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How the IRmadillo™ Improves Carbon Intensity scores

Key Words

- Carbon Intensity (CI) Scores
- Inline Process Analyzer
- Process Optimization
- FTIR Spectroscopy
- Real-Time Measurements
- Corn ethanol

Introduction

When working with Carbon Intensity Scores, sustainability means profitability. Achieving more efficient production through process improvements, enabled by the IRmadillo™, yields smoother processes, cleaner fuel and bigger returns.

Carbon Intensity (CI) scores account for emissions generated throughout the entire fuel life-cycle. Reducing the CI of a corn ethanol plant positions you to leverage rebates under the 45Z tax credit. The IRmadillo™ is perfectly placed to help across the process with key areas highlighted below in Fermentation, Distillation and Corn oil.

Increasing ethanol yield by 0.01 gallons/bushel can reduce CI scores by ~0.085 gCO_2 equivalent/MJ

If your plant is able to claim* you could be earning a rebate of ~$0.0018 per gallon of ethanol. For a plant producing 100 million gallons per year, this equates to $180,000 annually

* If operating below a CI score of 47.4 gCO_2 equivalent /MJ while meeting prevailing-wage + apprenticeship requirements

Using the IRmadillo™ to improve fermentation yield

Real-time monitoring of sugars and alcohols during fermentation provides valuable insights into process performance, allowing operators to fine-tune conditions for maximum ethanol yield. The IRmadillo™ can facilitate process improvements, reducing the need for guesswork.

Unexpected bacterial infections can disrupt the delicate balance by out-competing the yeast, thereby lowering ethanol yield. Mitigating these infections often requires interventions that affect CI scores. The IRmadillo™ can aid detecting early spikes in by-products, such as lactic acid and acetic acid, enabling a quicker and targeted response that helps preserve fermentation efficiency.

Maintaining optimal nutrient levels is crucial for robust yeast performance. Real-time monitoring of FAN (Free Amino Nitrogen) and PAN (Primary Amino Nitrogen) using the IRmadillo™ can be a proactive step in ensuring that the fermentation operates within its ideal nutritional window. In turn, it can optimize chemical usage, minimize unnecessary energy expenditure and improve ethanol yield – all key factors in lowering CI scores.

Using the IRmadillo™ to optimize urea, ammonia and enzyme dosing

Balanced dosing of urea, ammonia, and enzymes plays an important role in achieving favourable CI scores. Early in the production process, enzymes break down corn starch into fermentable sugars. The IRmadillo™ can support producers by monitoring sugar concentrations in real time, ensuring that starch conversion is both efficient and consistent.

At key junctures during the ethanol process, urea and ammonia are added to boost microbial activity, which in turn enhances process efficiency. Optimized dosing of enzymes, urea, and ammonia reduces the need for additional feedstock and minimizes energy and resource inputs, thereby lowering the overall CI score.

IRmadillo™

Elevate the game, supercharge sustainability

Real-time, chemical concentration data is an invaluable asset for ethanol producers, offering continuous process insights that enable optimization.

The IRmadillo™ can meet ethanol plants' needs - an inline FTIR process analyzer engineered with no moving parts. Exceptionally robust and reliable for industrial applications.

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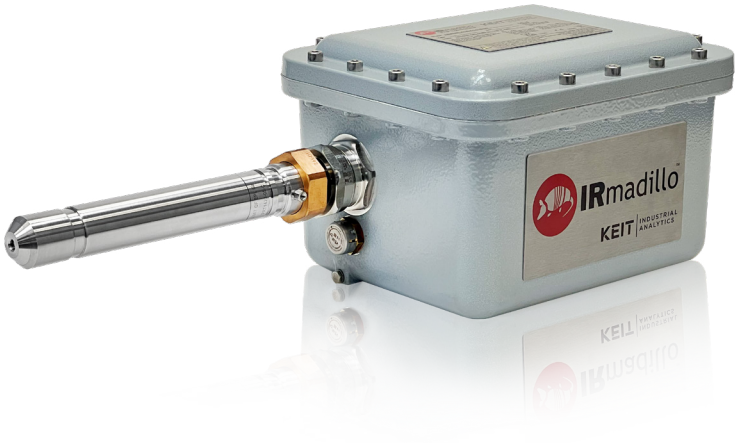
Using the IRmadillo™ to optimize distillation

Distillation is a crucial refinement stage but an energy-intensive process. Consequently, any inefficiencies not only have a pronounced impact on overall CI but also pose significant safety risks that can adversely affect downstream processes. The IRmadillo™ can help minimize ethanol losses in the beer bottoms stream and prevent overdriving the column. Additionally, it can also support producers in meeting rigorous quality standards by continuously tracking impurities in the column tops.



Using the IRmadillo™ to measure corn oil

In the evaporators, water is removed from thin stillage, allowing efficient extraction and measurement of corn oil naturally present in the corn kernel. Evaporator performance is affected by the feed's solids content – higher TDS% (Total Dissolved Solids) reduces energy efficiency and increases fouling risks, while low TDS% can lead to inefficiencies in the dryers. The recovered corn oil is not merely a by-product; it can be used to produce value-added products with lower associated green house gas emissions, like biodiesel. The net CI score of the ethanol plant can be reduced using the IRmadillo™ to monitor TDS% and measure the amount of corn oil recovered in the evaporators.

Conclusion

Ultimately, through advanced real-time monitoring tools like the IRmadillo™, corn ethanol producers can improve CI scores – by enabling better control over enzyme dosing, targeting nutrient management during fermentation, achieving energy-efficient distillation and optimizing the evaporators' performance – paving the way for a more sustainable and economically robust renewable fuel industry.

Keep in Mind

The IRmadillo™ can be calibrated to measure a large range of chemicals at the same time. Due to the versatility and robustness of the IRmadillo, ethanol plants can leverage its potential to optimize key processes and improve CI scores. Even small changes can make a difference!

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