



Sweet Rewards

3D modeling enables speedy design and installation of chocolate tempering unit

By modeling a chocolate tempering unit in 3D with Bentley® AutoPLANT®, Egemin Automation reduced piping design time by 60 percent and ensured a clash-free installation that took only three weeks.

The Egemin Group is a leading provider of advanced automation solutions for data and physical flows of solids, liquids and unit loads based on its own products and technologies. In the past, modeling a chocolate tempering unit would have been accomplished in 2D, where piping design was a time-consuming exercise in visualizing the third dimension, and there was no guarantee that all the components of the unit would fit together once the actual assembly began. But by using 3D plant design software, Egemin was able to create a complete digital representation of the tempering unit, including tanks, electrical and mechanical equipment, cabinets and all the piping.

“Routing the entire project in a single 3D model turned out to be much faster than the old 2D approach, where we had to try and reconcile dozens of individual drawings,” says Bart De Jans of Egemin Automation. “And by having everything represented in the model, we could detect interferences in software prior to construction. That made the installation go very smoothly.”

Keeping the Chocolate-Making Process Moving

The tempering unit was designed for a chocolate manufacturer as part of a retrofit to its existing process. During the production of chocolate bars, ingredients are heated to a temperature of about 45°C to melt and form a liquid. Before the liquid can be poured into molds to form bars, it must be tempered, or cooled and held at a temperature of 28°C to prevent the formation of white crystals. A tempering unit receives the filtered 45°C liquid material from the primary production tank. The



material passes through a heat exchanger and then into the tempering unit's tank, which is equipped with an agitator. While in the tempering tank, the liquid is maintained at 28°C by means of heated water that flows through pipes at the base. In addition to the various pieces of mechanical equipment, such as the filter, heat exchanger and agitator, this tempering unit consisted of insulated piping, the tank, structural steel, cabinets and instrumentation.

Because production would be halted during the installation of the tempering unit, the customer wanted it to be installed as quickly as possible. Egemin's goal was to have all piping prefabricated to the appropriate lengths and as much of the unit assembled prior to taking it to the customer's site.

2D Difficulties

Previously, when projects were done in 2D, it was not feasible to do this much work in advance because there was no guarantee that everything would fit once it was assembled. In those days, engineers used AutoCAD® to place equipment, pipes and structural steel on 2D drawings. However, it was difficult to detect interferences when only

two dimensions were visible. Designers used plan, section and elevation views to try to spot clashes, but if pipe heights on two drawings didn't match perfectly, for example, it was possible for an interference to go unnoticed. It was also difficult to detect interferences between disciplines because the different disciplines typically did not share drawings early in the design phase.

There were other difficulties to working in 2D, as well. Routing pipe this way was particularly challenging because it required piping engineers to imagine elevations and indicate with elbow symbols whether a pipe went up or down. They had to maintain consistency with other drawings as they worked, visualizing the z dimension of those other views, as well. Each 2D drawing was actually an exercise in piping design. Also, once a design was done, it was necessary to produce from scratch all the isometrics and other drawings needed for fabrication. This could be one of the most time-consuming aspects of a project.

Upgrading to 3D Enables Collaboration

These limitations led Egemin Automation to consider upgrading to new CAD software that could model process systems in 3D. The search was limited to 3D programs that ran on top of AutoCAD, since this program was already in use there. Egemin chose Bentley AutoPLANT, because, in addition to having full 3D modeling capabilities, there are modules for specific disciplines, such as piping design, equipment design, structural steel design and so on. This was desirable because it would permit the exchange of 3D models between disciplines, enabling earlier collaboration. For example, a structural engineer could import equipment models into his design and a piping designer could route pipes around the structural steel.

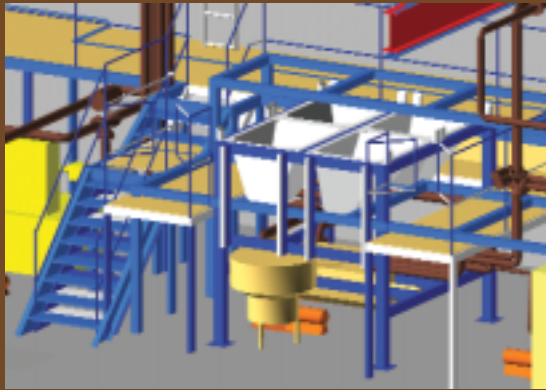
Egemin purchased the software from CAD Service NV in Belgium. Egemin's implementation included modules from both the AutoPLANT Plant Design Workgroup and the AutoPLANT Process & Instrumentation Workgroup. From the Plant Design Workgroup, Egemin purchased two seats of AutoPLANT piping; two seats of AutoPLANT Equipment two seats of

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the AutoPLANT Structural steel design module; and one seat each of

AutoPLANT Isometrics and AutoPLANT Isogen PLUS, programs that produce isometric drawings automatically from the 3D model. In addition, the group purchased one copy of AutoPLANT Explorer



and Explorer/ID (Interference Detection), which permits automatic interference detection and walk-through visualization of a 3D model. From the AutoPLANT Process & Instrumentation Workgroup, Egemin purchased two seats of the intelligent AutoPLANT Piping and Instrumentation Diagram (P&ID) module, one seat of AutoPLANT Hookups, and one seat of AutoPLANT Datasheets.

A Streamlined, Coordinated Design Effort

For the tempering unit, the design process began with the creation of P&IDs. The software maintained an up-to-date database of all the information on these drawings, such as the tag numbers for process lines, instruments and equipment. Simply having P&IDs linked to a database helped speed the design process.

“A big problem we had in the past was when we had to put in an extra valve, for instance, and give it a new tag number,” says De Jans. “We could spend a lot of time trying to determine what the last tag number was. With this software, if we tried to enter an existing tag number, it alerted us and prompted us for another value. This saved time also by reducing the amount of time we spent checking the drawings.”

After the P&IDs were done, datasheets and instrument lists were generated automatically. These documents and the drawings were given to mechanical, structural and piping engineers. Mechanical engineers used AutoPLANT Equipment to design and place equipment, cabinets and the tank in the model. This module automated much of their work by providing a library of parametrically defined components. With the library, an engineer

simply entered a few values representing the specifications of the equipment, and the software drew the model. Structural engineers used AutoPLANT Structural for steel design, which also has a library of standard shapes. When an engineer wanted to run a beam from one location to another, he simply chose the beam shape he wanted and indicated the desired location. The software draws the 3D model of the beam automatically.

Piping engineers used AutoPLANT Piping to route the pipe. To do this, they drew lines indicating where pipes should be placed, as they would in 2D. But rather than simply having geometric representation of the pipes, the digital model of each pipe was actually an object containing additional information from the database, such as performance and material specifications. And because the engineers were working in 3D, they were able to include the z dimension in the model, routing a pipe 10 meters horizontally, for example, then up five meters and then horizontally another 10 meters. Having the z dimension visible on the screen was easier than trying to imagine elevations on a 2D drawing.

Another benefit of building a 3D model of the piping was that entire lines were visible, compared to drawings that showed only the pipes in a certain section of the rig. When an engineer finished routing a line, he could see the impact of his work immediately, rather than flipping

The Egemin Group

founded in 1947, employs 550 people at facilities around the world. Egemin Process Systems offers expertise in design, realization and commissioning of automated systems for storage, transport and processing of both liquids and solids. Design activities include process engineering, electrical instrumentation and development of process control systems. The group also handles installation of mechanical and electrical components, implementation of management information systems and project management. It focuses on several specific market niches, such as food, pharmaceuticals, textiles, ferrous and non-ferrous metals, precision chemistry and tank farms. Customers include more than 4,000 companies worldwide, including some of the most well-known names in pharmaceutical and food manufacturing: Johnson & Johnson, Baxter, Merck Sharp & Dohme, SmithKline Beecham, Phillip Morris Group, Campbell Group, Proctor and Gamble and Heinz Group.

through 2D drawings and trying to follow it. All these features helped speed the process of routing pipes. This approach was also 60 percent faster than 2D because piping was designed only once instead of over and over again on each individual drawing with the 3D model.

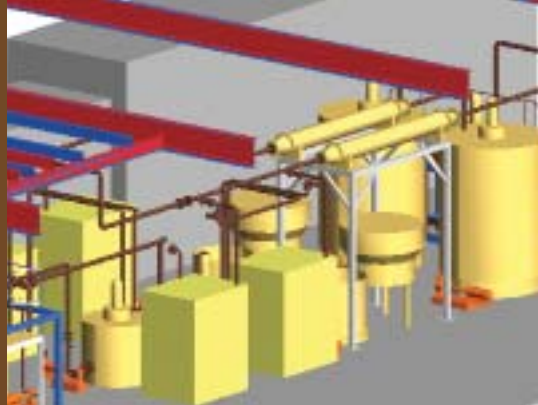
Evaluating the Model

When the 3D model of the tempering unit was complete, Egemin used the AutoPLANT Explorer/ID to perform a thorough evaluation of the model for interferences. The software recognized all one-two-and three-dimensional

AutoCAD entities for viewing and interference detection. Engineers fixed all the problems that were detected, then used AutoPLANT Explorer to create a walk-through presentation for the client. During the client review, it was discovered that more room was needed in a certain area for forklift access. This and other changes the customer requested were made to the 3D model. This went much faster, compared to modifying 2D drawings.

Piping isometrics for this project were generated automatically from the 3D model. Engineers simply selected the views they wanted and commanded the AutoPLANT Isometrics or AutoPLANT Isogen PLUS module to create the drawings.

“All the information was automatically extracted from the 3D model,” says De Jans. “We used the drawings just as they were without any touch up.”



The 130 drawings had elevations and dimensions tagged and located, and materials for purchasing were automatically derived from the model database. Fabrication drawings were also produced in this manner. All drawings required minimal checking because the software ensured that they were consistent with the 3D model.

Back Online in Only Three Weeks

Equipment, cabinets and pipes were all prefabricated and ready to go when the customer shut down the line for installation of the new tempering unit. Because the 3D model had been thoroughly checked for interferences in advance, no unexpected problems showed up during installation. Everything fit perfectly and the unit was online in only three weeks.

“That is very fast, considering this unit had 75 piping lines,” says De Jans. “Having assembled everything digitally was the key to having the real installation go so well.”

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