EnVision
e-Learning & Universal Simulation

Hydrocracker Unit

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

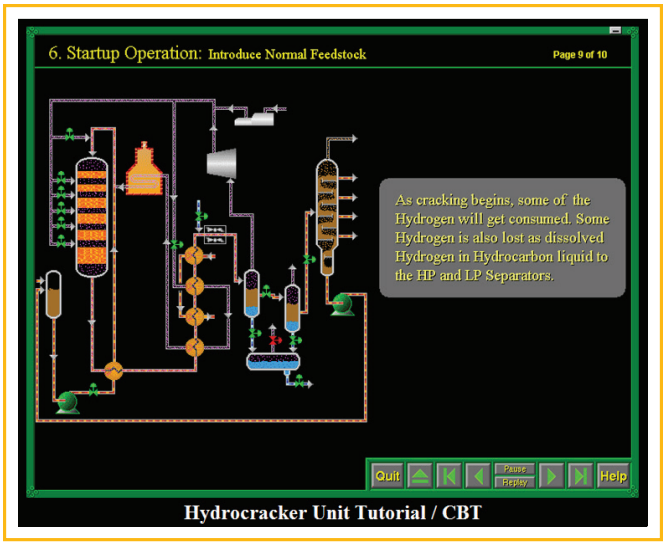
Safeguard System
- Depressurization Valves
- Reactor High Temperature Shutdown
- Reactor Feed Shutdown
- Recycle Gas Furnace Shutdown
- Reactor Quench System
- Low Recycle Gas flow
- Recycle Gas Compressor
- Make-Up Gas Compressor
- High & Low Pressure Separators

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

- 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

EnVision

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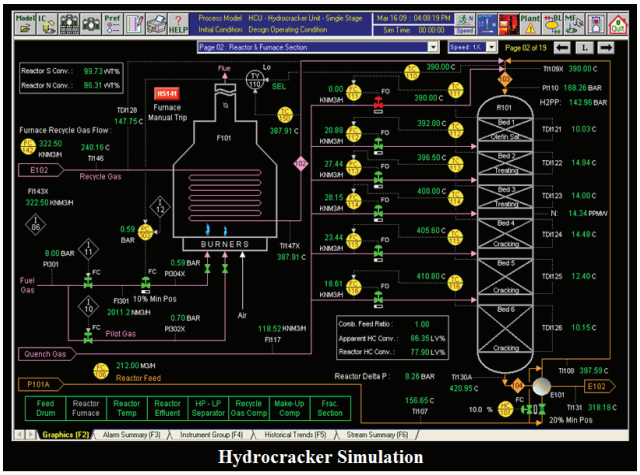
Simulation

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



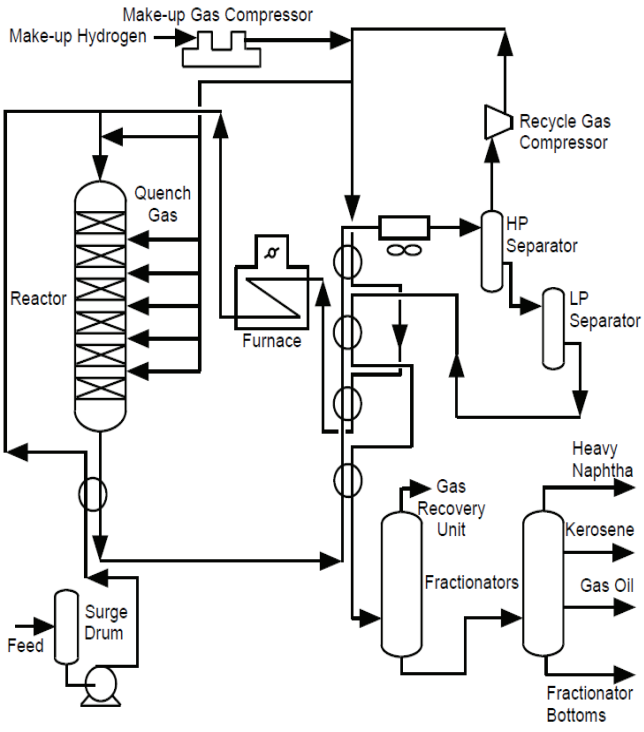
Hydrocracker Simulation

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	(2.2 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

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