

# **RFS2 and the Impact of Corn Oil Extraction on the Ethanol Industry**

Presented by  
GreenShift Corporation  
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# *The RFS2 Story*

- RFS2 history to date
- The role of corn oil extraction in RFS2
- The RFS2 amendment process
- Achieving RFS2 compliance with corn oil extraction
- Uses of extracted corn oil

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# ***RFS2 History***

- RFS1 became a Final Rule on May 1, 2007:
  - Effective September 1, 2007
- RFS2 became a Final Rule on March 26, 2010:
  - Amended as a Direct Final Rule May 10, 2010
  - Effective July 1, 2010
  - Subject to further amendments, if adverse comments were received by June 9, 2010

# ***Corn Ethanol Targets in RFS2***

- RFS1 set a total volume use requirement for all renewable fuels added to gasoline:
  - 7.5 billion gallons
  - By 2012
- RFS2 sets separate requirements by fuel type, for a total of 36 billion gallons by 2022.
- Targets for corn ethanol are:
  - No minimum in 2010
  - 15 billion gallons projected in 2022

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# ***What role does corn oil extraction play in EPA's RFS2 ?***

- RFS1 did not reference corn oil extraction.
- Subsequently, EPA recognized corn oil extraction systems were being installed to produce a new, environmentally beneficial byproduct.
- RFS2 thus featured corn oil extraction as a means to reduce energy use and thereby decrease GHG emissions compared to gasoline.
- RFS2 also listed corn oil extraction as an “Advanced Technology.”

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# ***What is the composition of extracted corn oil ?***

- Extracted corn oil is similar to food-grade corn oil and can be refined for culinary use.
- The corn oil, however, has a higher value for other uses such as a feedstock for biodiesel and as a base for oleochemicals such as biopolymers.
- In addition, extracted corn oil has concentrations of some constituents that have high value as nutritional supplants and pharmaceuticals.

# ***How green is corn oil extraction?***

- Corn oil extraction:
  - Decreases the mass of DDGS to be dried,
  - Increases heat transfer in the dryer,
  - Improves DDGS flow characteristics and low fat DDGS sales,
  - Produces a new product useful for additional renewable fuel production or the creation of oleochemicals, and
  - Decreases corn ethanol life cycle GHG emissions from 7 to 25 percent.

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# ***What are the benefits of corn oil extraction under RFS2?***

- Corn oil extraction has contributed to EPA's ruling that corn ethanol is a renewable fuel.
- Corn oil extraction reduces the energy used per gallon of ethanol, although GreenShift believes EPA has underestimated the savings.
- Corn oil extraction produces a new product, which has economic and environmental benefits.

# ***Under what conditions does a corn ethanol facility produce a “renewable fuel?”***

- A “Renewable Fuel” is one that is produced with attributable greenhouse gas (“GHG”) emissions that are at least 20% less than the base gasoline.
- Existing plants are grandfathered even if they do not meet this requirement.
- New or expanded ethanol facilities must use technologies designed to achieve the 20% standard if they are to produce a renewable fuel.

# ***What are the impacts of EPA's recently proposed amendments to RFS2?***

- On May 10, 2010 EPA issued a Direct Final Rule amending RFS2.
- Correcting mistakes and omissions, EPA added two changes affecting corn oil extraction:
  - A definition of corn oil extraction was added.
  - The degrees to which Advanced Technologies, including corn oil extraction, must be implemented were clarified.

# ***What is the significance of the new definition of corn oil extraction?***

- EPA defined corn oil extraction as:

*Corn oil extraction means the recovery of corn oil from the thin stillage and/or the distillers grains and solubles produced by a dry mill corn ethanol plant, most often by mechanical separation.*

- The definition includes the term “and/or” when referring to the process streams where corn oil is extracted.

# ***What is the significance of the new wording of corn oil extraction as an Advanced Technology?***

- EPA added language to set a minimum degree for the use of a technology in order for it to be termed “Advanced.”

Corn oil extraction that is applied to all the thin stillage and distillers grains and solubles produced by the ethanol production facility.

- This wording sets the requirement that all thin stillage and all DGS must be processed for corn oil extraction to be an Advanced Technology.

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# ***When does an ethanol facility need to use an Advanced Technology?***

- Corn ethanol production using conventional technology does not qualify as a renewable fuel under RFS2.
- Ethanol facilities in existence, however, are grandfathered, except if their production exceeds their permitted capacity. Then:
  - the added fuel does not qualify as renewable, unless, the facility uses a mixture of DGS drying and Advanced Technologies under one of three scenarios, which vary by the amount of DGS that is not dried.

# ***What are the scenarios under which a new or expanded corn ethanol plant can produce a renewable fuel?***

To generate RINs from corn ethanol:

1. Use natural gas and at least two Advanced Technologies.
2. Use natural gas, at least one Advanced Technology, and dry no more than 65% of DGS.
3. Use natural gas and dry no more than 50% of DGS.

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# ***What are the EPA listed Advanced Technologies?***

- Corn oil fractionation
- Corn oil extraction
- Membrane separation
- Raw starch hydrolysis
- Combined heat and power

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# *How do the definitions affect the use of corn oil extraction?*

- As written, corn oil extraction is an Advanced Technology if all the post-fermentation process flows are used in extraction.
- Comments have been made to EPA by ethanol facilities, trade associations and GreenShift on the RFS2 rulemaking to change the definitions to match how an ethanol facility actually works and set standards that support corn ethanol.

# ***When will the amendments to RFS2, proposed May 10<sup>th</sup>, become final?***

- The amendments of May 10, 2010 will be final on July 1, 2010, except for those that receive negative comments.
- Disputed rules will be withdrawn to be finalized at a later date in response to the comments.
- EPA may reopen specific sections for further comment.

# ***How do the RFS2 amendments affect corn oil yields?***

- Although EPA does not set a limit in RFS2 on how much corn oil must actually be extracted, EPA's analysis of future corn oil production leads to the expectation of about 1.4 pounds of corn oil per bushel from the average plant using Advanced Technologies.
- Currently, extraction of corn oil from thin stillage alone averages less than a 1/3 of the oil, corresponding to about 0.5 pounds of corn oil per bushel of corn.

# ***What are the options to modify the Advanced Technology definition of corn oil extraction?***

- EPA may remove the requirement that corn oil extraction must be applied to all post-fermentation process streams, if a minimum extraction rate is set, such as 0.7 pounds of corn oil per bushel of corn processed.
- Corn oil extraction from whole stillage, such as by GreenShift's Method II, may be considered a separate and distinct second Advanced Technology, reaching the 1.4 pound level.

# ***What are the uses for corn oil?***

- Corn oil is an excellent and badly needed feedstock to make biodiesel.
- Triglycerides, the predominant ingredient in corn oil, are also valuable as chemical feedstocks, again replacing counterparts based on petroleum.
- As new uses are discovered and commercialized, corn oil can only increase in value.

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