



Real-time Slurry Measurements for Efficient Fermentation Processes

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Relevant for:
Bioethanol Industry



Going into our third year of production, we, the operators of Utica Energy, understood the main components of fermentation, i.e. starch, enzymes, corn moisture, yeast counts, nutrients, pH, bacteria, and percent solids - but did we really understand percent solids? We certainly understood its importance, but not the precision needed to track it.



Fig. 1: DPRn 4122 Density Transducer

Problem:

In the past, our operators ran three slurry samples on our moisture analyzer per fermenter. These samples would then tell us how to set the grind of the corn scale. We had to leave room for error in our solids concentration due to the fact that moisture analyzers, although precise, can also be inaccurate and inconsistent. Human error must also be taken into consideration, as each individual takes and runs samples differently. Even when the same samples are run on two different analyzers, there can be up to 1% difference. In our case, the two analyzers varied between the larger percent, leaving us with more questions than answers. As the corn scale is zeroed, it is easier to readjust our corn rate, which decreases

the recovery time for % solids to be back on target. Previously, we would have reset the corn rate to the pre-zero set point and waited 20 minutes for the solids to settle out. Then we would repeat another sample and wait another 20 minutes for the moisture analyzer to finish before solids reached a set point. A very inefficient method.

Solution:

After the installation of an Anton Paar density meter after the slurry tank output, we can now make the changes instantaneously before carrying out any adjustments. The real-time data allows us to consistently monitor the contents of the mix tank. If our recipe calls for percent solids of 32.5, with variability of ± 0.5 , adjustments can be made instantaneously.

The main reason to buy the Anton Paar sensor was to have a system which provides real-time data. This has opened our minds to a few more applications. The Anton Paar sensor gives us more consistency in our slurry mix solids, enabling us to push the solids that we run. With the real-time data available to us, our enzyme use is closely monitored, providing more efficiency, and with even more solids, we reduce costs.

We installed Anton Paar's DAVIS software to track, trend, and analyze our solids. The Windows-based program allows us to record data points every 10 seconds for 24 hours. Using that trend, any slow decreases in solids can easily be countered. Problems with the corn scale are promptly detected and rectified. We are also able to export the data into spreadsheet programs such as Excel, to break it down into single fermentations.

Using this information, we are able to accurately predict fermentation outcomes.



Fig. 2: Percent Solids over 7 hours

Since the installation of the Anton Paar system, we have a dependable fermentation process. We have experienced less flow issues at our front end, and our beer well averages have risen.



Fig.3: Beer Well Average 2005/2006

The precision of the Anton Paar density meter helped us to reach a new level of understanding of the importance of consistency related to percent solids.

System configuration:

- ▶ DPRn 4122 Density Transducer
- ▶ mPDS 2000V3 Evaluation Unit
- ▶ DAVIS Software