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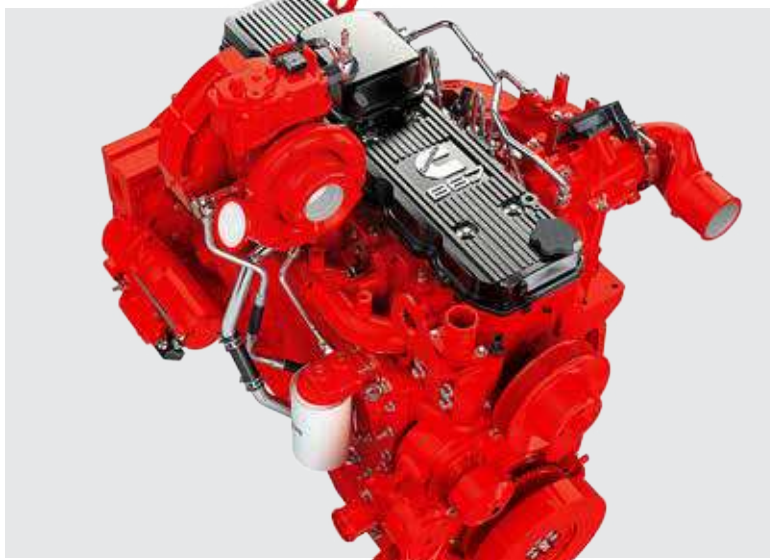
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GREEN INDUSTRY SPECIAL

Cummins bets on BS VI to boost its business

As India successfully leapfrogs into the Bharat Stage VI emission regime, the 101-year-old Cummins Inc's India business arm sees new prospects to establish itself even stronger here **Page 24**



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Lead acid versus lithium-ion

As OEMs and countries target greener motoring, the battle between tried-and-tested lead acid and premium lithium-ion battery chemistries has intensified. A detailed analysis **Page 42**



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 UNICA's CEO on how Brazil can assist India in developing an ethanol eco-system **Page 46**

haymarket

Praj Matrix looks to energise bio-mobility drive in India

Pune-based Praj Matrix, which is engaged in development of a range of renewable fuels and chemicals, has developed second-generation ethanol technology in-house. Can it give a new charge to India's clean mobility programme? **Shahkar Abidi** finds out.

Even though crude oil has seen its prices plunge on the global scale last month, there is no change in the considerable research actively underway worldwide in the field of alternative fuels, plant-derived ethanol being one. Around 80 percent of the ethanol produced worldwide finds use in vehicles. With growing demand for greener fuels and to reduce their dependence on crude oil, over 60 countries are currently in different stages of ethanol blending.

One company helping drive this change is the Pune-based Praj Matrix, the common innovation engine for all business units of Praj Industries. As the company says, its expertise cuts across a variety of sugar to starch-based feedstock, collectively called first-generation feedstock. Praj is one of the handful of companies in the world to successfully develop and demonstrate second-generation ethanol technology using agri-residue.

Praj has developed technologies for several clean, renewable fuels and chemicals – BioCNG and bio-butanol – which have the potential to redefine the global energy matrix. In addition, it has developed expertise in processing multiple feedstock to produce a variety of grades of ethanol.



What's second-gen ethanol tech?

A set of around 85 scientists at Praj Matrix, a Research and Development (R&D) centre located in the picturesque Temghar-Lavasa region near Pune, are busy these days screening, characterising and analysing microbial organisms, including enzymes and fermenting yeast. Most of these microorganisms have been screened from across flora and fauna of the country. A minuscule number of these tests may turn out to be positive for industrial stage application and pave the way for discourse on cleaner fuels in India and worldwide. The team expects the successful

The Praj Matrix R&D centre for advanced applied research in the field of biotechnology has an overarching goal of developing environment-friendly solutions for industry.

samples of enzymes and yeast to improve the overall yield and production of cellulosic ethanol.

A key challenge in production of second-generation (2G) biofuel is the identification of enzymes produced by microorganisms to catalyse biomass. The cocktail of enzymes breaks down the carbohydrates in sugarcane (or other materials), thereby converting it into simple sugars for fermentation process. Yeast is another important element commonly used in ethanol production as it is used for fermentation purposes.

The research is of tremendous significance for India, which is looking

to blend petrol with 10 percent ethanol by 2022, taking it further to 20 percent by the end of decade. According to industry estimates, India produces about 2.7 billion litres of ethanol annually.

As per the Petroleum Planning and Analysis Cell (PPAC) of Ministry of Petroleum and Natural Gas, India's ethanol requirement currently stands at about 330-340 crore litres for 10 percent blending with 3300-3400 crore litres of petrol. By 2030, the demand for ethanol will likely increase to about 1,000 crore litres for 20 percent blending with 5,000 crore litres of petrol. Globally, about 129 billion litres of ethanol are produced each year, of which 109 billion litres are used for fuel blending.

Supply-demand mismatch

During the first tendering which took place in August 2019, the oil marketing companies in India were looking to procure 5.11 billion litres of ethanol but managed only 1.4 billion litres. A second tender for 2.53 billion litres to make up for the shortfall was floated in January 2020. However, again the sugar industry could not match the demand and only 0.29 billion litres of ethanol were allocated. A new tender has been opened in early March, for 2.53 billion litres but industry insiders

claim that not many responses are expected this time too, as capacities are yet to catch up.

Research-driven expansion

Praj Industries' R&D Centre, set up in 2008 with an initial investment of Rs 80-100 crore, is playing a critical role in the company's journey. The facility, which encompasses all of 80,000 square feet, houses 16 well-equipped labs focusing on molecular biology, bioprocess technology, process engineering and scale up, and chemical sciences, among others. The R&D Centre conducts research in the emerging areas of industrial biotechnology such as second-generation biofuels, advanced biochemicals, health and wellness products among others. Praj-supplied plants contribute about 8 percent of total ethanol production globally.

Pramod Chaudhari, executive chairman of Praj Industries, says, "We created the R&D arm right from the initial stages of the company and R&D has always been an integral part of Praj's journey. The difference is, it was application R&D for the first 20 years; later we decided to upgrade our efforts so that we could start new process developments".

"One of the major accomplishments of our R&D efforts is the patented infinity technology, which has opened the doors of opportunities for us. We are setting up second-generation (2G) integrated smart bio-refineries based on this technology," reveals Chaudhari.

Infinity technology, the company claims, helps refineries process multiple feedstock/ biomass like corn and sugarcane residue, rice or wheat straw, various lignocellulosic biomass to produce fuel-grade ethanol, biochemicals, bio-

CNG, liquid CO₂ and bio-fertilisers.

Funding remains a challenge

Funding remains a pain-point for the industry. Chaudhari says, "There is steady demand for such technologies as they are eco-friendly and support COP 21 obligations. However, arranging funds to set up bio-refineries is a painful exercise."

Media reports quoting government sources reveal that of the 362 ethanol production projects cleared by the Indian government in around a year, just about 56 have received a final clearance from banks. This is despite the fact that in March 2019, the Central government cleared a soft loan package of Rs 15,000 crore with an interest subsidy of Rs 3,355 crore for helping those looking to set up projects under the ethanol blending programme (EBP). Earlier, in June 2018, the government had announced a Rs 1,332 crore interest subvention on soft loans by sugar mills.

Back to the future?

Ethanol, a colourless and volatile compound is obtained from a variety of biomass material including grains and crops having a higher level of sugar and starch content including sugarcane, corn and beet, among others. Although ethanol has for long been used for industrial and beverage purposes, its usage in automobiles remained minimal compared to diesel and petrol.

History, according to US Energy Information Administration, has it that in the 1850, ethanol, which was also called alcohol then, was majorly used as a lighting fuel. However, its popularity fell during the US Civil war in the 1860s when a liquor tax was imposed on ethanol



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to raise money, thereby making it uncompetitive against other fuels. Ethanol production fell sharply after that and could recover only after the taxes were repealed in 1906.

Two years later, in 1908, ethanol regained popularity as a result of Henry Ford designing his iconic Model T to run on a mixture of petrol and ethanol, prompting the legendary car maker to claim the mixture to be the 'fuel of future'. Shortage of other fuels in World War II also saw temporary demand for ethanol. In the 1970s, interest in ethanol as a transportation fuel was revived as oil embargos, rising oil prices, and growing dependence on imported oil increased interest in alternative fuels.

Ethanol got its biggest push in Brazil, starting 1980s, when OEMs re-engineered engines marginally to adapt to the increasing level of ethanol blending in petrol. Initially, even Brazil started with a 10 percent blend and now it has reached 27 percent. And over four decades, Brazil has achieved 100 percent ethanol in flex-fuel vehicles. Now Brazil and India are actively engaging with each other to see how India can develop an ethanol producing eco-system. On February 24, ISMA (Indian Sugar Mills Association), UNICA (Brazilian Sugarcane

Industry Association), APLA (Brazil's Ethanol Cluster), The Brazilian Government Ministry of External Relations and Apex-Brasil (Brazilian Trade and Investment Promotion Agency), jointly held a seminar, aptly called 'Ethanol Talks' in New Delhi. The seminar aimed to promote ethanol as a modern and sustainable option for mobility, capable of generating immediate positive impacts on energy security, public health through the reduction of local pollution and greenhouse gas (GHG) emissions, responsible for global warming. The year 2020 represents a milestone for specialists in climate change, as it would record the maximum level of GHG emissions. In this sense, the mixture of ethanol in petrol, when adopted through clear and long-term public policy, can provide an instant decrease in emissions in the auto sector, the sector responsible for more than one-fourth of global emissions. Praj Matrix's indigenously developed second-gen ethanol tech has the potential to make mobility cleaner and cheaper. ■

● **Interview with Evandro Gussi, President and CEO, Brazilian Sugarcane Industry Association (UNICA), p46**

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