth than in the simulator. However, participants will learn the actual startup while training.
	Shutdown	During shutdowns, there are instances where heat exchangers and other equipment experience significant temperature changes, leading to leaks. Therefore, participants will learn the shutdown procedures for actual equipment through simulator training.
Abnormal response operation	VGO feed trouble - feed stoppage	Participants can learn how to handle abnormal conditions.
	Hydrogen feed system trouble - feed stoppage	
	The amine feed control valve has failed and is fully closed	
	Fuel gas system trouble - FG feed stoppage	
	VGO charge pump failure	
	DVGO pump failure	
	Naphtha pump failure	
	DLGO pump failure	
	Recycle gas compressor failure	
	Makeup gas compressor failure	
	Heat exchanger bypass control valve failure	
	Heat exchanger outlet temperature control valve failure	
	Column level gauge failure	
	Drum level control valve failure	
	Drum reflux flow control valve failure	

Contact Information

For inquiries regarding the OmegaLand Educator Industry Edition and HDS, please contact the following.
 Omega Simulation Co., Ltd.
 TEL : +81-3-3208-4921
 E-mail : sales@omegasim.co.jp