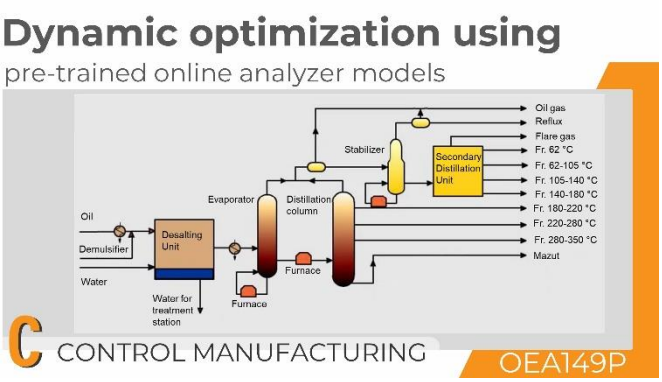

Topic ID	**OEA149T**
Title	**Dynamic optimization using pre-trained analyzer models**
Category	**C-Control Manufacturing**
eLearning Level	**Basic**

Introduction

The topic defines the use of artificial intelligence AI and Machine Learning ML and is termed as Digital Twin in this topic.

The topic also compares the traditional and integrated approaches using the digital twin methodology to optimize process units dynamically.

Process Optimization Methodologies

The traditional Approach involves solving two optimization problems. The first is finding the process's economically optimal steady-state working point. The second is bringing the process from its current to the desired state subject to a defined cost optimization criterion.

The group of advanced process control solutions responsible for bringing the process from its current state to the desired one is Model Predictive Control or MPC.

These solutions are primarily based on linearized approximation of the process dynamics.

MPC products have been used in the industry since the mid-seventies. However, while MPC allows an effective transition from the current to the desired state, it does not answer the optimal state's question.

The solutions for finding the process's optimal working point have been called Real-Time Optimization or RTO.

RTO systems are based on the first principles model of the process. Therefore, the limitation of RTO are low computation speed and modeling precision.

This Approach splitting Advance Process Control or APC between MPC and RTO has limitations. The most immediate one is the maintenance overhead. In addition, as both systems are based on different principles, the user, such as an oil refinery, must keep dedicated staff.

New integrated Approach

Modcon offers an integrated solution that iteratively pushes the process from its current state to the optimal one.

The basis of the solution is a process model, also called the "Digital Twin," implemented using the tools of Machine Learning.

Digital Twin combines Artificial Intelligence (AI) and Machine learning (ML).

Summary

DRL does not depend on the historical data but learns as it interacts with the process and allows to simulate of various scenarios for process constraints.

Options for eLearning this topic

Mode of eLearning	Available?
Free Course	No
Refresher Course	Yes
Pick N Choose (Custom Curriculum)	Yes
Advanced Level Course	Yes
Structured MCOR Curriculum	Yes