EnVision
e-Learning & Universal Simulation

Hydrogen Unit with Methanator

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

Tutorial/CBT:

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

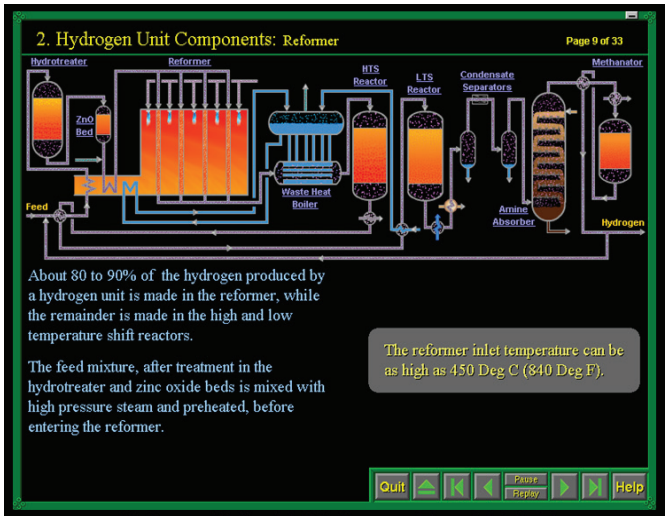
Overview
- Introduction
- Importance of Hydrogen
- Process Overview
- Personal Safety

Hydrogen Unit Components
- Feed Preparation
- Hydrotreater
- Zinc Oxide Bed
- Reformer
- Waste Heat Boiler
- High Temperature Shift Reactor
- Low Temperature Shift Reactor
- Amine Absorber
- Amine Regenerator
- Methanator

Principles of Hydrogen Unit
- Feed Treatment
- Reforming Reaction
- Shift Reaction
- CO2 Removal at Amine Absorber
- Methanation Reactions

Key Controlled and Operating Variables
- Recycled Hydrogen Flow
- Reformer Tube Outlet Temperature
- Steam to Carbon Ratio
- HTS, LTS & Methanator Temperatures
- Amine Concentration
- Amine Solution Circulation Rate
- Lean Amine Temperature

Safeguard Systems
- Introduction
- Reformer Furnace Shutdown
- Methanator Shutdown
- Emergency Shutdown (ESD)



Hydrogen Unit with Methanator Tutorial / CBT

Startup Operation
- Pre-Startup Check
- Catalyst Preparation
- Purging and Warming Up
- Feed Introduction

Shutdown Operations
- Normal Shutdown Operation
- Emergency Shutdown

Troubleshooting
- High Hydrocarbon in Reformer Effluent
- High Pressure Drop
- Poor Burner Operation
- Poor Amine Absorber Performance
- Foaming and Flooding in Amine System
- Degradation of Amine Solution
- Poor Quality of Boiler Feed Water and Steam
- Temperature Excursion at Methanator
- Mechanical Failures

- 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

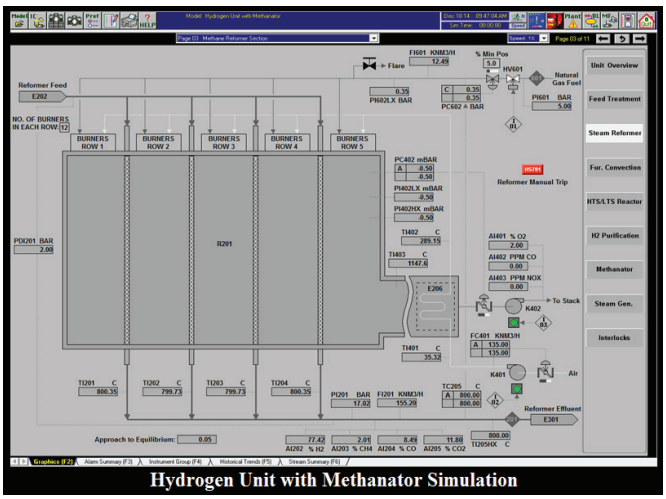
Hydrogen Unit with Methanator

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

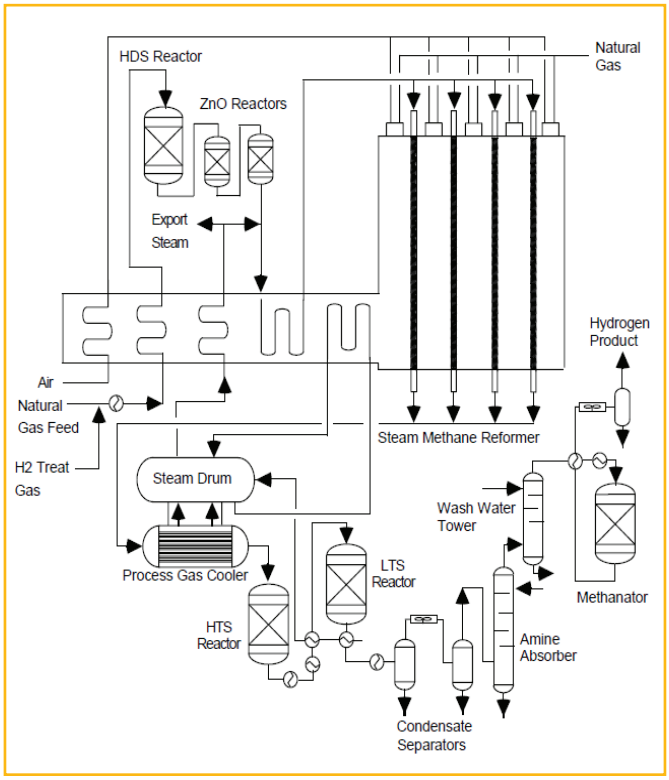

Hydrogen Unit with Methanator Simulation

Major Equipment:

- Hydrodesulphurization (HDS) Reactor
- Zinc Oxide (ZnO) Reactors
- Top Fired Steam Methane Reformer (SMR)
- Reformer Flue Gas Heat Recovery Section
- Process Gas Cooler
- Steam Drum
- High Temperature Shift (HTS) Reactor
- Low Temperature Shift (LTS) Reactor
- Condensate Separators
- Amine Absorber
- Wash Water Tower
- Methanator

Key Operating Variables:

• Natural Gas Feed:	17.0 KNM3/H	(600 MSCFH)	
• Hydrogen Treat Gas:	4.5 KNM3/H	(160 MSCFH)	
• HDS Reactor Temperature:	350 C	(660 F)	
• ZnO Reactor Temperature:	350 C	(660 F)	
• Reformer:			
◦ Steam to Carbon Ratio:	5.85 Mol/Mol		
◦ Temperature:	800 C	(1470 F)	
◦ Pressure:	17.0 BAR	(245 PSIG)	
• HTS Reactor Temperature:	330 C	(625 F)	
• LTS Reactor Temperature:	220 C	(430 F)	
• Methanator Temperature:	270 C	(520 F)	
• Hydrogen Product:			
◦ Flow:	68.5 KNM3/H	(2420 MSCFH)	
◦ Purity:	97.0 % Hydrogen		
• Steam Generation:			
◦ Pressure:	40 BAR	(580 PSIG)	
◦ Total Steam Generation:	110 T/H	(240 MLB/H)	
◦ Export Steam:	28.5 T/H	(60 MLB/H)	



- 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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