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CONCRETE STRATEGY: Amber Wave had nearly finished construction on its wheat mill, gluten plant and packaging facility this spring. The facility is scheduled to be commissioned this summer or early fall.

PHOTO: AMBER WAVE

Building for Food and Fuel

Summit Ag Investments' ethanol plant, Amber Wave, is in the process of becoming the largest wheat protein producer in North America, while continuing to make low-carbon fuel.

By Katie Schroeder

The food-versus-fuel debate has aggravated the ethanol industry for years, in spite of the fact that ethanol plant coproducts feed animals across the country and around the world. Some producers even consider feed to be their main product—ethanol being second—and one U.S. plant is now finding new purpose as a food ingredient producer while also creating ethanol from wheat starch.

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GRIND AND SIFT: Amber Wave's flour mill produces just under 3 million pounds of flour each day. The mill's roll grinders and sifters are from Sangati, one of the top producers of milling equipment worldwide; The milling process extracts the endosperm, which becomes the flour, and peels off the outer layer of the wheat kernel, also known as bran or wheat midds.

PHOTO: AMBER WAVE

Amber Wave, formerly Prairie Horizons Agri-Energy LLC, located in Philipsburg, Kansas, plans to make both food and fuel simultaneously, while also maintaining a low carbon intensity (CI) score. Amber Wave was acquired by Summit Agricultural Group in July of 2021. The plant had been producing traditional corn ethanol in recent years. Meanwhile, additions were made to transition to a new production model and fulfill Summit's vision to meet a need in the food industry for domestic supply of vital wheat gluten, while producing ethanol with an even lower CI score. Once complete, the plant will become the largest producer of wheat protein in North America, according to Justin Kirchhoff, president of Summit Ag Investors.

Inspiration and Location

Summit's leadership team was inspired to pursue the production of vital wheat gluten when they learned that 80 percent of the food ingredient was imported and a major domestic source for the ingredient was needed, explains Kirchhoff. This goal has become even more important in the last

year or so due to the impact of supply chain disruptions on many industries, including the food and pet food industries.

"Whether it's the Russia-Ukraine crisis, that obviously [has been] a very unique event, but I think it cemented in a lot of consumers' minds on the wheat gluten side, if they have an opportunity to buy their product from a U.S. producer, they're going to have a huge advantage," Kirchhoff says. "Based on the initial conversations that we've had with both bakeries and pet food customers, they are really eager to see a new producer of vital wheat gluten here in North America, because continuing to import 80 percent of that product long term is, I don't think, a sustainable outcome."

The "thesis" of what Amber Wave is all about is something that Kirchhoff and the rest of Summit leadership believed in for several years before acquiring the Prairie Horizons Agri-Energy plant. Finding the right location was a long process, he explains, Summit considered a greenfield plant in Montana, as well as some opportunities in Oregon, before deciding on the ethanol plant located in north central Kansas.

"[The plant] was attractive to us largely because it was an existing corn-based ethanol plant with ICM technology that we knew. And in addition to that, it was in an area that was pretty favorable from a wheat perspective," Kirchhoff says. "And on the finished product side, it's in a pretty attractive spot from a geographic perspective, given the proximity to bakery and pet food customers."

Buying an existing ethanol plant also had a significantly lower entry cost than building a greenfield facility, and doing so gave Summit an opportunity to easily acclimate to the plant's process due to familiarity with the technology.

Construction and Site Development

As of mid-April, Amber Wave was in the process of construction on its wheat mill, gluten plant and packaging facility, according to Steve Adams, chief operating officer of Amber Wave. These components are scheduled to come online in coordination in late summer or early fall. After construction and renovations are complete, Amber Wave will produce 60 MMgy of wheat starch-based ethanol and more than 100 million pounds of vital wheat gluten annually.

The ethanol plant is going through several changes in preparation for switching feedstocks, including evaporation and beer well changes, water handling additions and elimination of corn oil production. Some of the necessary changes are scheduled to begin when the plant goes into shutdown early this summer.

"We utilized this opportunity to upgrade existing equipment and technology and install the necessary pieces to handle the wheat starch, including additional beer well capacity, a third effect evaporation, and mixer system for our wet cake to evenly distribute the midds in with the syrups," Adams says.

Since Amber Wave will primarily produce food ingredients, it will be following all the Food Safety Modernization Act guidelines, Adams explains. The Amber Wave team has been working diligently with experienced industry representatives to develop a food safety plan



POINT OF EXTRACTION: Amber Wave's gluten extraction process is made up of a combination of Flottweg's process, as well as some U.S. manufactured components.

PHOTO: AMBER WAVE



WEAVE OF PIPES: After starch and Pentosane streams are separated, the protein extracted is dried in ring dryers, converted into granular form and sent to the packaging operation.

PHOTO: AMBER WAVE

that aligns with that of a world-class operation.

Plant Specs

Amber Wave will purchase in excess of 20 million bushels of hard red winter

wheat annually as feedstock. The wheat will be ground into flour and run through an extraction process to separate the protein from the starch. "It's the combination of the wheat protein as our primary product and the waste starch stream to biofuel that makes the magic," says Randy Cimorelli,

CEO of Amber Wave. "Our protein production helps solve the global supply challenges, thus being a solution provider to the baking and pet food industries, while producing advanced biofuels with the lower carbon intensity scores the renewable energy markets are in search of."

The flour mill has a 27,500 hundredweight capacity, producing just under 3 million pounds of flour each day, explains Adams. The mill's roll grinding and sifters are sourced from Kice Manufacturing in Wichita, Kansas, a manufacturer that represents Sangati, one of the top producers of milling equipment worldwide, according to Adams. The milling process extracts the endosperm, which becomes the flour, and peels off the outer layer of the wheat kernel, also known as bran or wheat midds.

"[The] wheat midds will be mixed with residual starch and syrup from the ethanol plant and the DDGs, so our wet cake feed will actually be a base of wheat midds and the byproduct residuals of the ethanol plant," Adams says. The flour will go through a mechanical process with water to extract the gluten, separating out the protein, which will then be dried, ground up and offered in 50-pound bags and 2,000-pound sacks, as well as bulk loadout, Adams explains. "That product will go to bakeries, pet food companies throughout the U.S. and ... [export destinations] as well," he says. The gluten extraction process is made up of a combination of Germany-based company Flottweg's process, as well as some U.S. manufactured components."

"You separate the flour into three streams using a Flottweg centrifugal tricanter. A starch, B starch and Pentosane streams are separated in this process and the B Starch is further processed into gluten. The residual starch is then transferred to ethanol," Adams says. "The protein extracted is dried in ring dryers, converted into granular form and sent to the packaging operation. The packaging process utilizes Premier Tech packaging equipment, some of the most state-of-the-art packaging equipment on the market today."

The residual waste wheat starch stream will be pumped into the ethanol side of the plant and be used to produce a lower-carbon inten-



IN THE BAG: Dried protein is converted into granular form and sent to Amber Wave's packaging operation, which utilizes state-of-the-art Premier Tech packaging equipment.

PHOTO: AMBER WAVE

sity biofuel. Cimorelli explains that they do not yet have an exact CI score for the plant, however they are certain it will be lower than a traditional corn-based plant because wheat is a lower carbon feedstock. “[Wheat] uses less water, it uses less nitrogen, so just from that alone if you hold all other things constant, you’re going to have a lower carbon score,” Cimorelli says. “But in this case, in terms of our overall production, [due to] how we create this residual waste starch stream, it even impacts it more.”

Prior to going through its transformation, the Amber Wave plant’s corn ethanol received a D6 RIN. After the feedstock change is made, Cimorelli anticipates that the wheat starch-based ethanol will receive a D5 advanced biofuel RIN.

Market Outlook

The target market for the vital wheat gluten made by Amber Wave is primarily bakeries and pet food suppliers across the United States, as well as Canada and Mexico.

The product is commonly used in the pet food industry as a way to add protein. Bakeries use vital wheat gluten alongside naturally occurring gluten found in wheat to add functionality, adding elasticity, binding properties and leavening characteristics, Cimorelli explains. “Eighty percent of the gluten today purchased for those uses in the United States [comes] from Europe, Australia and other parts of the world,” he says.

The market for DDGS made using wheat starch and midds is very similar to the market for corn based DDGS.

Summit’s vision for Amber Wave is to create its first world-class food ingredient business with a renewable energy arm that is “best in class” in everything that it does, including low carbon scores and production quality, Cimorelli explains. “If we can reward wheat growers for higher protein levels, then we’re doing our part to not only create a domestic manufacturing facility, but rewarding those that are part of the team, part of the family,” Cimorelli says.

Although food ingredient production is a new endeavor for Summit, ethanol production is not, Kirchhoff explains. The differences between wheat starch-based fermentation and corn starch-based fermentation are not greatly different from a process standpoint. However, the fact that the wheat starch is a waste product of the vital wheat gluten process has major implications for the ethanol’s CI score. This lower CI score was attractive three to four years ago, when the idea for the project first came about, but the growing low carbon fuel markets throughout U.S. and Canada, as well as policy developments like the Inflation Reduction Act, have increased Kirchhoff’s belief in the value of what the company is doing. “From our perspective, we were pretty attracted to it before,” he says. “I would say we believe in the thesis even more today, particularly given the increased value of low-carbon ethanol.”

The next 12-month project planned is a combined heat and power installation to further lower carbon intensity, Cimorelli explains. Carbon capture and sequestration/

utilization is another carbon reduction option that will be explored, but it is still a few years down the road as the economics are being studied.

“As it relates to vital wheat gluten and wheat starch ethanol production, we’re still really bullish, I think there’s a favorable long-term outlook,” Kirchhoff says. “I would expect that as we bring this plant online later this year, we will look for growth opportunities in that market.”

Opportunity and Community Impact

Amber Wave provides opportunities to create jobs in Kansas and offer better opportunities to wheat growers. “The impact we’re making on the grower and the community, we think, is relevant. And I think it speaks to the culture and the fiber of what Summit’s all about,” Cimorelli says. “It’s not just the business opportunity, it’s the opportunity for everyone.”

Kirchhoff says that he “could not have been happier” with the support Amber Wave has received from the state of Kansas and the Philipsburg community. He believes the plant will provide high-quality jobs and trigger an increase in economic activity in the area.

Looking ahead, Summit sees a lot of opportunity in the liquid fuel market as well and intends to continue looking for opportunities to move the industry forward.

“It’s hard to remember a time in recent memory where the value proposition for ethanol has been as strong as it is today, particularly as you think about new opportunities that they have to decarbonize,” Kirchhoff says. “And I think the growing recognition that there’s going to be a liquid fuel tank around for a long time and having ethanol part of that equation to help decarbonize the liquid fuel tank is a huge opportunity.”

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