



ETHANOL SECTOR OUTLOOK

Readjustment Today, Rationalization Tomorrow

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Key Points:

- Earlier this year, the U.S. ethanol sector experienced a catastrophic demand shock stemming from reduced gasoline consumption as government authorities enacted stay-at-home restrictions designed to contain the spread of the coronavirus. The industry initially responded by cutting production nearly in half between mid-March and mid-April.
- Motor gasoline demand has begun to recover. While weekly ethanol production has rebounded from the April trough, we do not expect a full recovery in demand in the near-term due to high unemployment, reduced attendance at public gatherings, and more people working from home.
- We believe that lower run-rate fuel demand coupled with a rise in excess capacity (currently 1 billion gallons rising to 2.4 billion or more in 2021) will result in some rationalization of capacity. Weaker players with less efficient technology, higher leverage, high operating costs, and an inability to attract new investment capital will be forced to exit through consolidation or plant closures.
- By 2025, we expect the U.S. ethanol industry to undergo a three-stage transformation resulting in fewer, well-capitalized players with diverse revenue sources. These could include current co-products (e.g., distiller’s grain for feed, corn oil for biodiesel and liquid carbon dioxide for freezing and chilling, and carbonated beverages), as well as other products being developed (e.g. high protein distiller’s grains or further distillation for enhanced product purity).
- Two factors could derail this transformation: the combination of an ethanol industry-wide bailout and a faster-than-expected economic recovery. Low interest rates, which are expected to persist for some time, would allow weak operators to continue operating without the need to transform.

Inside this Issue...

<i>Introduction</i>	2
<i>The U.S. Ethanol Complex Began 2020 with 1 Billion Gallons of Excess Capacity</i>	3
<i>Exports May Have Already Peaked</i>	4
<i>Brazil: A Formidable Export Competitor with Several Advantages</i>	5
<i>Average Operating Margins Peaked in 2014; However, Top-Tier Operators Have Performed Well</i>	6
<i>Declining Input Costs Help Operating Margins</i>	7
<i>Sharp Demand Drop in March Led to Major Production Cuts in April</i>	8
<i>Ethanol Production Has Begun to Recover, Incrementally, Though it Remains Below Average</i>	9
<i>Industry Excess Capacity Estimate to Rise to 2.4 billion gallons in 2021</i>	10
<i>Co-Products Offer Significant Revenue and Earnings Diversification</i>	11
<i>Excess Capacity Plus Export Competition Will Force the Industry to Transform</i>	12
<i>What it Takes to be an Industry-Leading Ethanol Player</i>	13
<i>Conclusion and Outlook</i>	14



Introduction

The economic shock in spring 2020 resulting from COVID-19-led economic shutdowns was unprecedented, causing ethanol demand destruction. The battering continued with the crude oil and gasoline supply shock led by Saudi Arabia and Russia. Ethanol production dropped almost 50% from mid-March to mid-April. The industry was already ripe for a correction; after five years of incremental plant expansion and improving productivity, the U.S. ethanol complex started this year with 1 billion gallons of excess capacity.

The softening export picture helped set the stage for today's situation. With a weak currency and access to cheap sugar for its ethanol production, Brazil has emerged as a formidable export competitor that is claiming U.S. global ethanol market share. While Brazil and Canada are the top two importers of U.S. ethanol, their imports are declining. Data suggest U.S. fuel ethanol net exports peaked in 2018.

With a smaller domestic market (at least in the near-term) and export competition, operators must lean into what they actually can control: inputs and outputs. Declining costs for corn and natural gas have helped buffer operating margins; those

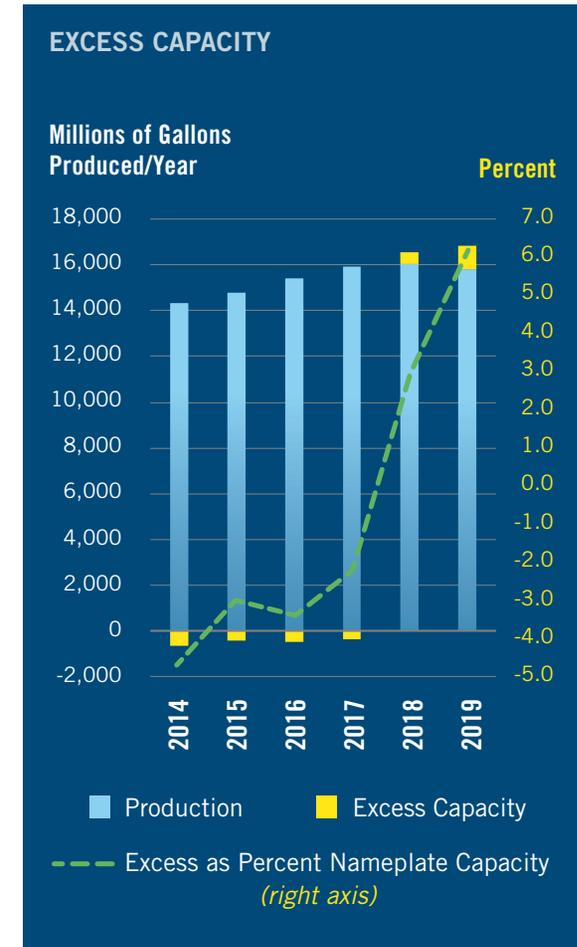
operators that can buy corn when basis is cheap have an advantage, as do those who've adopted technology and high-efficiency production. On the output side, co-products offer revenue and earnings diversification. These co-products, which include liquid carbon dioxide for beverage customers and distillers' grains, feed, and oil, represent \$7 billion or 25% of U.S. ethanol output.

Bottom line, the ethanol sector as a whole is set to restructure; the question is to what degree. COVID-19 has changed our lives for the foreseeable future. Reduced attendance at public gatherings, continued high levels of unemployment and more people working from home and not commuting has led us to believe ethanol demand may only recover to 85% to 95% of 2019 levels. If we are correct, industry excess capacity in 2021 could be closer to 2.4 billion gallons. The reality of overcapacity and evaporating demand will force the industry to transform its business model to create and capture greater value.

The U.S. Ethanol Complex Began 2020 with 1 Billion Gallons of Excess Capacity

By 2019, the industry had built excess capacity from plant expansions and technology productivity improvement.

U.S. ethanol production totaled 15.8 billion gallons in 2019, almost perfectly matching total consumption. (Total consumption is defined as domestic consumption of 14.6 billion gallons in 2019 plus net exports of 1.2 billion gallons in 2019.) However, the industry finished the year with over 1 billion gallons of excess capacity, equating to 6.2% of nameplate capacity. The culprit? The increasing number of ethanol producing plants (up 7%) and technology-driven productivity gains drove a 23% increase in total nameplate capacity between 2014 and 2019, compared to a much lower 11% increase in total consumption. An unexpected drop in net exports last year curtailed the upward growth rate in consumption, and thus was a key contributor to the rise in excess capacity.

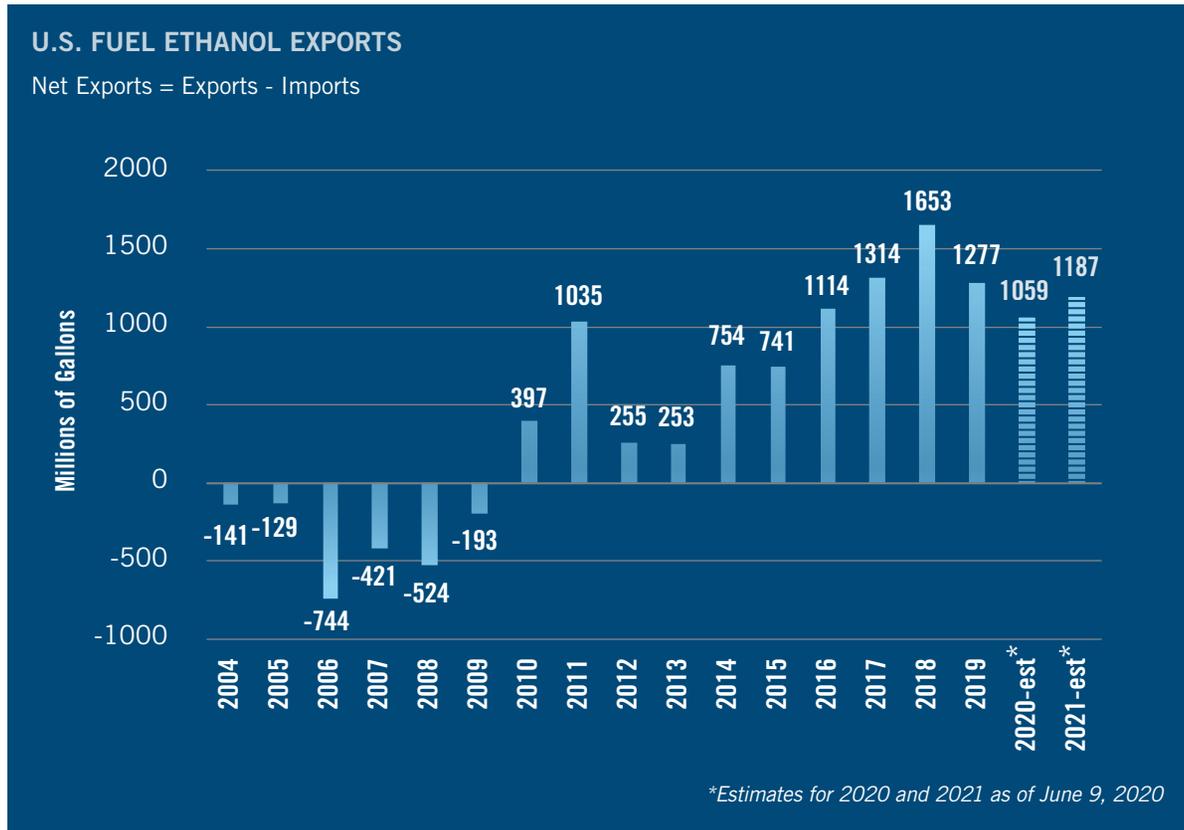


Source: EIA STEO Report, The ProExporter Network (PRX) and Renewable Fuels Association (RFA)

Exports May Have Already Peaked

Strong export growth would help reduce the aforementioned 1 billion annual gallons of excess nameplate capacity, but current projections do not support such an outcome.

Declining exports to Brazil and Canada caused last year's 23% drop in net exports. Net exports are expected to drop by 21% in 2020 and then grow by 31% in 2021, based on analysis by The ProExporter Network. While favorable, the large percentage positive growth rate in 2021 equates to only modest growth compared to 2019 and would be well below the peak of net exports of 1.653 billion gallons in 2018. This leads us to wonder whether we have already seen a peak in U.S. ethanol exports.

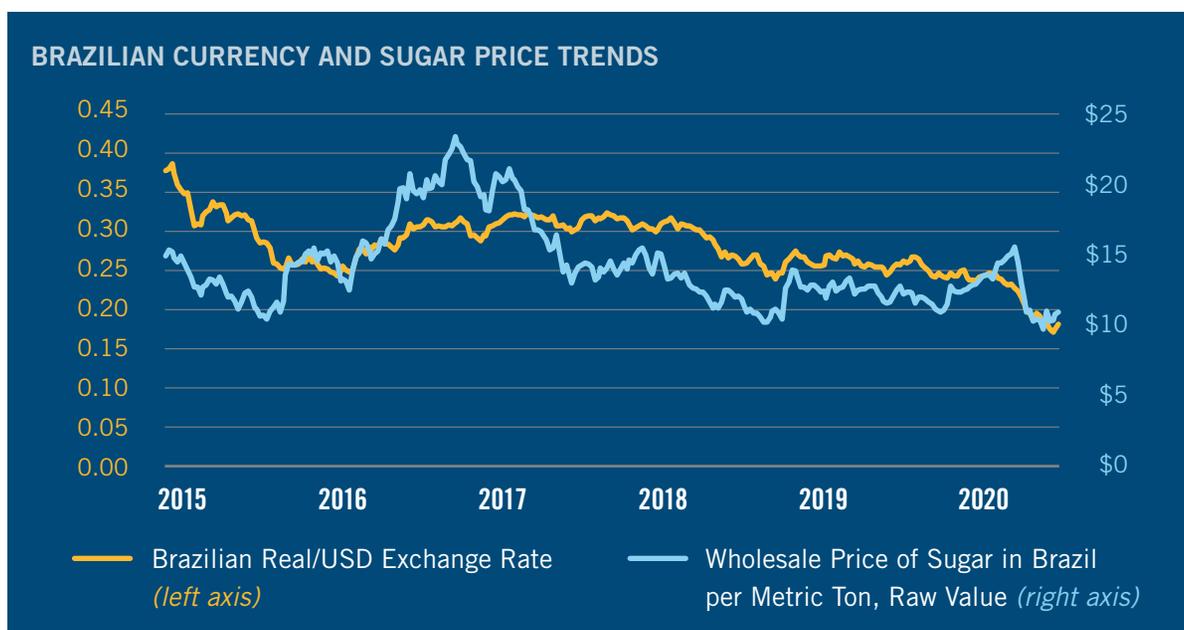
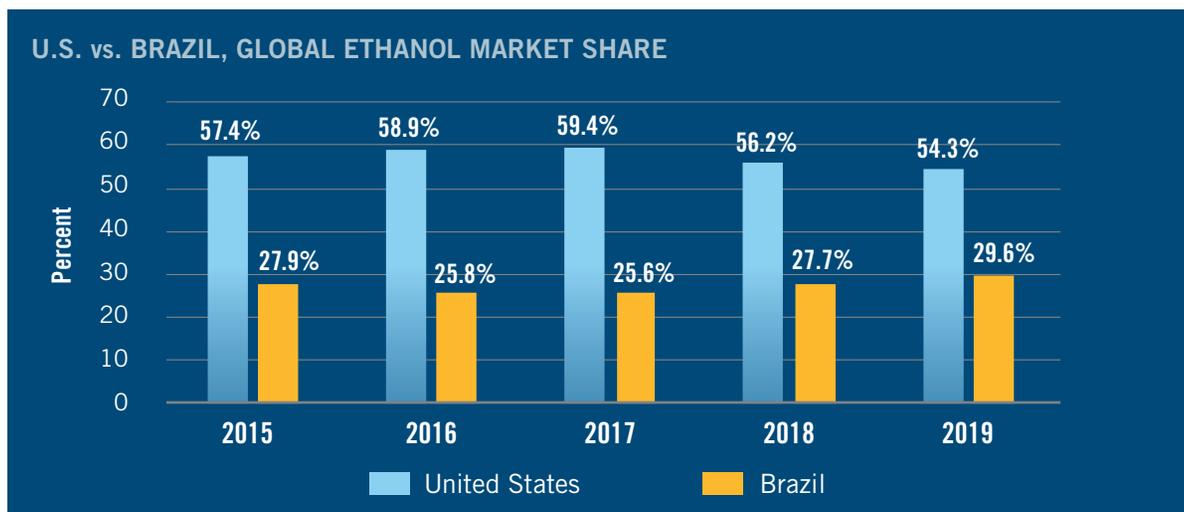


Source: EIA and The ProExporter Network

Brazil: A Formidable Export Competitor with Several Advantages

While Brazil still imports U.S. ethanol, it has become a formidable export competitor with several advantages – namely, increasing trade access to China, a weak currency and access to cheap cane sugar, which it uses to make ethanol. Brazil's ability to be more cost competitive is challenging the U.S.' long-term aspirations to increase ethanol exports.

In 2019, world ethanol production totaled 29.1 billion gallons, with the U.S. and Brazil accounting for 84%. Brazil has been growing production at a faster clip than the U.S. over the past five years (2015-19), averaging 5.2% vs. 2.0%, and faster than total world production growth of 3.0%. The result is in an incremental increase in market share for Brazil and decrease for the U.S. during this period.

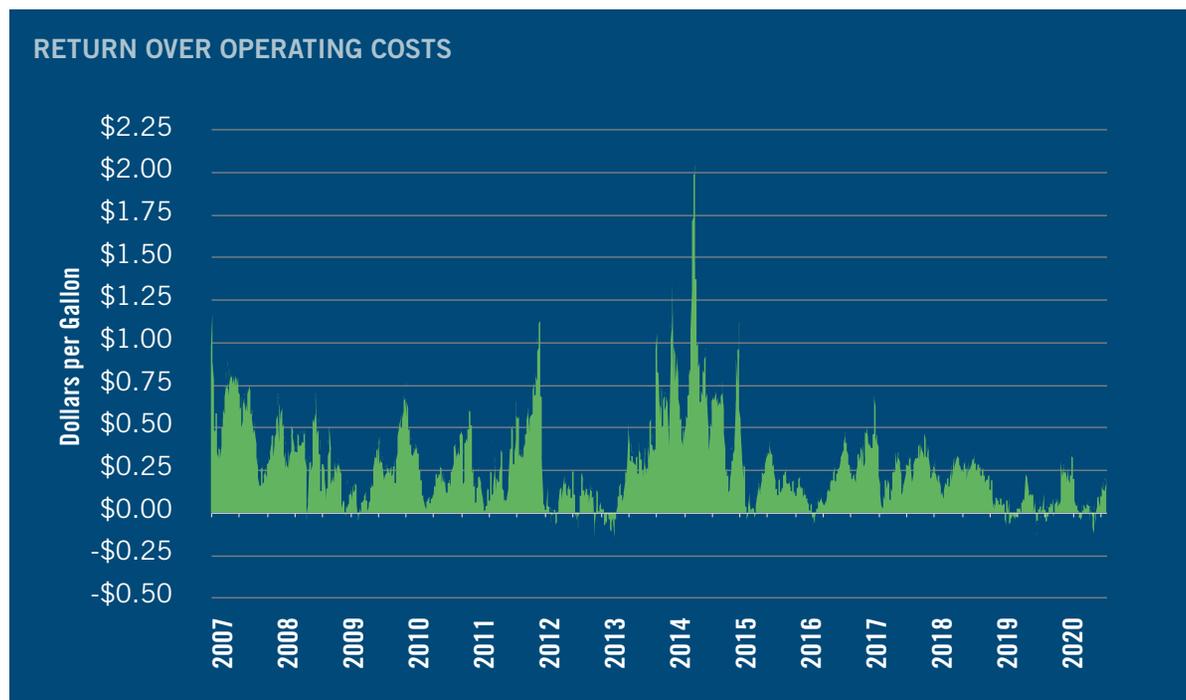


Sources: The Renewable Fuels Association, Barchart.com

Average Operating Margins Peaked in 2014; However, Top-Tier Operators Have Performed Well

While ethanol industry margins have been low in recent years, top-tier operators have continued to earn attractive margins.

Consolidated industry operating margins have been declining since the 2014 peak, and are currently 15 cents per gallon vs. the historical average of 28 cents. This is an average, however, and like other industries, ethanol has top, middle and bottom tier performers. Based on proprietary data, we note that top-tier and many middle-tier operators have consistently produced positive operating margins, or at least positive cash flows, over the past five years (pre-COVID-19). These operators' margins have been driven by their close proximity to corn, their ability to opportunistically buy basis cheap and their use of advanced processing and fermentation technologies to drive higher yields. In our opinion, bottom tier producers that have been under pressure in recent years will not be able to manage through the current COVID-19 environment without access to additional capital, government support, and/or a significant uptick in demand following a re-opened U.S. economy and greater export activities.

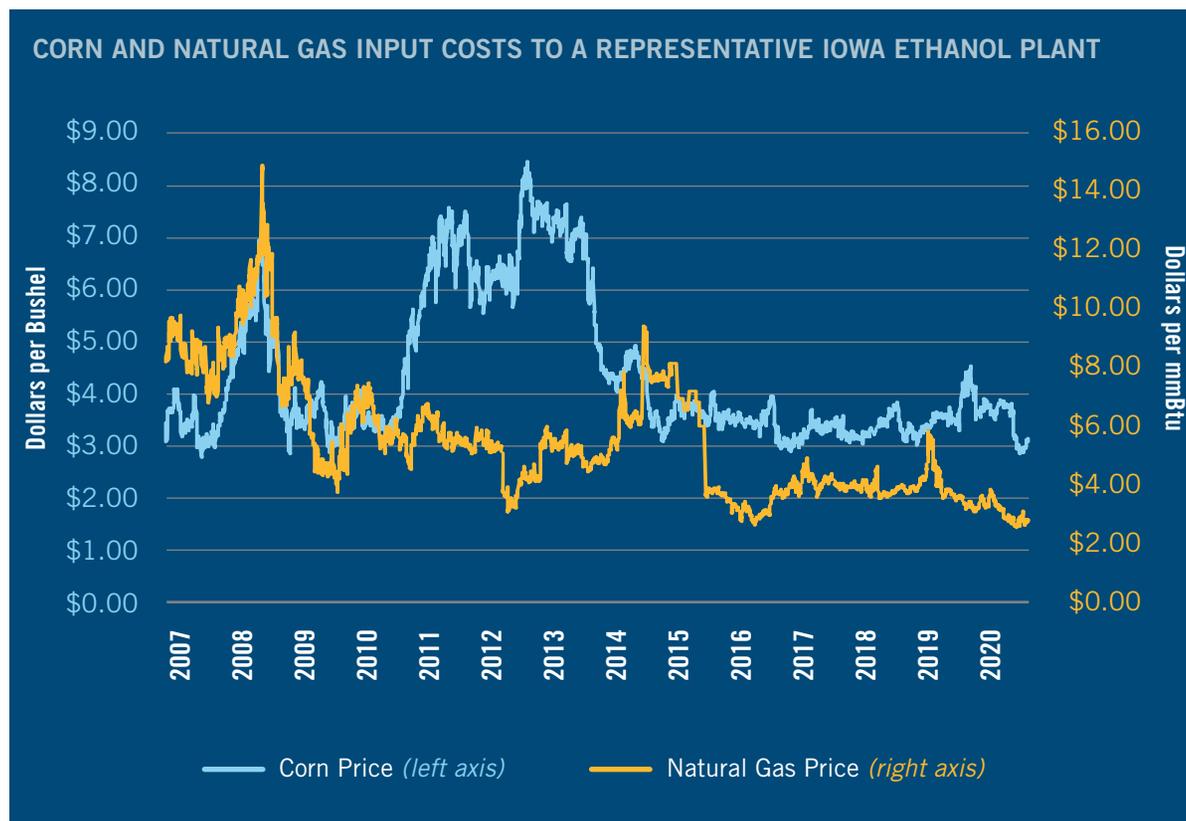


Source: Center for Agricultural and Rural Development (CARD), Iowa State University

Declining Input Costs Help Operating Margins

In any business with a commoditized non-differentiated product (like ethanol), the most successful operators win by being highly efficient with sufficient scale that can realize margin gains as input costs decline.

Declining input costs help operating margins. Costs for corn, the primary feedstock for U.S. ethanol, and natural gas fuel have been declining over the past seven years. This has helped cushion the aforementioned pressure on industry operating margins, while providing a margin tailwind for top-tier producers located in the Midwest that have the advantage of buying local corn when basis is cheap. While ethanol plants in other regions can also “buy cheap,” transportation costs can significantly reduce that advantage.

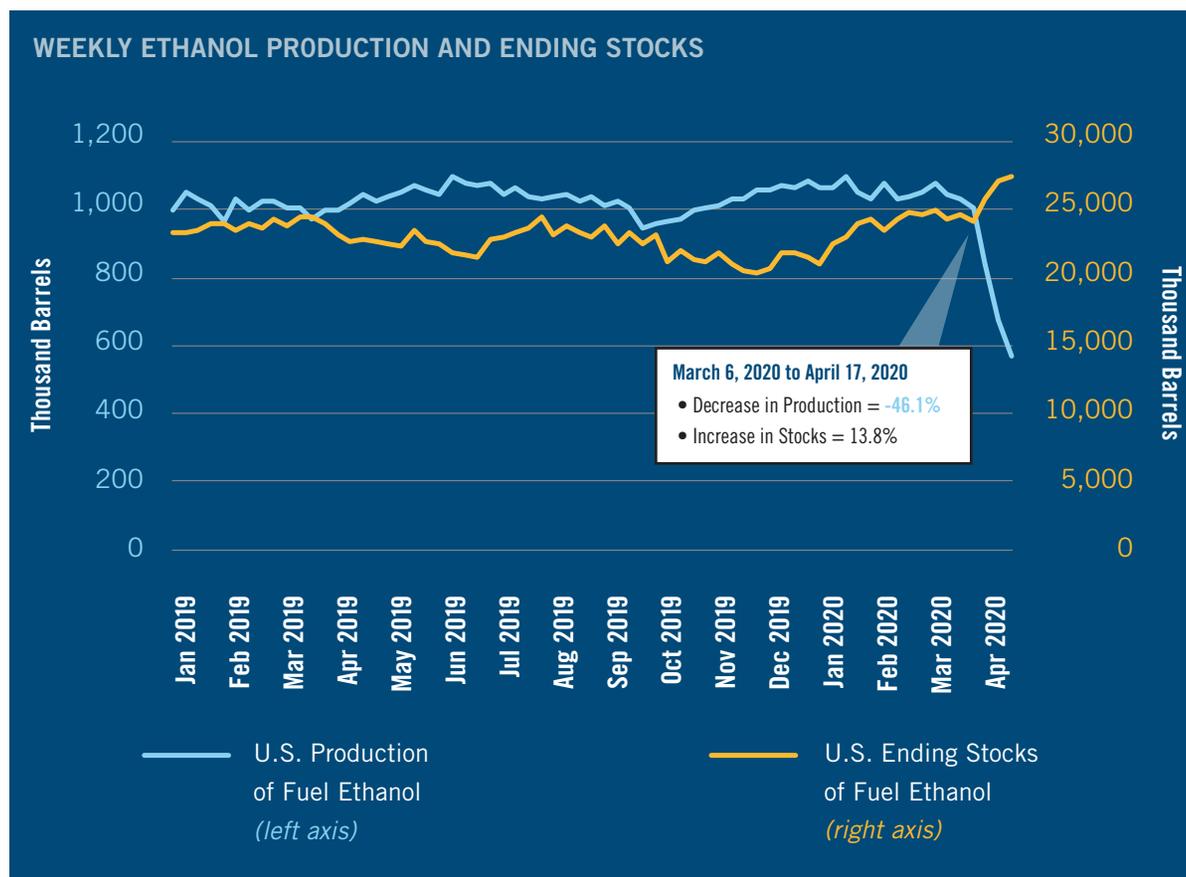


Source: Center for Agricultural and Rural Development (CARD), Iowa State University

Sharp Demand Drop in March Led to Major Production Cuts in April

March was a difficult month for world gasoline markets in general and the U.S. ethanol market in particular.

As COVID-19 worsened from epidemic to pandemic, the shelter-in-place restrictions and shutdown of non-essential businesses in the United States caused demand for motor gasoline and fuel ethanol to decline substantially overnight. While the initial shock was temporary, it resulted in almost a 50% drop in production between mid-March and mid-April.

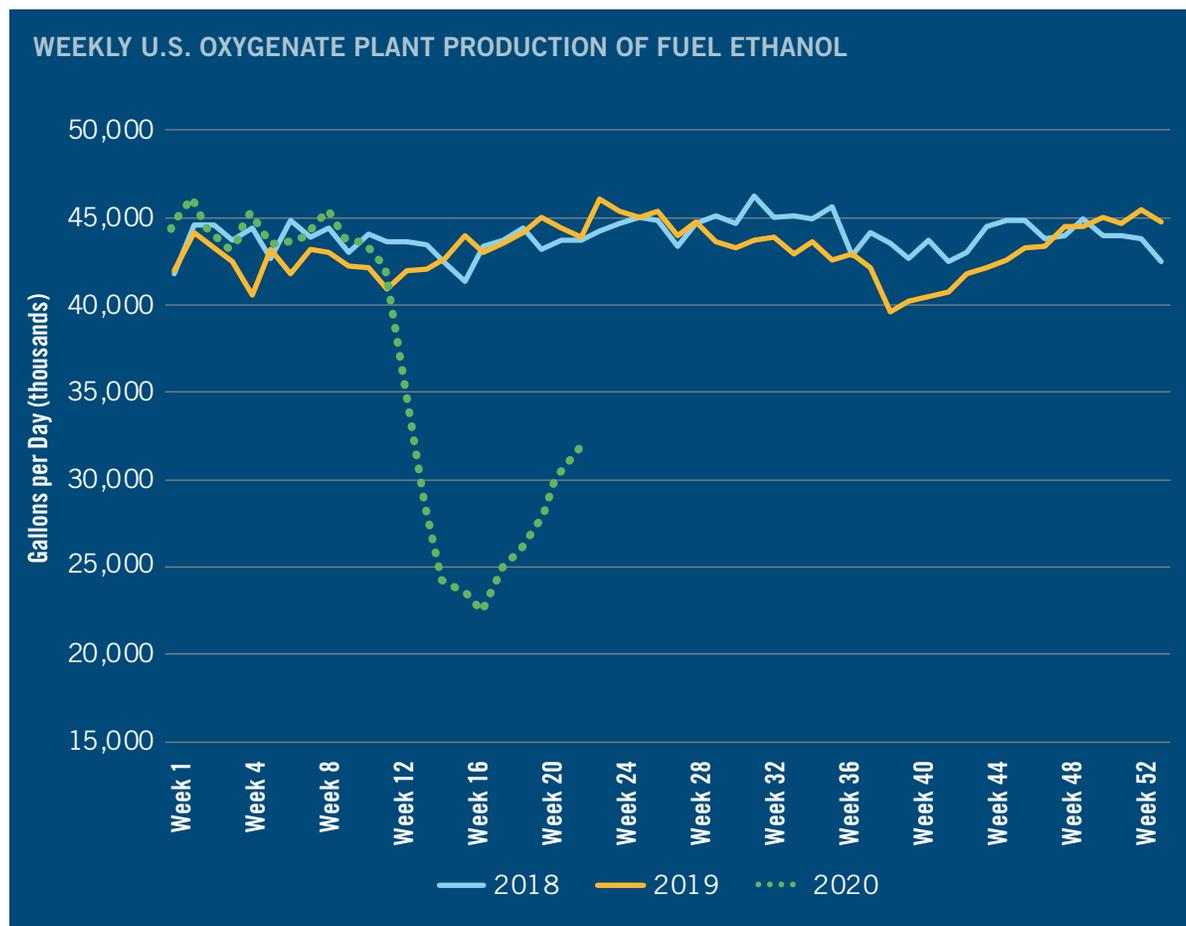


Source: EIA

Ethanol Production Has Begun to Recover, Incrementally, Though it Remains Below Average

Demand is beginning to rebound as local economies reopen, however a “V-shaped” economic recovery is unlikely and thus ethanol production may exhibit volatility over the next 18 months.

U.S. motor gasoline demand – as measured by EIA’s “product supplied” data – bottomed during the week of April 3, 2020, at an average daily volume of 213 million gallons vs. an average daily volume of 392 million gallons during 2018 and 2019. Since that time, motor gasoline demand experienced a mini-recovery to 285 million gallons, which is 27% below the 2018-19 average. U.S. ethanol production bottomed three weeks later than motor gasoline in late April. Since that time, ethanol production has begun to recover, rising from 23 million weekly gallons produced to 28 million gallons (for the week ending May 15, 2020). While encouraging, production is obviously still well below average.



Source: EIA

Industry Excess Capacity Estimate to Rise to 2.4 Billion Gallons in 2021

Industry estimates for U.S. ethanol production and consumption point to a dramatic increase in industry excess capacity to 3.9 billion gallons by year end 2020, settling to 2.4 billion gallons by year end 2021.

Based on our analysis of the detailed forecast published by The ProExporter Network, a leading provider of biofuels research and analysis, we see 2020 as a year showing incremental recovery in demand after the COVID-19 crisis. In 2021, we and PRX expect to see a rebound in total consumption and a year ending excess capacity position of 2.4 billion gallons, or 14% of nameplate capacity. The above analysis optimistically assumes that demand will recover to 93% of 2019 levels. However, due to the ongoing effects of the pandemic including high unemployment, reduced public gathering and work commuting, we think ethanol demand may only recover to 85% to 90% of 2019 levels, implying an even higher level of excess productive capacity.

U.S. FUEL ETHANOL SUPPLY, DEMAND AND PRODUCTION DYNAMICS

	Nameplate Capacity	Production	Excess Capacity	Excess Capacity as % Nameplate	Domestic Consumption	Net Exports	Total Consumption
2014	13,681	14,313	-632	-5%	13,444	730	14,174
2015	14,369	14,807	-438	-3%	13,947	775	14,722
2016	14,903	15,413	-510	-3%	14,356	1,074	15,430
2017	15,584	15,936	-352	-2%	14,485	1,248	15,733
2018	16,542	16,061	481	3%	14,420	1,505	15,925
2019	16,868	15,819	1,049	6%	14,579	1,187	15,766
2020-est	17,020 (a)	13,128 (b)	3,892	23%	12,366	1,059	13,425
2021-est	17,025 (a)	14,667 (b)	2,358	14%	13,491	1,187	14,678

(a) Nameplate Capacity estimates by PRX

(b) Production estimates from EIA STEO Report dated June 9, 2020

Source: EIA, The ProExporter Network (PRX) and Renewable Fuels Association (RFA)

Co-Products Offer Significant Revenue and Earnings Diversification

Significant additional value lies beyond fuel and in ethanol co-products.

In recent years, co-products have helped ethanol producers by providing them with revenue and margin diversification. In 2019, the U.S. ethanol industry generated nearly 40 million metric tons of additional biological co-products beyond ethanol fuel in the form of distillers grains, gluten feed and gluten meal. These products are substitutes for traditional corn and soybean meal rations in animal feed. Ethanol plants also extracted 3.8 billion pounds of corn distillers' oil (representing nearly \$1 billion of additional value) used in the production of biodiesel and other animal feed, and captured 5.8 billion pounds of high-grade biogenic carbon dioxide sold to food, beverage and industrial customers principally in North America. Therefore, the growth opportunity is not to start producing co-products but rather to expand product offerings and open up new markets by fine-tuning which co-products are produced.

WHAT VALUE DOES A BUSHEL OF CORN PROVIDE?

The average dry mill ethanol plant produces:

- **2.9 gallons** of denatured fuel ethanol
- **15.86 pounds** of distillers grains animal feed
- **0.80 pounds** of corn distillers oil for animal feed and biodiesel production; and
- **16.5 pounds** of biogenic carbon dioxide for food, beverage and chemical manufacturing

In 2019 a bushel of corn created \$1.20/bushel of additional feed and fuel value:

Fuel Ethanol	\$3.82
Distillers Grains and Feed	\$1.11
Corn Distillers Oil	\$0.17
Total Output	\$5.10
<i>Less Corn Cost</i>	<i>-\$3.90</i>
VALUE CREATED	+\$1.20

Source: Renewable Fuels Association

Excess Capacity Plus Export Competition Will Force the Industry to Transform

THE INDUSTRY'S EVOLUTION WILL HAPPEN IN THREE STAGES



What it Takes to be an Industry-Leading Ethanol Player

KEY SUCCESS FACTORS

FINANCIAL

- Conservative leverage
- Adequate free cash flow to invest into plant and technology upgrades
- Diversified business mix (co-products)

OPERATIONAL

- Access to a reliable local corn supply and natural gas
- Access to transportation markets (i.e., river, rail and truck transit) providing greater marketing flexibility for both ethanol and high value co-products (distiller grains and corn gluten meal for feed, liquid carbon dioxide for refrigeration and corn oil for biodiesel fuel)
- Expertise to develop co-products and sell into alternative markets and channels

STRATEGIC

- An ability to restructure, divest or otherwise repurpose assets to create tangible value
- The competency to execute large mergers and acquisitions to gain greater scale efficiencies

Conclusion and Outlook

Readjustment today, followed by rationalization tomorrow.

While ethanol remains an attractive business with long-term export growth potential, the U.S. ethanol industry will need to evolve to create and capture greater value and to improve its operational resiliency. By 2025, we expect the U.S. ethanol industry to undergo a three-stage transformation that will result in fewer, better capitalized players with revenue diversity beyond fuel ethanol. That diversity will include production of higher margin co-products, such as high-protein distillers grains for animal feed, carbon dioxide for refrigeration, beverage grade alcohol, and other industrial products including those used for personal hygiene (for example, hand sanitizing).

By 2025 the U.S. ethanol industry will be:

- **Consolidated with larger, more financially stable companies**
- **Diversified with a growing proportion of revenue and earnings derived from co-products**
- **More resilient to supply shocks and able to flex production with increases or decreases in fuel demand and exports**

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