Efficient Project Startup and Operations with HPS & UOP

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Agenda

• Introduction
• UOP Templates for Experion
• UOP Critical Control Systems

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Introduction

Performance Materials & Technologies

Honeywell is a global leader in designing and creating high-quality performance chemicals, materials and process automation technologies.

Process Solutions

- #1 in Refining & Petrochemical Automation
- Honeywell Process Solutions are installed at nearly half of the world’s refineries helping to refine nearly 40 Million barrels of oil a day
- Awarded Frost & Sullivan’s 2014 “Main Automation Contractor of the Year”

UOP and Honeywell Process Solutions together are an unmatched process technology company
HPS LEAP™ technology has taken the automation world by storm

HPS LEAP™ creates the flexibility to accommodate design changes without impacting the overall project schedule. LEAP™ takes automation completely off the critical path – and HPS is the only automation vendor with these global capabilities today.

Shortens automation project schedule by as much as 25% vs other automation technologies.
HPS and UOP know-how in order to

... Startup your facility sooner
• Early UOP input and validation of HPS base automation designs
• UOP integrated review at FAT ensures zero ICSS automation punch-list items at site and earlier verification of DCS functionality

... Reach your target production sooner
• UOP models embedded into HPS simulation software enable earlier development of operator training and manuals
• Capturing the UOP process in ASM compliant graphics improves ICSS operational readiness

... Operate at peak performance
• Optimize production to high-value products and changing demand with advanced process control
• Focus on your operations and know that your UOP integrated automation assets will maintain availability & performance
Leading-Edge Automation Technology

HPS investments in technology including:
- software-configurable IO
- virtualization
- cloud engineering

This integration is unique to Honeywell

Embedded Processes

UOP + HPS have invested in building UOP know-how and expertise into the Experion PKS platform, including:
- Graphics
- Control Loops
- Operating Procedures
- Advanced Process Control
- Training Simulators

Avoiding the enormous re-work later that exists in traditional projects

Fully integrated approach to de-risk and accelerate projects
2015 Honeywell Users Group Americas
Forty Years of Innovation.

UOP Templates for Experion
Why are we doing this?

• UOP has been designing and starting up their licensed units for many years
• A lot of this knowledge and experience is not transferred through Sched ‘A’ or through EPC project processes
• Looking for a way to bake “UOP knowledge inside” of base Honeywell automation systems
• Leveraging LEAP technologies to remove impact of independent physical/ functional design efforts
• Drive quality into project and operational aspects on control systems

Efficient Technology Transfer from Schedule A to Functional Control System
Reduce Start-up and Operations Risk
- UOP knowledge and best practices embedded into DCS and SIS
- DCS configurations on UOP processes are pre-engineered and pre-validated
- Project collaboration between UOP and HPS to ensure no surprises
- UOP operational experience embedded into Operator interface
- Minimal learning curve for UOP startup crews
UOP-HPS – Integrated Control and Safety

- **UOP Intellectual Property (IP) in the Experion automation system**
  - Improve the visibility to the process and ensure that the process stays within defined ranges
  - UOP defined graphics built to Abnormal Situation Management (ASM) Consortium standards using HPS standard graphics libraries
  - Fully documented alarm help system to ensure the most effective operations from day one of operations
  - Embedded procedures capturing UOP’s operations knowhow to ensure consistent operations
How are we doing this?

- Templates based on Schedule “A” process designs
- Templates structured around equipment within UOP units
- Each equipment template has associated control, safety, HMI, alarms and procedural elements
- Provides consistent approach for similar equipment across different process units
Designing the HMI components

• Interaction Requirements Analysis (IRA) workshop performed for each process unit

• Through input from UOP process and controls experts the following criteria are defined:
  – Console Operator Span of Control and Asset Hierarchy
  – Display Hierarchy and Operational workspace
  – L1 display definitions, KPIs and Critical parameters
  – L2 display interaction requirements and critical loops
  – Abnormal situation management requirements
  – Scope for Operator Training
  – Scope for Procedural Automation
  – Scope for Process Optimization
Contents of Templates

• For each UOP process, the unit templates will include:
  – Asset model and display hierarchy design
  – Level 1 displays with process KPIs and critical monitoring parameters, boundary definitions, etc.
  – Level 2 displays with critical control point definitions
  – Embedded critical operating procedures
  – Integrated Operator workspace design

• Within each unit, each equipment template will have the following deliverables:
  – Control strategies (indicators, control loops, sequences)
  – Safety strategies (trips and overrides)
  – HMI display templates (L3/L4 displays)
  – Alarm help information
Unit Templates Displays

- Provides cockpit type view of all critical variables and KPIs
- Shows multiple units across operational span of control
- Provides situational awareness across process
- Leverages Orion console screen layouts and HMIWeb Advanced Solutions Pack shapes
- Includes normal operating ranges for all key variables
Sub-Unit Templates Displays

- Provides process flow representation of equipment
- Each equipment is represented with an equipment tile containing only critical control and monitoring loops
- Unique template for each group of equipment per unit
- Contains references to master equipment tags
- Equipment tiles may be very similar across all process units
Equipment Template Displays

- Provides schematic representation of related equipment, piping, instruments, pumps, valves, etc.
- Unique template for each piece of equipment
- Contains references to master tags that become customer tags when implemented project
- Equipment templates may be very similar across different process units
- Includes all P&ID, MFD points
Other features of templates

UOP PIC system interfaces

• Native data integration for C300 and SM systems
• Quick Builder database package for SCADA interfaces
• PIC designed HMIWeb template L3/L4 displays
• Contains references to master tags that become customer tags on implemented project

Alarm Help

• Data is collated for each alarm identified
• The alarm help is based on master tags that will translate to customer tags
Embedded Procedures

- Procedures extracted from UOP general operating manuals

- Sequences contain documentation and flags for each manual step

- Operator will manually check-off each action flag as it is verified

- Automation can be added as desired to verify steps against live process values and perform operator actions in the PCS

### Step

- Prepare the Unit for charging
- Purge and start the NHT stripper and Platforming fractionation section.
- Evacuate and purge the Platforming reactor section.
- Evacuate and purge the net gas recontact section.
- Hydrogen pressure the Platforming reactor and net gas recontact sections.
- Start hydrogen circulation and reactor warmup.
- Start feed to the Platforming reactors.
- Establish separator operation.
- Start chloride adjustment program.
- Establish normal fractionation section operation.
- Lineout.

### Detailed Instructions

a. Be sure the recycle gas compressor has been purged first and then hydrogen. Any oxygen present from air will purge out the compressor suction line by admission of the compressor suction. The admission of hydrogen will purge out the nitrogen.

b. If the CCR section is installed, open and close appropriate lines to establish recycle gas purge flow to the reduction zone catalyst collector. Open the cooler liquid drain line.

c. Check the compressor suction and discharge lines from the separator(s) and any drains in the recycle gas circuit.

d. Establish normal operation on the products condenser trim coolers in the recycle gas circuit.

e. Start the recycle gas compressor using the manufacturer’s suggested procedure or the guidelines presented earlier in the manual.

f. With recycle gas flowing, purge the Platforming reactor interheaters as per normal refinery practices, light flare raising the reactor inlet temperature to 370°C (700°F) per hour. Due to the light heat load, only a limited number of burners will be required in the heaters for the warmup period. Maximum recycle gas circulation and line-up charge continues.

g. While the reactors are being heated to 370°C (700°F), the net gas reciprocating compressors per the manufacturer’s suggested procedure. Load the machines and slowly increase the discharge pressure. Pressure instrumentation should be observed as the pressures are brought up. Do not exceed design pressure.

**NOTES:**

1. In order to preserve the select properties of fresh crude feed, the period of time required to heat the catalyst to 370°C (700°F) should not exceed 12 hours.

2. Water circulation should be established in the steam section of the waste heat recovery system, if installed, prior to heater firing. Similarly, process flow should be modified at this point through any process tubes if any, installed in the connection section.
Planned Process Units

- **Gas Processing complex**
  - LNG Pre-treatment *(HG, Amine, Dehy, SeparSIV)*
  - Modular Gas Plants *(Amine, Dehy, Cryo, Fract, SRU)*

- **Naphtha complex**
  - Naphtha units *(NHT, Penex, CCR Plat, DHT, Par-Isom, LPG Merox, Kero Merox, Molex, PSA)*
  - Modular Refinery *(CDU, FB Plat)*

- **Oleflex complex**
  - C3 Oleflex units *(RX, CCR, Fract, Butamer)*

- **Aromatics complex**
  - Units common to Naphtha complex *(NHT, CCR Plat, PSA)*
  - Aromatics units *(Parex, Isomar, Sulfolane, Tatoray, BT Fract, Xyl Fract)*
How do we apply the templates?

TRADITIONAL


UOP Data flows through EPC

Automation FEED → Automation Design

FAT → SAT

THE HONEYWELL ADVANTAGE


Automation FEED

Pre-engineered solutions with UOP Knowledge embedded into ICSS and APC

Automation Design

Training Simulators

FAT → SAT

UOP process knowledge embedded in APC strategies can be implemented up to 4 months earlier.

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The PIC Mission

• PIC (Process Information and Control) was given the mission by UOP Engineering to provide process technology through control system solutions

• PIC helps ensure the UOP Process:
  – Operates safely
  – Reliably
  – Protects key equipment
  – Meets performance representations
  – Prevents startup delays due to control system issues
UOP PIC Critical Control Systems

• UOP PIC have been providing critical control systems for UOP licensed units since 1985
• Over the years these system have been provided on a variety of hardware and software platforms
• Over the past few years UOP has developed startup proven C300 and SM solutions that are now standard offerings

• Benefits include:
  – Superior integration with Experion DCS
  – Commonality of spares, training and support across site
  – Available using C300 and Safety Manager controllers
PIC Products

- **New Process Units**
  - CCR Platforming Regeneration Control System (CRCS)
  - Sorbex Adsorbent Chamber Control Systems (ACCS)
  - Drier Regeneration Control System (DRCS)
  - Adsorber Regeneration Control System (ARCS)
  - Oleflex Lock Hopper Control System (LHCS, CRCS/DRCS)
  - Pacol / PEP / Detal Control System (PPD LCS)
  - Emergency Interlock Systems for FCC Units (EIS)
  - MTO (Rx-Rgn & OCP Cat Rgn) Systems (EIS & OCP CRS)

- **Retrofits / Replacement Control System**
  - Atmospheric, Pressurized and Oleflex LHCS
  - CycleMax CRCS (first generation)
  - ACCS

Over 400 PIC Control Systems Delivered
• Used for all UOP CCR Regenerator control systems:
  – Platforming™ Atmospheric CCR (LHCS), Pressurized CCR (P-LHCS), CycleMax, CycleMax II and III CCR designs (CRCS);
  – Oleflex™ CCR CRCS including Rx Effluent Drier DRCS.

• Major functions include:
  – Circulates Catalyst from Reactor to Regenerator; provides Interlocks to separate potentially explosive atmospheres.
  – Protection System for protection of Catalyst and Equipment.
  – Allows for Electric Heaters and Chemical systems to properly regenerate catalyst.
  – Provides for redundant DCS communication and allows full control from DCS.
CCR Regeneration Control Systems

Preferred Hardware Platform: Honeywell Safety Manager™

System for protection of Catalyst and Equipment
In 1985, UOP commercialized the Lock Hopper Control System (LHCS) for a CCR Platforming™ unit – With on-going technological advancement, components used in earlier systems are obsolete.

UOP developed a LHCS retrofit for easy replacement that offers the most current technology, to overcome the parts support issue and to enhance process availability by reducing hardware downtime.

New features include hot shutdown state, white burn inhibit mode, and regeneration burn zone temperature protection.

Key benefits from the LHCS retrofit are:
- Enhanced on-stream efficiency, maximum process-side performance
- Reduced maintenance and spare-parts problems
- Improved catalyst conditioning and longer catalyst life
- On-schedule and on-budget implementation without the need to shut-down the process-side operation
Adsorbent Chamber Control Systems

- Used for all UOP Sorbex Process control systems:
  - Parex, MX Sorbex, Kerosene Molex, Motor Fuels Molex
- Controls critical Rotary Valve stepping and position
- Provides High-speed Chamber Circulation Flow and Pressure control
- Fully redundant hardware (CPU & I/O) or fault tolerant logic for non-redundant field devices for maximum availability and process up-time
- For Honeywell EPKS customers, integrates with Experion
Sorbex (ACCS)

Preferred Hardware Platform: Honeywell C300 for Experion PKS™
Drier Regeneration Control System

- Used for Penex, Butamer, HF Alky, Charcoal Absorber (CARCS), Oxygen Removal (ORU), Nitrile Removal (NRU) and Propylene Recovery (PRU) Process Units
  - Removes adsorbed water (or other impurities) from saturated Gas and / or Liquid Feed adsorbent vessels while keeping the unsaturated vessels online
  - Insures consistent and repeatable regenerations to protect catalyst and maximize absorbent life
  - Includes interlocks and prevents poor operation
  - Minimizes impact on downstream operation
Drier Regeneration Control System

Preferred Hardware Platform:
Honeywell C300 for Experion PKS™
Emergency Interlock Systems (EIS)

- Used for UOP FCC and RFCC control systems
- ESD / Protection system designed to automate S/D actions during an abnormal event affecting the catalyst sections of a fluidized catalytic cracking (FCC) unit.
- Provides for redundant DCS communication and allows full control from DCS
Emergency Interlock Systems (EIS)

Preferred Hardware Platform:
Honeywell Safety Manager™
PSA Control Systems

• UOP offers Polybed PSA systems as skid mounted, modular units, complete with hardware, adsorbents, and controls systems.

• Benefits of UOP supply are:
  – Superior knowledge of upstream and downstream hydrogen requirements and implications – Get the most economical unit in the most profitable application
  – Valves, vessels, and other equipment selected specifically for PSA service
  – On-time, on-spec delivery, easy installation, quick start-up
  – Superior quality control resulting in long-term safe, reliable operation
  – Greater than 99.95% on-stream factor from the rigorous design and selection of the valves and control system.
  – UOP services include pre-commissioning, commissioning, debottlenecking, troubleshooting, upgrades, revamps and optimization services for flawless start-up, smooth operation and optimal performance.
Key Takeaways

• PIC supports UOP’s challenging control applications with Honeywell Safety Manager & Experion C300 products

• All control systems fully tested 100% I/O and logic prior to delivery

• It works when it arrives!

• Long term support from UOP