

Technical Case Study

May 2008

LACTROL[®]

Optimizing the LACTROL feed on a 25 MM gal/year ethanol plant results in an increased profitability of \$1.9 MM per year, by increasing ethanol production by 700,000 gallons per year.

Benefit

A LACTROL customer was able to increase ethanol yield by 0.36% w/v (2.8% increase) resulting in an additional 700,000 gallons per year of ethanol or \$1.9 MM per year. This was achieved by using Phibro's technical resources to optimize LACTROL antimicrobial dosing.

The plant ended up spending an additional \$36,000 per year in higher LACTROL dosing in order to gain \$1.9 MM in increased profitability.

Problem

This particular ethanol plant previously had a serious issue with high lactic acid levels that were all pinpointed to Fermenter #3. The Phibro technical service team made suggestions for changes in the Cleaning-in-Place (CIP) process and saw lactic acid levels drop back to normal ranges of 0.2%. Data from high performance liquid chromatography (HPLC) analysis suggested that the plant was operating more effectively because of the drop in lactic acid levels. Additional sampling by the Phibro technical service team indicated that there was still a serious infection caused by *Lactic Acid Bacteria* (LAB).

Solution

It was determined that a higher dose of LACTROL was needed to reduce bacterial levels. On average, LACTROL feed-rates were increased by 34-50% depending on fermenter size. Table #1 summarizes the LAB levels after increasing the dose of LACTROL. None of the HPLC data showed any differences except for a 2.8% increase in ethanol yield (statistically relevant as all HPLC data processed with 95% confidence limits to insure that differences in data are real not random). This increase in ethanol was due to better control of LAB. Microbiological contamination will continue to be monitored over time.

Plant Operation Data

- 25 MM gal/yr ethanol capacity, batch process
- 8,000 gallon propagator working volume
- Fermenter #3 working volume 237,500 gallons
- Initial dosing of LACTROL:
 - Yeast propagator (0.5 lb.)
 - 1.5 lb. in Fermenter #3

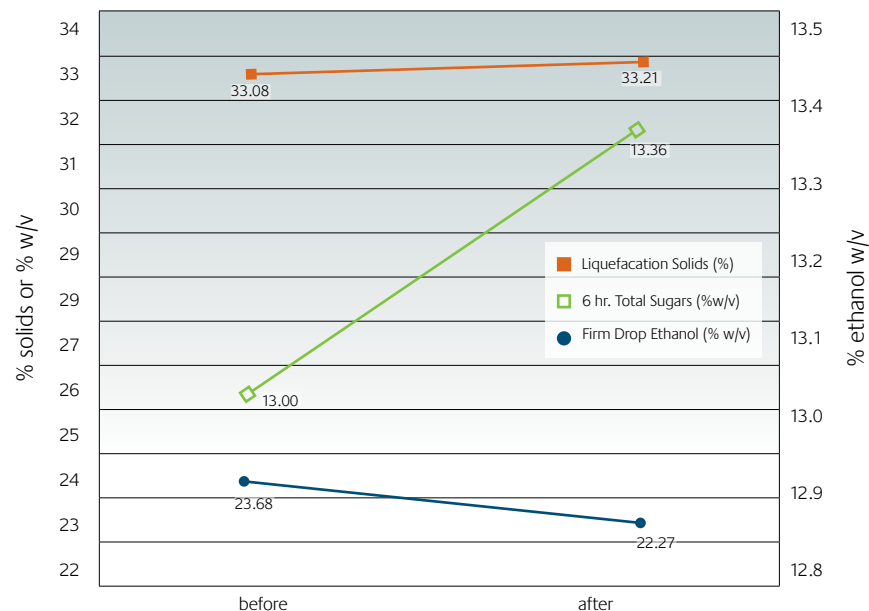
TABLE 1

LAB Levels after increased lactrol dosing

Microbe Type	Prop Drop	F3-6hr	F3-12hr	F3-18hr	F3-24hr
Lactic Acid Bacteria	7.4E+04	1.4E+05	1.3E+05	6.6E+04	1.2E+05
Change vs. lower LACTROL dosing	(98.2)%	>(99)%	>(99)%	(95.6)%	(95)%

GRAPH 1

Fermentor Drop Ethanol Yield vs. Percent Solids and Sugar Before and after Lactrol Change



Conclusions

- Optimizing LACTROL dosage can have significant economic advantages in terms of higher ethanol production.
- HPLC data alone is not adequate in diagnosing bacterial contamination and fails to provide a proper understanding of plant operating performance.
- Bacterial strains differ greatly in their ability to produce lactic and acetic acid. Using Phibro technical resources to provide a complete analysis of a plant's operating parameters can lead to higher yield in ethanol production.



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