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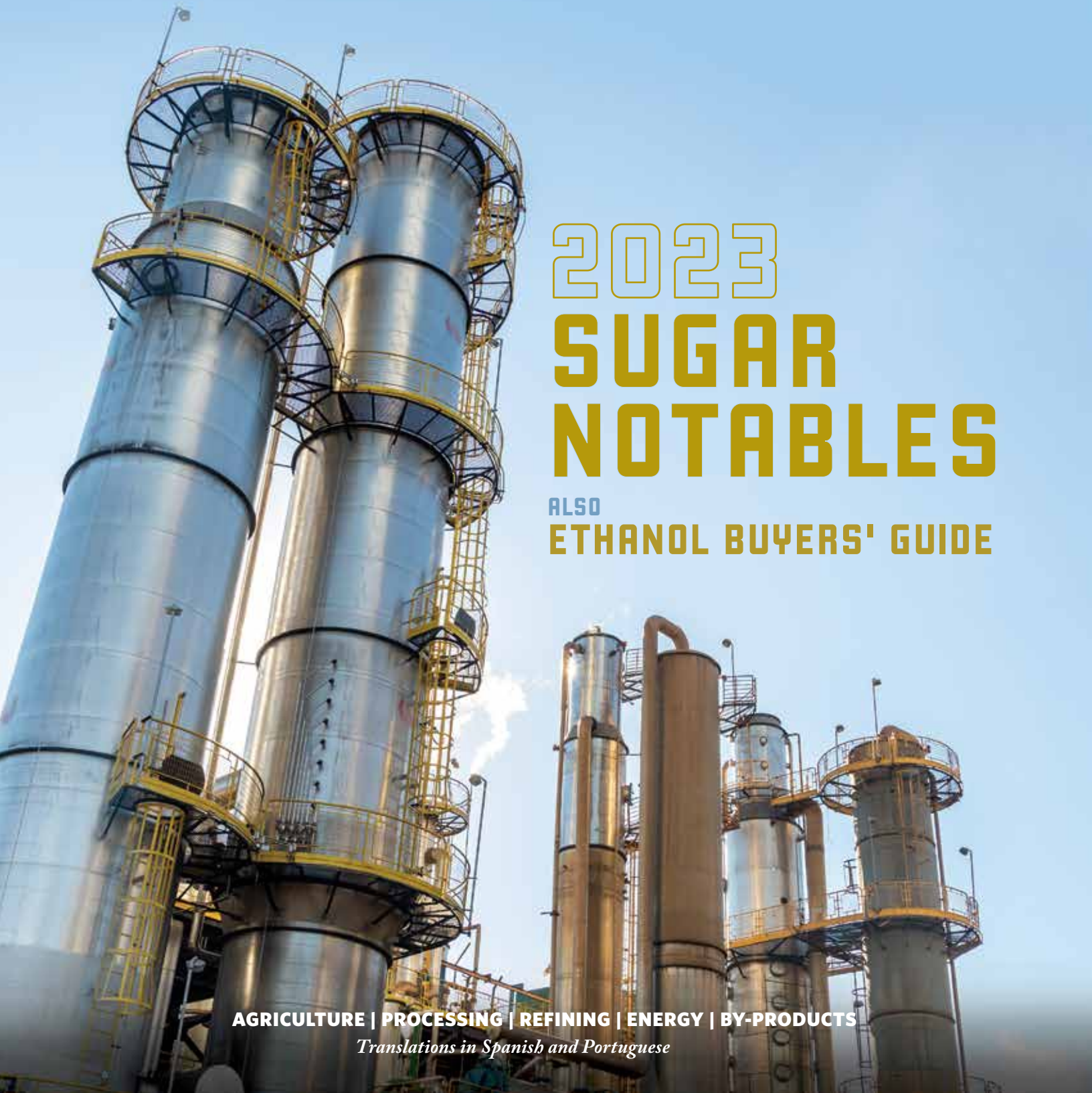

2023 SUGAR NOTABLES

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Publisher's Corner

We are announcing ***Sugar Journal's*** 2023 Sugar Notables in this edition of the journal. We are just as excited this year as we were last year because they really depict the leaders in our industry. The Sugar Cane Grower is Bret Allain, LA; Raw Sugar Factory is Jack Nelson retired from Rio Grande Sugar Cooperative TX; Raw Sugar Refiner, Richard Baker with American Sugar Refining MD; Researcher is Calvin Viator LA; Sugar Beet Grower is Kelly Erickson, American Crystal Sugar Company MN; and Sugar Beet Processor is Mark Flegenheimer who just retired from Michigan Sugar Company MI.

We congratulate all of them for excelling with their expertise in sugar production. And we will be celebrating this honor on July 15 for an exclusive dinner at Antoine's Restaurant in New Orleans.

Family and friends are invited to come and celebrate with us on July 15th. We have made special arrangements at the Omni Royal Orleans Hotel, just steps away from Antoine's, from Thursday, July 13th – 16th. Friday evening, Charley and I will be hosting a Soiree at our home and Saturday evening, we will start the celebration with a little bubbly at Antoine's. You can find out more information on SugarJournal.com or email Debbie@SugarJournal.com

Also, in this issue is the 2023 Ethanol Buyers' Guide. More and more, countries are using sugarcane and sugar beets to produce ethanol. Ethanol, blended with fossil fuel, makes much cleaner energy for our automobiles. With an ever-changing climate, we need to find alternatives to provide clean energy. One of our writers, Vlad Vorotnikov has written about biofuels in Europe and the challenges they are facing.

Also included is our columnist, Chris Rhoten, who continues his discussion on *Beet Sugar Crystallization*.

Next month will be our report on the Joint Florida and Louisiana ASSCT in Savannah GA. Stay tuned.

Beauregard
Office Mascot
Photo by Andy Baker

Romney K. Richard

Editor

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U.S. Sugar Supply Raised; Mexican Sugar Production Revised Upward

In the April 2023 World Agricultural Supply and Demand Estimates (WASDE), the 2022/23 U.S. sugar supply is raised by 177,000 short tons, raw value (STRV) to 14.637 million from last month on larger imports. High-tier tariff sugar imports are revised upward based on increased pace and additional raw sugar imports that are expected after the Office of the U.S. Trade and Representative (USTR) reallocated the unused World Trade Organization (WTO) raw sugar tariff-rate quotas (TRQ) on March 14. Domestic sugar production is marginally down as the decline in beet sugar production offsets the increase in cane sugar production in Florida and Texas. Given that the U.S. sugar use is unchanged at 12.740 million STRV, ending stocks increased by 177,000 STRV to 1.897 million. The resulting ending stocks-to-use ratio is 14.9 percent, up by 1.4 percentage points from last month's 13.5 percent.

Mexico's sugar production in 2022/23 is increased by 75,000 metric tons (MT), actual value from last month to 5.560 million on higher area harvested. USDA projects that the production of less than 99.2 polarity sugar can potentially be as high as 840,000 MT, about 75 percent of the 1.118 million-MT Mexican export quota. The bulk of the increase in production–60,000 MT–is apportioned towards the Industria Manufacturera, Maquiladora y de Servicios de Exportación (IMMEX) deliveries, which are increased to 331,000 MT, but still relatively low barring any increases from domestic production and/or qualifying imports for IMMEX. ERS/USDA

2023 Sugar Notables Selected

On July 15, 2023 the staff of Sugar Journal will celebrate the winners of the 2023 Sugar Notables. "We have so many outstanding individuals in our sugar industry that have done so much to improve and move the industry forward, that we felt we should celebrate the 'best of the best' that were selected," said Romney Richard, publisher and editor of Sugar Journal.

Nominations were opened last year and the criteria was – length of service to industry, success in their career, contributions to the betterment of the industry in a documented way, involvement in industry organizations / activities, and demonstrated leadership characteristics. Those who wanted to nominate someone could do so on the website SugarJournal.com After the nominations were in, a panel of industry leaders helped to pick the winners of each category.

Since the industry is split into different segments, there are were six categories identified. The winners are as follows:

Sugar Cane Grower – **Bret Allain**
Sugar Beet Grower – **Kelly Erickson**
Raw Sugar Processor – **Jack Nelson**
Cane Sugar Refiner – **Richard Baker**
Beet Sugar Processor – **Mark Flegenheimer**
Researcher – **Calvin Viator**

A fabulous dinner celebration at Antoine's Restaurant will be the stage to honor these Sugar Notables. Visit SugarJournal.com for more info.

Nicholl's Offers Sugar Courses

Nicholls State University offers two cane sugar institutes each year during the summer. They include the International Sugar Cane Refiners' Institute, which began in 1978, and the International Raw Cane Sugar Manufacturers' Institute, which began in 1985. The success of these institutes can be contributed to many factors such as timely topics, excellent professors, Cajun food, southern hospitality and especially the support of organizations such as the Sugar Industry Technologists, American Society of Sugar Cane Technologists, the American Sugar Cane League and of course the many sugar companies, mills and refineries around the world. All these programs have the same format, two weeks of intense day long discussions on the various and timely topics of each aspect of sugar production. Nicholls State University is happy to have contributed to the growth and success of the world sugar industry and is extremely proud to be a leader in world sugar education.

International Raw Cane Sugar Manufacturer's Institute. May 31-June 9, 2023

International Cane Sugar Refiner's Institute. July 17-27, 2023

Visit Nicholls.edu to find out more info or to register.

Indonesia'a Ag EXPO – INAGRITECH

The Indonesia Leading Exhibition in Agriculture Industry will be taking place 23 – 25 Aug 2023 at JIExpo Kemayoran, Jakarta, Indonesia. A well-known exhibition featuring agricultural machinery and technology trade fair largest indoor and outdoor trade fair in Indonesia. In conjunction with Inapalm Asia 2023, Pump & Valves Indonsia 2023 and SugarMach Indonesia 2023, all these events will serve as one of the most important shows in Indonesia. Visit inagritech-exhibition.net/ for more information.

Jack Roney – Sugar Man of the Year

Jack Roney, the former Director of Economics and Policy Analysis at the American Sugar Alliance, was honored at a Sugar Club dinner in New York City. Mr. Roney received the coveted Dyer Memorial Award 2021.

Sugar Journal

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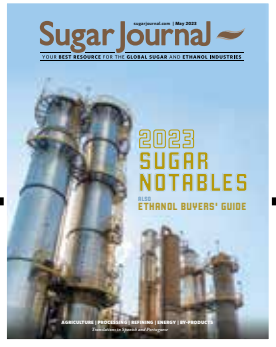


Cover
Industrial distillery for cane and alcohol

Sugar Journal

Sugar NOTABLES 2023

RICHARD BAKER,
Raw Sugar Refiner

As vice president of corporate engineering for American Sugar Refining, part of Richard Baker's job is training new engineers.

"I guess I have a different perspective on the younger generation than some other people," Baker said. "I find that they want to learn and feel valued. I like to challenge them and try to teach them what I've learned in my more than forty years in the industry."

Baker excelled in his high school chemistry class and while in college at Villanova University in Pennsylvania, he decided to major in chemical engineering. At that time, he said, engineers were in great demand, and as bonus, he found the subject interesting.

After graduating, he worked as an engineer for a chemical company. Soon, however, the company wanted to move him to Missouri. An avowed "East Coast guy," Baker preferred to work closer to home. He also hoped to return to Villanova for an advanced degree.

In February 1980, he began working in Amstar's Philadelphia plant. At the same time, he enrolled as a graduate student at Villanova, where he earned a master's degree in chemical engineering. He went on to earn an MBA from the University of Virginia in 1993.

When Amstar closed their Philadelphia plant, he moved to Baltimore, Maryland, where he has been ever since.

Amstar went through a number of changes during Baker's years with the company, eventually becoming American Sugar Refining in 2001.

Baker's career has involved many different aspects of the business including production, maintenance, and management. Currently, he travels between American Sugar Refining's five North American sugar refining plants, working with engineers to prevent and solve maintenance issues through training and improvements. Though he remains based in Baltimore, he spends about 80% of his time in Louisiana.

"If young people have ideas, I like to let them try them. I think it's important to listen to the younger

engineers. Technology changes and we have to adapt," he said.

At the same time, Baker loves to pass on the knowledge he has gained, especially to people who feel the way he does about the industry.

"It's not just a nine-to-five job. It gets in your blood. I've really enjoyed my time working in sugar," Baker said.

Overall, he has found sugar to be an industry where people are helpful and sharing ideas is the norm.

Being selected by peers in the industry makes Baker feel honored.

"It's nice to be recognized for just doing the best you can for the last 40 years. But I didn't do it alone. I always had a good team and good people around me to help as well," he said.

His other awards include the 2004 Industrialist of the Year Award for the city of Baltimore.

Baker has served on the board of directors for the Baltimore Museum of Industry and the Maryland Industrial Technology Alliance, and as a member of the Maryland Industrial Group.

Baker has been married for 27 years to his wife Terry, and they have three children, Lindsey, Sierra and Andrew.

In his spare time, Baker likes woodworking and restoring cars. Once or twice a year, he goes deep sea fishing with a group of friends he met in the sugar business.

CALVIN VIATOR,
Researcher

Calvin Viator's career in the sugar industry began when he was still a high school student.

"I was a scout for Al Dugas, who was the first sugarcane consultant," Viator said. "We'd go through the fields every week and check for insects and weeds."

Scouting is a small piece of his current business Calvin Viator and Associates. The consulting company offers a wide range of services to its clients, including budgeting, serving as expert witnesses on crop losses, crop management, scheduling and pest control.

The company is under contract with 75 sugarcane farms.

"I enjoy the people in the sugarcane industry. Some of them are fourth generation in the business. They are a unique group, and it gives me a lot of good feelings working with them," Viator said.

Though he is semi-retired, and his son Blaine has taken over much of the day to day work of the business, Viator still stays in contact with his clients.

Viator's first business was a partnership with Stanley Viator (no

relation), but they split the company around 1970.

Calvin also researched sugarcane ripener management, fertility management, and insect disease management as a professor at Nicholls State University before retiring in 1996.

"I'm proud of my former students who are now in the industry. Some have even become my clients. They have gone into many different capacities in the business including research and publishing, managing and farming," he said.

Viator earned a bachelor's of science degree in education with a focus on mathematics and science from the University of Louisiana at Lafayette, and both a master's degree and Ph.D. in plant pathology with a minor in agronomy from LSU.

His awards include induction into the Louisiana Agriculture Hall of Distinction and the President's Award from the American Sugarcane League in 2020. He served as a member of the Louisiana Agriculture Finance Authority from 2012-2022.

Viator and his wife of 58 years, Barbara, live in Thibodaux. They have four children, Dan, Beth, Miriam, and Blaine, and six grandchildren.

MARK FLEGENHEIMER,
Sugar Beet Processor

As a child, Mark Flegenheimer would go to the sugar beet factory his father Ernest ran and climb on the piles of sugar beets. "It's in my blood. I was around sugar beets my whole childhood," he said.

The family legacy began two generations before Flegenheimer with his grandfather Albert Flegenheimer. An influential force in the sugar beet processing business in 1920s Germany, Albert worked for the sugar beet processing giant Südzucker.

With the rise of the Nazi party in Germany, Albert was forced to give up his stake in the company and flee to Winnipeg, Canada, where he was involved with building a sugar beet factory. Eventually, Albert ended up running a sugar beet factory in Green Bay, Wisconsin, where Mark was born.

By 1963, Albert and a business partner had bought shares of stock in Michigan Sugar Company and they asked Mark's father, Ernest, to serve as president and CEO while Albert served as Chairman of the Board.

Mark worked summers in the factory as soon as he was old enough. After graduating with a major in psychology and a minor in business from DePauw University in Greencastle,

Indiana, he headed to New York City.

"I wanted to go see what Wall Street was all about," Mark said.

He landed a job with Amerop Sugar Corporation as a trader.

"I traveled around the world buying and selling sugar. I got to know people in Louisiana and the bigger players in Central and South America. I loved the job and got a chance to learn the other side of the business," he said.

When Mark had been with Amerop for about eleven years, his father decided to retire from Michigan Sugar and his replacement asked Mark if he'd like to serve as Vice President of Administration for the company.

At the same time, Amerop was planning to move its administrative offices to Miami. Mark and his wife Anne were thinking about starting a family.

"She's from New York City and when I asked her if she wanted to move to Michigan or Miami, she chose Michigan," he said.

They moved to Saginaw Township in 1994, where they have lived ever since.

In 1998, Mark became President and CEO of Michigan Sugar. The company turned into a grower-owned cooperative in 2002, a move Mark called a great step forward for the company and the growers.

"Before, growers were often concerned about the motivations behind the company's decisions and that disappeared as soon as we became a co-op. Now, everything is done for the benefit of the growers," he said.

As head of Michigan Sugar, Mark's priority is to make the company returns as big as possible for the 800 growers with ownership in the company.

"It's rewarding," he said. "They are the heart and soul of rural economies."

Mark's retirement from Michigan Sugar officially began on April 3, 2023.

"As I get to the end of my career and look back, I made a lot of good friends," he said. "The business has great people in it."

Mark added that he was honored to be selected as a Sugar Notable among what he called the other good people in the sugar industry.

In his retirement, he plans to indulge his love of travel and play a little more golf. His other hobbies include skiing, golfing, and sailing. His greatest passion outside of the sugar business, however, is giving back to the community. Currently, he and a friend are working on a project to have murals painted onto grain silos. He also serves as Vice Chairman of the Board of Directors at the Midland Center for the Arts, Chairman of the Board for Tri-Star Trust Bank, and on the Delta College Foundation Board of Directors. In the past, he also served on the board of directors of the Boys and Girls Club of the Great Lakes Bay Region and a board member of the Saginaw Community Foundation.

He and Anne have two children, Trevor and Katie.

KELLY ERICKSON,
Sugar Beet Grower

In 1965, American Crystal Sugar Company built a factory not far from Kelly Erickson's family farm in Kittson County, Minnesota. Many farmers in the area, including the Ericksons, began farming sugar beets and haven't looked back since.

A fourth generation farmer, Erickson earned an associate's degree in agronomy from the University of Minnesota and spent two years studying at North Dakota State University.

"Farming is what I enjoy and love to do," he said.

Erickson accompanied his father to meetings with growers and other organizations in the area and was eventually elected to a local board.

He quickly found a passion for finding solutions to the problems the industry faced and became a member of the American Crystal Sugar Company Drayton, North Dakota factory district executive committee and eventually served as its chairman. He also served as a member and Chairman of the Red River Valley Sugarbeet Growers Association executive committee as well as a member of the American Sugarbeet Growers Association. In 2021, he was elected Chairman of the American Crystal Sugar Company Board after serving as a member for 9 years. For two of those years, he served as vice president of the board.

One of the most rewarding aspects of his job is meeting and talking to people about farming. "It doesn't make any difference whether they are from Louisiana, Minnesota or anywhere else, we all have the same wants and needs that I have. It's fun to talk to different people about sugar markets, policy and so on. I enjoy all the people I have met in this business," Erickson said.

Erickson listed as a highlight of his career his involvement with securing suspension agreements as part of the United States-Mexico-Canada Agreement (USMCA) which replaced the earlier NAFTA policies. Erickson was on the board of directors of American Crystal at that time.

Another victory was convincing American Crystal to agree to use Roundup Ready sugar beets. Erickson was on the American Sugar Growers Association Board in 2007 when that decision was made. "The American Crystal Board was very conservative and they just needed a push" to accept the new technology, he said.

Erickson's son Scott has now taken over much of the day to day operation of the farm, leaving Erickson more time to advocate for the industry.

"It's good to have a young person in charge who can keep up with the new technology and equipment," Erickson said. "I couldn't do it without Scott."

Erickson has been married for 44 years to his wife Karen, and they also have two daughters, Sarah and Mary Beth.

JACK NELSON,
Raw Sugar Processor

Jack Nelson learned to drive a tractor at age 10 on his father's farm in Oklahoma. Along with his four brothers and one sister, he ran combines and other farm equipment, and learned to raise, vaccinate and castrate cattle. At his mother's insistence, all of the children attended college. Nelson went to what was then Oklahoma A&M. His class in 1958 was the first to graduate from the university under its new name Oklahoma State University. He majored in soil agronomy and continued at OSU to earn a master's degree in the subject.

"I knew the farming operation wasn't what it could be if we knew more and did more," he said.

When it came time to look for a job, he heard about an opportunity to be a sugarcane planter trainee with the Hawaiian Sugar Planters Association.

Nelson had only ever been to Oklahoma and Texas at that time, so he liked the idea of going to Hawaii. After the one year trainee program, he became a trainee with C. Brewer & Co. During his time in Hawaii, he learned about fertilization and weed control, rat control, record keeping, and harvesting of sugarcane.

In 1962, he moved to Puerto Rico to be a crop control superintendent for C. Brewer where he did more research as well as training other employees.

"Puerto Rico was my favorite place because I met my wife and got married there," he said.

After C. Brewer closed the operation in Puerto Rico, he spent a short time working for Dupont.

"I wanted to get back into sugarcane, so when the opportunity came up to go back to C. Brewer, I took it," Nelson said.

The company had a contract in Iraq. At 29, Nelson still hadn't had enough of seeing the world, so he agreed to go.

Once there, he was put in charge of land leveling, tile drain installation, and digging and construction of canals.

"I learned so much in Iraq. I loved the land leveling and construction side of the operation. I think all agriculture would be more successful if farms were leveled better. It would help farmers grow better crops and be more productive," Nelson said.

The know-how immediately paid off when he transferred to Cali, Columbia in South America to be an agricultural consultant and work in field operations. He gave advice on irrigation, drainage, land leveling and other agricultural issues.

"When I started there, they had hardly any cane. By the time I left four years later, they had more sugar than they could grind," he said.

Finally, Nelson ended up back in the United States in 1972 when he became an agricultural manager for Rio Grande Valley Sugar Growers in Santa Rosa, Texas. He later became general manager and chairman of the board and CEO in 1983, and finally president and CEO in 1993. He remained in that position until his retirement in 2005. He continued to work as a consultant until he turned 80.

When Nelson first joined the Rio Grande Valley Sugar Growers, he trained growers as well as setting up the harvesting system. He hired people from Louisiana with knowledge about growing sugarcane to help. At that time, sugarcane chopper harvesters hadn't been introduced into the United States yet, so he brought people from Australia to assist with the training.

"It was a new system and no one knew how to use it yet," Nelson said. "We also had to set up a maintenance system for it."

Switching to the management side had its unique rewards for Nelson. "I like managing people. I had 560 employees at Rio Grande and I felt like we were successful. We had record production."

Nelson has served as Chairman of the Sugar Association Board and the New York Sugar Lab Board, as well as on the Texas Governor's Council on Science and Biotechnology Development. His awards include the 2004 Texas A&M University Friend of Texas A&M Agriculture and Agricultural Cooperatives of Texas Distinguished Service Award.

Receiving a Sugar Notable award was a nice surprise for Nelson. "When you get to be 87, you think that's over," he said, adding that he has enjoyed the people he has worked with in the business. "Everyone taught me a tremendous amount."

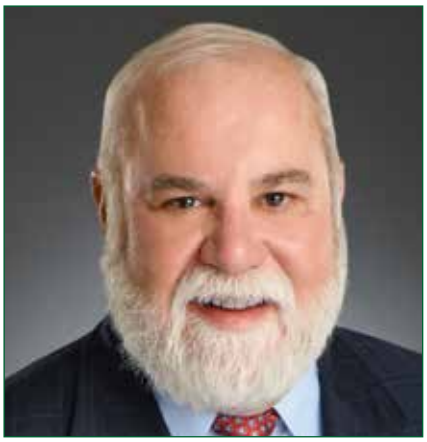
After retiring, Nelson and his wife Susan moved to Bryan, Texas to be near their grown children Dina and Katherine.

R.L. "BRET" ALLAIN II,
Sugarcane Grower

R.L. "Bret" Allain II's family has been growing sugar cane as long as it has been a Louisiana crop. Even though he has been a state legislator representing District 21 for 12 years and his family is also involved in other businesses, Allain is happiest on his family's farm in St. Mary Parish.

"Agriculture is a lifestyle, not a career. Since an early age, I've learned all aspects of growing several different crops and I've always enjoyed the lifestyle. You take sunshine and soil and make a living. Few professions are pure production like that," he said.

Allain graduated from LSU with



an agricultural engineering degree and then returned to work on his family farm. He was able to work with his father for ten years before the elder Allain passed away in 1990.

"My father was a great man, lovable, kind, and intelligent," he said. "I learned so much from him. He had the same love of the land that I do."

Both Allain's father and grandfather served as president of the St. Mary Sugar Cooperative sugar mill. Now, Allain is president of the farmer-owned co-op, which his grandfather, A.V. Allain built after World War II.

Allain's political career began in 1999 when he was appointed to the Louisiana State Mineral Board. In 2004 and again in 2008, he was appointed to the Louisiana Agriculture Finance Authority and served as its Vice Chairman. Governor Mike Foster, who is from Allain's district, asked him to run for the legislative seat.

"It took me five years, but I finally agreed," Allain said.

He began his first term in 2011 and in his years of service he has promoted agricultural issues at the state and local level.

He has served on many committees during his time in the Senate including Senate Revenue and Fiscal Affairs, Senate and Governmental Affairs, Natural Resources, and Agriculture. After 12 years, Allain says he won't be seeking another term.

"I've enjoyed being in the legislature, and it's one of the most challenging things I've ever done, but it's time to hand it off to someone else," he said.

Bret was honored and flattered to be a Sugar Notable recipient.

In his spare time, he loves all kinds of fishing, but especially fishing offshore for red snapper. He can also be found in his wood shop, burying himself in a project for his wife, Kimberly, one of his three children, Robert III, Quin and Emma, or his five grandchildren.

THREAT OF FOOD SCARCITY CHALLENGES THE EUROPEAN BIOETHANOL INDUSTRY

BY VLAD VOROTNIKOV

The future of European bioethanol looks highly uncertain as Germany rolled out plans to phase out its production from edible raw materials in the coming years. Still, as Europe keeps battling against the energy crisis it may be too early to expect the end of the bioethanol era.

In early 2023, German environment minister Steffi Lemke prepared a draft bill proposing an end to production of crop-based biofuels in stages by 2030

"Biofuels stand for land consumption and loss of biological diversity," Lemke said in a statement published on the environment ministry's website in January. "To replace only around 4% of fossil fuel use in German road transport, a land space in Germany and abroad is needed, which represents about 20% of the German agricultural area. That is not future-orientated."

Ethanol plants in Europe might be in jeopardy

Sugar beets were expected to be the primary ethanol feedstock in the European Union in 2022 at 8.1 million metric tons, followed by corn at 6.64 million metric tons, wheat at 2.95 million metric tons, barley at 521,000 metric tons, rye at 487,000 metric tons and cellulosic biomass at 260,000 metric tons, USDA FAS estimated.

As Lemke explained, she wanted to encourage the production of "real bioethanol" from garbage, waste and used edible oil instead of agricultural commodities.

These plans sparked protests amongst the industry community. The German bioethanol industry association calculated that only 4% of the grain harvest in Germany, in fact, was used for bioethanol. "Only 2% of the arable land is required for bioethanol production," said Stefan Walter, managing director of the association. In addition, he added, bioethanol production has nothing to do with food scarcity since the stuff commonly used in the industry would best fit for the production of animal feed, not food.

THE ENERGY CRISIS IS A GAME-CHANGER

The idea to cease crop-based biofuel production was brewing in the European Union for several previous years but fully materialized due to the fallout of the Russian gamble in Ukraine. Last year, the global grain market faced unprecedented turbulence. The price of a widely traded type of wheat that started the year at about $7.70 per bushel jumped to $13 in the immediate aftermath of the invasion. The price of corn, rye and rapeseed also skyrocketed.

The crisis has been partly mitigated when Ukraine resumed exporting grain by the sea in August, but glob-

al prices remain above the levels preceding the conflict. In addition, the lack of Ukrainian grain on the global market worsened concerns about famine in developing countries.

On the other hand, Europe was struck with an energy crunch as it scrambled to get rid of dependence on Russian hydrocarbons import.

Since 2011, in Germany, up to 10% percent of bioethanol can be mixed in conventional petrol. At gas stations, this fuel is sold as E10, estimated to be at least 6% cheaper than conventional fuel. Bioethanol producers calculated that a driver could save up to Eur4 per full tank.

Since not only the price of fuel but also electricity, heating and food soared last year, Europeans massively switched to cost-saving solutions. The German automotive fuel market saw a rise in the share of E10 to 20%, compared to 13% in the previous year, Stefan Walter, adding that the surge is taking place even despite a strong prejudice against the E10 fuel.

"There is a long-term acceptance problem. Many drivers would still mistakenly assume that the fuel is damaging their vehicle," Walter admitted.

The picture is similar in other key EU markets. French ethanol consumption has been steadily increasing since its introduction in 2007, thanks largely to its favorable cost, but the trend picked up the pace last year. In the first half of 2022, France saw a 53% increase in sales of E85 – a local mixture of petrol and up to 85% of ethanol, known as flex-fuel, according to figures released by French ethanol industry group SNPAA.

It was estimated that flex-fuel is nearly twice cheaper compared to standard petrol fuel. Until recently, it remained popular only in France and Sweden since its use would require substantial investments in converting fuel systems. However, recent calculations shared by ePure, the European association of ethanol producers, showed that the energy crisis makes switching to E85 more attractive for motorists since such investments are now paying off shortly.

LOSING TOUCH WITH REALITY

The battle for the future of the European bioethanol industry is far from being over. Several environmental protection organizations insist that bioethanol production should be banned entirely.

"Fresh oil like rapeseed oil doesn't belong in the tank, but on the dining table," claimed Martin Hofstetter, Greenpeace's agriculture expert, estimating that on average, twelve liters of rapeseed oil end up in car fuel in Germany per capita- an amount that covers the annual consumption for cooking.

On the other hand, 10 German agricultural organizations including the federal bioenergy association, the German bioethanol industry association, and the German farmers' association filed a joint appeal to the German government calling to give up the restrictions on bioethanol production and use. They claimed that those supporting the restrictions on bioethanol production might have lost touch with reality.

If the ban is enforced, Germany's dependence on energy and animal feed imports will increase. In 2021, biofuels provided around 3.7 million metric tons of climate-friendly fuel and 3 million metric tons of feedstuff, which comes as a by-product of sugar beet and rapeseed processing.

"In addition, there is a risk of losing a strategic energy reserve and thousands of jobs in rural areas [if the law is passed]," the letter's authors warned.

THE IDEA TO CEASE CROP-BASED BIOFUEL PRODUCTION WAS BREWING IN THE EUROPEAN UNION FOR SEVERAL PREVIOUS YEARS

Moreover, the restrictions could jeopardize the environment. In Germany alone, bioethanol prevents nearly 3 million metric tons of CO2 emissions in the atmosphere per year, the association of bioethanol industry estimated.

"Biofuels are currently and will continue to be the only effective way to reduce greenhouse gases in road traffic in the coming years. More than 45 million cars with combustion engines, which will still be on German roads after 2030, can only be defossilized with renewable fuels," said Norbert Schindler, Chairman of the Christian Democratic Union of Germany.

The European bioethanol sector has been steadily growing during the past decade, and the trend is expected to continue as the EU aims to increase the share of renewable energy in transport to at least 14% by 2030. Strong opposition from German farmers to the discussed ban on crop-based ethanol production, and a lack of similar initiatives in other European countries, are likely indicating that the industry remains relatively on safe ground.

On the Subject of Beet Sugar Crystallization

#13: The Influence of White Pan Crystal Yield on Sugar End Capacity – Part 1

BY CHRISTOPHER D. RHOTEN

In the last few articles of this series (Articles #10 thru #12) several possible approaches to batch pan crystallization control were discussed. In this article, our attention turns to certain specific aspects of massecuite quality and vacuum pan performance related to white pan crystal yield and its influence on the capacity and efficiency of overall sugar end operations.

At its essence, the capacity and efficiency of the sugar end crystallization process in a beet sugar factory depends on the crystal yield achieved in each of the crystallization steps in the process. For that matter, the capacity and efficiency of any processing system assembled for the purpose of crystalline sucrose production comes down to crystal yield. In beet sugar production, due to its relatively large recycle load, the white (1st product) crystallization yield has the greatest influence on the overall granulated sugar production capacity and sugar recovery from the feed liquor supplied to the sugar end.

At the most basic level, crystal yield is a function of the final dry substance (DS) concentration of the massecuite as it is discharged from the vacuum pan. However, it is almost never the case that the final massecuite %DS is actually controlled by a DS concentration measurement device. Most often, the final concentration of the massecuite is controlled by the power consumption or amperage of the pan's circulator motor. Literally, this is a measurement of the viscosity (or fluidity) of the massecuite in the pan. The massecuite "viscosity" is influenced by the average crystal size (MA) and size distribution (CV) of the crystal population, massecuite temperature, mother syrup DS concentration and mother syrup purity. The mother syrup temperature, DS concentration and purity define the viscosity of the mother syrup. Thus, in essence, the viscosity (or fluidity) of a massecuite is a function of the crystal content (yield), the nature of the crystal population size and size distribution, and the viscosity of the mother syrup.

Figure 1 shows the general relationship between massecuite purity and relatively "optimal" crystal yield in typical beet sugar massecuites having a crystal population of approximately 400-micron MA and +/-30 CV.

The relationship between purity and crystal yield is shown for typical white (93 Pur) and high raw (84 Pur) massecuites. The major reason for the difference in maximum yield between the white massecuite (57% Crystal Yield at 91.8% DS) and the high raw massecuite (49% Crystal Yield at 93.5% DS) is the viscosity of the mother syrup which is significantly higher in the high raw massecuite than in the white massecuite. This is reflected in the higher DS concentration in the high raw massecuite (Mass DS) which is largely due to the higher DS concentration in the mother syrup at the lower massecuite purity.

The size of the crystals in a massecuite also influences the overall viscosity of the massecuite. The larger the average crystal size (MA), the lower the overall effect of the crystals themselves on the massecuite fluidity. This effect is shown in Figure 2.

The example is for a typical high raw massecuite which would normally have a maximum massecuite to mother syrup viscosity ratio (n_{mass}/n_{ml}) of about 20 to 1. With an average grain size (MA) in the strike of 0.2 mm (200 microns), the maximum yield would be about 48.5% crystals. If the average grain size was 0.4 mm, the maximum yield would increase to about 50.5% crystals, an increase in crystal yield of a little over 4%. If the average grain size were 0.6 mm, the yield may be as high as 52%. A yield increase of over 7% as compared to the 0.2 mm example. These are not insignificant differences in potential yield and are 100% attributable to the average size of the crystals in a population. Larger grain size provides the possibility of achieving higher crystal yields and increased granulated sugar recovery in any given massecuite and in the massecuites produced in the sugar end as a whole.

The influence of the crystal size distribution (CV) on crystal yield is a little more difficult to predict due to the fact that there is very little information (data) on the influence of this specific parameter relative to crystal yield. However, observation of operating data for MA and CV results along with calculated crystal yield and analysis of final massecuite DS concentration indicates that as CV increases, especially where an increase in the percentage of under 150-micron crystals in a crystal population is noted, the crystal yield from

Figure 1

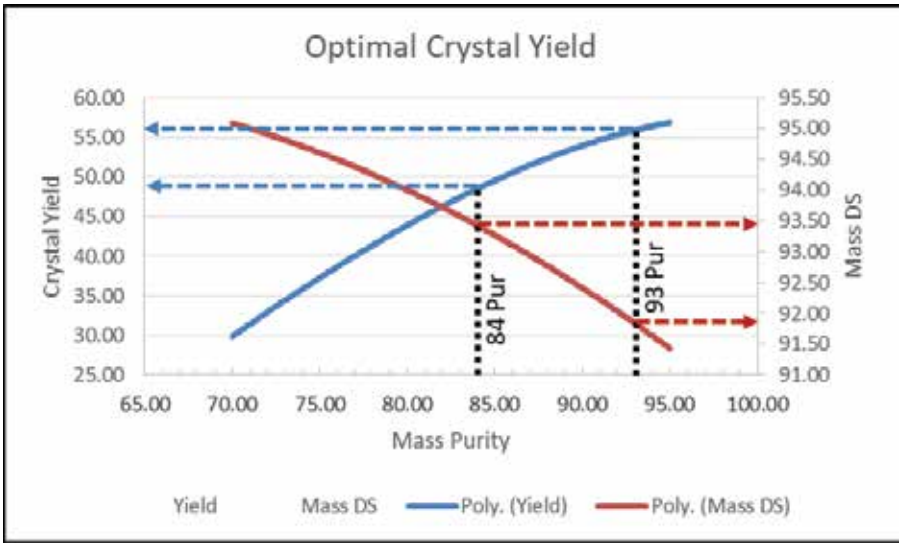
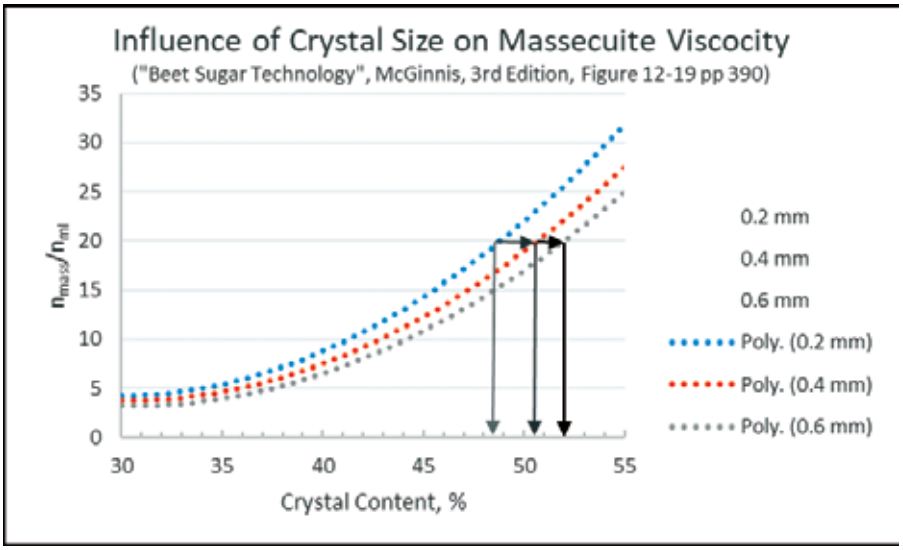


Figure 2



such strikes is reduced and the volume of sugar recycle in the sugar end is increased. Along with this increase in recycle load is an associated decrease in the processing capacity directly due to increased recycle loading.

In white sugar crystallization, the control of the crystallization process directly influences the average grain size (MA) and, especially, the grain size distribution (CV) of the crystal population. Both of these quality aspects influence the maximum achievable crystal yield from the white massecuite produced. It is usually the case that the average grain size (MA) produced is subject to a given quality standard. In the USA, the "Standard" MA for white sugar is normally in the range of +/-400 microns (0.0157 inches) and is a fixed control standard. However, the CV values produced in the average US beet factory sugar end vary widely between values as low as 28-29 CV to as high as around 40 CV or even higher. It is not uncommon in many factories to see large variation within daily operating cycles day-in and day-out. Such variation in CV means that the number of crystals that are less than 0.150 mm is varying from approximately +/-3% of the crystal population to +/-10% of the crystal population in the massecuite. Virtually all of these "small" crystals are being recycled in the process either as "sugar dust" from crystal drying and cooling or are being melted out in the white centrifugal and recycled in the run-off syrup from the centrifuge. AND they are reducing the maximum allowable crystal yield in the massecuites produce in the white pans.

Both high and highly variable CV is a "double whammy" to sugar end capacity and production efficiency. It is always related to the capability and effectiveness of the white pan crystallization control program and/or its correct and routine utilization in the process. Too often it is the case where to "go faster" means to push the white crystallization to make more massecuite from the pan without consideration of, or perhaps fully appreciating, the necessity of grain quality, correct crystallization control and the importance of optimal crystal yield. Mother nature simply does not abide pushing beyond its natural limits. In sugar crystallization, to do so usually results in a lot of smaller crystals amongst the larger crystals. These smaller crystals tend to recycle forever in the sugar end consuming capacity while also impeding the ability to achieve the necessary optimal crystal yields.

In the next article we'll take a look at just how crystal yield actually affects the capacity and sugar recovery performance of a typical sugar end in a beet factory. We'll take a look at the effect of all the things we have discussed in this article as well as what happens if we simply just stop short of reaching the highest possible massecuite DS concentration (crystal yield) in the white pans.

I hope you enjoy this series. It is intended to be a forum for the expression of my experiences, thoughts and ideas relative to sugar end optimization and also for my readers to chime in with their own. Please join me in the discussion of the issues and ideas presented in this series of articles. Let me know your own thoughts and ideas on these subjects at chrisrhoten2024@gmail.com Next: "The Influence of White Pan Crystal Yield on Sugar End Capacity – Part 2".

Prospective Analysis for the Fuel-Alcohol Business in the Colombian Sugar Sector - Foresight and Strategic Thinking

BY LF MUÑOZ SANTACRUZ1 AND DM URIBE OSORIO

ABSTRACT

In response to the need raised by the Colombian Government and the vision, commitment, and leadership of the Colombian sugar sector, several companies have started alcohol-based fuel plants since 2005, with a production capacity of more than 1.5 ML of alcohol per day in continuous operation. Currently, in Colombia, the mixture of ethanol in 10% and 90% of gasoline of fossil origin is approved for use. Based on all the recorded background and the public policy motivation expressed in the CONPES 3510 document, a strategic prospective analysis was conducted using various tools to establish scenarios to consider on the basis of the year 2028. First, 30 key variables were identified that represent the most important aspects for the ethanol business and the prospective exercise that will serve as the basis for the evaluation of these in the present and future. Then, a trend and structural analysis was conducted based on the Regnier Abacus to determine the positive or negative trends. Using the MIC MAC tool, the relationships between the variables were analyzed, using a cross-impact matrix to determine the motor skills index and the dependency index, thus determining the main influential and dependent variables that are considered the keys to the problem being analyzed. Through a IGO matrix, the importance and governability of the variables was established, identifying which ones should be prioritized because they are the object of improvement with high potential. Using an Uncertainty Matrix, the certainty variables were identified, correlating them with their importance in a three-level classification. All the results obtained were consolidated into a matrix for the construction of the scenarios. Finally, through the Delphi method, convergences of opinion and consensuses around precise issues were revealed through questions to experts. Scenarios for the Colombian sugar industry were then developed and presented as trend, optimistic and pessimistic scenarios.

INTRODUCTION

Ethanol is used as an additive for gasoline to improve the octane number and to reduce pollution generated by combustion gases. Since October 2004, Colombian law has allowed a fuel mix of 90% gasoline and 10% ethanol that can be used as fuel, both as is and in the form of a mixture with gasoline. Current engines can run on blends of gasoline and anhydrous ethanol up to 25% (E25) without requiring adaptations (Congreso de Colombia 2004). In 2001, the Colombian Government made the decision to promote the biofuel industry with ethanol and biodiesel (Congreso de Colombia 2001), and from January 2017 it has stimulated the free importation of ethanol based on corn, beets, wheat, and sugarcane.

Here, we conducted a prospective exercise based on the identification of key variables determined with tools such as the Regnier Abacus, the MIC MAC Cross Impact Matrix, the IGO Importance and Governance Matrix, Uncertainty, and the Delphi Method. This allowed us to construct optimistic, pessimistic, trend and desired scenarios.

MATERIALS AND METHODS

Key variables

From a brainstorm exercise, 30 variables (Table 1) were defined that represent the most important aspects for the Colombian ethanol business, were the most influential in the market and were of greatest interest to the sector.

Regnier's Abacus

The main objective of this tool is to allow the participation of stakeholders, which facilitates and speeds up the initiation of the prospective exercise. This instrument made it possible to detect what is continually changing through the trend behavior of each idea or factor in the ethanol business. A form was created in Google forms and shared with selected participants. The prioritization of the factors to be analyzed was conducted using the following code:

- Bright green indicates a particularly important and attractive idea or factor, that is, one that has a strong and positive impact on the ethanol business.
- Light green expresses an important idea or factor; it has less value than the previous one because it has less influence on the future ethanol business for the organization.
- Yellow means doubt, uncertainty or skepticism about the importance or weight of the respective factor.
- Fuchsia is more negative than yellow, but less negative or unfavorable than bright red.
- Bright red is a very unfavorable response and warns that the analyzed factor would be very negatively affecting the organization's business.

MIC MAC

Using this tool, we analyzed the relationships among the variables.

Table 1. Variables that impact on the Columbian sugar-ethanol industry.

Variable	Short name	Long name
1	Consumption	Fuel ethanol consumption
2	Population	Population concentration
3	Rate	Mixing rate of anhydrous alcohol in gasoline
4	Infrastructure	Infrastructure for fully hybrid vehicles
5	Price	Price of refined fuels - gasoline and diesel
6	Petroleum	World oil reserves
7	Import	Import of ethanol from Brazil and USA
8	Offer	Availability and reliability of ethanol supply
9	Fleet	Automotive fleet
10	Production	National ethanol production
11	Subsidy	Subsidized ethanol production in Europe and USA
12	Sugar	International sugar crisis
13	Financing	Bank financing for bioenergy projects
14	Impact	Environmental and social impact in the exploitation of resources
15	Commercialization	Marketing rules and environmental restrictions
16	Laws	Rural worker protection laws
17	Investments	Stimulation of foreign investment for ethanol
18	Policies	Policies that guarantee demand for ethanol
19	Security	Food and nutrition security
20	Ibiofuels	Impact on water, soil, and biodiversity of biofuel products
21	Technology	Biofuel production technology
22	Logistics	Transport logistics and transit regulations
23	Costs	Cost of production in the ethanol value chain
24	Markets	Fuel market variability
25	Sustainability	Sustainability requirements
26	Instrumentspd	Legal instruments to promote ethanol production
27	Contractual	Contractual relations in the agricultural sector
28	Exemptions	Tax exemptions for biofuels
29	Pandemic	Pandemic Impact of the pandemic on the hydrocarbon and food sector
30	War	War and biofuels

Using a cross-impact matrix to determine the motor skills index and the dependency index, we looked for the main influential and dependent variables, which are considered as the key in the analyzed problem. Motility is the impact that one factor has on the others, dependency corresponds to the impact that the distinct factors have on others. The relationships between the variables were scored from 0 to 3, with the possibility of indicating potential influences (those that may occur in the future), as indicated by the following convention: 0: No influence, 1: Weak, 2: Medium, 3: Strong, and P: Potential.

Importance and Governance Matrix – IGO

This matrix compares two criteria to then offer a prioritization of the actions to be evaluated in the ethanol business. This prioritization was conducted based on its importance for the sector and its characteristic of governability or transformation, since it is subject to improvement and empowerment. The evaluation was conducted by classifying the variables in importance on a scale of 1 to 5 and governance on a scale of 1- Little governable, 2- Moderately governable, and 3- Highly governable.

Uncertainty Matrix

This matrix evaluates the level of uncertainty of each variable considering its importance. The scale on which the classification was assigned was: 1- Little Uncertainty, 2 - Medium Uncertainty, and 3 - High Uncertainty.

Delphi Method

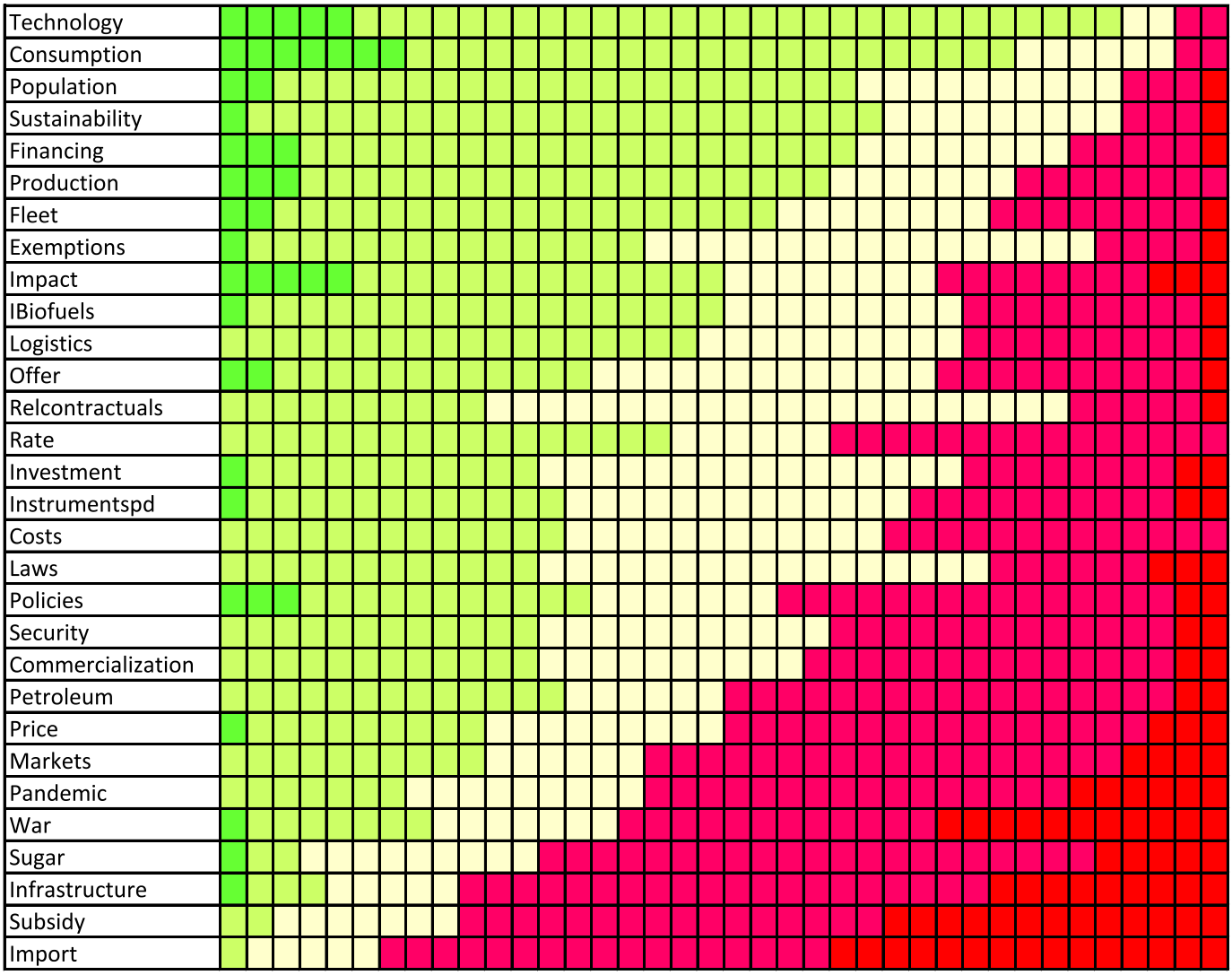
The Delphi method is a structured communication technique, developed as a systematic and interactive prediction method, based on a group of experts. It is a prospective technique used to obtain qualitative and precise information about the future. We applied it to experts, among them a senior manager with experience in the sugar and alcohol sector, and an executive from the biofuels company, highlighting convergences of opinion and consensus around specific issues. The most frequent objective of Delphi studies is to define the experts' thinking on areas of uncertainty to help the decision-making process.

RESULTS AND DISCUSSION

Regnier Abacus

Figure 1 shows the Regnier abacus results obtained for the present and future situation of the ethanol business; these results were obtained from

Figure 1. Regnier abacus results for: Present



the qualifications given in the forms.

The Regnier Abacus methodology was used to determine the positive and negative trend of the variables evaluated for both scenarios: present and future; with its respective graph. The trend analysis of the present scenario makes it possible to identify that the present variables that have a positive trend and contribute to an optimistic future scenario are technology, fuel ethanol consumption and population concentration. The variables that contribute to a pessimistic scenario due to its current negative trend are the importation of ethanol from Brazil and the USA, the subsidized production of ethanol in Europe and the USA, and the infrastructure for fully hybrid vehicles.

The trend analysis of the future scenario has a positive trend and an optimistic future scenario through biofuel production technology, bank financing for bioenergy projects and national ethanol production. The variables that contribute to a pessimistic scenario due to its current negative trend are the subsidized production of ethanol in Europe and the USA, the importation of ethanol from Brazil and the USA, and the War and biofuels.

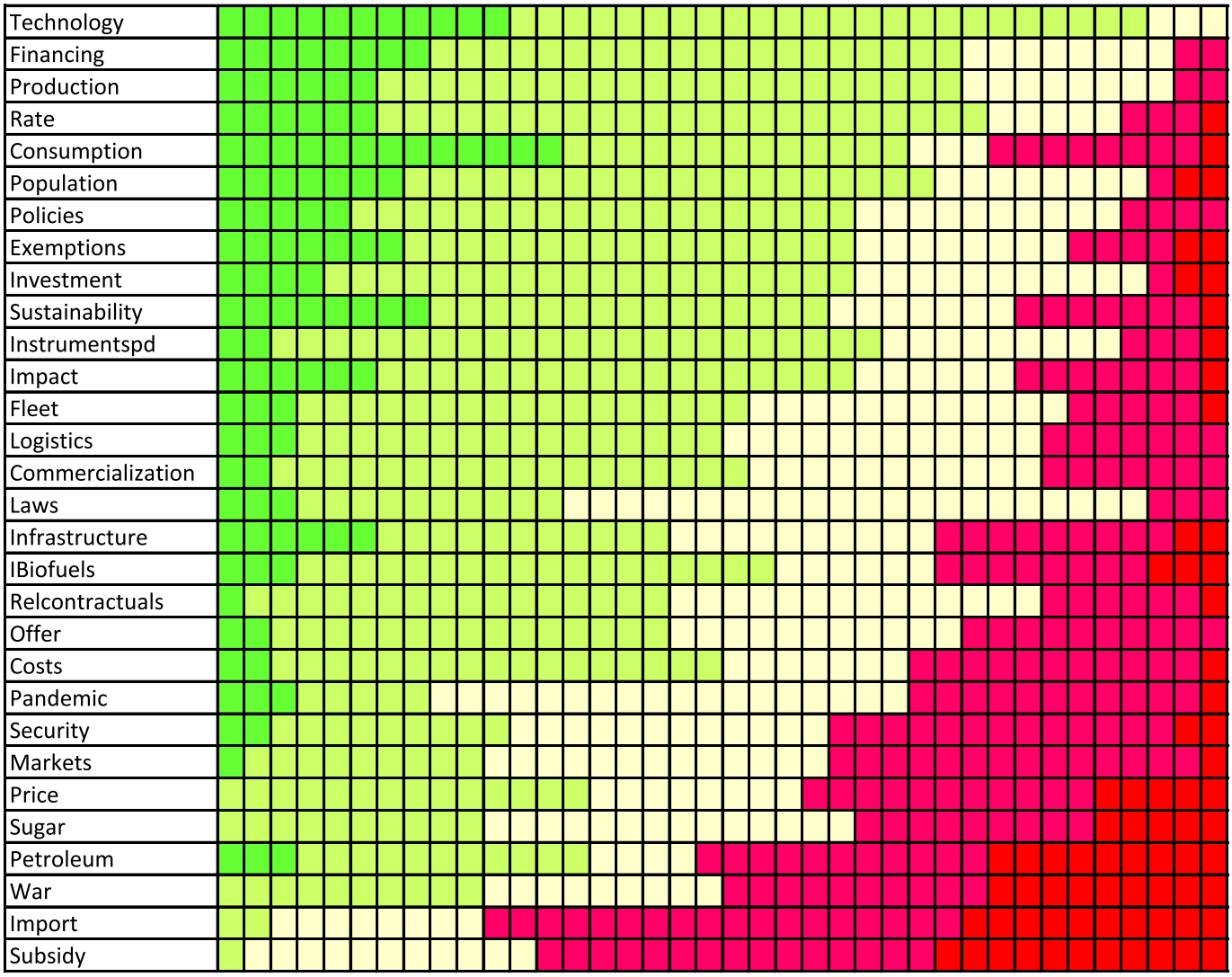
MIC MAC

The key or link variables are characterized because their changes produce strong impacts and, at the same time, they are very receptive to changes in the other variables. Highlighted variables were the national production of ethanol, consumption of fuel ethanol, imports of ethanol from Brazil and the USA, rate of mixture of anhydrous alcohol in gasoline, production costs, marketing rules and environmental restrictions (Figure 2).

Based on the same analysis, objective variables that can be promoted by the sector as key variables are bank financing for bioenergy projects, environmental and social impact on the exploitation of resources, and policies that guarantee demand for ethanol.

In addition, the Mic Mac analysis highlights as a regulatory variable the oil reserves worldwide and, as a moderately driving and/or dependent variable, the concentration of the population. The determining variables that become brakes or engines of the system were automotive fleets, variability of the fuel market, legal instruments to promote the production of ethanol,

Figure 1. Regnier abacus results for: Future



and tax exemptions for biofuels.

Once the graphs of direct and indirect relationships of the variables were presented, the displacements of the variables were mapped (Figure 3).

In the map of direct influence, the variables that have a great dependence and at the same time great motor skills are evident in the upper right quadrant. The variables located in this quadrant generate a significant impact on the others, that is, by achieving an adequate intervention in them, it is possible to equally affect other variables.

The autonomous variables with little dependence on others since their effects, both received and promoted, are not relevant for the evolution of the ethanol business, were laws for the protection of rural workers, food and nutritional security and contractual relations with the agricultural sector.

Of the variables found in the power zone (upper left quadrant), only 9 and 28 show a positive trend in the Abacus, that is, they are particularly good for the sector because they directly influence the target group and do not, they need other variables to resurface. The Colombian sugar sector must develop strategies that involve these variables.

Of the variables found in the conflict zone of the upper right quadrant, only three show a negative trend in the Abacus and of those, the "price" variable could become a power variable; the others remain on the same standing. The variables "offer ", "financing" and "investment" could move to the lower right quadrant, that is, to the results area. The Colombian sugar industry should be attentive to these variables and watch them over time.

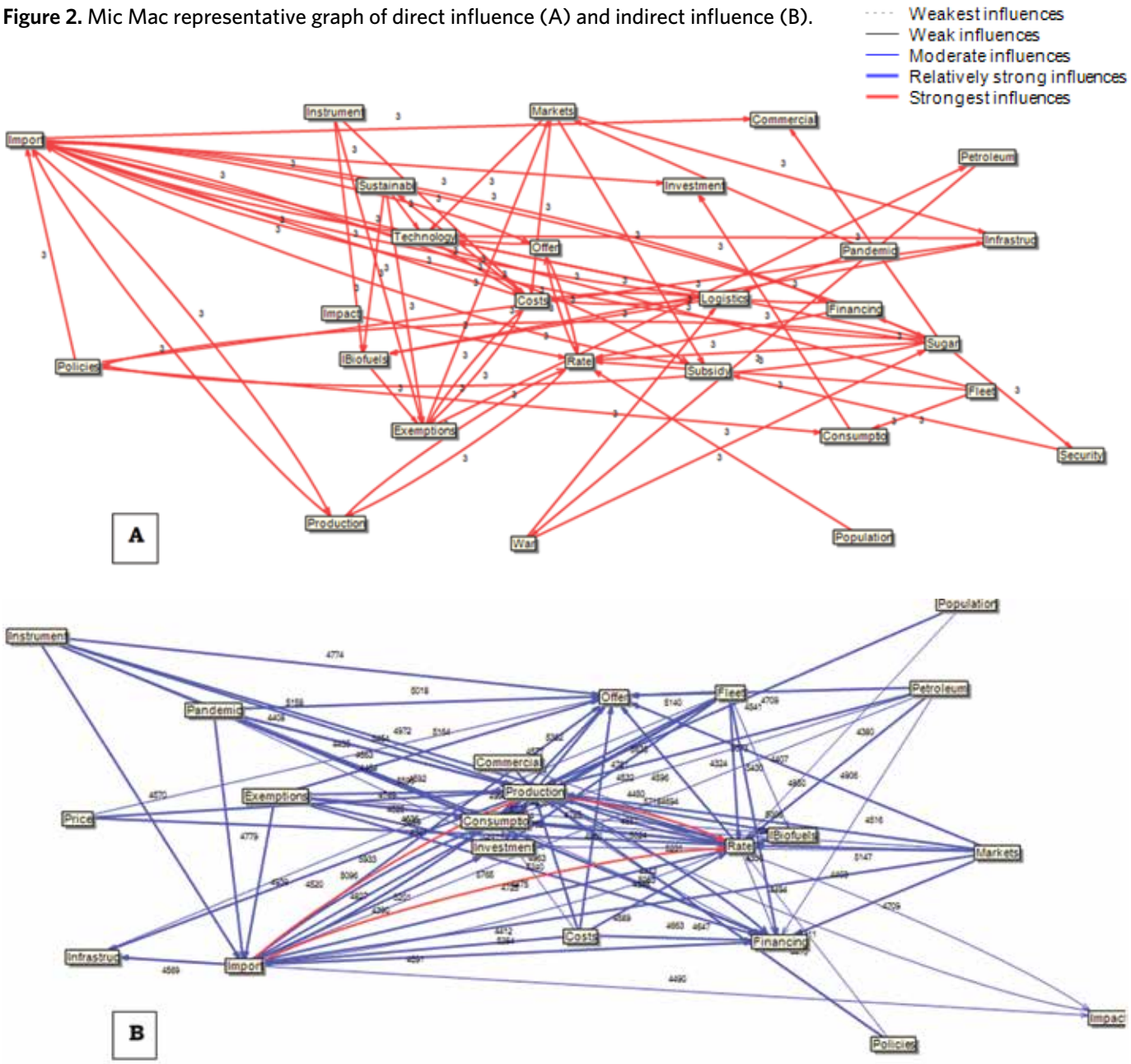
The variables that received the greatest indirect influences are the availability and reliability of the ethanol supply, the importation of ethanol from Brazil and the USA, the rate of mixing anhydrous alcohol in gasoline, bank financing for bioenergy projects, the national production of ethanol, and ethanol consumption. In turn, these exert major influence on other variables.

Importance/Governance Matrix (IGO) and Importance/ Uncertainty Matrix

The importance/governance matrix and importance/uncertainty matrix developed are shown in Figure 4.

The most important and most gov-

Figure 2. Mic Mac representative graph of direct influence (A) and indirect influence (B).



ernable variable is the production costs in the ethanol value chain, followed with medium importance and high governability by the availability and reliability of the ethanol supply, the national production of ethanol and the technology of production of biofuels. Particularly important, but moderately manageable, variables for the sector are the importation of ethanol from Brazil and the USA, the policies that guarantee the demand for ethanol and the legal instruments to promote the production of ethanol.

The particularly important but non-governable variables include the consumption of fuel ethanol, the rate of blending of anhydrous alcohol in gasoline, the international sugar crisis, the concentration of the population, the infrastructure for fully hybrid vehicles, and the subsidized production of ethanol in Europe and USA.

The variables with high importance and high uncertainty for the ethanol business are the rate of mixing anhydrous alcohol in gasoline, the concentration of the population and the vehicle fleet.

Of medium importance and high uncertainty are the availability and reliability of ethanol supply, domestic ethanol production, biofuel production technology, and fuel market variability.

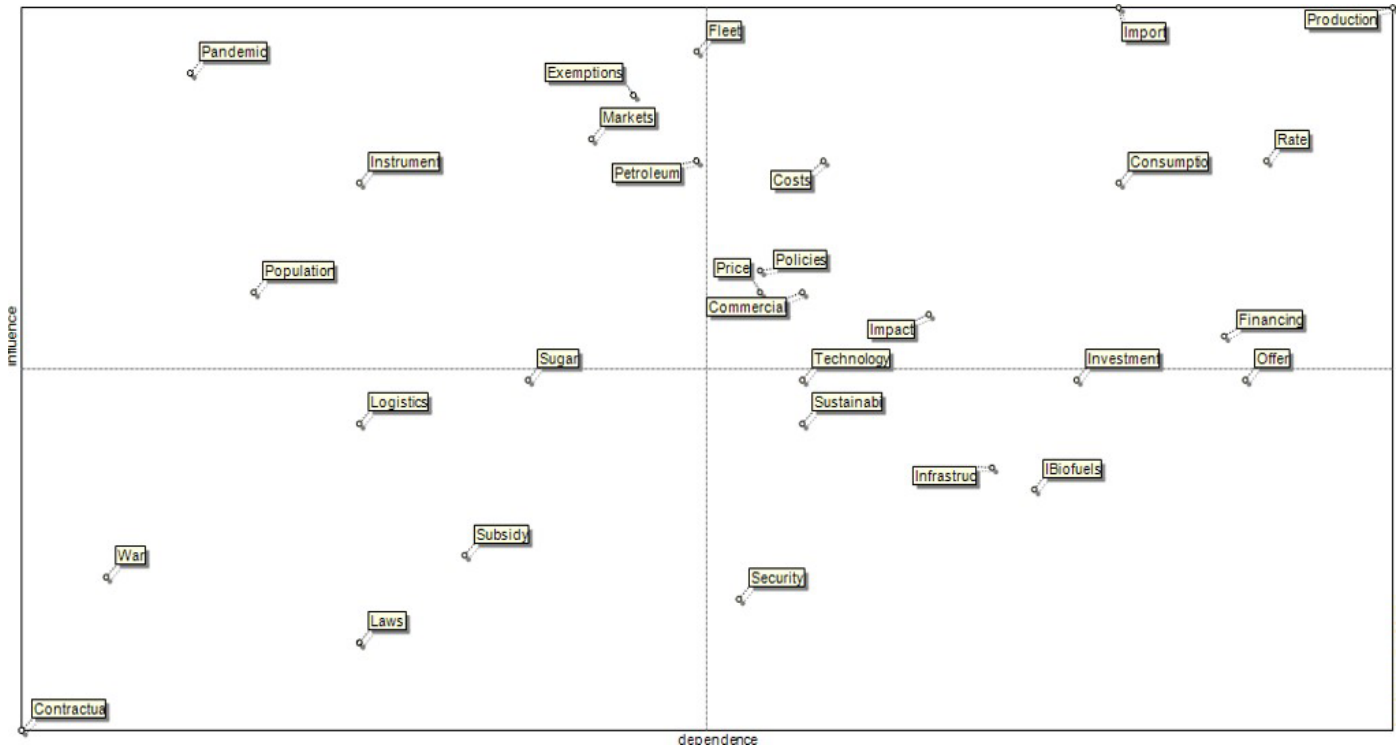
SCENARIOS

According to the analysis of the variables and the Delphi procedure, the following scenarios are developed by combining the results of each of the tools.

Trend Scenario

Ethanol made in Colombia: It is the year 2032, and the biofuel market

Figure 3. Map of displacements of direct relationships and indirect relationships.



in Colombia continues to operate in accordance with the regulations that have been stipulated through resolutions and decrees as incentives for their production and commercialization. Free importation generated a national crisis in the alcohol market between 2022-2024, since the distilleries that produce ethanol based on sugarcane were affected by the growing importation of corn ethanol from the United States that was characterized by a lower price and inferior quality to the national product.

During the crisis, new regulations were made for the sector, especially proposing a percentage of tax exemption based on the percentage of emission that is reduced according to the type of ethanol that is imported. Thus, alliances were made with national ethanol buyers, based on the benefits for quality and the differences in emission reductions, and thus national production based on sugarcane became more attractive.

As of 2026, through a resolution issued by the national government, stricter quality standards are required for imported ethanol, an initiative that has managed to stabilize the market. Thus, Colombia is approaching the objective assumed in the Paris Protocol of reducing carbon dioxide emissions by 20% by 2030.

Optimistic Scenario

Honey-flavored ethanol: It is the year 2032, in the country the boom of non-conventional renewable energies is felt and in response the State through the Ministry of Mines and Energy promotes laws that benefit the biofuels sector. Colombia is recognized in the United Nations Organization on Climate Change for the diversification of the energy basket in the development of its ethanol plants from sugarcane in the Cauca Valleyand the boom in projects associated with this source of energy, thanks to the benefits in financing by banks, the international community, and the State. In compliance with the country's commitments with COP 21 and the wide growing supply in recent years, the percentage of ethanol mixture in gasoline is raised to 30%.

The government has favored the importation of vehicles with flexible technology (flex fuel) that run on 100% ethanol. These vehicles are negotiated within the free-trade agreements and arrive without tariffs in the country. Distributors and wholesalers have been motivated to modify their infrastructure to serve this new market, driven by changes from the government to favor their transport and distribution logistics, as well as the growing demand by citizens. The increase in the prices of fossil fuels has favored the mixture with gasoline, generating a kind of subsidy that has kept the prices for final consumers very stable, in addition, the private media have joined the knowledge diffusion, promoting a society that understands the positive impact for the economy and the country.

Some companies have put into operation second-generation alcohol distilleries, from sugarcane bagasse and the crop residue that remains in the field after harvest, increasing their supply and energy portfolio by 250% per planted hectare. Under the "Plan Vallejo" import and export system, the government has favored the purchase of raw materials for ethanol production, and as part of the national policy has allocated part of its budget to the research and development of substitute goods for to the ethanol production chain, from the Ministry of Educa-

Figure 4. Importance versus Governance matrix (left) and Importance versus Uncertainty matrix (right).

tion through Colciencias This makes the production cost of Colombian ethanol within competitive margins and as surpluses can be exported to other markets, it makes ethanol an important source of foreign exchange. The Colombian industry continues to be the third largest producer of bioethanol in Latin America, with a five-year lead over other countries.

Pessimistic Scenario

Oxygenation of lukewarm cloths: It is the year 2032, the debates are still going on in the Colombian Senate about the formula to set the price of ethanol, unions are in conflict, distributors and producers are not satisfied with the way the price is currently calculated; and the misinformed and dissatisfied citizenry think that the high price of gasoline is due to the price paid today to alcohol producers. The mixture rate does not exceed 12% and fewer and fewer people see the benefits of biofuel.

Distributors and wholesalers have opted for the purchase of alcohol from the United States, obtained from corn, and in Colombia, a political decree has been signed by means of which wholesalers are allowed, without any regulation or national purchase quotas, to import ethanol. This is politically motivated by pressure from the United States government due to the oversupply in that country, due to the decisions of some states that have followed the example of California by not allowing gasoline mixtures with corn alcohol, and the considerable number of reforms that support North American agriculture. All the scientific and industrial machinery of the United States is aimed at the ethanol market where there are more than 230 distilleries that extract alcohol even from the stalks and stubble of corn, and in the last 12 months more than 20 distilleries have been inaugurated. In Colombia over the last 10 years, there has not been any expansion in the six installed distilleries.

The Colombian State has not been able to implement policies that make the production of fuel ethanol its strategic plan, which is why during the last three presidential administrations, the dynamics in politics, rather than promoting, have distorted and questioned the productivity and profitability of the business. For this reason, companies in the sector have not invested in recent years in modernizing or expanding their plants, and it is not even in their interest to carry out studies in this regard because the Government's Resolutions and Decrees have impeded national production. Neither for the private nor for the state company Bioenergy does the Ministry of Agriculture have incentive plans for the countryside, on the contrary, the new agrarian reforms have restricted the expansion of crops such as sugarcane, causing peasants and landowners to move to other crops by subsidizing the initial investment, technology and chemicals. However, the latest figures from the Bank of the Republic have shown that it has been a fallacy.

At the beginning of 2030 the European Parliament approved the elimination of sugar production quotas, and with this the world market saw an additional 3.5 Mt of sugar this year. Sugar-chemical industries that are not selling alcohol did not find substitution in sugar exports so there has been a checkmate. Through a resolution, the Colombian Ministry of Mines and Energy is proposing the new formula to calculate the price of ethanol, making it much cheaper so that wholesalers and distributors can buy it. This has a very serious effect on national producers who prefer to make raw sugar than alcohol and is why national production quotas have dropped by more than 50%.

CONCLUSIONS

The sector has through its associations the possibility of working in all the variables of the environment and a unanimous vision of a best scenario that allows it to organize its strategies and achieve medium and long-term objectives. Thus, prospective methods become a toolbox for the best solution to the problems of the ethanol industry. The prospective exercise outlined here identified the most influential and dependent variables of the ethanol business for the Colombian market, which should become strategic objectives for the different producing companies.

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Carbo Solutions International, LLC

CANE FACTORY (PROCESS)

ENGINEERING
Carbo Solutions International, LLC

EVAPORATORS
Carbo Solutions International, LLC

EVAPORATOR TUBES
Webco Industries

JUICE HEATERS
Carbo Solutions International, LLC

JUICE HEATERS TUBES
Webco Industries

STRAINERS AND JUICE SCREENS
Cobalt Chain Inc.

VAPOR CONDENSERS
Carbo Solutions International, LLC

CANE FACTORY (CRYSTALLIZATION)

BATCH VACUUM PANS
Carbo Solutions International, LLC

VACUUM PANS
Carbo Solutions International, LLC

VERTICAL & HORIZONTAL
Carbo Solutions International, LLC

CHEMICALS

BIOCIDES
Carbo Solutions International, LLC

CLARIFICATION AIDS
Carbo Solutions International, LLC

COOLING WATER TREATMENT
Carbo Solutions International, LLC

DECOLORIZATION AGENTS
Carbo Solutions International, LLC

FLOCCULANTS
Carbo Solutions International, LLC

ION EXCHANGE RESINS
Carbo Solutions International, LLC

SUGAR SYRUP CLARIFICATION
Carbo Solutions International, LLC

CONSULTING SERVICES

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CONSULTING SERVICES PROCESS CONTROL
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ENERGY OPTIMIZATION STUDIES
Carbo Solutions International, LLC

ENVIRONMENT

WASTE WATER TREATMENT
Carbo Solutions International, LLC

EQUIPMENT & SERVICES

CANE UNLOADERS
Cobalt Chain Inc.

CENTRIFUGES
Broadbent Inc.
Prodek

CONVEYORS
Cobalt Chain Inc.

DRYERS
Prodek

EVAPORATORS
Prodek

FEEDING TABLES
Cobalt Chain Inc.

FEEDING AND WASHING
Cobalt Chain Inc.

PUMPS
Prodek

STEAM TURBINES GENERATORS
Triveni Turbines

WATER TREATMENT EQUIPMENT SYSTEMS/CANE WASHING
Cobalt Chain Inc.

FILTERS

FILTERS, AUTOMATICALLY CONTROLLED
Carbo Solutions International, LLC

CANDLE
Carbo Solutions International, LLC

PRESSURE
Carbo Solutions International, LLC

REFINING

ACTIVATED CARBON
Carbo Solutions International, LLC

DECOLORIZATION PLANTS
Carbo Solutions International, LLC

LIQUID SUGAR PRODUCTION PLANTS
Carbo Solutions International, LLC

REFINERIES, DESIGN
Carbo Solutions International, LLC

GET TO KNOW YOUR SUPPLIERS

BROADBENT

Broadbent offers fully automatic batch and continuous high and low grade centrifugals to the beet, cane and dextrose industries together with an expanded range of equipment including mixers, re-heaters, batch pans and other auxiliary equipment. Broadbent also offers a wide range of conversion packages for Broadbent and competitors' equipment.

CARBO SOLUTIONS INTERNATIONAL, LLC

Carbo Solutions International LLC (CSI) is a USA based innovation company serving the sugar industry for two decades, with core strength in research & development, offering several high-performance patented process aids. CSI and associates also offer concept to commissioning EPC solutions, total turnkey projects and management, facilitation in raising project finance, plant operations, troubleshooting & consulting, energy management & auditing, energy efficient equipment supply, and plant equipment & spare parts.

Contact CSI for unique solutions for Sugar Mills & Refineries, Liquid Sugar Plants, Cogeneration Power Plants, Standalone bio-mass power projects, Alcohol plants of various grades, By-products and Co-products, with core strength in:

- Engineering, Design, Consultancy & Auditing Services
- Back-end & Standalone Sugar Refineries Plus Liquid Sugar
- Molasses & multi-feed distillery projects
- Water & zero effluent treatment sectors
- Energy efficiency & management
- High Performance Adsorbents (HPA) & Design offered for sugar mills, refineries and liquid sugar production

JOHN DEERE

Long considered the global leader in sugarcane harvester innovation, Harvest Monitor™, John Deere's exclusive decision support system for sugarcane, collects yield, trash, and field residue data while computing fuel rate, pour rate, field elevation, and more. Users can make on-the-fly adjustments with real time performance data, or plan for the future using multi-layer maps and data through John Deere Operations Center. Building on this system's already broad capabilities, John Deere has added and has beem utilizing the SmartClean™ technology since 2021. SmartClean is an integrated solution that works with Harvest Monitor to control primary extractor losses and trash levels, improving yield, sugar recovery, and reducing costs. Sensors generate a digital signature of everything going through the cleaning chamber. SmartClean then compares extractor readings with elevator data from Harvest Monitor to precisely determine loss and trash levels. Users can monitor loss and trash while controlling fan speed manually, or set trash and loss targets, and let SmartClean control primary fan speed automatically. Harvest Monitor with SmartClean has unique benefits over other systems. Non-contact, optical sensing virtually eliminates wear and unlike load cells, optical cameras can distinguish yield from trash for higher accuracy. Data is available in the cab, remotely via JDLink™, or in the office where users can view data in colorful, easy-to-use maps on MyJohnDeere.com or create prescriptions for precision ag applications. Added SmartClean technology gives users yet another adaptive tool to control costs and drive revenue farther than ever before.

HMS™ (Headland Management System), also new for model year 2021, automates row-to-row functions at the headland with two simple, fully programmable commands. Actions like harvest function engagement, machine lift/lower, and cleaning functions can now be paused and/or switched with the push of a button. The benefits of headland automation go far beyond significant fuel savings. HMS reduces fatigue and operational complexity, and it has an easy-to-access interface with a help feature integrated into the display. HMS also uses an advanced prediction algorithm to automatically determine the next unloading side.

Yet another exciting innovation for John Deere since 2021 is LoadView™. Using digital cameras and a display-integrated monitor, LoadView enables operators to see a true overhead view of cane as it loads into transport systems. Operators can now reduce loss from spillage, overflow, and misalignment from a significantly more comfortable viewing angle. Ruggedized, adjustable cameras mounted near the mouth of the elevator provide a wide, 112° field of vision and offer excellent digital image quality even in low-light conditions.

Innovation is a core value at John Deere, and our sugarcane product line bears no exception. These exciting new technologies and much more are now available on CH570 and CH670 sugarcane harvesters. Check us out online or visit your John Deere dealer to learn more.

PRODEK INC.

For over 30 years, Prodek has been extending its reach all the way through the American continent and the Caribbean, while serving the sugar industry and working every day to keep providing reliable and efficient supply solutions and technology for its clients.

WEBCO INDUSTRIES, INC.

The Webco Industries J47-M™ product line offers an extensive size range of high quality stainless steel tubing manufactured specifically to meet the demands of sugar refiners. Customers with high demand, seasonally driven sugar refinery requirements know they can depend on our quick turnaround shipping, exceptionally reliable tubing, and proven responsiveness. We deliver quality welded stainless steel specialty tubing products for evaporators, vacuum pans, juice pre-heaters, and more on budget, on spec every time.

Triveni TURBINES

Power Solutions for the Sugar Industry

With over five decades of experience, Triveni Turbine Ltd (TTL) o customized steam turbine solutions to industrial customers and power producers for power and heat requirements, globally. Triveni Turbines is one of the largest manufacturers of industrial steam turbines generators (STG) in the sub-30 MW range. The company also designs and manufactures steam turbines up to 100 MW delivering robust, reliable and efficient end-to-end solutions.

Triveni Turbines manufactures steam turbines at its world-class facilities in Bengaluru, India. With installation base of more than 6,000 steam turbines across 20 plus industries, Triveni Turbines is present in over 75 countries across the globe.

Apart from manufacturing, the company also provides a wide range of aftermarket services through its refurbishment arm, Triveni REFURB to its own fleet of turbines as well as turbines of other makes of up to 500 MW supported by its team of highly experienced and qualified service engineers that operate through its global servicing offices.

Our steam turbine generators (STG) are used by independent power producers in Biomass, Waste-to-Energy, District Heating and Geothermal etc. as well as by industrial customers such as Sugar, Distillery, Cement, Steel, Textiles, Pulp & Paper, Chemicals, Petrochemicals, Fertilisers, Solvent Extraction, and Palm Oil to Food Processing and more.

Triveni Turbines has a long-standing association with the sugar industry and has supplied tailor-made steam turbine solutions since 1968. Over 2,500 steam turbines are currently in operation in sugar plants across 36 countries, totalling approximately 5,000 MWe of power generation capacity.

The company offers Condensing and Back-Pressure steam turbines for process steam and power generation applications, which are designed for higher efficiency and are capable of performing under varying process steam requirements and operating conditions. The governing and actuating system of these turbines provides speedy response and stable control to accommodate grid fluctuations and frequent load throw-off conditions.

Sustainable Power Generation Using Thermal Renewable Fuel in Sugar Industry

A conventional power plant burns fossil fuels in a boiler to produce high-pressure steam to drive a turbine, which in turn drives an alternator to generate electricity. However, a combined heat and power (CHP) or cogeneration plant can use thermal renewable fuels, such as bagasse (a sugarcane by-product) to generate steam for power generation. The CHP plant also utilizes the steam extracted from the turbine for various sugar manufacturing processes, making it more efficient.

By using bagasse as fuel, the CHP plant can generate enough power to run the sugar mill during the season and sell excess power to the grid during the off-season, pro-

Triveni's Product Offerings for Sugar Industry

TYPE	SUB-TYPES
Back-Pressure Turbine Generator	1. Straight Back-Pressure 2. Controlled Extraction Back-Pressure 3. Uncontrolled Extraction Back-Pressure
Condensing Turbine Generator (with water- or air- cooled condenser)	1. Controlled Extraction Condensing 2. Uncontrolled Extraction Condensing
POWER OUTPUT Up to 100 MW	**PARAMETERS:** Inlet Steam Pressure – Up to 140 Bar Inlet Steam Temperature – Up to 545 Deg C

viding additional revenue. Furthermore, the cost of power generated by the CHP plant is around 14-15% lower than that of Independent Power Producers (IPPs).

Case Studies

1. Bagasse-based cogeneration plant installed overseas driven by Triveni 30 MWe back-pressure steam turbine with an inlet steam of 65 Bar and inlet temperature of 500 Deg C with 2.5 Bar exhaust.

The plant's main goal is to generate electricity while also utilizing the extracted steam for various processes in sugar manufacturing. This cogeneration approach enables the plant to operate more efficiently, reducing the overall energy costs and carbon footprint. The use of bagasse as a fuel source also contributes to the plant's sustainability objectives.

The installation of this bagasse-based cogeneration plant demonstrates the viability and effectiveness of utilizing renewable energy sources in the power generation sector. The Triveni 30 MWe steam turbine's high-performance capabilities allow for efficient power generation, making it a reliable and cost-effective choice for cogeneration plants worldwide.

Challenge: A customer had a requirement for a steam turbine with higher efficiency, and their expected delivery within 7 months.

Solution: To meet the customer's needs, a steam turbine with reaction technology was installed. The turbine's steam path was designed to handle a significantly large volumetric steam flow, while the rotor with reaction blading ensures higher efficiency.

Benefits: The exterior casing of the turbine was single-cast, which includes guide blade carriers, allowing for faster start-ups. The turbine's reaction stages also provide better efficiency, leading to increased energy output.

Overall, the installation of this steam turbine offers improved performance and energy savings for the customer.

2. Bagasse-based cogeneration plant installed overseas driven by Triveni 2*16.5 MWe back-pressure steam turbine with an inlet steam of 42 Bar and inlet temperature of 400 Deg C.

The Triveni steam turbines are designed with back-pressure technology, allowing for efficient steam utilization and energy generation. The turbines also feature a robust construction with high-quality materials, ensuring long-term reliability and performance.

The installation of this bagasse-based cogeneration plant is a testament to the effectiveness of Triveni steam turbines in the power generation industry. The turbines' high-performance capabilities and efficient design enable the plant to meet its energy demands while reducing its carbon footprint. Overall, the project demonstrates the viability of utilizing renewable energy sources for sustainable power generation.

Challenge: A customer had a requirement for a steam turbine that could operate at maximum efficiency with two different inlet steam parameters: 42 Bar (a) for a new boiler and 21 Bar (a) for an existing one.

Solution: To meet the customer's needs, the steam path of the turbine was meticulously designed to handle extremely high volumetric steam flow, ensuring maximum efficiency at both inlet steam parameters.

Benefits: The blade and nozzle of the turbine were constructed using high-quality materials, specifically American Society for Testing and Materials (ASTM) grades. This ensures longer blade life and reduced operational expenditures. The plant utilized the generated power to produce sugar, with the remaining power sold to the local electricity grid, contributing to sustainable energy generation.

Overall, the installation of this steam turbine demonstrates the effectiveness of precise steam path design and high-quality material construction in maximizing energy efficiency and sustainability. The project serves as an example of the importance of meeting customer requirements and utilizing renewable energy sources in power generation.

As sustainability becomes increasingly important for industries, the sugar industry is also exploring ways to reduce its reliance on fossil fuels. One of the key challenges faced by the industry is how to improve energy efficiency and lower capital expenditure (CAPEX) over a wider range of operational flow conditions than traditional steam turbines can offer.

To address this challenge, an innovative hybrid axial exhaust steam turbine solution has been developed (Figure 1).

Figure 1: Axial exhaust turbine with controlled extraction for sugar factory cogeneration

In the sugar industry, steam turbines must be able to operate under different flow conditions during both on-season and off-season periods. During on-season, the high-pressure (HP) section of the turbine is fully loaded, while the low-pressure (LP) section operates with partial loading. In contrast, during off-season, both HP and LP sections are fully loaded.

Triveni Turbines has developed a unique blade path that keeps the conversion efficiency relatively flat across widely varying flow conditions. The axial exhaust turbine solution helps to reduce both operational expenditures (OPEX) and CAPEX, making it an attractive option for the sugar industry looking to improve its sustainability practices.

Triveni Turbines provides aftermarket solutions for rotating machinery worldwide, including steam turbines, compressors, and gas turbines. To operate turbines efficiently and save costs, they may need to be redesigned to meet new parameters. Triveni REFURB enhances the efficiency of turbines of any make and age by replacing critical components such as rotors, guide blade carriers, and bearings. They also offer services such as health surveys, condition assessments, and long-term service agreements.

Over a period of time, the existing turbines degrade thereby reducing the efficiency of the turbines by consuming more steam. Our Triveni REFURB team provides solutions to enhance the efficiency of turbines of "Any make, Any age" by only replacing the critical components of the turbine i.e., rotor, guide blade carriers and bearings, which ensures the efficiency is restored and thereby reducing the carbon footprint.

The re-engineering will be done to ensure the old rotor and stator can be reused within the existing casing once the price of power improves, thereby giving the customer flexibility of choosing any option based on the fluctuation of power pricing and enhancing the efficiency in either case

Case studies show how Triveni REFURB converted double extraction-condensing and single extraction condensing turbines to back-pressure turbines to improve efficiency and meet changing process needs. The re-engineering process retains the existing system and only modifies the turbine internals to suit the new parameters, reducing costs and carbon footprint.

Triveni REFURB is today a multi-brand repair arm of Triveni Turbines offering various benefits of efficiency enhancement services on Steam Turbines, Renovation & Modernization, Re-engineering/Reverse Engineering, Health Survey and Condition Assessment, Residual Life Assessment (RLA), Overhauling, Operation & Maintenance (O&M) and Long-Term Service Agreements (LTSA), and Remote Monitoring (Triveni Touch).

The demand for thermal renewable energy sources is increasing globally, and the turbine industry is shifting towards energy conservation through the usage of renewable sources. Governments are promoting bagasse-based cogeneration, biomass power, waste heat recovery, and municipal solid waste-based power generating solutions to achieve sustainability goals. Replacing coal-fired power plants with clean fuel-based power generation will further drive the demand for renewable/thermal renewable power generation in the future.

ADVERTISERS

UPCOMING MEETINGS & CONFERENCES

2023

MAY 7-10 | **Sugar Industry Technologists (SIT),** New Orleans, LA USA; SugarIndustryTechnologists.com

JUNE 13-15 | **Joint Florida and Louisiana ASSCT,** Savannah, GA. USA

AUGUST 4-8 | **American Sugar Alliance (ASA),** Napa CA

AUGUST TBD | **Florida Division of ASSCT,** Belle Glade, FL USA; ASSCT.org

SEPTEMBER 18 - 22 | **Association of Sugar Technolgists of Latin America (ATALAC),** Costa Rica

SEPTEMBER 20 - 22 |**Association of Sugar Technologists or Mexico (ATAM),** Veracruz, Mexico; atamexico.com.mx

COBALT

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Sugar Industry Chains

Exceptional Performance, Superior Results

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Harvest Monitor with SmartClean™ from John Deere.

Don't watch your profits get blown away. Available with Harvest Monitor™ for CH570 and CH670 Sugarcane Harvesters, the new SmartClean™ system tracks and controls primary extractor loss, field residue, and wagon trash. Reduce cleaning loss and improve sugar recovery at the mill by letting SmartClean™ take control with both manual and automatic primary fan speed adjustments based on your preferred loss and trash targets. Pay your John Deere dealer a visit to learn more. What do you have to lose?

JohnDeere.com