

# Applying the Digital Twin to Methanol Plants

Dynamic simulation with Mimic Simulation Software provides a high-performance solution for operator training and control system optimization. This Digital Twin technology delivers the complete environment for control system optimization and is an effective tool for teaching process and control engineers the control and operation of methanol plants.

## Methanol Modeling

Solutions for methanol facilities include dynamic models of the following process areas:

- Natural Gas Saturator Column
- Adiabatic Pre-Reformer
- Tubular Fired Reformer
- Oxygen-fired Secondary Reformer
- Water-cooled Methanol Synthesis Reactors
- Gas-cooled Methanol Synthesis Reactor
- Methanol Separators

## Application Capabilities

- Dynamic real time mass and energy balances
- Dynamic real-time flash calculations for processes with Vapor Liquid Equilibrium balance
- Configurable thermodynamic activities and enthalpy correction factors to account for mixture non-idealities
- Reaction model with mechanics and kinetics configurable to plant design, including side reactions, tunable to match plant operations data
- Effect of catalyst on reaction rates are simulated using heterogenous catalytic reactors kinetics based upon Lanmuir-Hinshelwood-Hougen-Watson (LHHW) models

## Mimic Simulation Software



Train operators on infrequent and dangerous process occurrences



Test control system enhancements



Transfer knowledge from seasoned to inexperienced operators



Increase overall plant safety

## Instructor Station

Instructor controls in Mimic and instructor screens in Mimic Component Studio allow your training team to prepare for working with the control system and process. Any element in Mimic can be manipulated or controlled, and instructor screens provide

easy access in one location. Typical controls allow instructors to manipulate operating conditions, such as boundary conditions and compositions, introduce ad-hoc device failures, control scripted training scenarios, and restore snapshots to steady-state operations.

**Plant Feed Conditions**

Manipulate costs, prices, composition and other boundary conditions.

**Ad-Hoc Process**

Switches for individual unit failures.

**Process**

**Operating Conditions**

RESOURCE COST	
NATURAL GAS	\$ 35.00 MT
OXYGEN	\$ 3.00 Kg
WATER	\$ 3.00 gal
FIXED COST	\$ 20.00 hr

PRODUCT PRICE	
METHANOL	\$ 245.00 MT
STEAM	\$ 16.00 MT

**Snapshots**

STEADY STATE

COLD START

SHUTDOWN

**Scenarios**

COLD\_RIR

CATALYST\_BLOCKAGE

FEED\_COMPOSITION

C3\_PUMP\_FAIL

**Process Snapshots**

Control and restore full steady-state, cold, or other methanol plant conditions.

**Scripted Scenarios**

Pre-engineered scenarios with dynamic representation of student scores.

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