



FOCUS ON GREEN SUSTAINABLE TECHNOLOGIES TO SUPPORT DEVELOPMENT

Pramod Chaudhari, Executive Chairman, Praj Industries shares information regarding potential for bio-based technologies, sustainable solutions and EPC requirements in India. He also summarizes the brownfield opportunities in terms of retrofitting and modernization of several existing, old ethanol plants in the country.

Chemical industry global trends making an impact on EPC players.

The global market trends are positively changing with the adaption of cleaner fuels. The effect of this change is visible in the pockets of international markets, and is now ready for higher levels of biofuels integration. On the 1G ethanol front, we have witnessed a slew of high-potential order leads from international markets across Latin America, South-east Asia, and parts of Europe, driving overall market sentiment. With the strong expertise and market leadership, Praj is participating in various opportunities in the India and international markets after successfully delivering some complex contracts in the chemical and oil & gas sector. Our sustained efforts to position ourselves as preferred partner for global T-EPCm players are yielding dividends by way of critical repeat orders. The certification and approvals by global players will enable us to bid for projects on a wider international scale. With a manufacturing unit at Kandla port that can manufacture equipment according to U, U2, ASME, GOST and other international standards, this business line contributes meaningfully to our exports.

Process equipment market scenario for chemicals & related industry.

With the change in geopolitical dynamics, the global trends are changing and the oil prices are hovering at a high level. This is specifically due to America's move to end sanction waivers on oil imports from Iran and warlike situation in Libya. With this, oil prices are expected to remain high in the near future. Looking at these opportunities, major oil companies like Exxon Mobil and Shell are raising their investments for oil exploration & refineries and are constantly in pursuit of investing in newer oil fields. This will also create a huge opportunity in Greenfield Projects.

Also, several old refineries are using legacy technologies and are looking forward to expand the existing plant capacities. This will lead to brownfield opportunities in terms of renovation, upgradation and modernization. Process industries around the world are implementing advanced digital technologies in terms of remote monitoring for performance, data analytics for optimizing product mix and the quality. Not to miss, the preference for skid systems and complex materials is also gaining momentum these days. The Global Companies certifications will help us to bid for projects on a wider international scale and help us to cater to multiple industries.

This business is expected to follow the industrial investment cycle with key sectors being Pharmaceutical, Biotech, Oil & Gas, Chemicals & Agrichemicals and Textiles.

Potential growth sectors within India.

Over the years, we have seen a gradual shift and improvement in the Indian Chemical Industry. The US originally was known as the home for innovation and production of chemicals and specialty chemicals. The industry then gradually transitioned to Europe and China. Currently, the growth drivers of the Chemical Europe, China and India Industry are the availability of raw materials, competitive prices in the domestic market and the increasing demand of premium products in the market. Also, the competitive manufacturing costs, the much appreciated strong government support for research & development and of course an evolved ecosystem that fully supports the industry and innovation are the main contributors of growth.

Some of the industries from whom we can expect a potential growth are Agro Chemicals, Specialty Chemicals and Colorant Chemicals. The Indian agrochemical industry is worth \$4.9 billion and is the fourth largest producer of agrochemicals after US, Japan and China. Specialty Chemicals industry in India accounts for nearly 20 percent of the total chemical industry with worth of \$28 Million and is expected to account for 5 percent of Global Specialty Chemicals by 2020. The Indian colorant industry stands at \$5400 million and it is poised to increase to \$9100 million by 2020.

Renewable chemicals is another segment that has huge potential in the coming years. A lot of R&D is happening in this field across the globe. At Praj Matrix R&D centre, our scientists are developing different renewable and oleochemicals such as Furfural, Xylitol, Hyaluronic Acid, Vitamin E etc. These renewable chemicals find applications in growing industrial segments such as health & wellness, cosmetics and nutraceuticals.

Implementing de-carbonization in the country.

In order to reduce carbon emissions, it is necessary to shift from fossil fuels to green fuels at the earliest. This is possible only with the use of renewable fuels, including ethanol in petrol, use of Compressed Bio Gas instead of Compressed Natural Gas, use of alternative fuels and energy sources like solar panels, electric vehicles etc. Additionally, the use of renewable chemicals instead of traditional chemicals made from fossil fuel should

be implemented. In line with the vision of reducing pollution and the need to efficiently manage the crop residue across the nation, the government has announced the new Sustainable Alternative towards Affordable Transportation (SATAT) policy, in which it envisages 5,000 Compressed Bio-Gas plants in the next five years.

Praj Industries is also working towards this vision and has introduced a new technology - "Renewable Natural Gas Technology (RENGAS)". RENGAS is an advanced technology to produce Renewable Natural Gas (RNG) from agri-residue such as cereal straws and farm remainders as well as from Agro-industrial waste such as Sugar mill press mud or distillery Spent wash. RENGAS byproduct, fertilizer, has also received the approval and certificate from the Natural Organic Certification Association (NOCA) as per set NPOP Standards. Currently 6 percent ethanol is blended with gasoline, and as per the National Policy on Biofuels, 2018, the government has set the target to 20 percent by 2030.

Ethanol 2G to help reduce dependence on fossil fuels.

With Ethanol 2G biofuels, up to 20 percent blending is possible without any changes in IC engines. With 20 percent blending, 7000 million liter worth of fossil fuels will be replaced with cellulosic ethanol resulting in \$4920 to 5075 million worth saving on oil imports whereas the existing capacity of 1G ethanol will not help blending rate go beyond 5 to 7 percent due to limited availability of sugarcane. There is an abundance availability of the biomass currently and hence government of India has taken initiative to establish 12 ethanol manufacturing plants based on 2G technology and if 20 percent blending is achieved, GHG Emission Saving worth 26.7 Million MT will be possible. It will be equivalent to removing 5.5 million passenger cars from the road which can create a huge difference to the country and the environment.

Praj is also working towards expanding the 2G Ethanol manufacturing plants. Our 2G project deliverables for, Bharat Petroleum Corporation Limited (BPCL) plant at Bargarh, Orissa and Panipat plant for Indian Oil Corporation Limited (IOCL) are progressing as planned. We have already completed Basic Engineering Design Package (BEDP) for both the plants and execution activities related to Engineering, Procurement and Construction Management (EPCM) for IOCL plant has commenced. BEDP related to Hindustan Petroleum Corporation Limited (HPCL) plant at Badaun (UP) has started.

Business roadmap and growth plans for the company.

Praj is a globally leading company with a bouquet of sustainable solutions for various segments such as bioenergy, high purity water, critical [process equipment](#), breweries and industrial wastewater treatment. The company has been a trusted partner to customers around the world for more than three decades for innovative, sustainable solutions in bioenergy, high purity water solutions, critical process equipment and skids, [beer plant](#) manufacturing, industrial [wastewater treatment](#) skids and bio-products. We are present across 5 continents in more than 75 countries. On the whole, we see the enhanced prospects for growth across business verticals and target markets. All business segments namely, Bio-energy including Compressed BioGas, Praj Hi-purity and engineering are well poised with unique set of capabilities, comprehensive offerings and a steady rise in opportunities across the landscape.

Over the last eight years, the global economy has gone through a challenging time with contraction in investments. Now, over the past one year, there have been signs of economic revival. US have also shown positive growth with potential of fresh investments across different geographies. This augurs well for businesses that are driven by investment climate as well as export markets.

R&D and innovation specific for the India market.

Over the past 3 decades, the company has focused on Environment, Energy and agriculture process led applications and we have a state-of-the art 'Innovation Centre' called Praj-Matrix which is DSIR-Govt. of India recognized R&D unit. The unique features of Praj Matrix R&D Centre are –

- Its' First of its kind R&D facility with Bench and Pilot scale facilities which enable validation of scientific assumptions and rapid commercialization
- With expertise of over 90 Scientists and technologists, 23 PhDs
- Focus on "Green technologies" with emphasis on sustainability
- Devoted to developing bio-fuels and renewable chemicals using advanced biotechnology tools like genetic engineering and fermentation.
- Consistent innovation in Design & Development (D&D) endeavor to improve water and energy footprint in the market
- Praj Matrix developed the technology for 2nd generation ethanol as well as compressed bio gas plants

The company's R&D unit, Praj Matrix is a biotech R&D center. So far, it had been focused upon serving the existing businesses of Ethanol, Brewery and water & wastewater. With investments exceeding Rs100 crore over the past few years, Praj Matrix is now divided into three main divisions: one is the division which serves the existing businesses; another for 2G ethanol technology development and the third for developing BIO CNG technologies.

Collaboration with Gevo USA and benefit for the market.

Praj Industries signed a Construction License Agreement (CLA) with Gevo, Inc USA on 4 April 2019, to commercialize technology for the production of Isobutanol using sugary-based feedstock, such as juice, syrup and molasses. Pursuant to the CLA, Praj will provide Technology Engineering Procurement and Construction (T-EPC) services to 3rd parties using a process design package developed by Praj. This package will use Gevo's proprietary Isobutanol biocatalyst on sugary-based feedstock. Isobutanol

derived from said proprietary process is high energy renewable intermediate product that finds application in Aviation and Racing cars. Praj also signed a Memorandum of Understanding (MOU) with Gevo Inc. to commercialize Gevo's renewable hydrocarbons products. This includes Gevo's renewable alcohol-to-jet fuel ("ATJ") and renewable isooctane, derived from Gevo's renewable Isobutanol.

This collaboration is an addition of Isobutanol technology to Praj's diverse product portfolio and a step in our endeavor towards smart bio refineries that facilitate sustainable decarbonization. This solution can be offered both as a 'bolt-on' to an existing ethanol plant or as a Greenfield plant. We value our partnership with Gevo and believe that this technology will help the aviation industry fulfill their obligation of Green House Gas (GHG) reduction.

Importance of sustainable solutions and development.

Fiscal 2019, thus far, has been an exciting year marked by a series of positive development geared towards the bioenergy landscape in India. The National Policy on biofuels 2018 is a huge step undertaken by the government to structure the ecosystem for sustainable adoption of biofuels and enhance their usage in the energy and transportation sectors in the coming years. The Policy expands the range of feedstock by permitting the use of 100 percent sugar cane juice as well as damaged food grains, corn and sugar beet for ethanol production. This step helps to bring in abundant feedstock into the system setting the stage to significantly accelerate the blending levels across the country which were hitherto constrained by the availability of adequate feedstock.

This all will lead to a lot of development in the country. It will see an inclusive growth of the industry with generating a lot of job opportunities, a significant growth in the rural economy will be visible as the farmers will be the ones, pollution control, and betterment of the ecosystem of stakeholders of biofuel industry as demand for the raw materials will also increase with the development of [ethanol plants](#). With Ethanol 2G, the possibility of sustainable development will surely be achievable.

Having an edge over industry peers in the India market.

Praj Industries started as an entrepreneurial venture three decades ago, is today India's most successful company in the field of bio-based technologies and engineering with presence all over the world.

Praj has the best capabilities of the industry with the patented chemical technologies, state of art research laboratories, the expertise. We can work on all the technologies at lab scale, pilot scale to Demo to commercial scale. We are involved in Research & development to Design & Development of large plants. Headquartered in Pune, India, Praj has spread its presence across the globe with more than 750 references with knowledge of the varied markets.

Challenges faced in India.

Every industry and each company faces different challenges. The challenges faced are commercializing the technology that we develop in-house and get it approved by the board and arranging finance for customers. Also the main challenge is to deal with intellectual property issues. The country really needs to work on increasing the strictness of the IP laws and data security, as this is very important for people working towards innovation and development in the industry.