A NEW TEMPLATE

Bringing together process design and plant automation
An Integrated Approach to Process Design and Plant Automation

Refining and petrochemical producers stand to benefit

PAUL BONNER AND THEODORE FAIELLA
VICE PRESIDENT UOP/HPS INTEGRATION; SENIOR DIRECTOR APEX, HONEYWELL

Oil refining, chemical, and petrochemical companies are continuously seeking new ways to optimise, de-risk, and accelerate capital projects. They need to maximise return on investment from both brownfield and greenfield assets by being able to start up facilities sooner, reach target production faster, and sustain operations at peak performance.

Plant owners and operators have found that combining the best process technology and equipment with advanced automation delivers faster and more sustainable value throughout the plant lifecycle.

This article describes an integrated and holistic approach that Honeywell UOP (UOP) and Honeywell Process Solutions (HPS) have created to address operational efficiencies and maximise project ROI in the refining and petrochemical industries.

The approach, known as Honeywell Advantage, allows companies to install new UOP-licensed processes or upgrade existing installed UOP-licensed units to the latest control and automation technology, via pre-designed, templated automation and safety systems. The approach benefits from rapid implementation, efficient vertical startup, and assured operations excellence.
SYNERGY – THE NEXT BIG STEP CHANGE IN PERFORMANCE

For many years process licensors and process automation companies have continued to invest and innovate – for example, new process technologies, improved catalysts and adsorbents to increase yields and reduce energy consumption, new technologies such as universal remote I/O (field-mounted input/output terminals that can function with any type of instrument signal), virtualisation, advanced sensors/field instruments, and smart Industrial Internet of Things (IIoT)-enabled edge devices. While performance improvements continue to be made individually, the inter-dependency between the process, sensors, automation and operations environment is a largely unexplored area. It is here where we envisage the next big step change in performance.

To really understand the opportunity, it is useful to understand how projects are typically executed between the process licensor, the customer, their engineering, procurement and construction (EPC) contractor, and the automation vendor/systems integrator.

**WHILE PERFORMANCE IMPROVEMENTS CONTINUE TO BE MADE INDIVIDUALLY, THE INTER-DEPENDENCY BETWEEN THE PROCESS, SENSORS, AUTOMATION AND OPERATIONS ENVIRONMENT IS A LARGELY UNEXPLORED AREA. IT IS HERE WHERE WE ENVISAGE THE NEXT BIG STEP CHANGE IN PERFORMANCE**

In the early stages of a project, the process licensor is selected and performs the basic engineering (FEED) for the process. This results in a set of specifications, schedules, narratives, and P&IDs which are passed to the customer and their EPC for detailed engineering. During detailed engineering, significant time and cost are spent on interpreting and further specifying the engineering and equipment requirements. These derivative specifications are then provided to automation vendors and systems integrators where they are again interpreted in order to develop their control and automation offerings for the project.

Once an automation vendor is selected and the project goes into execution, more detailed engineering is carried out, resulting in an automation and safety system which is put through factory acceptance testing (FAT) then delivered to site for site acceptance testing (SAT) by the customer.

So what is missing with this approach?

- The original intent/design from the process licensor gets reinterpreted at least twice during the process. First by the EPC and then again by the automation supplier. This often results in significant misinterpretations of some of the more complex logic and control loops, resulting in errors being programmed into the system, which are only discovered during plant startup. Ultimately this can result in startup delays.
- Best practices and learnings from multiple previous projects are not applied to the new project as in many cases they cannot be, due to different EPC teams, different automation teams, and legal restrictions on carrying proprietary licensor information from one project to the next.
- This is purely an engineering exercise in which there is no place to consider the operations requirements. A great example of this is the process graphics, as it is almost certain that the automation supplier will deliver a set of operating graphics which are a close facsimile of the supplied P&IDs. While the P&IDs are excellent for engineering, they are not optimised for what the operator needs to see when starting up and operating the process.
- Everything starts from a clean sheet of paper as there are no valid templates to work from. This means that each automation system has to be built from the ground up, resulting in significant work and additional cost.

Now imagine a new and different approach where:

- Long before the project exists the process licensor and automation vendor work together on each licensed process unit to build a master design template for the unit.
- The template (Solution Suite) contains licensor-designed and tested:
  - control/DCS configuration
  - optimised process graphics specifically designed for operations
  - safety system narratives and logic configuration
  - critical control applications pre-built and delivered on the same automation platform
  - alarm management and pre-defined alarm help
  - operator training simulator (OTS) including licensor
models and automation logic and graphics
- high-level operating procedures embedded in the DCS system
- key performance indicators predefined
• The template avoids misinterpretations of the licensor control requirements and means that the engineering of the automation system for each process unit comes 60–70% complete before the project starts.

This results in a fast, clean implementation with very few punchlist items to be corrected due to the pre-tested nature of the templates; a system that exactly meets the licensor’s specifications and is startup ready; and a system which focuses on the operator environment, ensuring that the right information is always available and situational awareness is always maintained.

So can this really be done? The answer is yes – UOP and HPS have released the first of its kind Experion Solution Suites for UOP, providing all of the pre-engineered features described above for four major UOP process complexes, dealing with naphtha, aromatics, C3 and C4 Oleflex, and modular gas separation.

BROWNFIELD APPLICATIONS
UOP has been around for many years and there are many existing UOP processes which have provided years of good service. Over time their control systems are becoming obsolete and challenging to support with spare parts. Until now, brownfield customers in this situation were faced with a choice – either upgrade, or migrate the existing applications/code onto a more modern hardware platform. In either situation they end up with old code, old graphics, and logic running on a new platform. While this does solve the hardware obsolescence issue, it really does not take advantage of the process improvements which have been implemented by the licensor since the unit was originally installed. By using the same template approach, brownfield customers can rapidly migrate onto a new state-of-the-art hardware platform and take advantage of the latest logic and operating graphics, turning what was just a cost of obsolescence into real benefits.

TRANSITION FROM PROJECT EXECUTION TO OPERATIONS
The licensor/automation vendor relationship delivers significant one-time benefits – such as a shorter schedule, fewer man hours, and getting a unit online quicker – during the project engineering and construction (CAPEX) phases. It is also important to understand what this approach promises to deliver during startup and ongoing operations (OPEX) phases.

Earlier we discussed the improved operator environment, designed in close collaboration with the licensor. Optimised graphics, alarm management, embedded operating procedures, integrated critical control applications, and integrated safety systems all go towards a safe and efficient operating environment driving operations excellence.

In transitioning a new facility into an operating plant, one of the most critical elements is operator training. Successful operator training requires a robust dynamic model of the plant, a close representation of the operating environment, and a set of realistic and meaningful training exercises using key performance indicators (KPIs) with which to qualify the trainee. UOP and HPS have developed a set of training simulators for UOP processes. Embedded in these simulators are dynamic models for full startup to shutdown simulation, as well as multiple operating and failure mode scenarios to ensure the operator is prepared to recognise and deal with many of the more common operational issues that, if un-corrected, can lead to loss of plant performance.

With a growing drive for higher reliability and extended operating runs, there is an increasing demand for asset models and analytics to monitor the process and provide early warning of impending issues or downtime.

A second area where models play a part is in advanced process control (APC). Well-designed APC is like having your best operator running the plant 24/7. It typically results in increases in yield and throughput while reducing product variability. The improved plant stability which results from APC has also been seen to improve plant reliability/OEE (overall equipment effectiveness). APC connects field-installed instrumentation and analysers to multi-variable controllers to fully optimise the performance of a process unit. Having close collaboration between the licensor and the automation supplier ensures the right instrumentation and analysers are designed into the project from the start and that the right inferential properties and constraints are used to drive the controller applications.
In addition to process models and dynamic models for APC and operator training simulation (OTS), there is a third category which comes from the synergy – asset models. With a growing drive for higher reliability and extended operating runs, there is an increasing demand for asset models and analytics to monitor the process and provide early warning of impending issues or downtime. Here the licensor has the operational insight from many years of experience and many operating units.

Combining this with asset modeling capabilities and predictive analytics provides the customer with an unprecedented insight into the future performance of their unit. There are many third party products offering excellent solutions to asset modeling and reliability. The only drawback is that they can generally only provide future insight based upon the collected history of one customer’s process unit, whereas our approach can provide access to insights from many hundreds of field operating units.

**CHALLENGES**

To ensure balance, we should talk about any potential downside which may arise from this combined licensor/automation supplier approach.

This approach works perfectly for the licensor-supplied units, however a typical site may have process units from multiple licensors as well as open-art units, tankage, and utilities (OSBL). In this case, the licensor units and their templates allow for high efficiency, but there will still be significant work in implementing automation across the other units, somewhat reducing the actual savings across the entire plant. The template approach still provides a configuration and graphics infrastructure that can be applied to other process units, although not quite the same level of pre-configuration as the licensor-developed suites.

**MANAGING INNOVATION AND SUSTAINABILITY**

Combining the potential of process licensor expertise, advanced sensors, automation, modelling, and IIoT capabilities has opened many exciting possibilities for the development of new technologies. In order to meet market needs and remain competitive, licensed technology and the automation technology that supports it is a continuously evolving portfolio. Maintaining the relevancy of the templates requires very close collaboration and an integrated approach to product line management and technology sustainability. As part of the same strategic business unit in Honeywell, UOP and HPS have been able to accomplish this by establishing an internal centre of excellence. This area, known as the Applied Process Excellence (APEX) Center, is tasked with developing and maintaining products that combine the intellectual property of UOP with the automation technology of HPS.

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