Major ethanol producer increases the upgrade of syrup solids to dry DDGS (Distiller Dry Grain Solids) product and reduces fuel gas costs and DDGS moisture content variability by implementation of APC's and associated inferred property correlations on the rotary dryers in the plant's "energy center"

DDGS moisture content varied widely due to variations in dryer feed rate and moisture content, and also due to changes in the addition rate of syrup. Because high product moisture often led to plugging of the discharge conveyor, the operators tended to run with much lower average moisture content than actually required to meet the maximum specification. Operation under these more severe conditions consumed excess fuel gas and offered little opportunity to add syrup to the dryer feed in order to upgrade the syrup solids to DDGS quality.

Main Objective

Plant engineering management sought an improved control scheme that would ensure adequate DDGS moisture reduction while maximizing syrup addition and/or reducing fuel gas consumption. This ethanol producer sought the help of MAVERICK Advanced Process Control (APC) personnel to analyze the control problem and design and implement an effective solution.

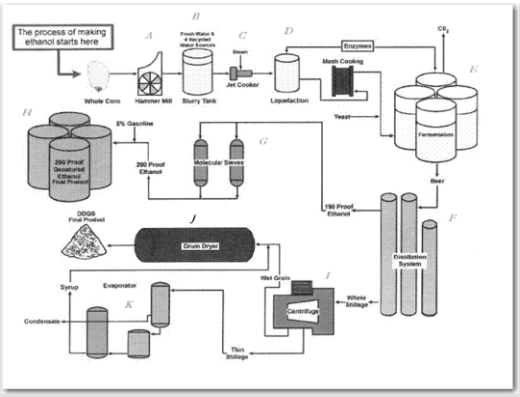
Customer Results

The control solution was developed in close coordination with the senior unit operations engineer and board operator. The controls were developed in a step-wise fashion; that is, each variable was first tested in isolation with all other variables held constant. This led to a true understanding of the characteristics and dynamics of the underlying process, allowing the further inclusion of feedforward to compensate for multivariable interactions. This coordinated MAVERICK/customer effort resulted in much improved dryer operation with measurable decreases in moisture variance, reduced fuel consumption, and increased syrup addition rate. The project exceeded the client's expectations. The controls and tools have now been in place for two years.

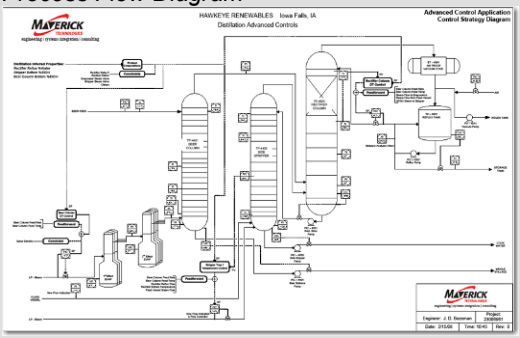
Application Description

The total solution relied on four key applications:

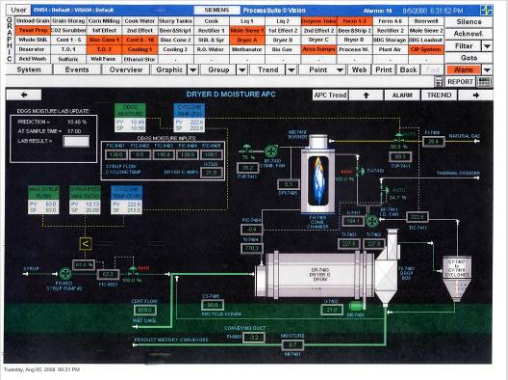
- **DDGS Moisture Inferred Property Calculation**. The calculation continuously estimates the DDGS moisture based on syrup feed flow, centrifuge feed flow, number of centrifuges in service, Dryer temperature, and Dryer drum amps. The calculation is also adjusted based on operator entry of laboratory results for DDGS moisture.
- **DDGS Moisture Control:** Adjusts the setpoint of the following control
- **Dryer Temperature (Fuel Gas) Advanced Control**. The advanced temperature control adjusts the dryer fuel gas valve and improves control of the temperature by making feedforward adjustments to the fuel gas to compensate for changes in the centrifuge feed flow, syrup flow, and trim screw activation and deactivation (Dryer B only).
- **Syrup Maximization Control** is a constraint control that maximizes the syrup flow subject to three constraints – a maximum syrup flow target set by the operator, a maximum syrup/feed ratio, and a maximum dryer temperature.



Process Flow Diagram



Distillation Advanced Controls



Main Operator Screen

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