Hydrogen with Methanator Simulation and Tutorial

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)

**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
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:

• Hydrodesulphurization (HDS) Reactor
• Zinc Oxide (ZnO) Reactors
• Top Fired Steam Methane Reformer (SMR)
• Reformer Flue Gas Heat Recovery Section
• Process Gas Cooler
• Steam Drum

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.