Challenge

Specialty chemical producers supply products that enhance the performance of consumer and industrial goods from renewable chemicals to paints and adhesives. There are thousands of different specialty chemicals produced and supplied to a wide range of industries. SRI Consulting describes specialty chemicals as: “chemical products that are sold on the basis of their performance, rather than for their composition. They can be single-chemical entities or combinations of several chemicals whose composition sharply influences the performance of the product.” (SRI Consulting Report).

In order to compete, specialty chemical companies offer a broad range of high quality products, but what they all have in common is a need to:

- **Deliver product on time, every time** – as an integral part of the supply chain, specialty chemical producers must supply product to their customers when it is needed. This requires consistent and reliable manufacturing operations.

- **Deliver the right product** – quality is critical. Supplying poor or inconsistent quality product increases costs for everyone and may cause the customer to look for another source. Quality starts at the manufacturing process. Controls need to be in place to ensure consistent operation and quality outcomes.

- **Capitalize on opportunities for new products** – the marketplace does not stand still; there is a constant need to improve product performance and develop new products to meet new requirements. Manufacturing agility is key.

- **Control manufacturing costs** – customers are looking for the highest quality materials delivered on time at the lowest cost. Investors expect the highest profitability possible. With costs of goods sold being as high as 7.5% (based on analysis of Specialty Chemical annual reports), there is intense pressure to improve manufacturing performance. Process understanding and control is key to improving performance and better utilizing raw materials and energy.

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**Figure 1. Specialty chemicals average business costs.**

All of these business goals require manufacturing operations to perform at peak efficiency. There are many metrics that can be positively impacted by the manufacturing plant. For example, accurate, consistent manual addition of raw materials can improve inventory control and product quality. Being able to make the right product at the right time is a function of equipment availability and visibility. Real-time knowledge of order status and final product quality can improve customer satisfaction and can provide increased value that can justify a higher price. All of these business objectives can be achieved with a highly reliable production system and real-time visibility into that system. These factors are of critical importance to competitiveness in the specialty chemical market.

The right automation solution can meet these goals by addressing needs for product reliability, quality, agility and efficiency – the keys to a sustainable competitive advantage. Product reliability requires tight integration between manufacturing and sales to know what to make in real time.
Then, you have to be able to rely on production assets to deliver the product per the schedule. Product quality requires consistency and controlled results in every aspect of production operation—from people to equipment to the process itself. Agility requires the flexibility to adapt and respond to market opportunities while still making existing products profitably.

Solution

Honeywell’s solution for small specialty chemical sites addresses all of these requirements in one scalable, integrated offering within the Experion® LX environment. Various system functions and applications that are aimed at delivering safety, compliance, reliability and efficiency are inherently available in the context of batch production. In addition, data from these various functions is presented in an integrated operating environment.

Honeywell is a leading automation solution provider in the chemicals market, present in every region of the world. Honeywell provides scalable systems and solutions to a variety of chemical plants from small single product plants to world-scale petrochemical complexes. Eight of the top 10 specialty chemical companies use Honeywell systems and solutions. Leveraging our experience in continuous and batch automation, Honeywell has provided solutions for applications as diverse as agricultural chemicals, paints and pigments, synthetic fibers, polymers and resins, polysilicon and pharmaceutical ingredients. This experience and know-how was leveraged to create a solution specifically for small specialty chemical sites, which provides the following:

- **Scalability and flexibility** from systems to applications to address the wide range of processes in these markets.
- Operational environment enabling **maximum efficiency for sites with limited resources** through integrated operator workflow, real-time monitoring and mobile worker tools.
- A **reduction of manufacturing costs** via tools and capabilities like batch automation, advanced process control and material handling.
- Features that minimize **total cost of ownership** such as a global database, integrated tag configuration and built-in functionality.
- **Manufacturing agility** through capabilities like online updates, automated equipment procedures, wireless offerings and simple drag-and-drop configuration for new production strategies.
- Features that help **optimize production cycle time and improve reliability** such as providing controller-based batch recipe execution and alarm management.

In addition to the platform, customers expect system support throughout the expected life cycle. Experion LX customers are backed by Honeywell’s Technical Assistance Center (TAC) for system support. Trained, experienced TAC engineers will provide telephone troubleshooting support, prompt answers to questions regarding procedures, documentation, operation, service, training and system enhancements. Support from TAC may include reviewing operational procedures, analyzing software and memory dumps, and recommending what diagnostics to use.

Honeywell also has a large network of authorized System Integrators who have been trained and equipped to implement complete greenfield or modernization projects to small enhancements and additions for Experion LX customers. Our network of authorized System Integrators provides local resources for project execution and application support.

Control System Platform – Experion LX

Honeywell’s solution for small batch manufacturing sites is based on Experion LX, which brings the value and reliability enjoyed by Honeywell customers around the world to smaller operations. Experion LX is optimized for small projects requiring a combination of loop, logic and batch automation. The solution can be as simple as one PC and one controller, while still delivering historian, batch sequencing, advanced control, and reporting capabilities. The solution can then be expanded to offer multiple operator stations, redundancy, custom algorithms and batch management. In addition, the system provides best-in-class peer-to-peer support of third-party devices and drives, like PLCs, weigh scales and motor drives, and integration of SCADA data. Because Experion LX is based on the Experion PKS platform, there are several major benefits that small sites can realize.
Experion LX leverages Experion architecture to provide data integrity and determinism so that you know when your logic will be processed. Experion LX is available with redundant controllers, I/O, power, networking and servers to provide heartbeat failover operations. In addition, tools needed to manage and monitor the system are integrated into Experion LX. For example, system resources like memory, processor utilization and disk drive space on the Experion LX nodes are monitored and can generate alarms on the operator window if they reach critical levels. Diagnostics from Experion LX controllers are also available at the operator stations. Finally, Experion LX ships with all the necessary software to provide an interface to the operator. Honeywell ensures that the system components work together and that new versions of system software are compatible with other system components. These built-in features mean that Experion LX system is ready to deliver right out-of-the-box.

**Improved Operational Efficiency**

Honeywell’s control platforms are built to optimize the operator experience. To increase operator effectiveness, Honeywell leads the Abnormal Situation Management (ASM) Consortium, a group of companies that have spent over 10 years and $40M researching abnormal situations caused by equipment failure, human error and security breaches that can lead to extreme financial loss and excessive damage caused by disrupted production, fires, explosions and toxic emissions. ASM Consortium research has improved integration of alarm, event and alert management tools and provided guidelines to increase operator awareness, decision-making abilities and responsiveness, reducing operator-related incidents by as much as 40 percent.

Experion LX has a sophisticated and rich alarm and alerting system, capable of handling alarms and alerts for your process. Experion is the first system to incorporate a “from the ground up” open alarm and event system. This alarm system supports not only Experion application alarms, events and messages, but also provides full integration with third-party alarms and events via OPC. Comprehensive commenting and annotation capabilities are provided to capture “knowledge” as it happens in relation to alarms and events.

Designed to conform to the ASM Consortium’s recommended guidelines, the standard alarm summary display allows operators to focus on the problem.

- Location pane supports rapid alarm filtering and provides summary alarm count details.
- Detail pane shows extensive alarm condition details.
• Location pane showing alarm counts for a particular asset
• Alarm summary columns can be customized to suit individual site or operator requirements. Fields can include the actual trip value and current live value among many other fields.
• View Configuration creates, saves and recalls custom operator alarm views.
• Alarms can be filtered by priority.
• Repeat alarm handling keeps the alarm summary from filling up with a chattering alarm. A single alarm includes details on the time the alarm originally occurred, the time it last occurred and the total number of times the alarm occurred.
• Operators can easily add comments to alarms and events from the alarm summary display either individually or per page. On custom graphics, alarms can similarly be acknowledged on an individual or per page basis.
• The event summary lists events that occur in the system such as alarms, alarm acknowledgments, return to normal, operator control actions, operator login and security level changes, online database modifications, communications alarms, system restart messages and more.
• Experion allows the engineer to configure custom alarm priority colors.
• Users can configure archive functionality to store events online as well as to network servers or removable media to access at a later date.
• System status display provides the operator one place to review the health and status of all Experion components.

During execution, operators are able to monitor and view the details of interlock logic, control logic, sequences and other functions that are executing in the controller. This on-line view shows operators which elements of the function are okay and where there might be problems. The graphical interface will show the blocks while executing with live updated values and color codes for discrete signals. The view is accessible on operator graphics via double-click action by the operator. The views are created automatically by Experion LX when a function is built in the controller. This function is helpful for verifying a control sequence or for troubleshooting a process problem. One small site was able to reduce operator calls to equipment and instrumentation staff by 90 percent during production, due to this built-in capability of Experion.

**Batch Automation**

Honeywell has a rich legacy and commitment to batch automation. In addition to offering industry-leading batch solutions for over 20 years, Honeywell was one of the founding members of the S88 Batch Standards Committee and continues to participate in committee activities.

In addition, Honeywell offers scalable batch solutions that can range from simply turning a pump on or off, to automating an equipment startup procedure, to fully implementing an S88 batch solution. Honeywell has pioneered the industry’s most reliable, configurable batch automation solution resulting in gains of 2-5 percent production throughput compared to other solutions. In addition, our batch solution is an inherent function within the Experion LX control environment, enjoying seamless interoperability with Experion control functions like alarming, history, mobile tools, real-time visualization of the batch sequences, and intuitive operator displays based on ASM Consortium principles. This delivers a unique, integrated environment to the operator, boosting productivity, efficiency and reliability.

![Figure 3. Typical Batch Manager Operating Display.](image)

Honeywell’s solution for batch automation is based on the S88 standard, is scalable and can be fully redundant. Sequences are constructed via drag-and-drop operations and include built-in functions for operator messages, abnormal condition handlers, mode propagation and more. Templates are available to minimize engineering time.

Using S88 concepts and starting with simple sequence control, batch applications can be constructed using layering techniques to create simple or sophisticated batch automation within the controller. The controller-based batch layers provide unmatched reliability by eliminating several components that are capable of failing and causing production losses. In addition, through elimination of communication between the controller and server at every step transition, batch cycle times can be improved. Reporting, management of formula sets, validation and other advanced capabilities are also available.
Honeywell allows users to determine the approach that best meets their batch processing needs, whether it is standalone controller-based procedures using sequence operations or higher level batch management functions using recipe control modules. Processes with limited or no unit coordination, fixed procedures and a small number of formulas and/or infrequently changing formulas are the most likely candidates for using sequence operations in the controller. These processing operations typically need to repeat batches through standardized sets of equipment that offer higher availability, simplicity and reliability. Where there is complex unit coordination, a large number of procedures and/or frequently changing procedures, and more complex recipe management, the Control Modules, Sequence Control Modules and Recipe Control Modules can be combined together for a comprehensive solution. All of these (CM, SCM and RCM) use the same Control Builder tool for a consistent common implementation methodology.

**Complementary Offerings**

**Wireless Solutions**
Honeywell is a leader in industrial wireless technology. Our portfolio includes wireless solutions for low-cost process monitoring, critical process control, virtual control rooms, operator productivity tools and resource tracking. Honeywell’s OneWireless™ network provides manufacturers with one optimized multifunctional network that supports many applications with comprehensive end-to-end security.

Supporting a mobile workforce, Mobile Station technology, an extension of Honeywell’s Experion PKS, enables engineering, operations and maintenance personnel to safely capture and share process data locally at the source. OneWireless focuses on applications that improve operations including:

- Capturing valuable plant information in places where it was not previously possible, utilizing mobile and wireless technologies that automate field operator activities and bring the control room to the field.
- Providing real-time, accurate and reliable process and asset data faster and at lower costs than traditional wired sensors.

**Process Optimization**
Honeywell’s Profit Loop is a single input/single output (SISO) model predictive control application specifically designed with the operating simplicity of a standard PID controller. This technology, which is tightly integrated into Experion LX, is a Smith Predictor, gap controller and optimizer all in one that is used to control discrete analyzers, tank levels, long process delays and more. Profit Loop can reduce valve travel and wear, provide better control and reduce the possibility of controller windup.

Because Profit Loop is tightly integrated with Experion LX, specialty chemical users can incorporate Profit Loop into complex and custom control strategies, driving better control of their processes.

**OPC Integration**
OPC (OLE for Process Control) consists of a set of standards that define interoperability among different automation and control applications, field systems and devices, and business and office applications. OPC provides data from a data source (server) and communicates the data to any client application in a standard way, thereby eliminating the requirement for an application to have specific knowledge about a particular data source, such as its internal structure and communications protocols. Experion integrates OPC with DCS technology to create the most flexible and powerful OPC suite available, with a broad range of Client, Server and redundancy OPC technologies.

**History**
The Experion LX historian is a fully integrated, on-board historian. Users can collect standard history snapshots and averages, fast history snapshots down to one second or extended history snapshots. Configuration of history is done at the same time and using the same tool as database configuration. There are no separate databases to maintain or synchronize with Experion LX. Historical data can be archived and made available for use by fast history, custom displays, reports, application programs, spreadsheets, ODBC compliant databases or other uses.

**Equipment Procedures**
Automating routine or infrequent equipment procedures integrates best practices for batch turnarounds, catalyst regeneration, filter change-out and system startup/shutdowns to improve operator performance, reduce cycle times and improve quality. This capability prevents downtime by capturing knowledge gained by operators over years of performing cyclic procedures – knowledge that could otherwise be lost as the workforce transitions. Steps for executing these procedures are available in the control system, ensuring that these tasks are done consistently, correctly and efficiently every time. Automating operator procedures can reduce the time to perform product changeovers or equipment procedures by as much as 40 percent.

**Material Handling**
Raw materials and energy can contribute between 50-80 percent of COGS (based on analysis of Specialty Chemical annual reports), which makes accurate material handling a business imperative. Honeywell has a variety of solutions to help manufacturers control and reduce raw material use.
Honeywell’s VersaFlow flow meters provide accurate and reliable measurements for demanding applications:

- The **VersaFlow Electromagnetic Flow Meter** is a general-purpose transducer suitable for a variety of measuring tasks and applications. It delivers the highest degree of reliability, even when media changes rapidly, pH shifts, flows pulsate or large amounts of solids are present.

- The **VersaFlow Ultrasonic Flow Meter** is designed for liquid applications and provides reliable flow measurements independent of conductivity, viscosity, temperature, density and pressure.

- The **VersaFlow Vortex Flow Meter** is the only flow meter of its kind with integrated pressure and temperature compensation in two-wire technology. It provides reliable measurement of operating, standard volumetric and mass flow.

- The **VersaFlow Coriolis Mass Flow Meter** reliably measures mass flow, density, volume flow, temperature, mass or volume concentration. It can be installed regardless of pipe vibrations or other external influences.

For maximum feed throughput with extremely high accuracy, Honeywell offers built-in algorithms and integration with Mettler-Toledo weighing terminals. These terminals cover a wide range of weighing applications from straight weighing applications to advanced material feed management systems. No matter which of the two terminals you choose to optimize your dosing application, it can be tightly integrated with Experion LX through a set of specialized interface function blocks to tighten material transfer control, decrease batch cycle time and improve production quality.

Finally, Experion LX enables automation of manual material additions to improve repeatability, minimize material losses and prevent additions of wrong materials or quantities. Instructions to the operator are seamlessly presented during the automated procedure and confirmation is captured in the report.

**The Honeywell Advantage**

Honeywell’s solution for small batch manufacturing enables small sites to boost performance and agility, achieve reliability targets, improve quality and drive down costs – without the resources and investment of a large site. Batch producers with small sites have limited resources and capital, and require a simple solution that provides the agility needed in the marketplace without sacrificing reliability and lifecycle costs. Honeywell’s solution for small batch manufacturing sites is based on Experion LX, which brings the value and reliability enjoyed by Honeywell customers around the world to smaller operations, including project implementation resources and ongoing application support.