Hydrocracker Simulation and Tutorial

A self-paced MultiMedia based Tutorial/CBT and real-time dynamic simulation of a Hydrocracker Unit.

**Tutorial/CBT:**

This interactive tutorial provides an Overview, Fundamental Principles, and Control and Operating Principles for a Hydrocracker Unit using Voice, Video, Animation and Graphics.

- **Overview**
  - Importance of HCU
  - HCU vs. FCCU
  - Process Overview
  - Single-Stage Hydrocracker
  - Two-Stage Hydrocracker

- **Safeguard System**
  - Depressurization Valves
  - Reactor High Temperature Shutdown
  - Reactor Feed Shutdown
  - Recycle Gas Furnace Shutdown
  - Reactor Quench System
  - Low Recycle Gas flow
  - Recycle Gas Compressor
  - Make-Up Gas Compressor
  - High & Low Pressure Separators

- **Startup Operations**
- **Shutdown Operations**

- **Key Controlled and Operating Variables**
  - Feed Surge Drum
  - Feed Flow
  - Delta Coke
  - Feed Properties and Composition
  - Combustion
  - Reactor Inlet Temperature and Recycle Gas Furnace
  - Reactor Bed Temperature Controls and Quench System
  - Recycle Gas Flow
  - Reactor Effluent Cooling
  - High and Low Pressure Separators
  - Recycle and Make-Up Gas Compressors
  - Fractionation Section

- **Principles of HCU**
  - Hydrotreating Reactions
  - Hydrocracking Reactions
  - Reactor Conversion
  - Reaction Kinetics
  - Catalyst
  - Catalyst Deactivation and Regeneration

- **HCU Components**
  - Feed Preparation and Preheat System
  - Reactor System
  - Reactor Effluent Cooling
  - HP-LP Separation System
  - Sour Water Section
  - Recycle Gas Compressor
  - Make-Up Gas System
  - Fractionation Section

- **Troubleshooting**
  - Loss of Incoming Feed
  - Loss of Feed to Reactor
  - Reactor Temperature Excursion and Runaway Reactions
  - Loss of Recycle Gas Furnace
  - Loss of Recycle Gas Compressor
  - Loss of Make-up Gas Compressor
  - Nitrogen Poisoning
  - Foaming or Emulsion
  - Problems in HP-Separator

- **Features**
  - Tutorial has a built-in Quiz and comes with a Learning Management System (LMS) called TutAdmin. The LMS allows an instructor to register trainees and monitor their performance and Quiz scores.
  - Tutorial is available as a Standalone or Web based application.
  - Available in English, Chinese, Danish, Dutch, French, German, Spanish and Swedish.
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Simulation

GSE's EnVision simulation is a real-time dynamic process simulation program used for Operator Training. It is based upon a rigorous and High-Fidelity mathematical process model to provide a realistic dynamic response of a process unit.

The Simulator allows a Trainee to Practice:
- Startup and Shutdown Operations
- Normal Operations
- Emergency Shutdown Operation
- Control Exercises
- Troubleshoot and practice recovery from Equipment, Instrument, and Control Valve Malfunctions

Major Equipment:
- Feed Surge Drum
- Reactor
  - One Filter / Olefin Saturation Bed
  - Two Hydrotreating Beds
  - Three Hydrocracking Beds
- Reactor Effluent Heat Recovery Train
- Recycle Gas Furnace
- Recycle Gas Compressor
- Make-up Gas Compressor
- High and Low Pressure Separators
- Sour Water Flash Drum
- Fractionation Section (Simplified)

Key Operating Variables:
- Reactor Feed: 212 M3/H (32 MBPD)
- Hydrogen Feed: 62 KNM3/H (2200 MSCFH)
- Off Gas Product: 4.5 KNM3/H (160 MSCFH)
- LPG Product: 27.5 M3/H (4.1 MBPD)
- Light Naphtha Product: 37 M3/H (5.5 MBPD)
- Heavy Naphtha Product: 45 M3/H (6.8 MBPD)
- Kerosene Product: 68 M3/H (10.3 MBPD)
- Gas Oil Product: 50 M3/H (7.6 MBPD)
- WABT: 412 C (774 F)
- Sulfur Conversion: 99 Wt%
- Nitrogen Conversion: 96 Wt%
- Cracking Conversion: 79 LV%

Simulation comes with a Learning Management System (LMS) called SimAdmin that allows an instructor to register trainees and monitor their performance
- Simulation is available as Standalone (Single or Dual Monitor) and Instructor-Trainee versions