Agenda

- Introduction
- Process Solution Suites for UOP Technologies
- Experion Solution Suite for UOP Naphtha units

- Matt Willmott
  - HPS Projects and Automation Solutions Marketing
Honeywell is a global leader in designing and creating high-quality performance chemicals, materials and process automation technologies.

**UOP**
- 31 of 36 today’s refining technologies were developed by UOP
- UOP technology makes more than:
  - 40% of the world’s LNG
  - 60% of the world’s gasoline
  - 70% of polyester
  - 90% of biodegradable detergents
- UOP technologies offer a high ROI

**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 HPS together are an unmatched process technology provider.
Game-changing Automation Technology

- HPS LEAP™ technology is taking 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.

LEAP shortens automation project schedule by as much as 25%
HPS and UOP know-how in order to

... Startup your facility sooner

Pre-engineered control and safety solution suites for UOP technologies provide head-start for the project

Consistent design and execution of UOP designs from templates optimizes commissioning activities and minimizes ICSS punchlist items

... Reach your target production sooner

UOP models embedded into HPS simulation software enable earlier development of operator training and manuals

Capturing the UOP process knowledge in ASM compliant graphics shortens learning curve and improves operator effectiveness

... 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
This integration is unique to Honeywell

Leading-Edge Automation Technology

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

enable projects to be integrated early – avoiding the enormous re-work later that exists in traditional projects

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

Fully integrated approach to de-risk and accelerate projects
Why are we doing this?

- UOP has been designing and starting up their licensed units for many decades
- A lot of this knowledge and experience is not transferred through Schedule A or through EPC project processes
- Develop a way to bake UOP knowledge inside of base automation systems
- Leveraging LEAP technologies to remove impact of independent physical/functional design efforts
- Drive quality into project and operational aspects on control systems
- Reduce risk to project schedule and startup

Efficient Technology Transfer from Schedule A to Functional Control System
Typical Issues with New Unit Startups

• Extensive punchlist items for control systems
  – Basic controller configuration, graphics, alarms, complex strategies
• Last minute changes to automation causing delayed startup
• Untested and unproven DCS control strategies
• Non-functional DCS interfaces to UOP critical control systems
• Poorly designed graphics causing operator confusion
  – Displays based on P&ID information only with no consideration for operator interaction and multi-unit operations
• Poorly design alarm system causing alarm flooding
• Operators unfamiliar with unit procedures missing critical steps
Issues Encountered by UOP Startup Crews*

* Comments taken from UOP Instrument Advisor Survey – 2014 and relate to multiple projects and multiple DCS vendors

Incorrect controller actions, extremely poor initial tuning constants and malfunctioning complex loops (i.e. heater firing controls) led to process trips, instabilities, and upsets.

DCS <=> CRCS integration was misunderstood and incomplete, meaning the CRCS was used exclusively for unit startup instead of DCS control.

The user interface could improve in order to make it a more intuitive experience. The DCS required a day to understand how to navigate.

The DCS screens are hard to navigate. Too much information is there on a single screen. Graphics could be better.

The DCS programmers had no knowledge of the process at all. Often it seemed like they did not receive input from engineers or operators to help decide how to setup and configure the DCS.

This is probably the worst DCS I’ve encountered due to a variety of issues: bad/incorrect customer requests, inexperienced programmer, inexperienced customer, aggressive schedule. Part of the issue here is that its a brand new facility; there was no existing DCS to use as a basis.

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The DCS vendor used the contractor’s master list of all DCS tags and programmed to that, and it was very difficult when it conflicted with UOP’s specifications.

This DCS had a lot of minor errors with the complex loops, mostly from misunderstanding our 623-N. The written items had more issues than items that used equations or graphic representations. Possibly translation issues?

When I first checked the DCS, a lot of items were at the default setting. All controllers were reverse acting, all valves were Fail Closed, all tuning constants were the same, all alarms were the same.

No PIC functions were included in the DCS when I first checked. Customer ‘didn’t know’ the CRCS/DRCS could be operated from the DCS. These functions have been added but are very hard to find and use.

Average startup delay due to DCS issues encountered on site = 2.3 days per unit

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UOP-HPS – Integrated Control and Safety

• 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
  – Standardized HMI improve consistency for better UOP startup assistance
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

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How are we doing this?

• Pre-engineered 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
The IRA Process

- **UOP experts provide:**
  - Key process objectives
  - Unit operations and primary variables
  - Equipment list review
  - Normal operation
  - Abnormal operation
  - Startup and shutdown

- **HPS experts provide:**
  - Graphic layout
  - Cognitive based shape selection for best operator response
  - HMI level selection
    - Key process indicators – safety, financial, operations, environmental
    - Overview and detailed views
Solution Suite Template Structure

• 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
Other Features of Solution Suites

UOP PIC system interfaces

- Fully integrated database package for Experion and Safety Manager based systems
- Pre-configured interface package for PLC interfaces
- Consistent operator displays between DCS and UOP packages

Operator Alarm Help

- Additional operator information is provided for each UOP defined alarm
- Alarm help provided with integrated DynAMo Alarm Suite
Planned Process Units

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

• Gas Processing complex
  – LNG Pre-treatment (Amine, Dehy, SeparSIV)
  – Modular Gas Plants (Amine, Dehy, Cryo, Fract)

• Oleflex complex
  – C3 Oleflex units (C3RX, CCR, Fract, Butamer)

• Aromatics complex
  – Units common to Naphtha complex (NHT, CCR Plat, PSA)
  – Aromatics units (Parex, Isomar, Sulfolane, Tatoray, BT Fract, Xyl Fract)
Experion Solution Suite for UOP Naphtha units
• CCR Platforming™ Process
  – Used throughout the petroleum and petrochemical industries, the UOP CCR Platforming process utilizes naphtha feedstocks boiling in the range of 180-400°F to produce high-octane gasoline blending components or petrochemical precursors
  – UOP’s 250th CCR Platforming unit went into production in 2014
• UOP Continuous Catalyst Regeneration Process
  – The Continuous Catalyst Regeneration (CCR)™ Section of a UOP Platforming Unit gives refiners the flexibility to operate the reaction section at high-severity conditions. At high-severity conditions in the reaction section, reforming catalyst deactivates more rapidly because coke lays down on the catalyst at a faster rate.
UOP Naphtha Processes – NHT

- **UOP Naphtha Hydrotreating Process**
  - The hydrotreating process is commonly used to remove Platforming catalyst poisons from straight run or cracked naphthas prior to charging to the Platforming process unit.
UOP Naphtha Processes - DHT

• **UOP Distillate Unionfining™ Process**
  - Distillate Hydrotreating
  - The UOP Distillate Unionfining™ process improves the quality of distillate boiling-range feedstocks – kerosene, jet fuel and diesel oils.
UOP Naphtha Processes – KMX

• **UOP Kero Merox™ Process**
  – Hydrocarbon sweetening
  – Merox sweetening is used with heavier hydrocarbon streams for direct, in-situ conversion of the mercaptans to di-sulfides, with no reduction in total sulfur.
UOP Naphtha Processes – LMX

• UOP LPG Merox™ Process
  – Liquid-Liquid Extraction Merox Process
  – Merox extraction is used with light hydrocarbon streams, such as gas, LPG and light gasoline, for removal of mercaptan sulfur with resultant reduction of total sulfur.
UOP Naphtha Processes – PSM / PNX

• UOP Par-Isom™ and Penex™ Processes
  – Light naphtha isomerization
  – UOP's portfolio of LN isomerization technologies, including the UOP Par-Isom and Penex processes, provides important options to suit a refiner's specific operating objectives and site conditions.
• **UOP Motor Fuels Molex™ Process**
  – The Molex process is a liquid-state separation of normal paraffins from branched and cyclic components using UOP Sorbex technology.
  – It operates in liquid phase and simulates a moving bed in a fixed-bed system by use of the UOP Rotary Valve.
## Experion Solution Suites for UOP Naphtha

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<td>Par-Isom unit</td>
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Additional Naphtha units to be added will include Penex, Motor Fuels Molex, PSA units.
Orion Operator Workspace for UOP Units
Orion Operator Workspace for UOP Units

Level 1 Displays

- Provide situational awareness across the operator’s span-of-control
- Summarize KPIs and critical monitoring points across multiple units
- Allow awareness of drift away from ideal operating conditions
- Allow for proactive adjustment
Orion Operator Workspace for UOP Units

Level 2 Displays
• Provides critical control and monitoring points
• Represents basic process flow
• Allows operator to make most common adjustments
Level 3 Displays

- Provides detailed displays at equipment level
- Allows operator to address abnormal situations
- Provides access to logic and safety systems
Embedded Procedures

- Provides operator with step-by-step instructions when performing critical operations such as:
  - Startup, shutdown and restart
  - Procedure can be semi-automated to provide assistance to operator
  - All operator actions and instruction confirmations are recorded in the system log
How do we apply the templates?

TRADITIONAL

Basic Engineering Design → Schedule A Release → Contractor FEED & Selection → Design Review → Check-out → Process Guarantees

Contractor FEED & Selection → Detail Design & Construction → Commission & Start-Up

Automation FEED → Automation Design → FAT → SAT → APC

THE HONEYWELL ADVANTAGE

Basic Engineering Design → Schedule A Release → Contractor FEED & Selection → Design Review → Check-out → Process Guarantees

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

Automation FEED → Automation Design → Training Simulators

Detailed operating procedures, scenarios, exercises, & workbooks developed on OTS using UOP proprietary models.

UOP process know-how embedded in APC strategies can be implemented up to 4 months earlier.