Applying the Digital Twin to Ammonia Production

Chemical

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 ammonia production.

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

Ammonia Modeling

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

- Natural gas primary reformer, coupled with the waste heat boiler
- Natural gas secondary reformer
- Acid gas removal system
- Ammonia converter
- High and low temperature shift reactors
- Methanator
- Auxiliary separators, heat exchangers, fluid movers, and piping

Application Capabilities

Natural Gas Primary and Secondary Reformers

- Dynamic real-time mass & energy balances
- Catalyzed reforming and oxidation reactions with online adjustable kinetics
- Catalyst mass heat capacity effects
- Direct-fired heating
- Waste heat boiler flue gas heat recovery
- Real-time display of reformer reactions using Mimic Reactor View

Acid Gas Removal System

- Dynamic real-time mass and energy balances
- Vapor-liquid equilibrium with configurable activity coefficients
- Multiphase outlet flows

Ammonia Converter

- Dynamic real-time mass and energy balances
- Catalyzed ammonia reaction with online adjustable kinetics
- Reactor jacket
- Start-up heater
- Real-time display of converter reactions using Mimic Reactor View

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Instructor Station

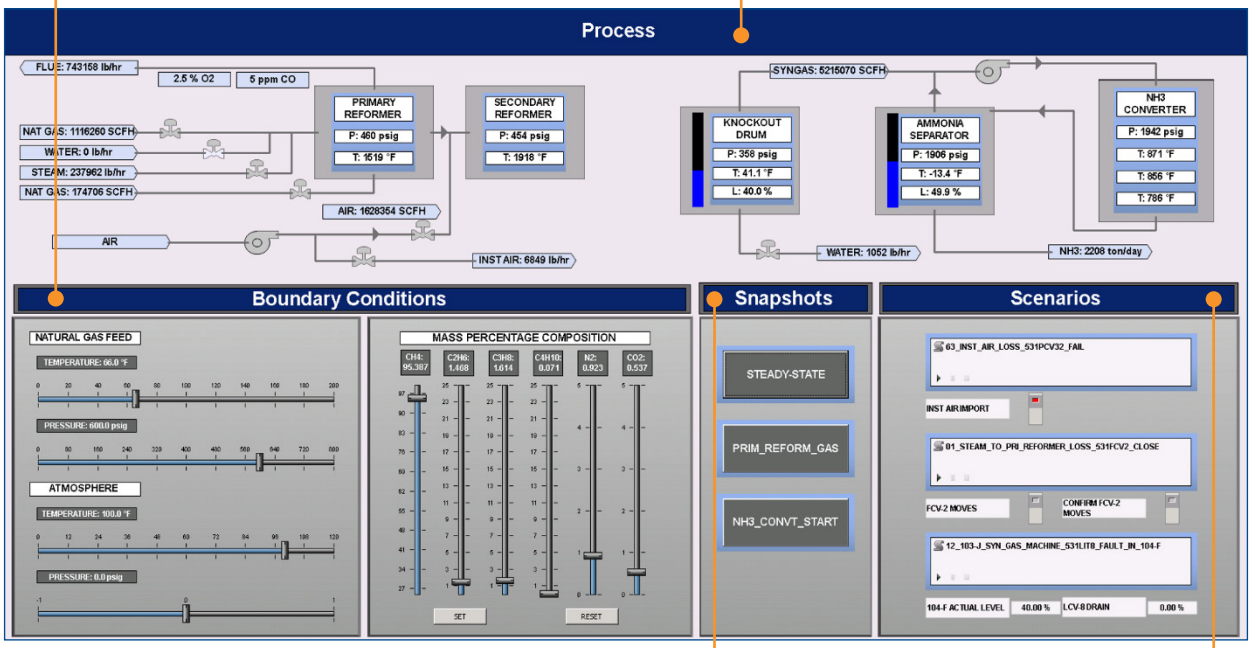
Instructor controls in Mimic and instructor screens in Mimic Component Studio allow your training team to prepare for working with the control system and process. Any element in Mimic can be manipulated or controlled, and instructor screens provide easy access in one location. Typical controls allow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

Ammonia Plant Feed Conditions

Manipulate gas quality and composition, plant water conditions, and many other boundary condition controls.

Ad-Hoc Process

Switches for individual pump and valve failures.



Process Snapshots

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

Scripted Scenarios

Pre-engineered scenarios with dynamic representation of student scores.

Emerson
North America, Latin America:
+1 800 833 8314 or
+1 512 832 3774

Asia Pacific:
65 6777 8211

Europe, Middle East:
+41 41 768 6111

www.emerson.com/mimic

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