The Sweet Smell of Operational Success

Firmenich operates more effectively with an integrated MES deployed across their enterprise

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FRAGRANCE AND FLAVOR COMPOUNDING

Operating Intelligently and Transparently

How we helped Firmenich give its customers quality and production data with a new MES system integrated with their ERP system.

Firmenich, a Plainsboro, New Jersey-based manufacturer of fragrances and flavorings, already had the enterprise system that it needed to command business functions and manage production in place. What it needed to achieve more complete control of its processes was a link between its top-level management system and its plant-level systems, including PLCs from Intellution and Allen-Bradley.

By combining the talents of a qualified, understanding integrator, Automated Control Concepts Inc. (now Inflexion-Point), with the experience of the production workforce, Firmenich designed and implemented a control system that integrated its operations from the top floor to the shop floor.

Relieving the Burden

Flavor and fragrance manufacture is actually better described as "compounding" — the complexity involved in this process matches that of any batch-ori-

ented production method. What's more, Firmenich typically divides large batch jobs into more manageable sub-jobs for production in any one of the plant's departments. Consequently, the move from paper-and-pencil data collection to full-blown factory automation would require a well-thought-out system strategy.

Not only would the company's new system need a single, easy-to-use interface for different departments and different levels of computer experience, but it would also have to transfer data between new and existing equipment while maintaining data integrity. All that, while retaining flexibility for future expansion.

Integrating with the ERP System

An enterprise resource planning (ERP) system from Ross Systems Inc., Atlanta, had been in place since January 1998, taking care of the administrative side of the business-materials management, manufacturing planning, and financial controls. It enabled Firmenich to become

Challenges

- Company must meet exceedingly high quality standards and demonstrate it to customers
- Lack of information about production and quality due to lack of computerization

Solution

- A comprehensive approach using MES will provide the ability to manage production from end to end
- Integration with the existing ERP system ensures total visibility and coordinated planning and reporting

Results

- The payoff was immediate, as the new software conformed to the existing plant practices and culture
- Firmenich's customers now get the data they need, in a timely manner
- The system has reduced the amount of time required to plan and manage batches

A version of this story first appeared in Software Strategies for the Integrated Manufacturing Enterprise, August 1999.

lot-traceable for raw materials, "a capability actively sought by our clients," says the project manager. "The Ross system is lot-number dependent. That helped us in assigning an expiration date and providing traceability for all of our raw materials products. As a result, the system improved our business practices and quality control, but it also created an increased amount of data entry."

Relief would require integrating the Ross ERP system with production operations on the plant floor, including batch management, operation, and auto¬ mated data retrieval-a requirement that presented special challenges.

First among them was the creation of a single interface which could accommodate different practices within Firmenich's departments while keeping the system relatively simple to construct and flexible enough to accommodate future expansion. Second, the integrated system had to include automated dosing systems which use different methods of data transfer. Finally, the new system had to offer significantly reduced training times for operation by new computer users.

"It was an exciting, challenging project," says Chris Monchinski, InflexionPoint's chief technology officer. One of the nice things about this project," he adds, "is that we could provide all the services needed" because of our added capability to custom manufacture hardened PCs.

Making a Thoughtful Choice

By contrast, the selection process leading to that purchasing convenience was not quite as direct. After developing a design specification and project objectives, Firmenich invited proposals from multiple vendors, among them InflexionPoint, with whom Firmenich had become familiar at an Intellution product seminar. The various vendors' responses included proprietary solutions, proposals for using off-the-shelf software configured to Firmenich's needs, and custom code.

Despite competing vendors' preference for proven integration technologies, Firmenich chose InflexionPoint based on the company's assurances it could develop applications that would conform precisely to Firmenich's business objectives. This path, says the project manager,

"ensured that the software would fit our existing practices, business system, and plant and database structures. We were confident that if we gave the right attention to all the details we could be successful."

Defining Objectives

Firmenich took the first step to that success by establishing a clear understanding of system objectives. First, InflexionPoint reiterated its understanding with a General Design Specification (GDS). Review and commentary of the GDS led to a Detailed Design Specification (DDS). "It provided a last-chance review of all our objectives-major and minor," says the project manager. "We distributed the DDS to the various programmers and designers so that all

> "This system has enabled us to completely computerize a formerly non-computerized plant floor."
>
> Project Manager
> Firmenich

pieces of the integration would mesh perfectly." By designing the custom software to accommodate existing systems when possible, Firmenich could minimize rework and speed commissioning of the completed system.

"The major obstacle," says the project manager, "was ensuring consistent data transfer between eight different programmers." The team used e-mail to ensure that all concerned parties were informed simultaneously, including documenting and releasing all verbal communications.

To achieve the required high-functionality, the project manager and Monchinski developed the Compounding Station PC (CSPC) software, an open architecture electronic recipe management and data acquisition system. With an interface designed using Visual Basic, CSPC hosts more than 30 workstations, including computerized manual weighing stations, precision automatic dispensing systems, and custom¬ built bulk dispensing systems.

"Microsoft Transaction Server 2.0 was used as the middleware between the workstation PC software and the server," explains Monchinski, "making it easy to deploy and maintain this system from development to startup at the factory. I was able to create a true logical three-tiered system, where the business rules were encapsulated in Visual Basic and maintained centrally on the server."

Other CSPC software components include Microsoft NT Services and PLC software from Intellution and Allen-Bradley. Oracle Replication was selected to provide two-way data transfer and security between the factory floor and the Ross system. "We didn't want the [CSPC] system to get into the guts of the ERP," explains Monchinski. "I consider [Replication] to be a valuable technology for isolation of the ERP database. I have a great deal of respect for the Oracle product. It's very reliable."

Organizing and Managing the Workload Across the Operation

The CSPC splits recipes into more manageable pieces, then directs those pieces to the most appropriate part of the plant. Operators retrieve those recipe portions, then follow on-screen prompts, adding the appropriate amount of each ingredient required. "The server-based tasks that actually do the batch splitting are NT services," explains Monchinski.

"There are workstations throughout the plant, the Firmenich project manager explained. "Most are CSPC manual weighing stations which allow for a recipe to be displayed on-screen and prompt the operator through the required steps for compounding the product. CSPC tells the operator which material to add next and in what quantity. It then confirms that the expiration date is acceptable for that material, records who added the material, what lot number it came from, and confirms the actual amount added to the batch. That means CSPC won't let operators add an expired lot or the wrong material. It also tells QC if too much or too little of a given material was added."

The remaining workstations are auto-compounding machines that automatically dispense materials without any human intervention. Production data is reported much the same as with the manual weighing stations. The auto-compounders are typically used to dispense smaller quantities. The final CSPC workstation is a bulk dispensing system designed by the Firmenich project manager and programmed by Monchinski and another programmer, Ilan Freiner. Mass flowmeters link to Intellution FIX control software for automatically dispensing large quantities of liquids to the large compounding tanks. "The Visual Basic program
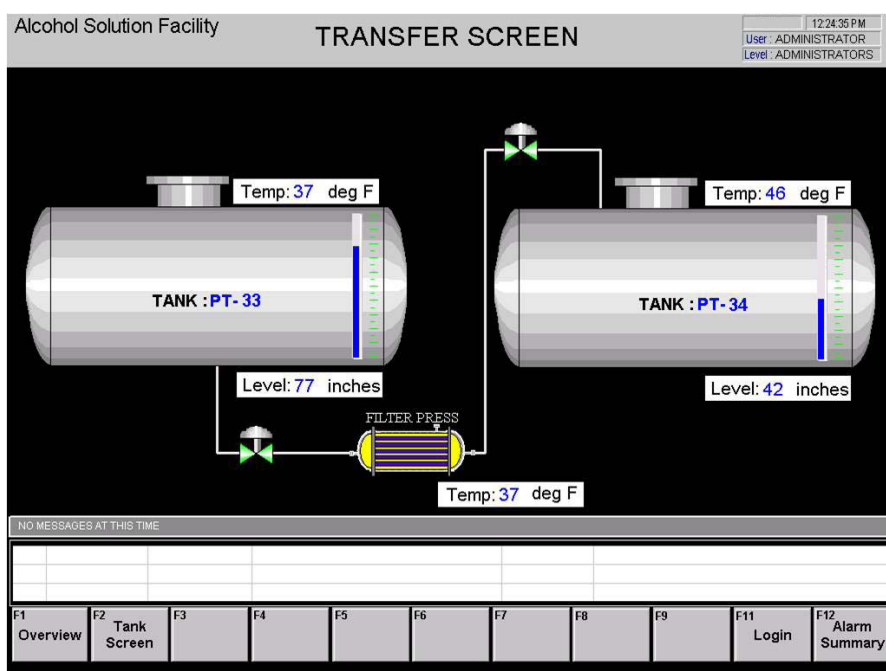
makes this system look and feel just like one of the manual weighing station workstations," the project manager says.

As constructed, the system is virtually infinitely expandable. "With its open architecture," says the project manager, "CSPC can accommodate any future automation system from any vendor that can accept data exchange using common methods like TCP/IP, Ethernet, Windows File Transfer, or Oracle Replication."

Microsoft Transaction Server is critical to ensuring system growth, says Monchinski. "We can increase the power of the server or add more servers to maintain the back end as more and more workstations come online."

During the manufacturing process, real-time electronic data capture using bar code scanners, electronic scales and mass flow meters minimizes the potential for input error and ensures data integrity. CSPC then aggregates the data before uploading it back to the Ross ERP. Regardless of which data station was involved, at the completion of a compounding job, an automatically generated quality control report prints a hard copy of all collected manufacturing data and highlights any deviations from the original recipe.
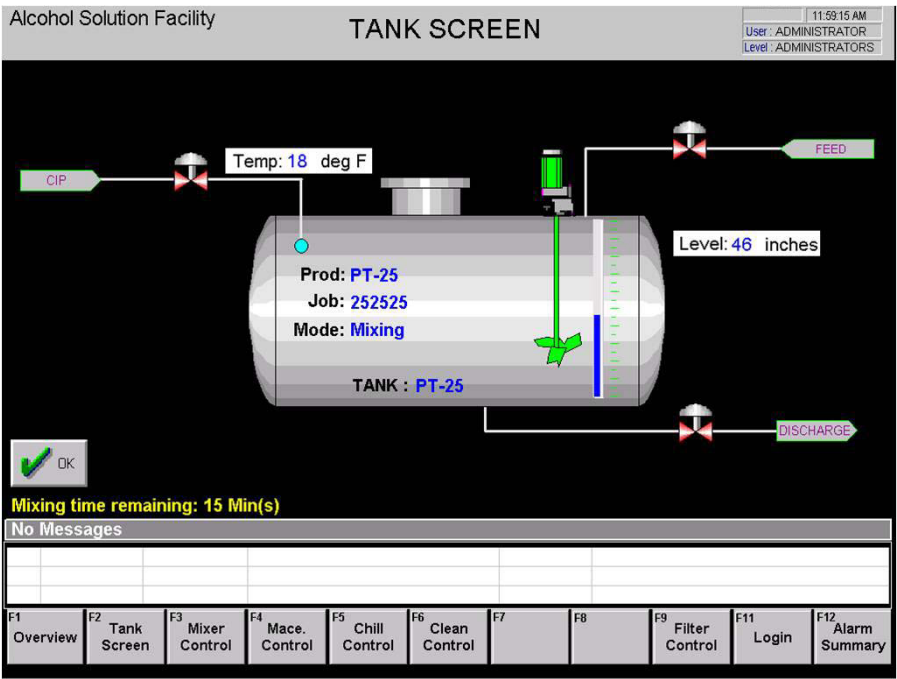
Operator Involvement for Improved Design

Work began on the CSPC system during the first quarter of 1998, leading to the completed DDS for the CSPC by the end of the second quarter. The CSPC went live during the first quarter of 1999, but with operations conducted in training mode until its official activation this past April. The custom bulk liquid dispensing system, also ordered in early 1998, was activated in May. All systems were commissioned within 12 months of their initialization.

However, such exposure was more than just a matter of familiarization. "I would like to stress the amount of effort devoted to encouraging the plant operators to test and comment on the system prior to its activation," the project manager explains. "Most of that criticism led to changes that were implemented in the final software release."

To meet design and operational goals, both super¬ visors and plant operators became critical contributors in the new system's design, installation, and implementation. "We saw that training was going to be critical to the success of the project," says the project manager, "because most plant floor operators had very limited experience with computers."

Having received training in November 1998 at the InflexionPoint facility, operators were given the opportunity to test the system in February 1999. "This let us do the final testing of the system with actual recipes," says the project manager. "Each operator got to manufacture at least a dozen jobs while the system ran in parallel mode" over an eight-week span.

Not only did workforce involvement ensure that the new software conformed to the existing plant practices and culture, but also parallel operation using old production methods with the new system in practice mode ensured a seamless transition once the system went live.

Firmenich attributes its success to mutual respect and the high level of communications between team members. "I enjoyed working with the Firmenich team," adds Monchinski, "It was a great project all around."

And who appreciates the team's success most? The project manager has the definitive answer: "Every one of our customers who has seen the system loves it. I have not yet heard a negative comment." ∎