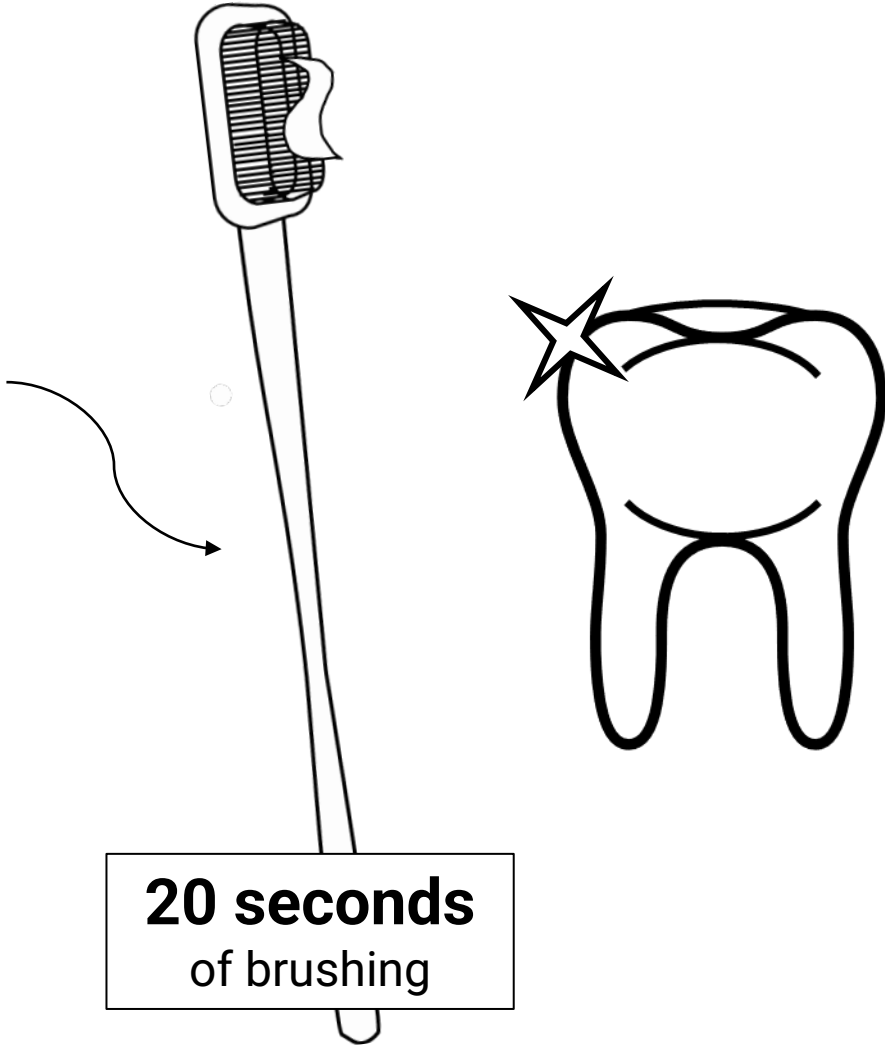
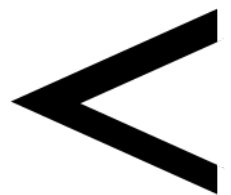
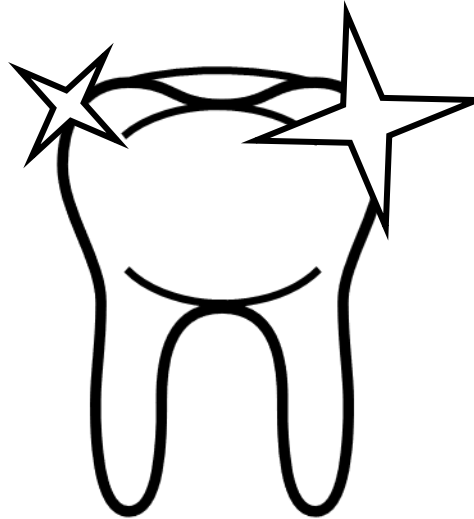
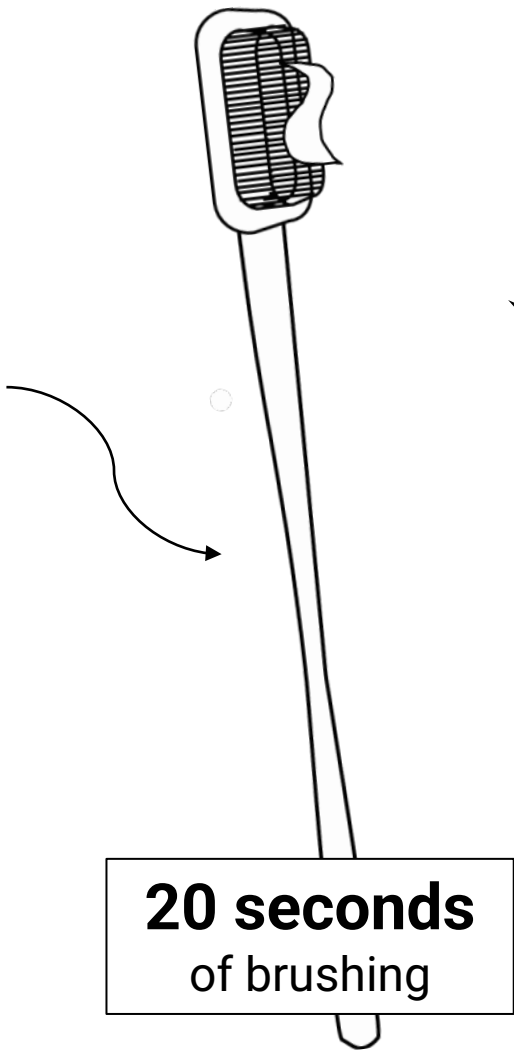


Manual
toothbrush

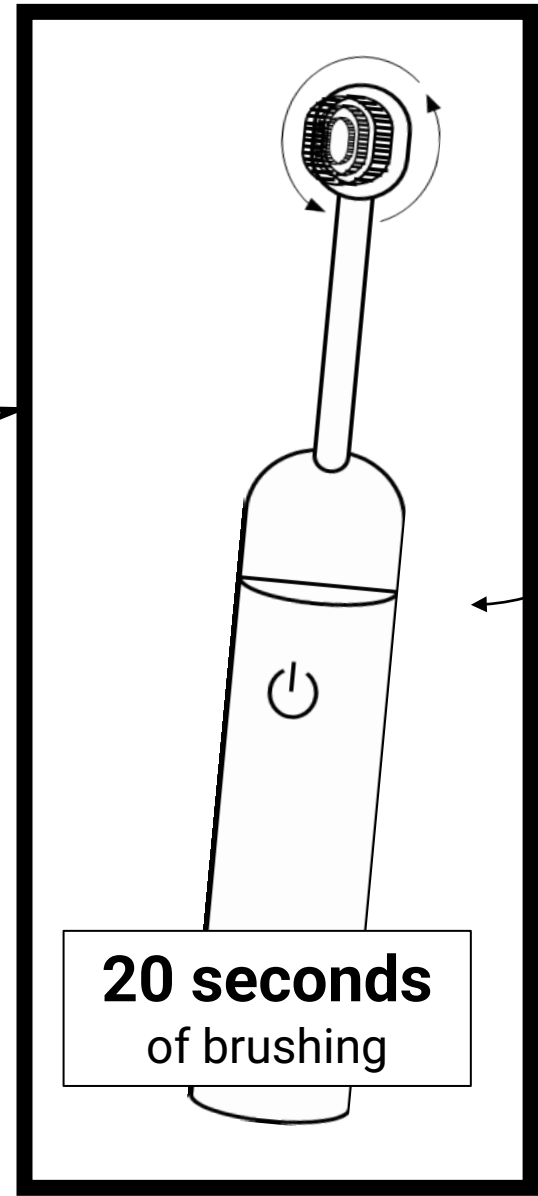


20 seconds
of brushing

Manual
toothbrush



Electric
toothbrush



Optimizing Fermentation CIP

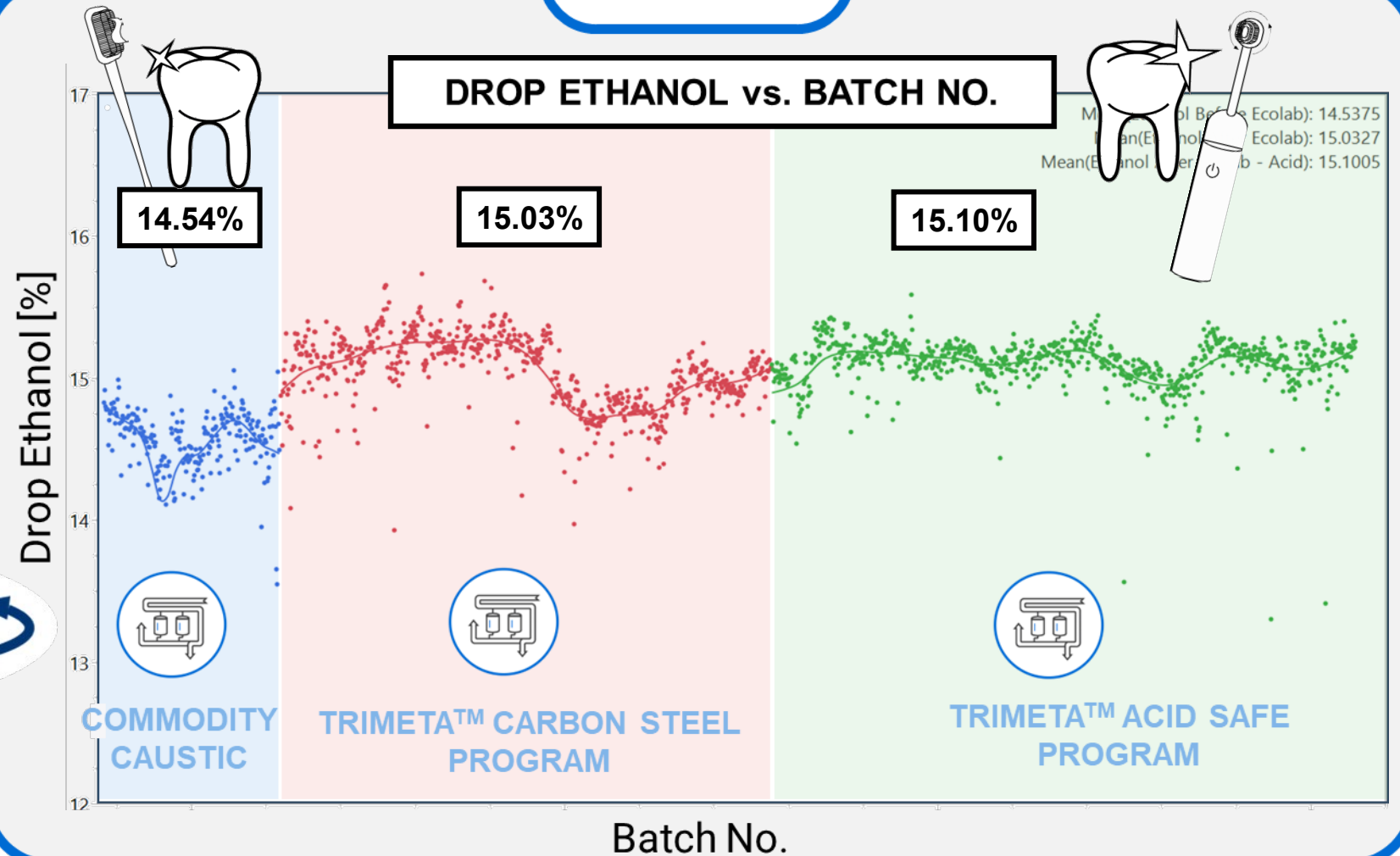
SITUATION

Carbon Steel CIP Equip.
(initially)

Looking to increase EtOH



RESULTS

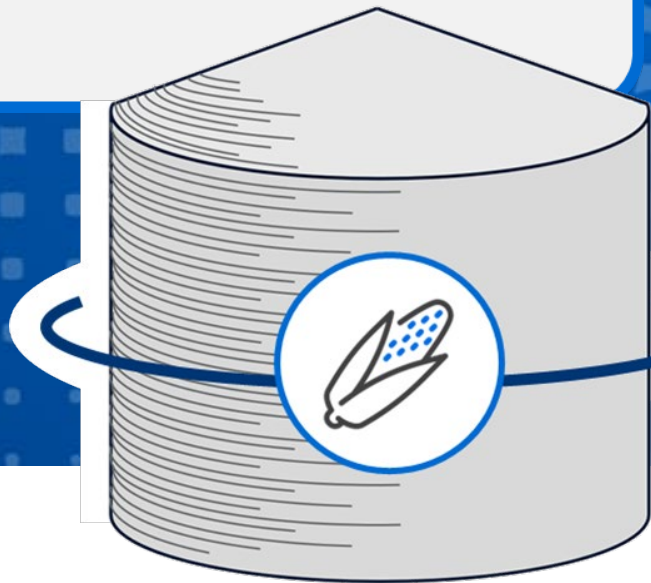


Optimizing Fermentation CIP

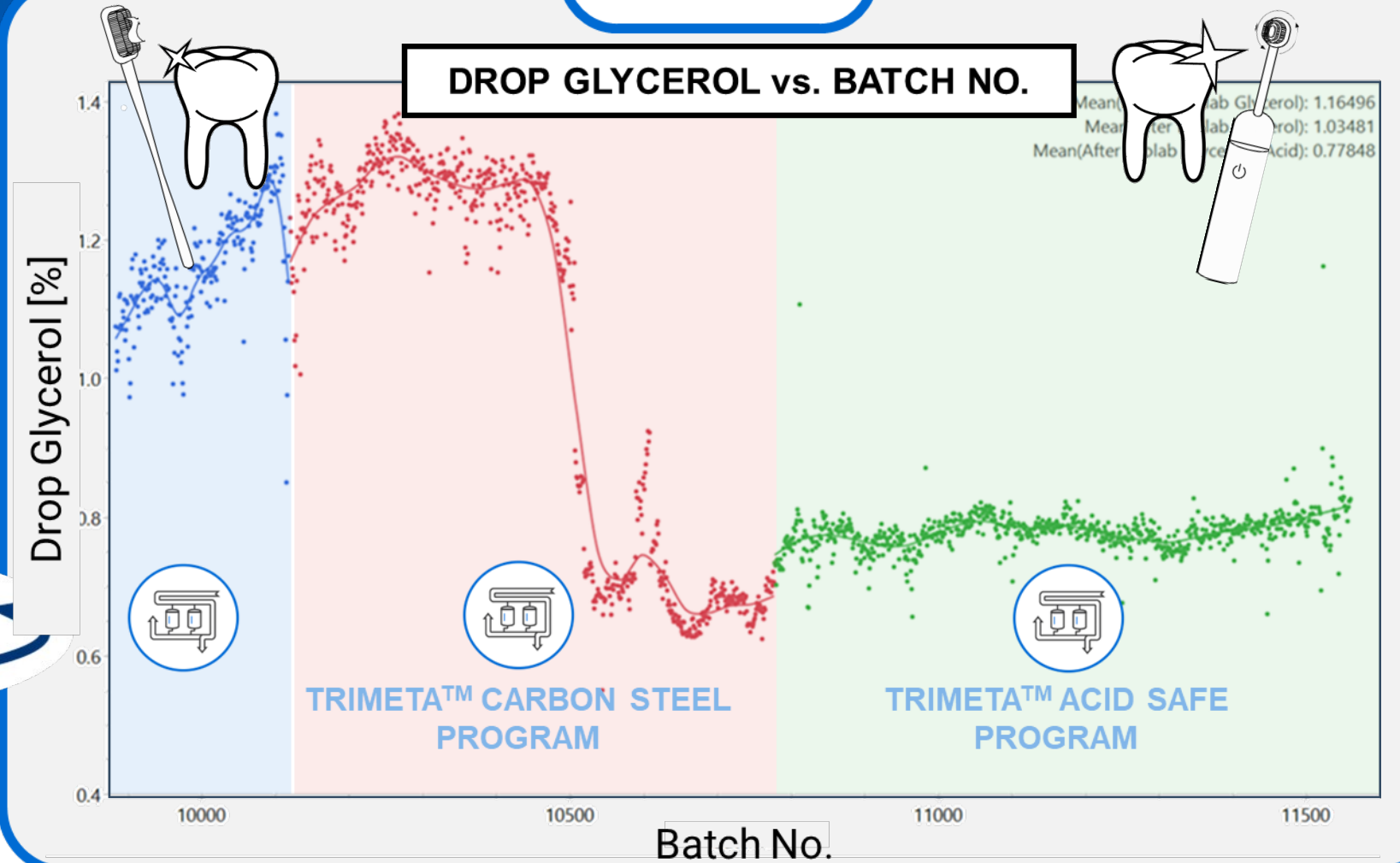
SITUATION

Carbon Steel CIP Equip.
(initially)

Looking to increase EtOH



RESULTS



Optimizing Fermentation CIP

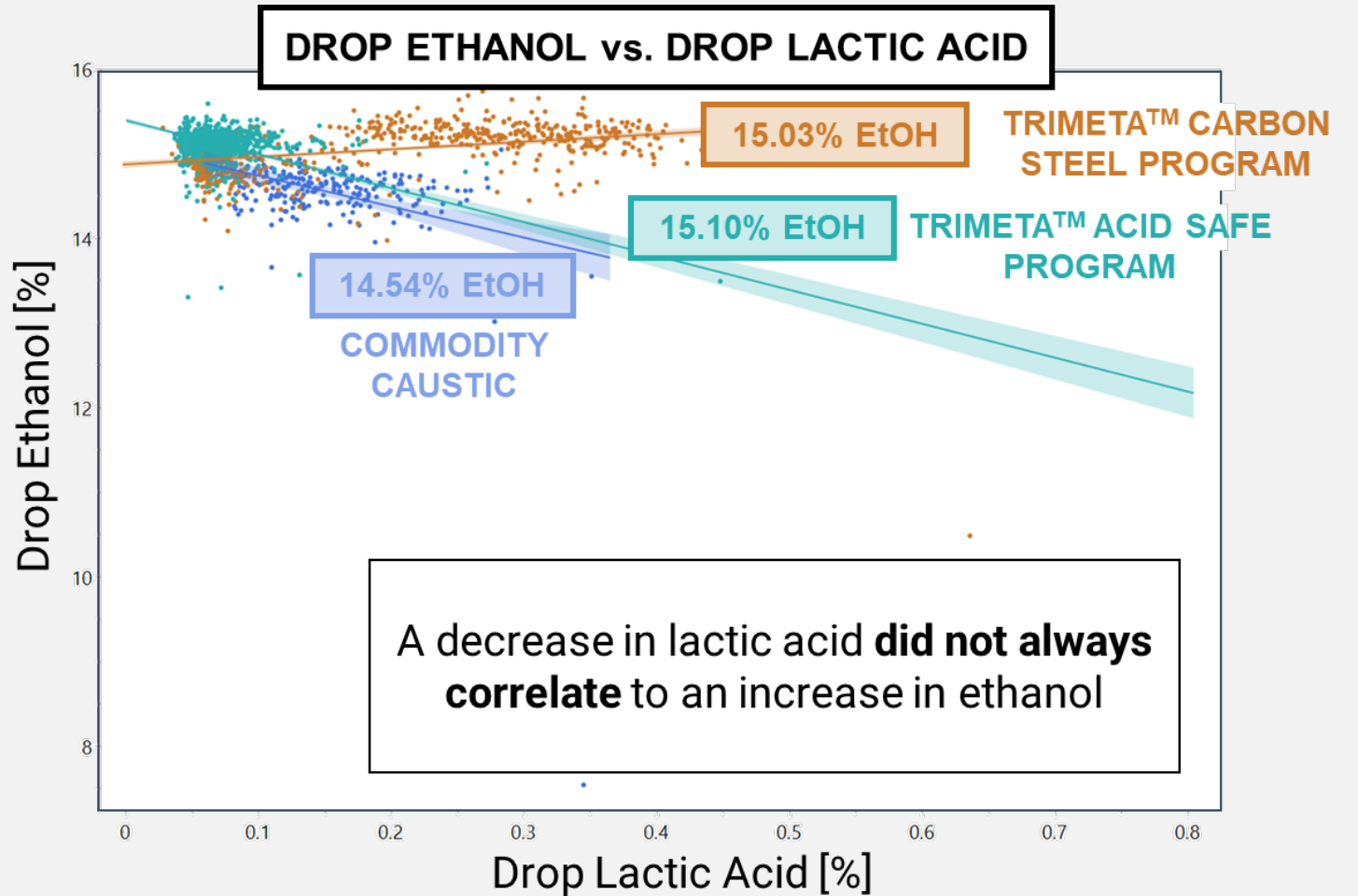
SITUATION

Carbon Steel CIP Equip.
(initially)

Looking to increase EtOH



RESULTS



Optimizing Fermentation CIP

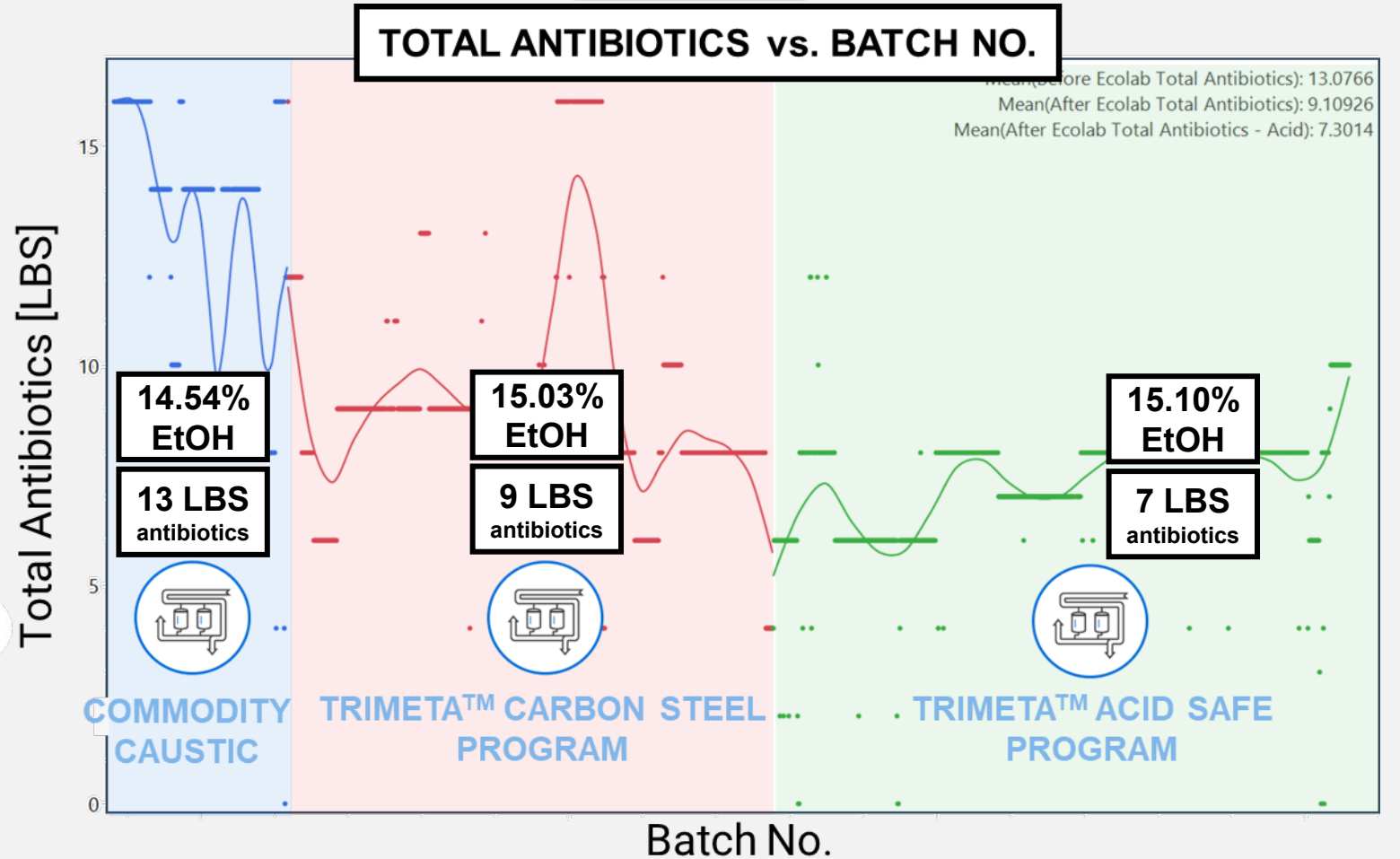
SITUATION

Carbon Steel CIP Equip.
(initially)

Looking to increase EtOH



RESULTS

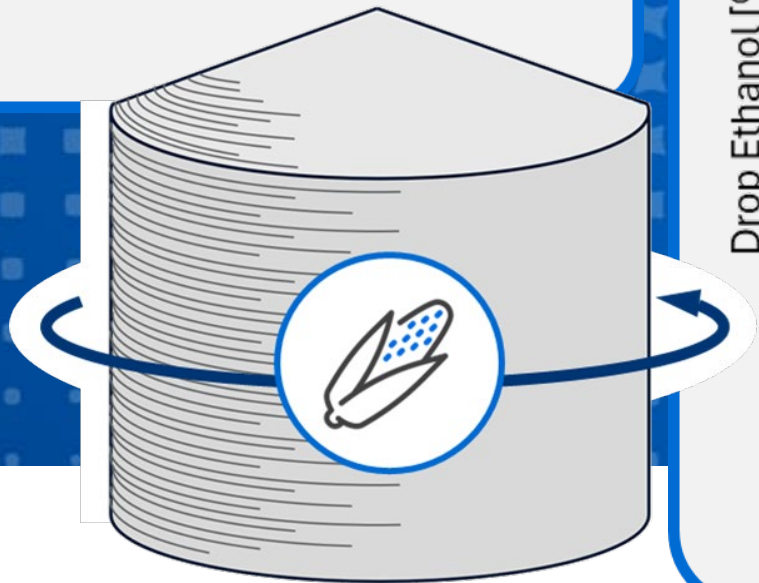


Optimizing Fermentation CIP

SITUATION

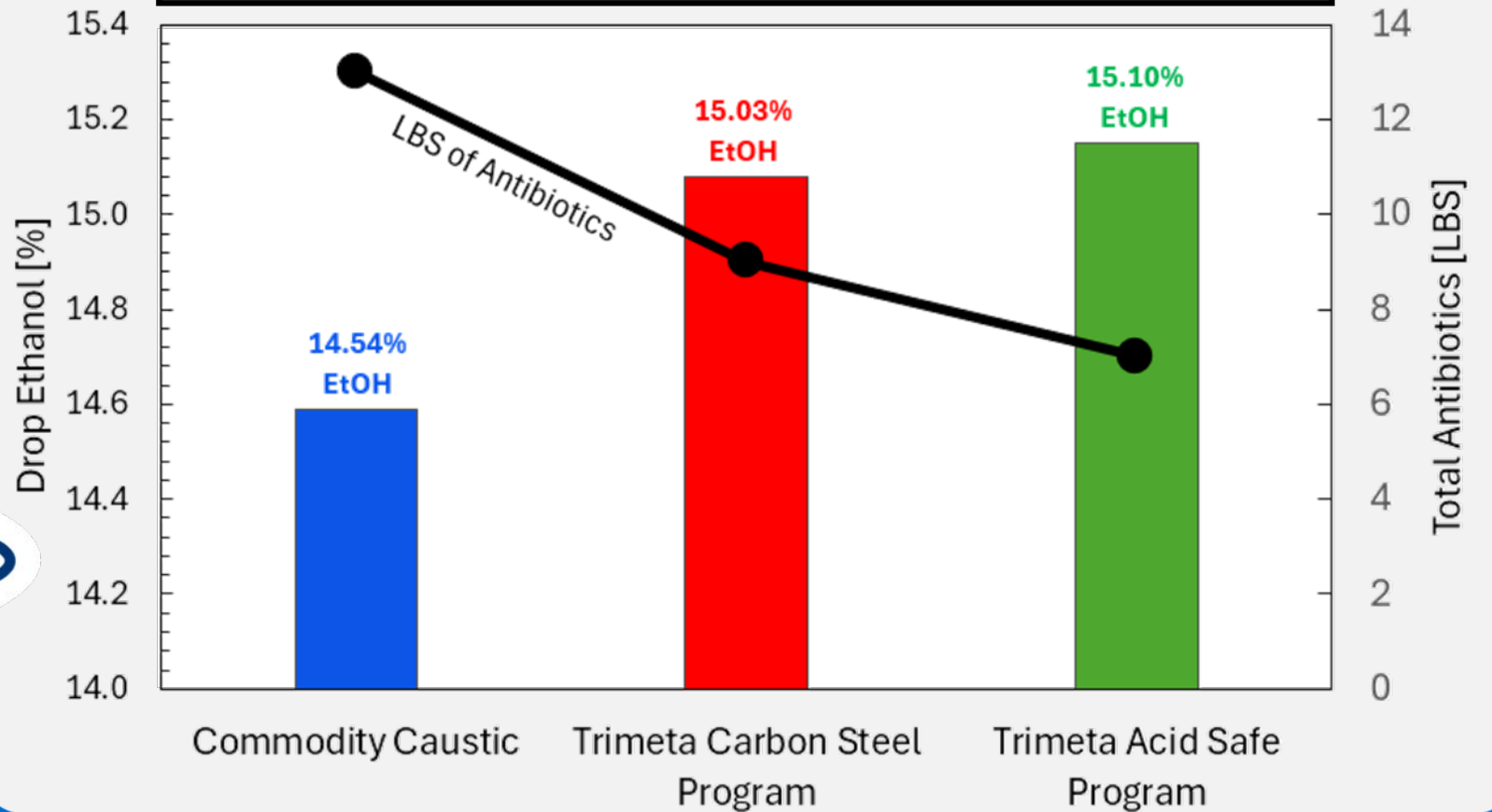
Carbon Steel CIP Equip.
(initially)

Looking to increase EtOH



RESULTS

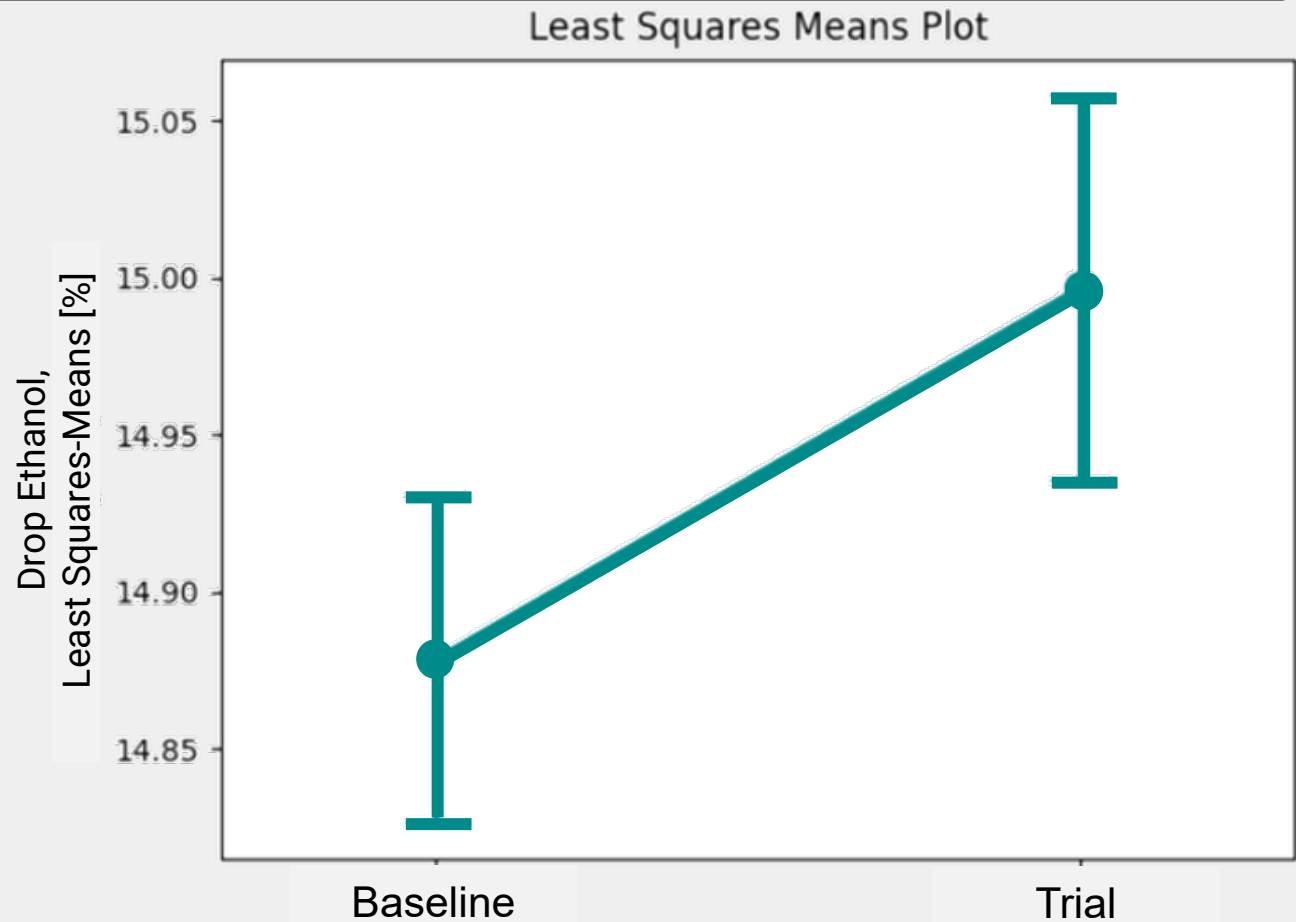
DROP ETHANOL & TOTAL ANTIBIOTICS per CIP PROGRAM



Calculating a Solids-Adjusted Ethanol

Use a Multiple Linear Regression Model to consider Firm Solids when analyzing drop Ethanol

- 1 **Check for significant interaction** between Firm Solids and time period in built model (considering *quality*)
- 2 **Check for** residual constant variance
- 3 **Check for** residual normality

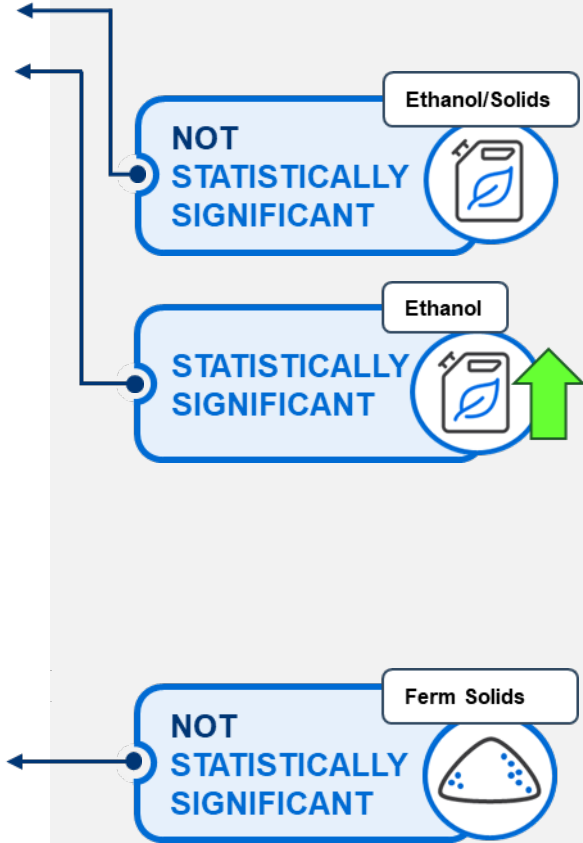


Why a Solids-Adjusted Ethanol



Used
Trimeta™ Fermentation
Enhancer

~ 1 Month



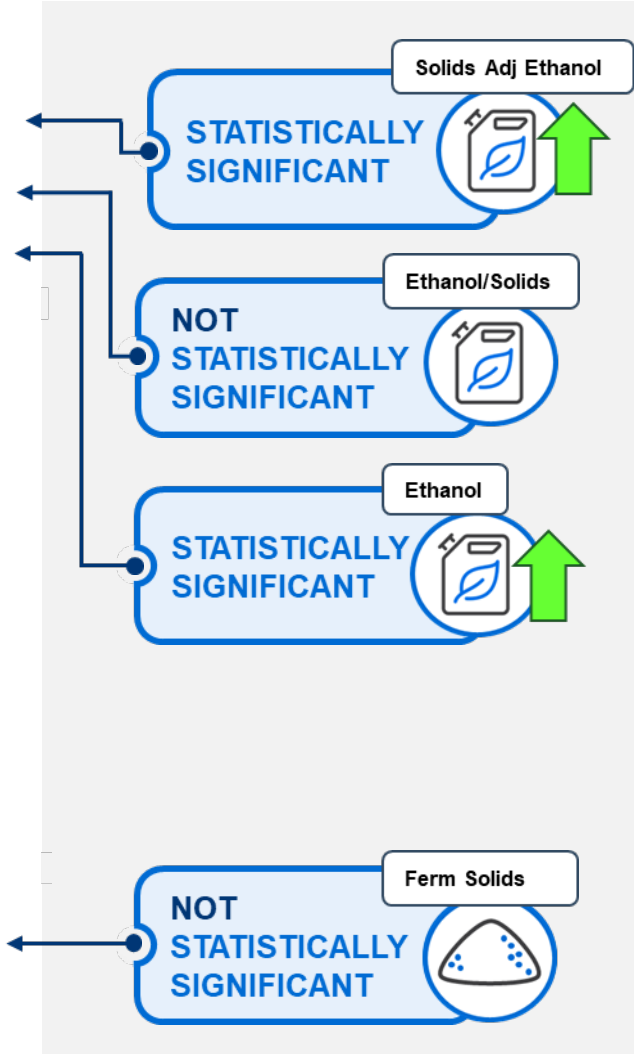
¹ Statistical significance is based on 90% confidence

Why a Solids-Adjusted Ethanol



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Trimeta™ Fermentation
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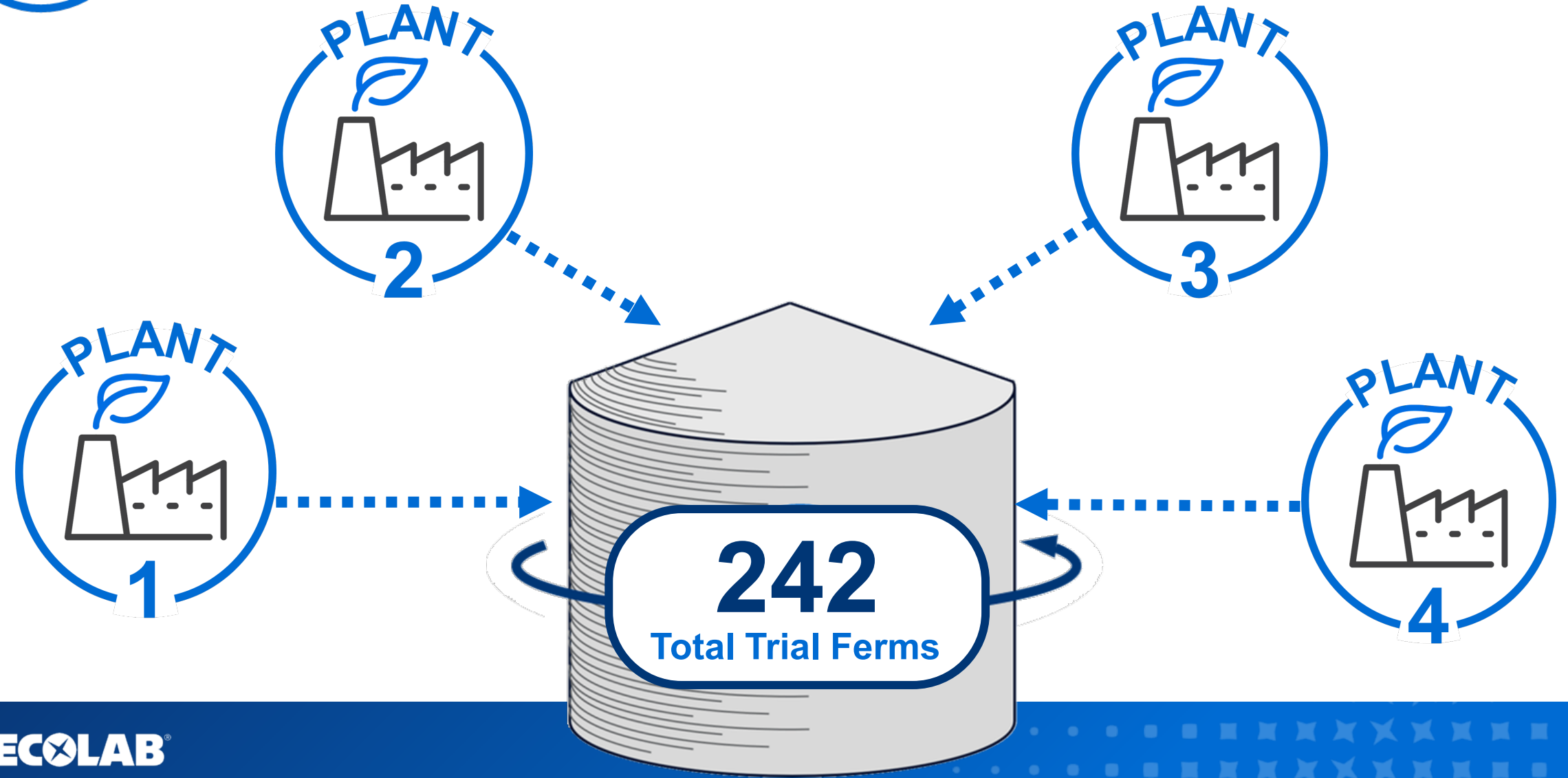


¹ Statistical significance is based on 90% confidence



Trimeta Fermentation Enhancer

PRODUCT PERFORMANCE in 242 trial ferm (across 4 sites)



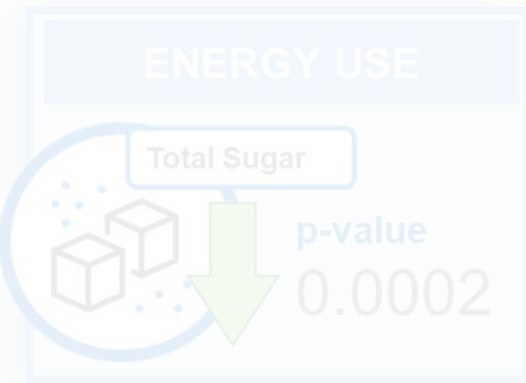
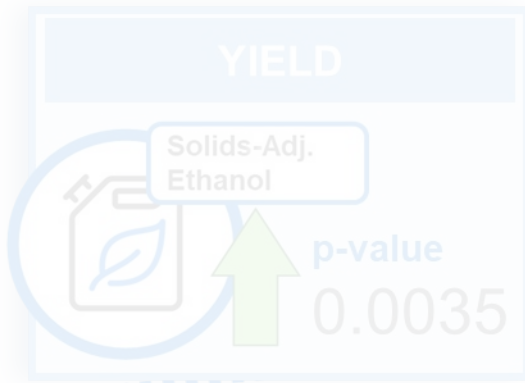


Trimeta Fermentation Enhancer

PRODUCT PERFORMANCE in 242 trial ferms (across 4 sites)



In a mixed effects model, with plant as random effect ...



Antibiotic Free Product

Help amplify DDGS' market value



Increase Ethanol Levels

Increase ethanol concentration at drop^{1,2}



Reduce Energy Use

Reduce sugar foulant sent to evaporators^{3,4}

1 The ethanol concentration at end of reaction, when considering process inputs (such as fermentation solids) was shown in trials to increase anywhere from 0.04 – 0.15 percentage points.
 2 Ethanol yield is defined as solids-adjusted increase in drop ethanol which was shown in trials to increase anywhere from 0.04-0.15 percentage points
 3 In trials there was a statistically significant drop in total sugar levels and a statistically significant increase in solids-adjusted drop ethanol levels compared to the baseline where antibiotics were used
 4 Energy reduction calculation based on impact of drop total sugars on the evaporator energy use.
 5 <https://www.epa.gov/pesticide-registration/antimicrobials-used-fermentation-fuel-ethanol-clarification-jurisdiction>

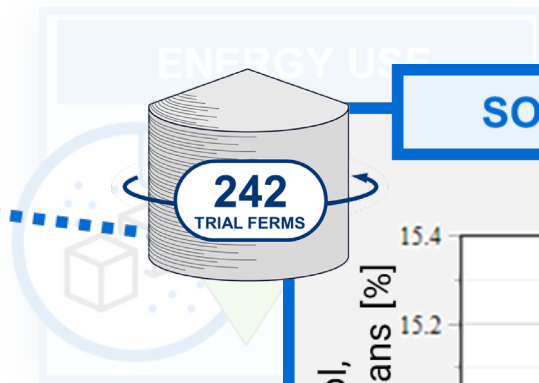
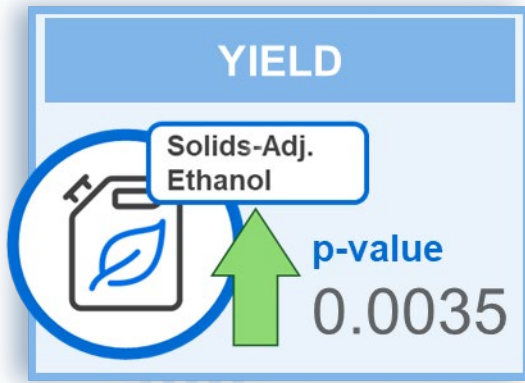


Trimeta Fermentation Enhancer

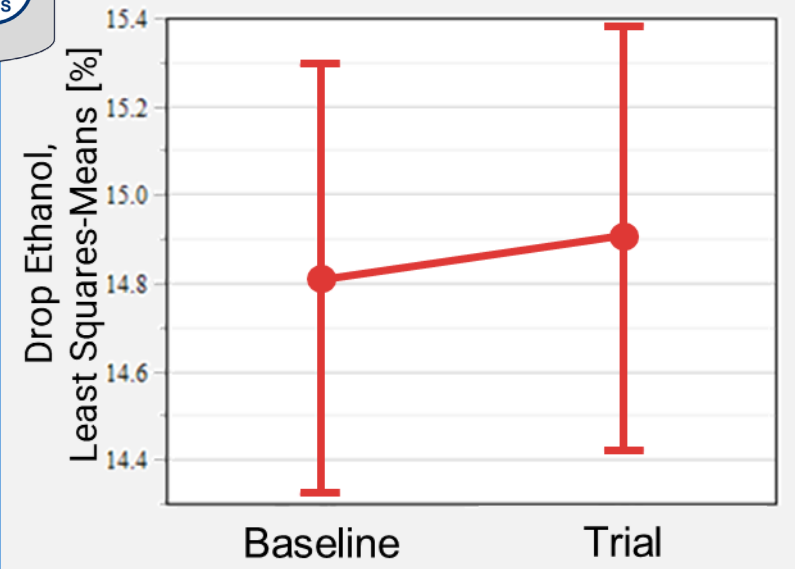
PRODUCT PERFORMANCE in 242 trial ferms (across 4 sites)



In a mixed effects model, with plant as random effect ...



SOLIDS-ADJ ETHANOL



Increase Ethanol Levels

Increase ethanol concentration at drop^{1,2}

Antibiotic Free Product

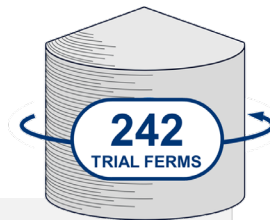
Help amplify DDGS' market value

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Trimeta Fermentation Enhancer

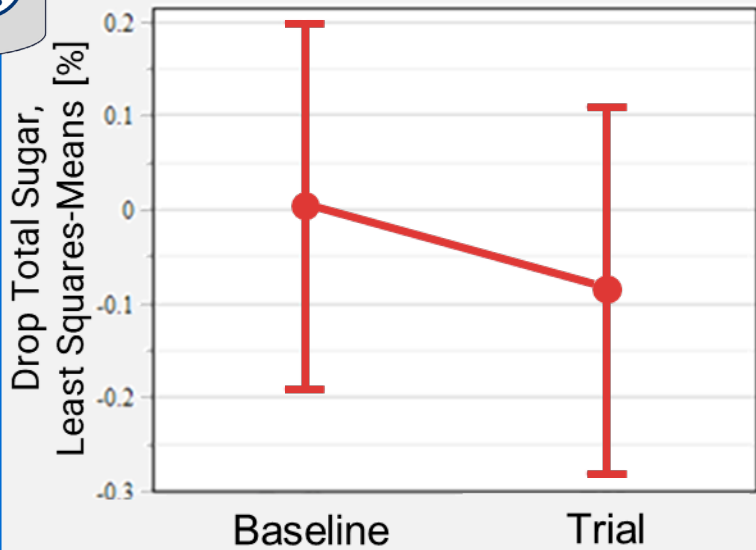
PRODUCT PERFORMANCE in 242 trial ferms (across 4 sites)



In a mixed effects model, with plant as random effect ...



DROP TOTAL SUGAR



ENERGY USE

Total Sugar

p-value 0.0002



Reduce Energy Use

Reduce sugar foulant sent to evaporators^{3,4}

Antibiotic Fr

Help amplify DDG

anol Levels

ethanol on a drop^{1,2}

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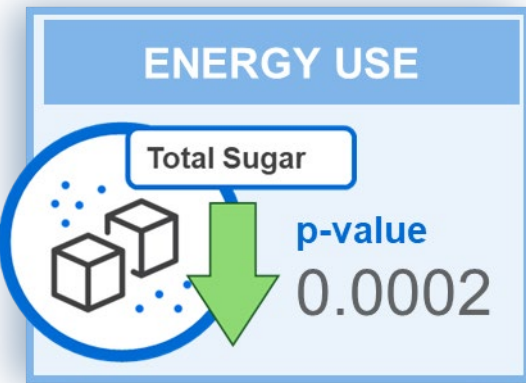
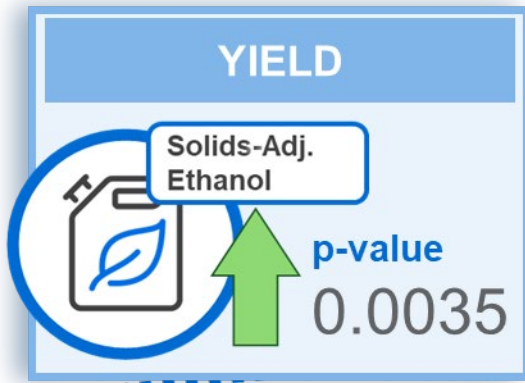


Trimeta Fermentation Enhancer

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In a mixed effects model, with plant as random effect ...



Antibiotic Free Product

Help amplify DDGS' market value



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Reduce Energy Use

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