From the Classroom to the Plant:

Operator Training Simulators Provide Hands-on Training

By Kevin D. Johnson

Ethanol plant start-ups face many challenges. These include environmental and land permitting, project financing, feedstock supplies and product marketing. Equally important is the need for qualified plant operators. However, the need for qualified plant operators and technicians is not limited to new plants—existing facilities also require a new crop of skilled personnel to fill gaps left by workers who move on to other positions or industries. Without proper operation, plant design capacities and efficiencies may not be realized, thus resulting in lower production yields and reduced production revenues.

In the words of instructor Duane Carrow, program director of Renewable Energy Technology at Minnesota West Community & Technical College, "As the demand for ethanol continues to grow, so will the demand for qualified plant operators."

Carrow believes that the community college system is well suited to provide the necessary education, experience and associated training to supply a required crop of plant operators and trained technicians to fill these job positions.

In response to this need, Minnesota West has created a program in Renewable Energy Technology (RET).

Upon graduation, the RET student receives an associate degree that combines theory and practical application preparing them for a rewarding career in the renewal energy industry.

"Today's processing plants are highly technical and completely automated and renewable energy technicians have an enormous amount of responsibility to ensure that the plant continues to operate in the most efficient and economic way possible," Carrow said. "To do so, the technician needs to be conversant in mechanical and instrumentation basics, chemical and microbiological processes, safety fundamentals, and process optimization techniques."

At Minnesota West Community and Technical College-Granite Falls, students in the RET program are trained for entry into the agricultural processing plant industry, which converts crops such as corn, soybeans, alfalfa and sugar beets into products such as ethanol, soy oil, corn syrup, starch, carbon dioxide and bulk/bagged sugar.

One of the unique features of the program is its practical approach. Carrow and his staff sought to develop a well-rounded curriculum that would include hands-on training on a plant simulator.

For this task, he enlisted the skilled process control engineers and applications development personnel of NovaTech Process Solutions LLC. NovaTech has been providing reliable process control and simulation solutions to the process industry for more than 20 years and currently serves several large processors of corn and grain products and producers of ethanol in the marketplace.

Carrow and Steve Scott, NovaTech's director of application development, began work on an ethanol plant application based on a realistic generic plant design utilizing NovaTech's D/3 Process Automation System. The D/3 is a highly reliable and robust Distributive Control System (DCS), proven to be the ideal foundation for application development.

The first step in the process was to identify the objectives of the training and simulation program for the college curriculum application. Carrow indicated that he wanted to have a training tool that replicated the operation of an actual ethanol production facility. Based on Scott's 20-plus years of application development experience, he recommended that they start with an actual production plant model and adapt it for training purposes.

Johnson (left) and Carrow

"The best way to gain operational experience is by using an application simulation that is founded on an actual production system," Scott said. "That way, the students will be able to see the results of the decisions they make on a real-time production process."

An initial baseline design was chosen

Benefits of NovaTech's
Configurable Ethanol Control System

NovaTech's combined experience in the utility and process industries is incorporated in the Ethanol Plant Application to help the plant operators and owners achieve improved efficiencies, reduced operating costs and improved product quality.

Improve efficiencies

▸ Utilities management
▸ Feedstock management

Lower operating costs

▸ Automation of manual processes
▸ Less down time through improved maintenance
▸ Improve quality controls
▸ Facilitate access to other control systems
▸ Out source non-core competency tasks where possible and feasible

Improve quality

▸ Less reprocessing of off spec product
▸ Improve consistency of cleaning processes
▸ Effective monitoring of the process and tracking of the product
▸ Eliminate operator errors through control and training
▸ Ensure all changes to process are properly tested

These are just a few of the major process areas included in the Configurable Ethanol Application:

▸ Corn receiving
▸ Grinding
▸ Twin screw slurry
▸ Slurry tank
▸ Jet-cooker/hydro-heater
▸ PH adjusting and liquefaction
▸ Fermentation
▸ Distillation columns
▸ Molecular sieves
▸ Evaporation
▸ Process recovery/coproduct

D/3 PAS Workstation

that focused on a production facility that consisted of a dry mill ethanol process with a capacity of about 50 mmgy. The plant was designed with corn as its feedstock and a batch fermentation with three distillation columns and rotary drum dryers for DDGS processing.

At the heart of the simulation and training application is the D/3 Process Automation System, which utilizes the very powerful Sequence and Batch Language (SABL) for process control. The D/3 PAS handles all of the sequence logic, alarming, data collection and trending, and is the backbone of the application. The operator interface is accomplished through TotalVision, the D/3's custom Human Machine Interface (HMI) or Graphical User Interface (GUI).

TotalVision is an object oriented package that provides the operator with a control interface and view into the process using real-time dynamic information, detailed graphics, multi-level pop-ups and animation to show the current operating conditions.

TotalVision can also be used to access data from other computer systems and applications, including laboratory information and maintenance systems as well as any Microsoft application.
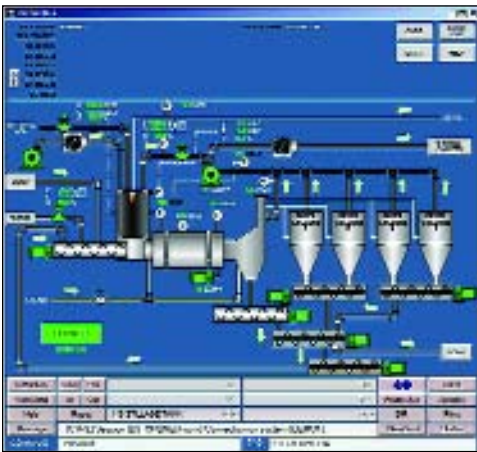
After several months of engineering and development, the application was ready for testing and evaluation. The result was an application that demonstrates the benefits

TotalVision Graphic

D/3 open system architecture

of a highly automated ethanol production facility utilizing state of the art process control technology.

Kevin Johnson, senior account manager for NovaTech said, "The Configurable Ethanol Plant Control System couples world class plant automation and simulation technology into a single solution set to address a variety of engineering and operational challenges faced by the ethanol industry today. More importantly, the Configurable Ethanol
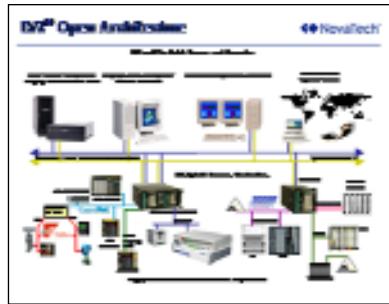
Application will provide plant design engineers as well as plant operators with a powerful and cost effective tool that can be used for training, designing, and optimizing plant operations—all on the same platform."

The D/3 PAS incorporates an open system architecture that enables it to communicate with skid mounted equipment, intelligent field devices and other control system technology and PLCs.

"Utilization of the NovaTech Configurable Control System Application as a baseline for the plant control system design can result in significant savings," Johnson said. EP

For more information regarding the training simulation please, contact Duane Carrow. For more information regarding the Configurable Ethanol Control System Application or to arrange for a demonstration, please contact Steve Scott or Kevin Johnson.

Duane Carrow
Director: Renewable Energy Technology
Minnesota West Community &
Technical College
(320) 564-4511

Steve Scott
Director of Application Development
NovaTech Process Solutions, LLC
(410) 772-3412
e-mail: steve.scott@novatechps.com

Kevin D. Johnson
Sr. Account Manager
NovaTech Process Solutions, LLC
(570) 585-6970
e-mail: kevin.johnson@novatechps.com