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RENEWABLE DIESEL FROM SOYBEAN OIL

Use of Renewable Diesel [RD–also known as hydro-treated vegetable oil] has become a hot topic in this country because of its capability to replace petroleum-based diesel fuel. This biofuel is quite different from biodiesel because it is produced by a different production process that yields a hydrocarbon product that is molecularly identical to standard fossil fuel diesel. Thus, RD can be used in any diesel engine with no required modifications to that engine–i.e., it can be used as a "drop-in" fuel. Also, it does not have to be blended with petroleum-based diesel to maintain performance in standard diesel engines. RD emits significantly less emissions than standard fossil fuel diesel and gasoline. It is easier to refine than gasoline, has the potential to power myriad commercial vehicles, and can replace coal and other fossil fuels for generating electrical power.

A Sept. 2022 report titled "Renewable Diesel Projected to Turbo Charge Biofuel Growth" by K. S. Zuckerberg, Lead Economist with CoBank, provides positive news for U.S. soybean producers as they look for new markets for their soybeans. Key points from that report follow.

- Biofuels such as RD are liquid fuels that are produced from plant feedstocks, and are being promoted to reduce the use of fossil fuels.
- Consumption of energy from renewable sources has increased across the globe, and this will likely continue as more governments mandate a shift to less carbon-intensive energy sources.
- All current and proposed RD projects will require the U.S. to vastly increase production of the feedstocks used for RD production, and the most available and important feedstock source will be soybean oil.
- A key element of the 2022 Inflation Reduction Act that was enacted by the U.S. Congress is the subsidizing of private sector investment in domestic production of clean energy.
- Ethanol [alcohol fuel produced from corn feedstock] and biodiesel [diesel fuel made by processing vegetable oils and other fats] are biofuels that have to be blended with petroleum gasoline and petroleum diesel, respectively. Since RD is chemically similar to petroleum diesel, it does not have to be blended with traditional petroleum diesel. It can be used in any diesel engine with no required modifications to that engine–i.e. it can be used as a "drop-in" fuel.
- Electric vehicle sales are increasing; however, production of batteries needed to power these vehicles is being hampered by high elemental lithium prices and supply chain issues.
- RD is a "greener" fuel [carbon intensity score of 41] than petroleum diesel [carbon intensity score of 90], and thus produces lower greenhouse gas emissions.
- Of all the crops that can provide oilseeds for RD production, soybeans occupy by far the largest acreage in the U.S. Thus, it is the crop that is presently considered the primary source of feedstock for U.S. RD production.
- Growth in U.S. RD production is expected to rise from today's production of approximately 1 billion gallons to 6.5 billion gallons by 2030 [barring unforeseen limitations], and this will require 3.4 billion new bushels of soybeans. Using a projected U.S. soybean yield estimate of 51.9 bu/acre, and assuming the stoppage of all soybean exports [projected to be 2.5 billion bushels in 2030], this would require an additional 17.9 million U.S. soybean acres to produce the 927 million bushel shortfall needed to meet the projected RD demand.
- Acres that would have been devoted to corn will likely be the primary source of new soybean acres needed to meet projected RD demand. This may not be an issue if electric vehicle adoption reduces the need for corn-based ethanol (historically, ~35% of U.S. corn production has been used for ethanol production), which in effect would lower the needed U.S. corn acres.

According to information in a Nov. 2022 article titled "Economist's Angle: Soybean Processing Growth is Crushing It" by Scott Gerlt, ASA Chief Economist, the soybean processing industry plans to grow significantly over the next few years. Much of this planned expansion is in response to the anticipated growth in demand for RD. Announced plans for 23 new or expanded crushing plants in the U.S. would increase crush by 34%, and would add about 750 million bushels per year in crush capacity. Of course, this planned expansion of U.S. crush capacity that is based on growing RD production will only come about as the RD industry grows and barring U.S. government restrictions on RD production. The locations, capacities, and timelines of these planned U.S. plant expansions are presented graphically in the above-linked article.

An article titled "Soybean crush is expanding" by Ed Usset provides further commentary on what the use of soybean oil as a feedstock for RD production may mean for soybean and grain markets in coming years. Key points from that article follow. 1) New construction or expansion for the soybean crushing industry is estimated at 4 billion dollars to produce an additional 600 million bushels of crushing capacity. 2) Assuming a national average soybean yield of 53 bu/acre means that an additional 11.3 million acres of soybeans will be needed to satisfy this

increased demand. 3) There is much conjecture about what crop acres will be displaced by the additional soybean acres that will be needed to meet the demand for soybean feedstock for RD production. In addition to current corn acres that may be impacted as stated above, it is likely that current acres devoted to wheat and other small grains, plus acres currently devoted to cotton, will be impacted as well. 4) In the coming years, RD likely will influence every grain market in the U.S.

Since soybean oil is now and is projected to be the primary feedstock for RD production, U.S. soybean producers are in a position to play a major role in reducing greenhouse gas emissions by providing the raw material for producing RD fuel that has a lower carbon footprint than petroleum diesel. This will result in an increased demand for soybeans, and will likely cause a shift to more soybean acres in this country in order to meet this increased demand for RD feedstock. All of this should be great news for all U.S. soybean producers [this may be tempered by information in the following-cited article].

An article titled "Renewable Diesel's Uncertain Future" by Jacqueline Holland covers how the planned production of RD may or may not be affected by factors that could alter the timeline of the planned expansion of crushing plant capacity. Pertinent points from this article follow.

- Over the past few years, processing companies have been announcing plans to expand crushing capacity to increase their capability for producing RD.
- The ripple effect from increased production of RD from soybean oil would include increased production of soy meal, which would in effect make animal feed cheaper.
- Rising interest rates, high construction costs, skilled labor shortages, and lack of government programs that could incentivize RD production will likely contribute to a delay in the building of the facilities needed to produce RD.
- Since RD does not have to be blended with fossil-fuel diesel, it should not be affected by EPA's recently-announced biodiesel production volume mandates that are cited in the article. Producers are encouraged to read the above-linked article to learn how RD production may or may not be affected by government policies and economic factors..

MAR. 2024 UPDATE

Information in a Feb. 2024 article titled "Serious Oversupply looms for renewable diesel" paints a gloomy picture for RD producers in 2024 and beyond barring a change in the Renewable Fuel Standard [RFS] mandate of 4 to 4.5 billion gallons/year set by the U.S. government. This is already below the U.S. capacity to produce biodiesel and RD, and will likely result in some crushing and processing plants closing or reducing production, as well as plans for new plants being shelved. This is further exacerbated by RD's being more expensive to produce than petroleum diesel.

JUNE 2024 UPDATE

An article titled "FAME: Biodiesel, Renewable Diesel, and Biomass-Based Diesel Feedstock Trends over 2011-2023" by authors Gerveni, Irwin, and Hubbs provides the following information and data that pertain to the composition of feedstock shares used in the production of biomass-based diesel.

- FAME is the acronym for Fatty Acid Methyl Esters, which have physical characteristics that are closer to those of fossil diesel fuels than those of pure vegetable oils. The main feedstocks for FAME are oil seeds, used cooking oil, and waste animal fat. Click here for a FAME Fact Sheet.
- FAME biomass-based diesel and RD are the two main types of biomass-based diesel fuels that are used to comply with the U.S. RFS mandates. The production of these two fuel types uses the same feedstocks, but the different production processes used to produce them result in two different fuels.
- According to data in the article, yellow grease [vegetable and animal fats and oils, and used cooking oil] and corn oil are cutting into soybean oil's dominant position as the primary feedstock for RD. This is because of the lower carbon intensity [CI] scores assigned to RD made from yellow grease and corn oil feedstocks, and RD feedstock use is skewed more towards feedstocks with low CI scores.
- For RD, yellow grease is the most-used feedstock at 29%, followed by soy and corn oil at 27% and 15%, respectively.
- Soybean is the most-used feedstock for biodiesel at 57%, but the production of biodiesel has declined in recent years while production of RD has increased significantly.
- The above-cited article contains details that support the above summary statements, plus links to other articles that provide additional information about feedstocks used for biomass-based diesel production.

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