



U.S.-India Synergies in Energizing India



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FOREWORD



Ms. Ranjana Khanna

Director General CEO
AMCHAM India

India is poised to be the 3rd largest economy in the world and it is anticipated that the energy sector shall play a crucial role in India's growth story. The Government of India is aggressively pursuing energy transition with the development of environmentally friendly energy sources and decarbonization to help India achieve affordable and sustainable energy and Net Zero goals by 2070. It is expected that India's energy demand will double by 2045 and the government is committed to unprecedented levels of investment in the energy sector.

The 2024-25 budget emphasizes enhancing energy security – stating India's commitment towards nationally determined contributions (NDCs) aimed to reduce greenhouse gas emissions as part of climate change mitigation. Development across the sector is being addressed by the Government of India in a mission mode, including initiatives, such as, Global BioFuel Alliance, National Green Hydrogen Mission, Carbon Capture Utilization and Storage (CCUS) Mission, creation of a road map on energy efficiency for hard-to-abate sectors and promoting renewable energy. Simultaneously the government is effectively evaluating and addressing the pressing global energy challenges of ensuring energy availability, affordability, and sustainability and prioritizing energy security.

AMCHAM member companies, U.S. industry in India, have been playing a pivotal role to bring in the latest and globally benchmarked technologies to support the government's efforts in energizing the nation, transition efficiently and achieve Net Zero goals.

This capability deck showcases the best practices of AMCHAM members highlighting the work undertaken in the global energy sector, future plans, contribution to the Indian economy by operating in the energy sector through technology sharing and indigenization, direct and indirect employment, talent and skilling and how they have bolstered the ecosystem through research and development. This document provides reference information on the U.S.-India partnership in the energy sector and would help synergize forthcoming opportunities of collaboration.

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Baker Hughes 



We are
Baker Hughes

July 2024

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We are Baker Hughes, an energy technology company. Together, we're making energy safer, cleaner, and more efficient for people and the planet.

Energy for today and tomorrow

The energy sector is changing, faster than ever before. The energy trilemma—solving for energy security, sustainability, and affordability—is rebalancing our priorities and creating a new path forward for the industry. We believe we can meet those objectives together.

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Health, safety, environment, compliance, and quality are the **personal responsibility** of every employee

OUR VALUES



GROW



COLLABORATE



LEAD



CARE

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Why Baker Hughes

Where there's demand, we deliver.

Our ability to deliver energy tech leadership, integrated solutions, and customer focus is unmatched. By combining our unique strengths, we're making cleaner, more reliable, and more efficient energy a reality.



People & culture

We are a people-first company, driven by a relentless pursuit to serve our communities, and working together to achieve our shared vision.



Advanced technology

Our highly engineered, connected technologies are what the world relies on to meet energy demand now, while redefining what's possible in the future.



Low carbon & sustainability

As the leaders in energy technology, we are setting the pace, delivering a sustainable energy transition and cleaner energy future, faster.



Solutions & scale

We're the only energy tech company with the portfolio, scale, and reach to develop reliable, cleaner energy solutions for today and tomorrow.

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Baker Hughes

Our strategy is focused on three core areas

Transform the core

Transforming our current businesses to improve margins and cash

Invest for growth

Driving organic and inorganic growth to build our businesses

Position for new frontiers

Making strategic bets to drive decarbonization of energy and hard-to-abate industries

Our strategy is at work across both business areas

Transform the core

- Driving margin improvements
- Execution excellence
- Portfolio optimization

Invest for growth

- Digital and software growth
- Future-proof technology

Position for new frontiers

- Low carbon and emissions management solutions
- Carbon capture/storage (CCUS)
- Clean energy (H2, geothermal)

INDUSTRIAL & ENERGY TECHNOLOGY

OILFIELD SERVICES & EQUIPMENT

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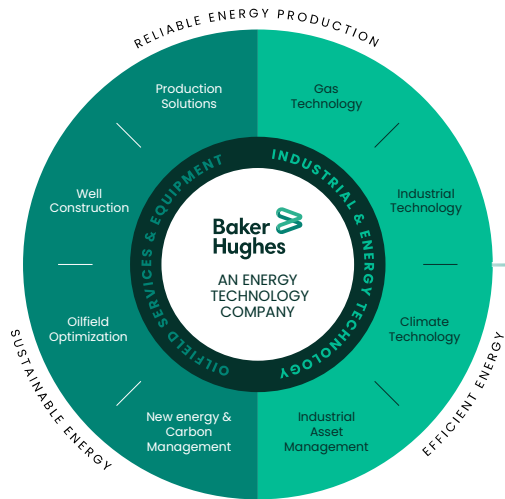
Baker Hughes

HORIZON 1

OFSE AND IET
Bringing better visions of energy to life

In pursuit of our purpose, we've built a business that can drive the next era of the energy transition.

Alongside Oilfield Services & Equipment (OFSE), Industrial & Energy Technology (IET) resolves the critical task of the energy transition: bringing energy security, sustainability, productivity, and efficiency together.

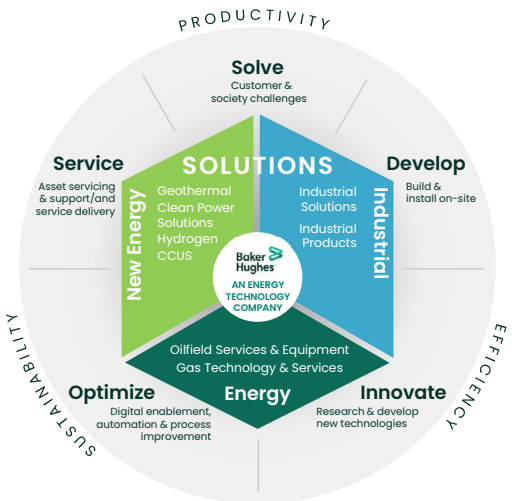
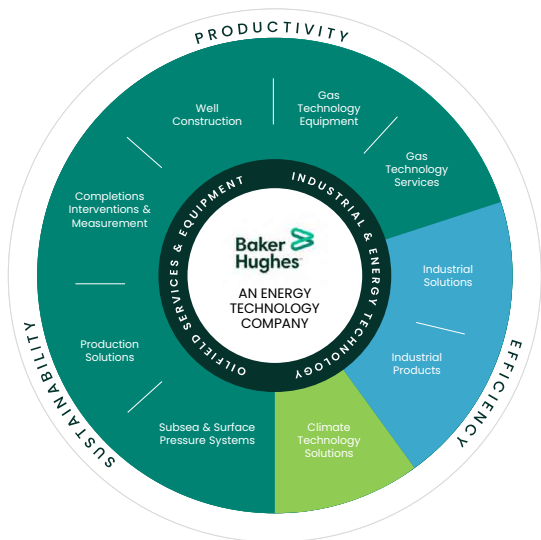


We deploy solutions to the world's greatest energy challenges

- Global energy security
- Climate change
- Industrial efficiency and productivity

TOWARDS HORIZONS 2 and 3

Our two Business Segments both focus on 3 key customer solution areas



TOWARDS HORIZONS 2 and 3

Leading Energy Technology Company

1. Why we exist

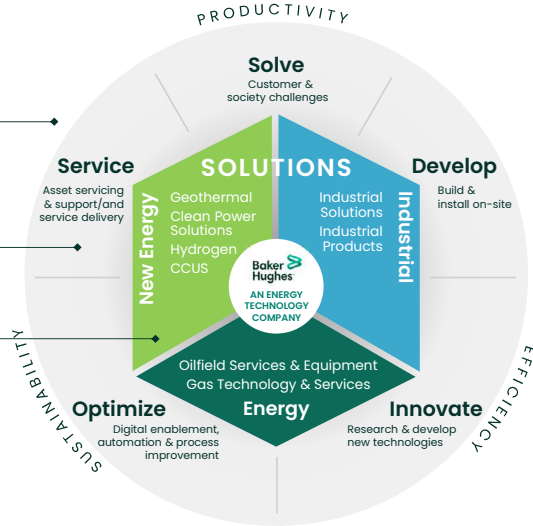
The benefits we bring to customers and society and anchor us in the energy trilemma. Importantly, customers are seeking productivity and efficiency along with solutions to Net Zero.

2. How we deliver

One Baker Hughes through the common roles we play in clients' ecosystems.

3. Where we play

Our key technology (vectors/spaces) aligned to technology solutions areas.



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Investing for growth today and tomorrow \$2.1B of strategic acquisitions and investments

CARBON CAPTURE, UTILIZATION, AND STORAGE

 Orbital Energy Modular Carbon Capture technology Nov 2020	 SRI Exclusive license for mixed-salt capture Mar 2021	 Electrochaeta Bio-methanation and synthetic natural gas technology investment Jun 2021
 Mosaic Next-gen Direct Air Capture technology Apr 2022	 Horisont energi Polaris carbon storage project in Norway Mar 2021	 ICS Industrial process equipment and technologies to eliminate GHG emissions Feb 2022
 BORG CO, AS CCS hub for Norwegian Industrial Cluster Jun 2021	 HIF Project developer that utilizes CO ₂ and H ₂ to produce eFuels March 2023	

HYDROGEN

 EKONA Methane pyrolysis technology to produce turquoise H ₂ Nov 2021	 Nemesys Early-stage hydrogen technologies Dec 2021
 AIR PRODUCTS Hydrogen compression and turbines for multiple projects Jun 2021	 Hy2 Hydrogen infrastructure investment platform Anchor Investor Apr 2021
 Bloomenergy Clean integrated power and hydrogen solutions May 2021	 NETPOWER Technology development & global deployment of zero-emission power plants Feb 2022

DIGITAL

 ARMS Reliability and industrial asset management solutions Feb 2021
 OILFIELD SERVICES & EQUIPMENT Well intervention services & downhole technology Mar 2022
 ALTUS Advanced artificial lift and electrical submersible pumps technology Jul 2022

GAS & INDUSTRIAL

 QI2 Inspection solutions for critical infrastructure Mar 2022	 Quest Integrity
 BRUSH Power Generation Electrification equipment, generators, and motors Aug 2022	
 GEOTHERMAL GreenFire Energy Closed loop geothermal technology Mar 2022	

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Baker Hughes

Committed to sustainability

Led by our purpose of making energy cleaner, safer, and more efficient for people and the planet



DRIVING CARBON FOOTPRINT REDUCTION

Reduction in Baker Hughes Scope 1 and 2 GHG emissions compared to 2019 baseline

- Investing in low carbon energy technologies enabling customers' emissions reduction
- We are now reporting on 10 categories of Scope 3 emissions
- 26% of Baker Hughes electricity comes from renewables or zero-carbon sources, up 2% YoY

HEALTH, SAFETY AND WELLNESS

Providing a safe and healthy workplace for all

- Achieved 199 Perfect HSE days in 2023
- We offer more than 230 unique HSE courses including foundational training required for all employees, workplace and job specific training, and human-performance leadership training for managers.

COMMITTED TO DIVERSITY, EQUITY, AND INCLUSION

Enacting new programs to promote inclusion and diversity

- Recognized as "DEI best places to work for disability inclusion" by Disability:IN with score of 90% by participating in Disability Inclusion Index
- In May 2023, we published our 2022 Diversity, Equity, and Inclusion Annual Report
- Updated process to evaluate and reconcile pay equity across the company

ETHICS, COMPLIANCE, AND TRANSPARENCY

Improving external reporting and internal processes

- 97% of all employees completed annual Code of Conduct training, including training on ethics, compliance, and anti-corruption
- 100% of enterprise security personnel trained in human rights policies or procedures
- 99% of governance body members have received training on anti-corruption¹

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Source: Baker Hughes Sustainability Report <https://www.bakerhughes.com/company/corporate-responsibility>
1. Governance body members include 116 Senior Executive Band and above employees, which include the most senior-level managers and individual contributors, such as Vice Presidents and above.
Note: Results for 2023
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Our Corporate Responsibility framework



Baker Hughes ESG ratings and rankings



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Cargill

We started our India operations in 1987. Today we have businesses in refined oils, food ingredients, industrial specialties, grain and oilseeds, cotton, animal nutrition and trade and capital markets. We market six leading consumer brands of edible oils: *NatureFresh*, *Gemini*, *Sweekar*, *Leonardo Olive Oil*, *Rath* and *Sunflower brand of hydrogenated fats*. We also market wheat flour under Nature Fresh brand.

Our Animal Nutrition & Health business provides feed, premix, additive and animal health products and solutions for aqua, dairy and poultry. We market animal feed and premix under three brands: *Provimi*, *Purina* and *EWOS*. Our Grains and Oilseed business has originated millions of metric tons of grains & oilseeds over the years with storage locations across India.

5,000+
employees

13
manufacturing
facilities

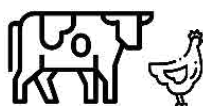
Over 35 years
of experience
in India



Agricultural Commodities

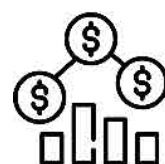
We connect producers and users of grains, oilseeds and other agricultural commodities through origination and marketing in India. We handle wheat, corn, rice, pulses, lentils, barley and sorghum besides oilseeds like soybean, rapeseed, groundnut and soybean meal.

We are present in major grain and oilseeds producing and consuming states in India. We operate through regional merchandising and origination offices besides multiple storage locations.



Animal Nutrition and Health

We serve the animal nutrition market in dairy, poultry and aqua primarily through three businesses: Cargill Animal Nutrition, Cargill Aqua Nutrition and Cargill Health Technologies. We operate through marketing and branch offices across various locations, a technology application center and seven manufacturing facilities across India and offer a wide range of feed, premix, additive and animal health products and solutions under brands such as Purina, Provimi, and EWOS.



Trade & Capital Markets

Our expertise helps our businesses manage risks around letters of credit and other cross-border credit and financial risks associated with trade and commodity finance.

In addition to meeting Cargill's own trade finance and funding needs, we optimize our physical trade flows to generate trade finance derived liquidity in emerging markets for our customers.

Cargill Food Solutions



Edible Oils

We process, refine and market a wide range of both indigenous and imported edible oils, fats and blends to the food industry and serve household consumers with branded and vitamin-fortified edible oils such as Nature Fresh, Gemini, Sweekar, Leonardo Olive Oil, Rath and Sunflower brand of hydrogenated fats. We also market wheat flour under NatureFresh brand.

We own and operate two edible oil refineries located at Kandla (Gujarat), Kurkumbh (Maharashtra) and Nellore (Andhra Pradesh). All our processing plants comply with world-class international quality assurance and food safety standards including HACCP and FSSC 22000.

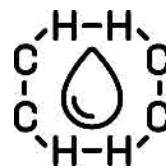


Starches, Sweeteners and Texturizers

We offer a broad range of high-quality food ingredients for industries like confectionery, pharma, beverage, culinary, infant formula, snack foods and nutraceuticals.

Our ingredients' portfolio includes modified starches; Lecithins; Texturizers like Pectin, Carrageenan; low-to zero-calorie sweeteners like Stevia, Maltitol, Mannitol, Erythritol, among others.

We also serve the Indian feed & pet food industry with high-quality corn gluten meal, germ & fiber, providing well-balanced nutrient solutions.



Bioindustrial Solutions

We create unique, bio-based solutions that deliver high value in focused markets of asphalt, dielectric fluids, paints, inks, coatings, lubricants, oilfield, consumer products, flexible foam and other diverse applications in the chemical industry.

Our two state of the art production plants at Kurkumbh, Pune produce bypass fats for cattle feed besides high quality fatty acids and natural ester dielectric fluids (Envirotemp FR3) meeting stringent international standards.

Recent Investments in India

Plant	Location	Investment	Year
Edible oil refinery	Nellore, Andhra Pradesh	US\$ 35 mn	2021
Bioindustrial Plant	Kurkumbh, Maharashtra	US\$ 15 mn	2020
Corn silo	Davangere, Karnataka	US\$ 10 mn	2019
Fish Feed Plant	Vijayawada, Andhra Pradesh	US\$ 10 mn	2018
Wet Corn Milling Plant	Davangere, Karnataka	US\$ 110 mn	2016
Animal Feed Mill	Bathinda, Punjab	US\$ 15 mn	2016
Cargill Innovation Centre	Gurugram, Haryana		2022

Cargill Business Services: CBS uses Cargill's size and capabilities by centralizing common work in Business Service Centers and works to continuously improve process and deliver value to the organization. CBS capability in India has grown rapidly over the last few years to establish itself as a Global Hub for providing efficient and effective services to Cargill businesses and functions. From two centers (Bengaluru and Gurugram), over 3,500 employees are providing high-end Digital, Knowledge and end to end process services for identified functions-Finance, Global IT, P2P, GHRO, CTL & Trade Execution.

Key Milestones

1987	Set up liaison office in New Delhi
1996	Cargill India set up as a 100 % owned trading company
1997	Begun primary sugar supply business Country office set up in Delhi
1998	Exited seed business as part of a global divestiture to Monsanto First desk of Grain and Oils Seeds business begin operations
2000	Packaged foods business under NatureFresh brand launched with wheat products
2003	NatureFresh brand transitions into refinery unit for sale in packed form
2004	Entered JV with Parakh Foods Ltd. "Gemini" brand of refined oil and two oil refineries in West Coast of India comes into portfolio
2005	Commercial production of oil refineries at Paradip in East Coast of India and at Kandla in West Coast begun Acquired 100% stake in JV with Parakh Foods Ltd.
2006	Established Animal Nutrition business Refined Oils India starts institutional oil selling to food industry
2008	Launched Oliante brand of olive oil
2010	Acquired 'Rath' brand of Vanaspati (hydrogenated fats)
2011	Acquired 'Sweekar' brand sunflower refined oil

2012	Global acquisition of AWB expands grain & oilseeds business Global acquisition of Provimi expands animal nutrition footprint Re-launched NatureFresh whole wheat flour Acquired Sunflower Vanaspati
2014	Acquired Leonardo brand of olive oils
2016	Set up wet corn milling plant in Davangere, Karnataka Opened Dairy feed mill in Bathinda, Punjab
2018	Opened first fish feed mill in Vijaywada, Andhra Pradesh
2019	Inaugurated Corn Silos in Davangere, Karnataka
2020	Set up first chocolate manufacturing unit in India Opened a Bioindustrial plant in Kurkumbh, Maharashtra
2021	Acquired an edible oil refinery in Nellore, Andhra Pradesh
2022	Cargill Innovation Centre, Gurugram

FR3 - A biobased transformer dielectric fluid with multiple environmentally beneficial properties

As a bio-based material derived from plants, FR3 fluid is effectively free of harmful substances such as PCB's, heavy metals, sulfur compounds, and volatile or semi-volatile organic compounds that may be found in other insulating liquids. This gives FR3 fluid (as compared to mineral oil and other types of transformer fluids) the following distinctive properties contributing to its outstanding environmental benefits:

Biodegradability and microbial resistance

Results obtained from the well-established biodegradability tests confirm that FR3 fluid is readily biodegradable as per OECD 301 and has ultimate aerobic aquatic biodegradation property according to EPA OPPTS835.3100. Its biodegradability is also superior to that of synthetic ester liquid and mineral oil.

Non-toxicity in soil, water, and oral tests

FR3 fluid contains over 95% vegetable oils and all the performance enhancing additives are approved for food contact. The absence of oil sheen on water surfaces and the high level of biodegradability also mean that the fluid can be broken down without significant depletion of the oxygen level in water. FR3 fluid was found to be non-toxic, even at 100 times the required

OECD dose in the acute aquatic toxicity tests and the highest dose in the acute oral toxicity test when tested on fish and mice respectively, with zero mortality reported.

Zero carbon footprint

Life Cycle Analysis (LCA) conducted on FR3 fluid in accordance with Building for Environment and Economic Sustainability (BEES 4.0) method shows that CO₂ absorption by the crops grown for FR3 fluid equals the CO₂ emissions during the production, transportation and operation of the transformers. Thus, allowing FR3 fluid to be classified as a carbon neutral product. In addition, the total greenhouse gas emissions is 56x lower than that of mineral oil, and significantly lower than that of other synthetic transformer liquids and gases.

Minimizing impact to soil & waterways

Due to its higher viscosity and natural tendency to polymerize when thin layers are exposed to oxygen, the infiltration rate of FR3 fluid in the soil is much slower than that of mineral oil, thereby mitigating the risk of the material reaching tap water. The use of secondary spill containment is still recommended, especially for preventing entry into waterways, but the containment is highly simplified. Should a spill happen, FR3 fluid's biodegradability and non-toxicity in soil and water minimize the remediation costs.

As the U.S. EPA (through its Spill Prevention, Control and Countermeasures rule under the Clean Water Act) and other government agencies worldwide put in place increasingly stringent regulations against oil spills and related incidents, using FR3 fluid helps utility companies and other end users be proactive in the planning of spill mitigation and remediation as well as potentially providing cost savings.

Sustainability beyond bio-based

Perhaps the ultimate challenge faced by utility companies and other end users is the need to operate in an environmentally sustainable way without compromising on performance and efficiency. Apart from the environmental benefits described above, FR3 fluid is also known for improving the reliability of transformers, as well as extending their life span and loading capacity.

While these benefits might not seem to be directly related to the environment, they ultimately help reduce the consumption of raw materials during manufacturing and the costs of disposal.

Finally, FR3 fluid can be reclaimed and, after end-of-life as an insulating liquid, reused as raw materials for other industries, such as bio-diesel or other applications of vegetable oils. In lieu of the new product life cycle responsibilities enabled by the European Union normative guidelines, this attribute has the potential to provide relevant advantages.

Advantages over mineral oil

Mineral oil

1. Risk of fires:
 - Flash point is less than 40°C higher than operating temperature limit
2. Low biodegradation rate
3. Low moisture saturation
 - Especially at low temperatures, dielectric capacity may be reduced / free water
4. Oxidation may lead to sludge formation, paper degradation and dielectric issues

Ester based fluids

1. Fire safety
 - Flash point is more than 2x the operating temperature limit
2. Readily biodegradable
3. Moisture saturation more than 10x higher
 - Keeps dielectric performance at very low temperatures
 - Reduces paper degradation rate
4. Very low sludge formation and, for natural esters, oxidation leads to increase of viscosity

India compact substations

Transformers installed in Mumbai, India

- Redesigned for FR3™ fluid
- 25MVA having a footprint of a 20MVA
- Sustainable Peak Capacity of 28MVA
- Government "Smart City" Initiative

Relevant advantages

- Yields cost-savings of about 16%
- Increases fire safety
- Enhances the transformers' environmental profile



FR3™ & Envirotemp™ Fluids are:



Safer

- Risk of transformer fire mitigated by using a K-Class filled transformer

Sustainable

- Biodegradable
- Reusable

Reliable

- Robust solution
- Dielectric capacity preserved

Resilient

- Enhanced capability
- Continuous drying of paper



Carrier

Made in India
For India.



Carrier: A global leader in intelligent climate and energy solutions.

Carrier is a global leader in intelligent climate and energy solutions, with a diverse and world-class workforce. With more than a century of expertise, we drive innovation while putting our customers first, helping protect our planet, and inspiring and empowering all our people. Through Carrier's performance driven culture, we are driving long-term shareowner value by growing earnings and investing strategically to strengthen our position in the markets we serve.



\$22.1B
2023 NET SALES



160+
COUNTRIES

We strive to be a catalyst for positive and sustainable changes as we innovate, empower our people and operate with integrity.



We have committed to spend **\$2Billion+** on developing Sustainable solutions by **2030**



Reduce our customers' carbon footprint by **MORE THAN 1 GIGATON**

OUR HISTORIC JOURNEY IN INDIA

Our journey in India began in 1936 with a momentous milestone - the installation of country's first ever air-conditioning system at Rambagh Palace in Jaipur. This groundbreaking achievement marked the beginning of a legacy that would continue to impact the lives of millions across the nation.

In 1986, we officially established our presence in India, solidifying our commitment to contribute to India's growth and prosperity. In 1988, we commissioned our first manufacturing facility in Gurgaon, Harayana. Spanning across 19 acres, this is now a state-of-the-art facility that houses a highly automated manufacturing unit, an advanced R&D Center and an advanced quality clinic. We have been serving customers across business verticals like Healthcare, Hospitality, Commercial Buildings, Education and many more.



In India since 1986

Commercial HVAC

Refrigeration

Fire & Security

ECENERGY
INSIGHTS

20 locations | 2 factories | 2 Global Engg. Centers |

HRDC IRDC

Largest Engg. hub in Carrier

CARRIER INDIA'S MANUFACTURING FACILITY

Our manufacturing facility stands as a testament to our unwavering commitment to providing world-class products while preserving the environment. The 33 years old manufacturing facility proudly holds the prestigious IGBC Platinum rating, a true testament to our commitment to sustainability and responsible manufacturing practices. Today, we manufacture the entire range of commercial HVAC solutions starting from light commercial units to chillers. We are expanding the manufacturing capabilities across all the product segments. With our manufacturing facility, we confidently meet the demands of our customers while ensuring the highest standard of quality and reliability.



ECO-ENERGY INSIGHTS

EcoEnergy Insights is a leading provider of AI and IoT-enabled solutions and services that focuses on energy efficiency, maintenance, comfort and safety.

Our solutions and services enable enterprises, equipment manufacturers and service providers, to resolve issues before they occur.

With these solutions, we have been able to save 5 billion+kwh energy for our customers in India.

Gurgaon Research & Development Center

The heart of our operations lies in our advanced R&D Center based in Gurgaon, where a brilliant team of researchers and engineers tirelessly working to shape the future of HVAC solutions for customers across the globe.

Within our facility we house NABL-certified laboratories, equipped with cutting-edge technology, and staffed by skilled technicians. The center has 6 labs including the recently inaugurated state-of-the-art Sound & Vibration Test Chamber



Hyderabad Research & Design Center

Hyderabad Research and Design Center (HRDC) was established in 2002 as a global Research and Development (R&D) center that became a part of Carrier Corp., w.e.f. April 2020.

HRDC is one of the largest engineering centers for Carrier with 700+ researchers and engineers. involved in the design and development of 70+ products that are launched every year by Carrier.

The center partners with other Carrier engineering sites across the globe to develop products closer to those markets.



DIGITAL HUB INDIA (DHI)

Hyderabad is home to Carrier's largest digital capability center Digital Hub India (DHI). DHI is a specialized team that aims to drive simplification, efficiency, growth, break silos and unlock hidden value across the organization by driving digital transformation across the organization. DHI is a unique capability center that acts as an extension of the Digital Headquarter and works on critical areas like Enterprise Cybersecurity, Analytics and Automation, Customer Experience, Shared Services, and Corporate Applications as well as supports the digital transformation of our businesses.

CARRIER BUSINESS SERVICES (CBS)

Carrier Business Services (CBS), Hyderabad, is one of the largest business services centers of Carrier. CBS, Hyderabad, in partnership with the business, leads transformative efforts to optimize finance and human resource processes & strives to sustainably improve productivity, quality, and efficiency and create a seamless user experience.

Over the years, we have forged strong bond with our customers and partners, earning their trust & loyalty through our consistent performance and customer centric approach. As we look ahead, we remain steadfast in our commitment to contribute positively to the Indian society and economy.



Dastur Energy



Dastur Energy

Dastur Energy is an energy technology company that is leading the way in the field of clean energy with a strong track record of pioneering innovative projects in North America, the Middle East, and India.

Dastur Energy's expertise and commitment to sustainable energy solutions has won the company several projects in design, engineering, techno-economic assessments, and technology & policy roadmap development from global enterprises as well as respected funding agencies like the U.S. Department of Energy, the U.S. Trade and Development Agency, the Government of India, and the G20 Presidency.

Equipped with its own proprietary IP and significant clean energy solution delivery experience, Dastur Energy offers complete end-to-end commercial-scale clean energy solutions that deliver significant sustained long-term techno-economic impact. The solutions areas include - industrial carbon capture, clean hydrogen, CO2 to products, green methanol, green steel, green cement, and other clean chemicals.

Over the past two years, Dastur Energy has secured over ten million U.S. dollars in grant funding, a testament to the company's exceptional work in developing clean energy solutions. With a focus on driving change towards a more sustainable future, Dastur Energy continues to lead the way in implementing innovative energy solutions across the globe.

Dastur Energy's advisory and engineering services has also enabled Indian companies in the Oil & Gas, Iron & Steel and Chemicals sectors to decarbonize and transition to clean energy thus helping them align to a broader national goal of becoming net-zero by 2070. In addition to contributing to towards India's net-zero goals, decarbonizing these key hard-to-abate sectors also ensures a more sustainable all-round growth for the Indian economy. In the short two years of its existence, projects engineered by Dastur Energy have already resulted in 4 mtpa reduction of Carbon with an estimated capital investment of US\$ 2.2 bn of investment to build production capacity for producing US\$1.3 bn of clean products.

Dastur Energy has also assisted the Indian government to shape its CCUS based clean energy transition policy to meets India's net-zero goals and is also advising various government agencies in devising its best fit implementation roadmap.

Expertise

Dastur Energy's solution areas include – industrial decarbonization, green chemicals, clean hydrogen, gasification and energy policy.

Industrial Decarbonization

Dastur Energy works in the design and engineering of industrial-scale carbon capture, utilization, and storage (CCUS) systems for a variety of industries, including steel plants, cement plants, chemical complexes, oil and gas refineries, and power plants. We specialize in consideration of different carbon capture technologies, capture points, gas conditioning and carbon disposition schemes to achieve maximum efficiency and sustainability. Systematic estimation of Life Cycle Cost of Carbon Capture (LCoC) and Life Cycle Cost of Hydrogen (LCoH) is critical for guiding a plant's decarbonization strategy and future path.

Dastur Energy's expertise in CCUS technology and project management is helping industries move towards a cleaner and more sustainable future.



Largest carbon capture effort underway at an integrated steel plant

- ✓ 5 mtpa steel plant
- ✓ 2.8 mtpa CO₂ capture
- ✓ 90 ktpa Clean H₂ - LCoH of US\$ 0.4-0.5/kg



Decarbonizing H₂ production by capturing 0.9 mtpa CO₂ using grid powered capture technology

- ✓ Merchant SMR
- ✓ 0.9 mtpa CO₂ capture



First industrial-scale (0.7 mtpa) CO₂ capture project in the Oil & Gas sector in India

- ✓ Refinery SMR
- ✓ 0.7 mtpa CO₂ capture: EOR & F&B
- ✓ LCoC: US\$ 40-45/ton without H₂ valorization

Green Chemicals

Dastur Energy partners with clients to develop balanced and market-hedged product portfolios of clean chemicals and fuels by converting CO₂, syngas, and waste gases. The solutions are tailored to balance economic and environmental considerations, unlocking financial value while reducing the carbon footprint transforming sustainability challenges into a sustainable competitive advantage.

Dastur Energy is committed to creating sustainable solutions that enable its clients to thrive in a low-carbon economy.



First CO₂ utilization effort in the steel sector in India

- ✓ Conversion of waste CO₂ to marketable "green" methanol
- ✓ Feasibility study for CO₂ to methanol pilot plant



Coal to methanol at commercial scale

- ✓ Scaling technology from pilot to commercial scale
- ✓ Basic engineering services for 100 tpd coal to methanol



Green molecules entry by one of the largest RE players in India

- ✓ Techno-economics of Carbon Capture from different industrial sources
- ✓ Minimizing the "green premium"

Gasification

Dastur Energy is at the forefront of designing and implementing some of the largest gasification projects with integrated carbon capture in the Middle East and India. These projects utilize the gasification of petcoke, coal, and biomass to produce an array of clean chemicals, hydrogen, and other sustainable fuels. Dastur Energy's integrated business-driven approach, results in cost-effective solutions that generate dense stream CO₂ for Enhanced Oil Recovery (EOR), or enable the utilization and conversion of by-products such as petcoke, waste, and biomass to produce value-added products.

Dastur Energy's ability to deliver high impact innovative and sustainable solutions for its clients, is helping enable a cleaner and more sustainable future.



CO₂ capture of 5 mtpa, going up to 10 mtpa, targeting a sub US\$20/tonne capture cost

- ✓ 5 mtpa petcoke gasification
- ✓ 10 mtpa CO₂ capture
- ✓ 200 ktpa clean H₂ — LCoH US\$ 1.0-1.1/kg



Gasification solution for one of the largest refineries in India

- ✓ 1.2 mtpa petcoke gasification
- ✓ Multi-product portfolio
- ✓ 90 ktpa H₂ — LCoH US\$ 0.9-1.2 /kg



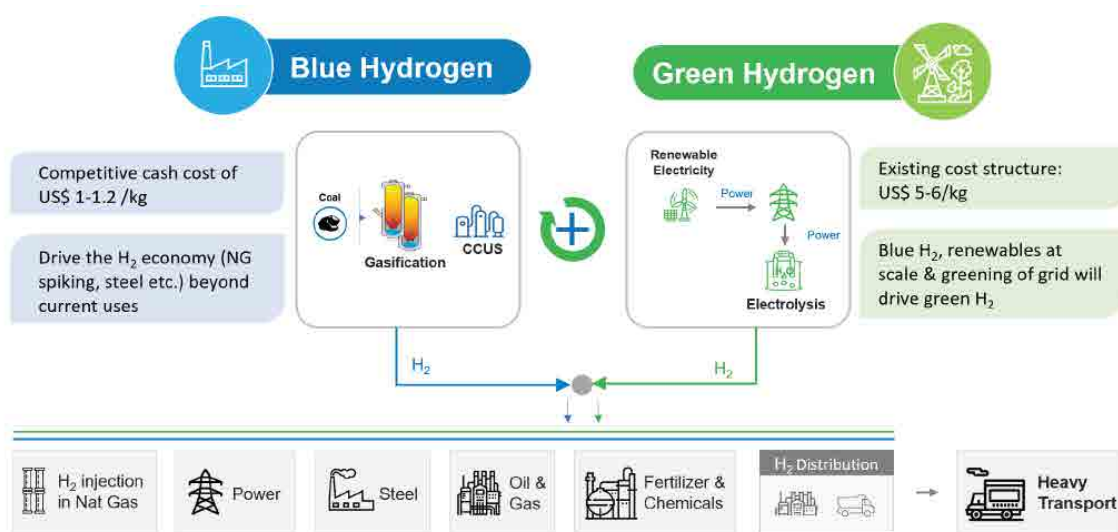
Roadmap for green cement for one of the world's cleanest cement producers

- ✓ Net negative biomass gasification
- ✓ Fuel replacement and CCUS — initial conceptualization

Clean Hydrogen

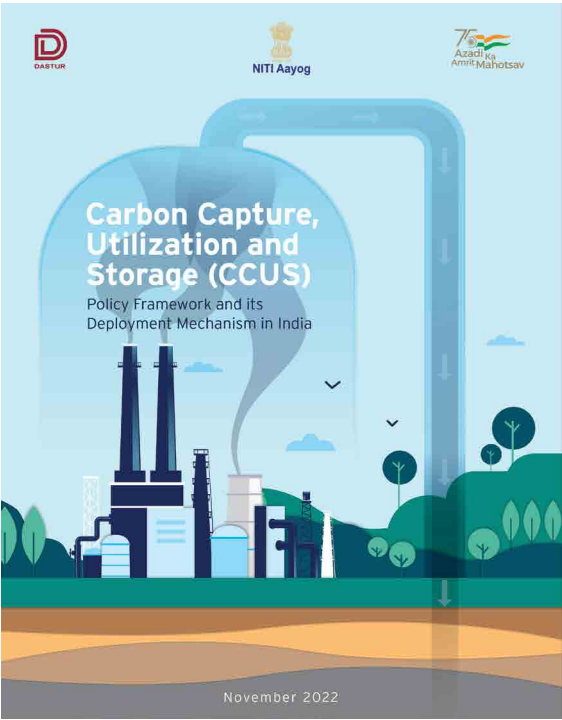
Dastur Energy specializes in the design and engineering of projects that produce clean energy carriers such as hydrogen, ammonia, and methanol to decarbonize hard-to-abate industrial transport and agricultural sectors. The designs are optimized to combine multiple energy sources, including electrolyzers, renewable power, pumped storage, biomass, fossil fuels, and waste gas processing, to enable a reliable and continuous supply of hydrogen and other carriers.

Dastur Energy is driving the development of a low-carbon economy that can meet the energy needs of businesses and communities around the world while creating a cleaner and more sustainable future for all.



Energy Policy

Dastur Energy is a trusted advisor to governments around the world, offering expert guidance on policy design to - enable and accelerate decarbonization, promote clean energy technology development and adoption, establish market development mechanisms, create innovative business models, and identify suitable financial and funding mechanisms. Given its experience in delivering successful projects, and deep understanding of the global energy landscape, Dastur Energy is uniquely positioned to provide comprehensive and tailored advice to governments seeking to transition towards a cleaner and more sustainable future.





Emerson At-A-Glance

COMPANY PROFILE

Emerson is a global leader in automation technology and software. We help customers in critical industries, like energy, chemical, power and renewables, life sciences and factory automation, operate more sustainably while improving productivity, energy security and reliability.

BUSINESS GROUPS

SOFTWARE AND CONTROL

- AspenTech
- Control Systems & Software
- Test & Measurement
- Measurement & Analytical

INTELLIGENT DEVICES

- Final Control
- Discrete Automation
- Safety & Productivity



CONSECUTIVE YEARS OF INCREASED DIVIDENDS

COMPANY IMPACT

20%

Global power generation automated using Emerson control systems and software

65%

Of 2022 electric vehicles produced using Emerson solutions

25 of Top 25

Life sciences companies use Emerson technology

17,000+

Employee-owned patents

9 of Top 10

Semiconductor manufacturers use Emerson technology

Note: All numbers represent pro-forma 2023 Emerson including Test & Measurement, formerly NI (National Instruments).

GLOBAL SALES

FOUNDED

1890

NYSE:

EMR

\$17.0 BILLION

HEADQUARTERS

ST. LOUIS, MO USA

WORLDWIDE



74,000

EMPLOYEES



130

MANUFACTURING LOCATIONS

2023 RECOGNITIONS

AMERICA'S MOST INNOVATIVE COMPANIES

Fortune Magazine (#33)

INDUSTRIAL IOT COMPANY OF THE YEAR

IoT Breakthrough

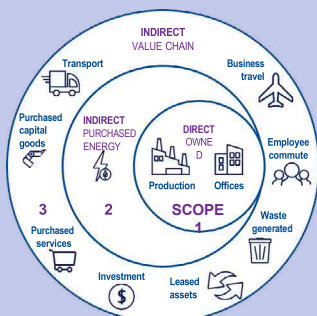
Emerson's environmental sustainability framework — we are highly relevant, across our portfolio, to a lower carbon future

GREENING OF

Reducing GHG emissions intensity by 20% across 185 major sites by 2028.

Enlisting our energy providers, supply chain partners, and logistics services to **support similar objectives**.

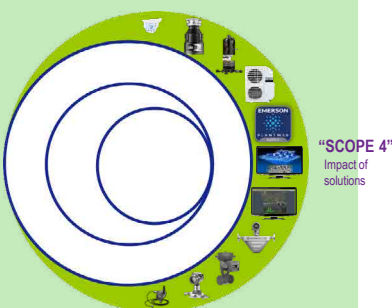
Embedding sustainability focus throughout our **management process**.



GREENING BY

Providing products, expertise, solutions & services to help our customers transition to lower carbon by:

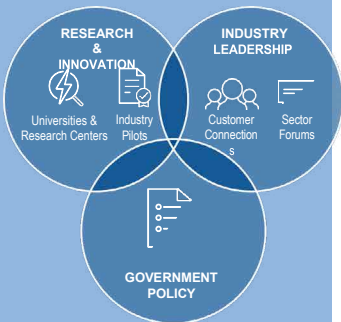
- Energy Source Decarbonization
- Emissions Management
- Electrification & System Integration
- Energy Efficiency & Optimization



GREENING WITH

Engaging external stakeholders by:

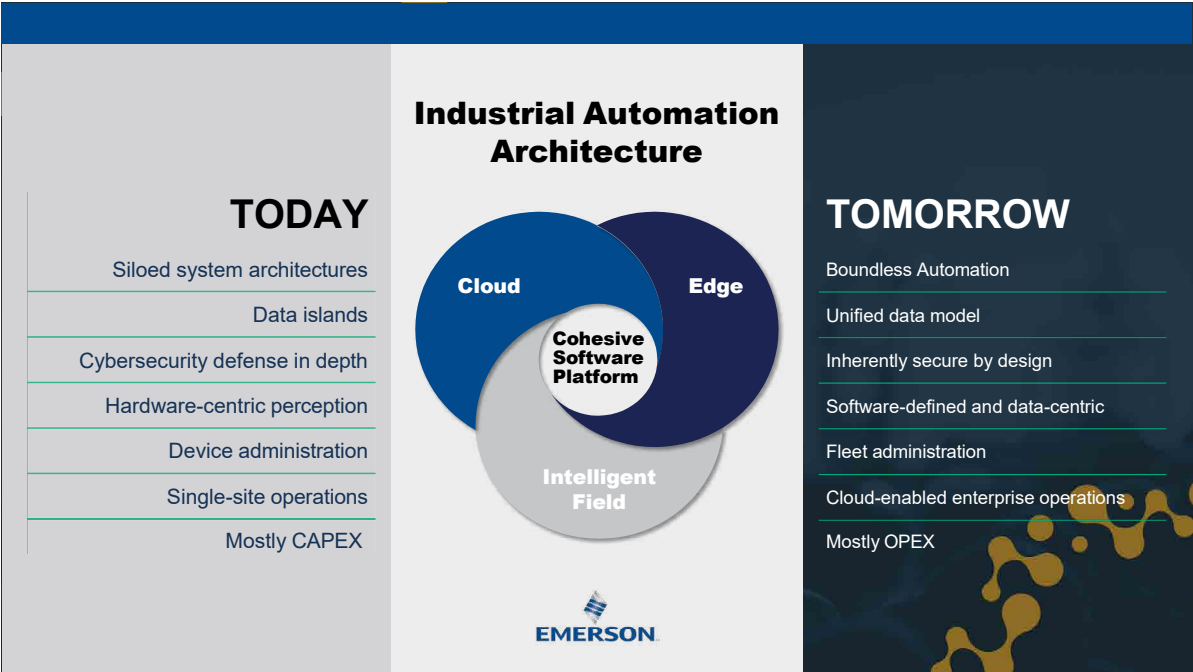
- Partnering to develop innovative solutions
- Participating in sector and customer initiatives
- Sharing our expertise to shape future policy developments globally



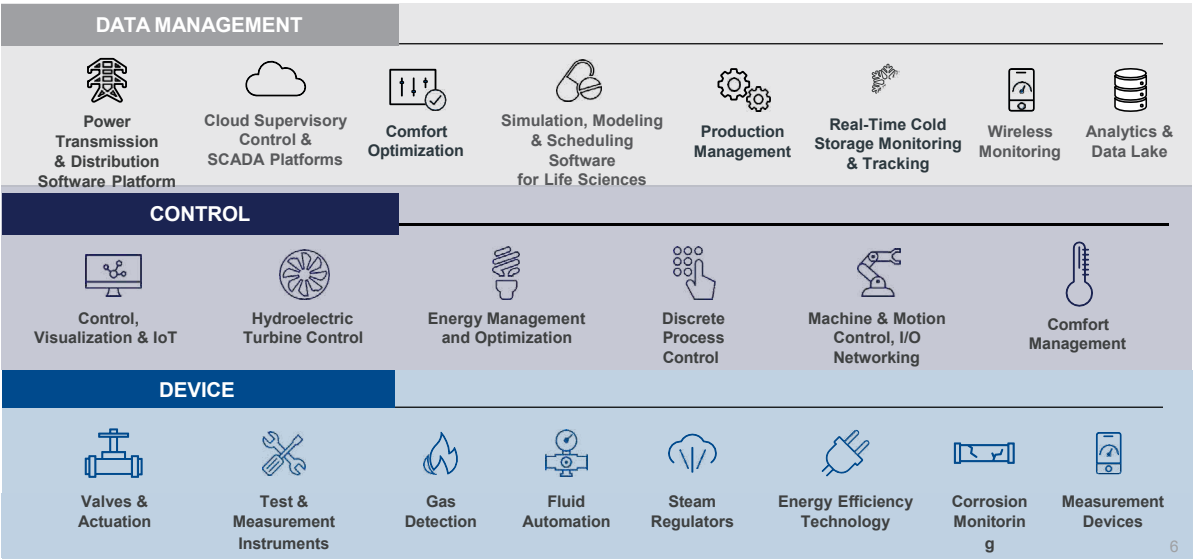
Energy Transition Segments

Four major segments for environmental sustainability

1 ENERGY SOURCE DECARBONIZATION	2 EMISSIONS MANAGEMENT	3 ELECTRIFICATION & SYSTEM INTEGRATION	4 ENERGY EFFICIENCY & OPTIMIZATION
LOW-CARBON POWER (SOLAR, WIND, NUCLEAR, HYDRO)	EMISSIONS MONITORING & CONTROL	END-USE ELECTRIFICATION (HEAT PUMPS)	ADVANCED CONTROLS & ANALYTICS
LOW-CARBON FUELS (BIOFUELS, LNG)	CARBON CAPTURE UTILIZATION & STORAGE	ENERGY SUPPLY OPTIMIZATION	SIMULATION & REMOTE MONITORING
HYDROGEN & HYDROGEN-BASED FUELS	NATURAL & LOW GHG REFRIGERANTS	ENERGY STORAGE & GRID MANAGEMENT	WASTE MANAGEMENT



We are Building our Franchises Through Innovation and Acquisitions Across All Technology Layers



Emerson For a Self-Reliant India

Emerson's vast footprint in India forms a complete ecosystem to support the Government of India's *Make in India* and *Aatmanirbhar Bharat* visions



Emerson Innovates in and for India:

We are mindfully leveraging India's potential to position itself as one of the leading innovative nations of the world

Emerson's Industrial IoT offerings aid business performance improvements, while its innovative Commercial & Residential Solutions business ensures energy efficiency, infrastructure, food safety and human comfort



Emerson Engineers in and for India:

Our focus in India is to develop a large-scale, efficient and cost-effective domestic technology & engineering ecosystem

A sizeable percentage of Emerson's workforce in India is made up of engineers who are poised to provide high quality engineering services in the field of process automation for local and global operations



Emerson Manufactures in and for India:

There is consistent emphasis on leveraging India's manufacturing capabilities and local ingenuity to create global impact

Nearly 70% of Emerson products for India are made in India. Our vision for India as a manufacturing hub is to serve customers in India, Asia, the Middle East & Africa



Emerson Builds Skills in and for India:

We recognise that India's biggest opportunity is to expand its labour force and talent pool through upskilling education

Emerson is galvanizing partnerships to help address the skills-gap issue in STEM through investments in upskilling promising talent for India and the world

Best-in-class infrastructure, innovation, intellectual property and skill development



ExxonMobil

Current business interests in India

ExxonMobil has been powering India's growth for three decades.

The Company brought the first supplies of liquefied natural gas (LNG) to India in the early 2000s and is now a major LNG supplier to the country, helping to advance its transition to a gas-based economy.

ExxonMobil's cutting-edge product solutions such as Mobil lubricants are driving productivity and energy efficiency in India's automotive and industrial sectors, helping individual consumers and businesses achieve more with less. The Company's chemical products are enabling Indian manufacturers to make high-quality products and deliver sustainability benefits across sectors, including food processing, consumer durables, agriculture, water treatment, pharmaceuticals, and construction.

ExxonMobil's business and technology centres in Bengaluru provide critical support to the Company's global operations. The technology centres help develop strategies to reduce global emissions and collaborate with homegrown manufacturers to enhance global competitiveness of made-in-India products.

Striving to make a positive contribution to the communities where we operate, ExxonMobil supports a wide range of education, health, skill development and community-building initiatives in India.

The Company has offices in India in Bengaluru, Mumbai, and the National Capital Region.

Initiatives in India

To meet growing domestic demand from industrial sectors such as manufacturing, steel, power, mining, and construction, as well as from passenger and commercial vehicle segments, **ExxonMobil is investing nearly INR 900 crore (USD \$110 million) to build a lubricant-manufacturing plant** at the Maharashtra Industrial Development Corporation's Isambe Industrial Area in Raigad. This new plant is expected to produce 159,000 kiloliters of finished lubricants per year to help meet demand growth in India. In a significant boost to the "Make in India" initiative, the plant will source a larger part of the base stocks, additives, and all packaging locally.



Apart from ExxonMobil's pioneering effort in developing India's LNG market in collaboration with value-chain players, its affiliates have also been developing solutions for India's agriculture, mobility, and packaging industries.

For example, Rishi FIBC, one of India's largest manufacturers of container liners and silo bags, has been using **ExxonMobil's high-performance chemical solutions to boost their storage technologies**, which includes mulch films and greenhouse films to improve crop quality and productivity. These films help [minimize soil erosion, control soil temperature and suppress weeds](#), thereby enhancing the yield.

ExxonMobil's Bengaluru Research and Development Technology Centre helps Indian businesses to **redesign packaging, making it thinner, stronger, reducing weight by 20-40% and blending recycled materials with new ones**. For example, the company collaborated with Indian packaging manufacturer Shrinath Rotopack and packaging-machine maker Syntegon to develop recyclable packaging for dry foods that can replace hard-to-recycle multilayer plastic packaging.

While ExxonMobil is helping its customers 'to do more with less,' the company itself is creating a benchmark for plastic packaging in India and lifting the levels of recycled plastics in lubricant pails. It recently launched a 20-liter lubricant pail in new plastic packaging, made of 50% post-consumer recycled (PCR) content. This includes discarded plastic pails, jars, and battery casings. Since launching in 2023, 115 metric tons of recycled plastic have been sourced to make these pails. This is roughly equal to recycling 2.3 million used plastic bottles, and these pails can be recycled again.



Exxon Mobil Corporation has numerous affiliates, many with names that include ExxonMobil, Exxon, Esso, and Mobil. For convenience and simplicity, those terms and terms like "corporation," "company," "our," "we," and "its" are sometimes used as abbreviated references to specific affiliates or affiliate groups.



Honeywell

**THE
FUTURE
IS WHAT
WE
MAKE
IT.**



Company’s Operations in India: 90+ years

9
Decade
Legacy

13000
Employees

5500
Engineers

20
Facilities in Major
Cities

Bengaluru
Pune
Bengaluru
Gurugram
Chennai
Dehradun
Mumbai
Kolkata
Madurai
Hyderabad
Jamshedpur
Vadodara

\$1B
Domestic Sales
and Exports

3000+
Products, Solutions,
Applications
Engineered in India

4
Technology
Development Centers

Bengaluru
Madurai
Hyderabad
Gurugram

3
Manufacturing
Centers


Gurugram
Dehradun
Pune

-  UOP technology used in almost all India refineries, improving yield and fuel quality.
-  Supporting the country's defense, space and civil aviation for more than 40 years through strategic partnerships.
-  Supporting STEM education and technology incubation in deep Science.
-  Atmanirbhar Bharat – commenced N95 face mask production in Pune.
-  Committed 150 crores towards environmental sustainability initiatives in India.
-  Strong partner to the government of India's Smart and Safe Cities Mission.

Honeywell is a committed partner to India. Investing in cutting-edge technology development and engineering centers, manufacturing facilities and our people across the country, we are creating solutions for challenges faced by the Indian industry. Made in India, by Indians, for India and the world.


Organization Overview

AEROSPACE TECHNOLOGIES




Our products and services are used on virtually every commercial, defense, and space aircraft. We build aircraft engines, cockpit and cabin electronics, wireless connectivity systems and mechanical components. Our hardware and software solutions create more fuel-efficient aircraft, more direct and on-time flights and safer skies.

BUILDING AUTOMATION




Commercial building owners and operators depend on our operational technology hardware, software and analytics to help create safer and more efficient and productive facilities. Our solutions and services are used in more than 10 million buildings worldwide.

ENERGY & SUSTAINABILITY SOLUTIONS



We help solve tough sustainability and energy transition challenges across our end markets that help reduce emissions and deliver innovative sustainable solutions while seizing new opportunities to deliver outstanding value to our clients and shareholders.

INDUSTRIAL AUTOMATION



We provide solutions to support our customers to help deliver results with enhanced productivity and safety standards. Our innovation powers process solutions, asset performance management, cybersecurity, and warehouse and retail automation.





HONEYWELL CONNECTED ENTERPRISE

We empower those who make, move and operate critical resources to grow responsibly. Our flagship Honeywell Forge solutions help drive business outcomes around performance, efficiency, cybersecurity and safety by uniting data across assets, people and processes. We leverage the latest technologies and persona-focused design to help uncover hidden insights, increase productivity and enhance the user experience from the shopfloor to the top floor.

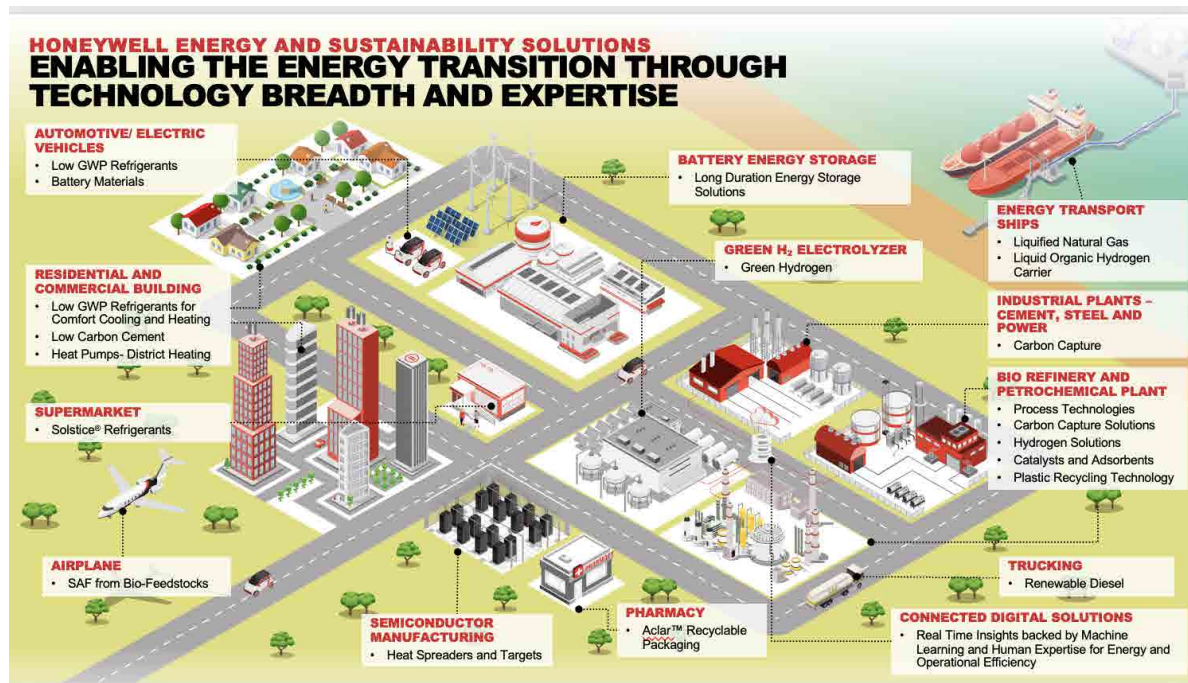
Honeywell Energy and Sustainability Solutions

Delivering leading solutions for energy transition, greenhouse gas reduction and conversion to sustainable materials.

Energy & Sustainability Solutions

Sustainability & Decarbonization	Advanced Industrial Solutions	Honeywell UOP	Sustainable Technology Solutions
 <p>Sustainable solutions to support the drive towards reducing carbon emissions.</p> <ul style="list-style-type: none"> Solstice® ultra-low GWP refrigerants for EVs, heat pumps supermarkets and residential and commercial buildings Solstice propellant for meter-dosed inhalers Aclar® films for healthcare packaging Foam blowing agents for building insulation Propellants and solvents 	 <p>A global technology leader focused on providing innovative industrial solutions.</p> <ul style="list-style-type: none"> Leading-edge semiconductors, advanced packaging and advanced displays Ultra-high molecular-weight polyethylene fiber for high-end protective armor High purity chemicals and specialty additives that pave the way for a cleaner and more efficient future 	 <p>Over the last century, Honeywell UOP's engineers and chemists have shaped the refining, petrochemical and gas processing industries by turning laboratory science into industrial reality.</p> <ul style="list-style-type: none"> Refining and catalysts Petrochemicals HSP adsorbents Gas processing equipment Connected and outcome-based solutions 	 <p>Enabling the energy evolution, STS provides solutions that reduce emissions and delivers innovative sustainable solutions across industries.</p> <ul style="list-style-type: none"> Carbon capture Renewable fuels Blue hydrogen/blue ammonia Plastic circularity Green hydrogen Hydrogen transport

Specialized offerings, IP and applied material sciences provides a differentiated growth path in the market



Company's role in energy sector and the impact on Indian economy

India is now at the center of the energy transition, combining economic and energy demand growth with rapid decarbonization efforts. The country has set ambitious targets, including achieving 50 percent of its generation capacity from non-fossil fuel resources by 2030 and achieving net-zero emissions by 2070.

India's power sector currently accounts for 34 percent of the nation's total greenhouse gas (GHG) emissions, with fossil fuels making up 75 percent of the energy mix for electricity generation. Urgent action is required to decarbonize this sector, offering significant potential for reducing GHG emissions across residential, commercial, and industrial domains. Honeywell presents ready-now solutions leveraging renewable resources to aid India's transition. These include smart microgrids for load management, energy storage solutions, and dispatchable power generators ensuring grid reliability amid fluctuations in renewable output.

The transport sector contributes 10 percent of India's total GHG emissions, with more than 300 million vehicles on Indian roads. Decarbonizing road and rail transportation can be further accelerated by the adoption of green diesel. Honeywell's Ecofining technology enables the production of green diesel that can be a drop-in replacement, requiring no changes to fleet technology or the fuel storage and delivery infrastructure. Depending on the type of ethanol feedstock used, jet fuel produced from Honeywell's ethanol-to-jet fuel process can reduce greenhouse gas (GHG) emissions by 80 percent on a total lifecycle basis, compared to petroleum-based jet fuel.

Industrial manufacturing constitutes 28 percent of India's GHG emissions, with key sectors like steel, cement, refining, iron, aluminum, and mining expected to grow, amplifying both investments and emissions. Honeywell's diverse range of process, environment, and industrial control systems can play a crucial role in transitioning these sectors to lower emissions.

To summarize, Honeywell's Sustainability Solutions are developed based on foundational pillars of Circular Economy, Energy Evolution, Environmental Transformation, Health Safety, Security, Resilience, and Accountability. Globally, 60 percent of Honeywell's research and development expenditure is focused on solving sustainability challenges for its customers, with much of the technology development work being undertaken in India, which is a matter of great pride for the company.

Skill development and training

Honeywell has driven technological collaboration and greater localization through partnerships for the last 4 decades. All of Honeywell's global businesses have a strong legacy in India, built over the last eight decades. Honeywell's India commitment is evident in 3 state-of-the-art

manufacturing facilities and 4 global R&D centers of excellence for technology development and innovation. Most of these technologies breath life in these hubs which are run and managed by a diverse talent pool. Honeywell has been actively engaged with various skill development programs and research-oriented projects across premier institutes (IISc and IITs) and multiple engineering colleges to mentor, nurture and engage the institutions in building an in-country strong engineering talent pool for critical domains like energy transition. In addition, their teams have been closely interacting with various government and industry fora on knowledge sharing and trainings for safety critical product development, aviation safety and certification.

Results achieved / partnerships / future programs

Over the last century, Honeywell engineers and chemists have shaped the refining, petrochemical and gas processing industries by turning laboratory science into industrial reality. Honeywell UOP processes produce the fuels that power our cars, trucks, jets, and trains. They make the natural gas that heats our homes and serves as a source of power generation. Biodegradable detergents and the plastic resins, films and fibers we use in commercial goods, packaging and fabrics are made with technologies from Honeywell. Honeywell continues to innovate to create flexible, future forward and sustainable solutions that address the challenges in our ever-changing world. We're striving to create cleaner fuels by developing processes that reduce emissions and produce renewable fuel sources. Our process technologies, equipment and lifecycle solutions are helping customers generate the most value from every drop of oil, every cubic foot of natural gas and every ton of coal. And through connected software, Honeywell is helping customers become more efficient and profitable through digital tools that ensure plants are running at the peak of their capability. We are leading industry into the new world of energy.

Honeywell celebrated our 50th Renewable Fuels license in 2024. When functioning, the 50 sites have a combined capacity to produce more than 500,000 barrels per day of renewable fuel. Eight facilities are currently operational, and more than 40 licensed plants will be operational by 2030. From a catalyst perspective, Honeywell introduced 7 new catalyst offerings that have been commercialized and we are committed to R&D investment for future generation catalysts. These catalysts are seeing strong acceptance with customers, including multiple takeaways. Our sustainable technology solutions business is driving the clean energy movement forward. ExxonMobil selected Honeywell's CO₂ Fractionation and Hydrogen Purification System - at its integrated complex in Baytown, Texas. This technology is expected to enable ExxonMobil to capture about 7 million tons of carbon dioxide (CO₂) per year, the equivalent of the emission of 1.5 million of automobiles for one year. Honeywell's digital transformation business is powering real time insights with our digital performance services that help unlock greater efficiencies, to benefit our customers' bottom line. We recently announced a strategic collaboration with ESS Tech, Inc to advance technology

development and market adoption of iron flow battery (IFB) energy storage systems. The relationship builds upon each company's development of energy storage systems, and brings together ESS' market-leading, patented IFB design with Honeywell's advanced materials and energy systems expertise. And finally, Honeywell recently announced it will be acquiring Air Products' liquefied natural gas process technology and equipment business to expand on its LNG pretreatment business. Honeywell already pre-treats 50% of the world's LNG and this acquisition makes it a more robust partner for customers within this industry.

Global / Local best practices

Honeywell helps organizations solve the world's most complex challenges in automation, the future of aviation and energy transition. As a trusted partner, we provide actionable solutions and innovation through our Aerospace Technologies, Building Automation, Energy and Sustainability Solutions, and Industrial Automation business segments – powered by our Honeywell Forge software – that help make the world smarter, safer and more sustainable.

Honeywell exemplifies both global and local best practices through its commitment to innovation, sustainability, and community engagement. Globally, Honeywell sets industry standards by integrating advanced technologies, such as IoT and AI, into its products and services, ensuring operational excellence and efficiency across diverse sectors. The company's stringent adherence to international regulatory frameworks and quality certifications further underscores its dedication to best practices. Locally, Honeywell tailors its initiatives to meet specific community needs, fostering strong relationships through localized projects and investments. By prioritizing sustainable practices, reducing environmental impact, and promoting workforce diversity and inclusion, Honeywell demonstrates a holistic approach to best practices that benefits both global markets and local communities.





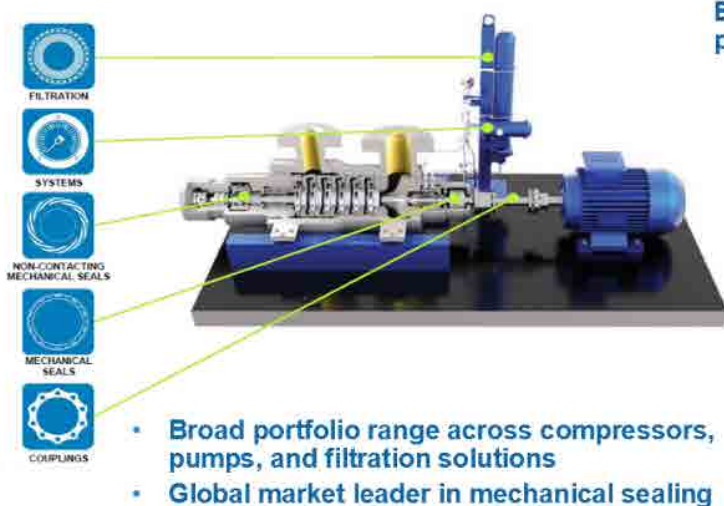
John Crane: Technology Enabling Decarbonization and Energy Transition

Who is John Crane

John Crane is a world leading provider of mechanical seals, industrial filtration, power transmission couplings, and other mission critical technologies to the energy industry. The company is the largest subsidiary of Smiths Group PLC, a multi-billion industrial technology company listed on the FTSE 100. Founded more than 100 years ago in Chicago, John Crane has been at the forefront of innovation in rotating equipment, including the development of the first non-contacting dry gas seal. John Crane employs over 5,800 employees around the globe, including 600 employees in India. John Crane is present in India for more than 3 decades with manufacturing units in Bangalore and Pune.

Our Product & Services

John Crane has end-to-end capabilities in large projects delivery, plant upkeeping and maintenance. We work closely with OEMs, EPCs, Licensors, EUs and other stakeholders in the energy sector. We contribute significantly to several industry segments, such as Oil & Gas and New Energy, Power Generation including Renewable Power, Cement, Metal & Mining, Fertilizer etc. through cutting edge technologies of John Crane.



End-to-end capabilities in large projects delivery & plant operations

- Project design & management
- Aftermarket repairs & services
- Methane abatement solutions
- Turbomachinery upgrades
- Reliability & inventory programs
- Asset management solutions
- Training

Our View on the Energy Transition Ecosystem

As the world races to build a net zero future, the energy industry will play a critical role in meeting expected energy demand growth while contributing to ambitious decarbonization goals. John Crane is committed to supporting global efforts that address climate change, accelerate decarbonization and build a sustainable, secure new energy ecosystem. By doing so, we not only safeguard our planet and people, but the future of our industry. Drawing from our legacy of technology leadership, innovation and service excellence, John Crane's New Energy Solutions accelerate two fundamental net zero initiatives: the transition to clean energy and the overall reduction in greenhouse gas (GHG) emissions. We deliver these market-ready solutions with pioneering spirit, empowering our customers to shape their new energy reality today.

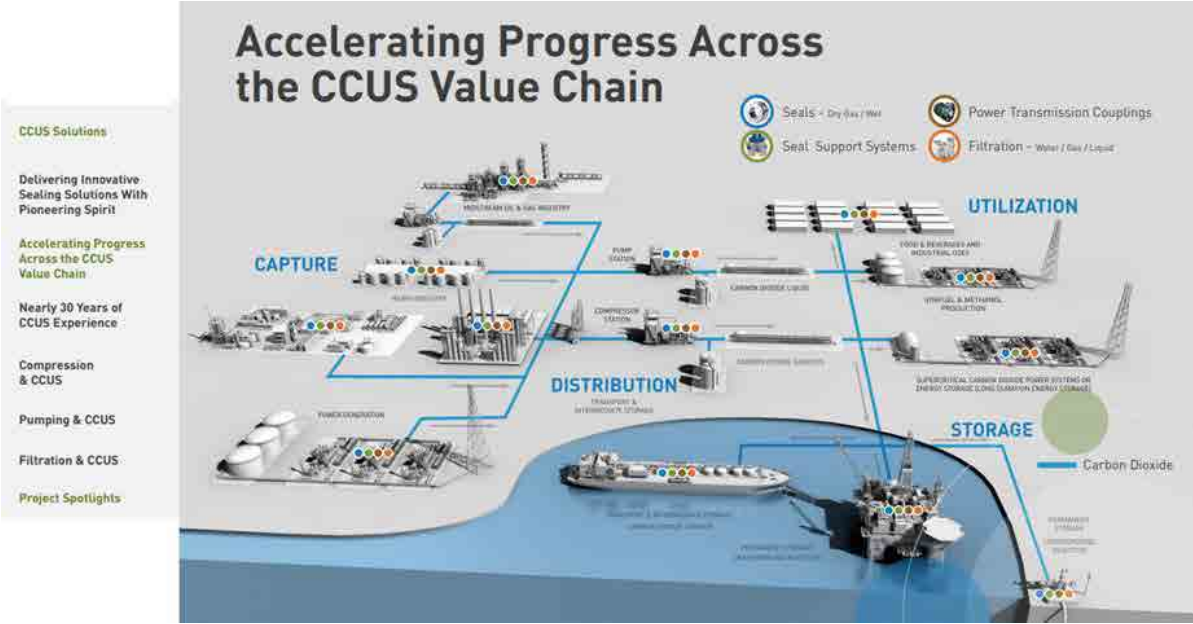
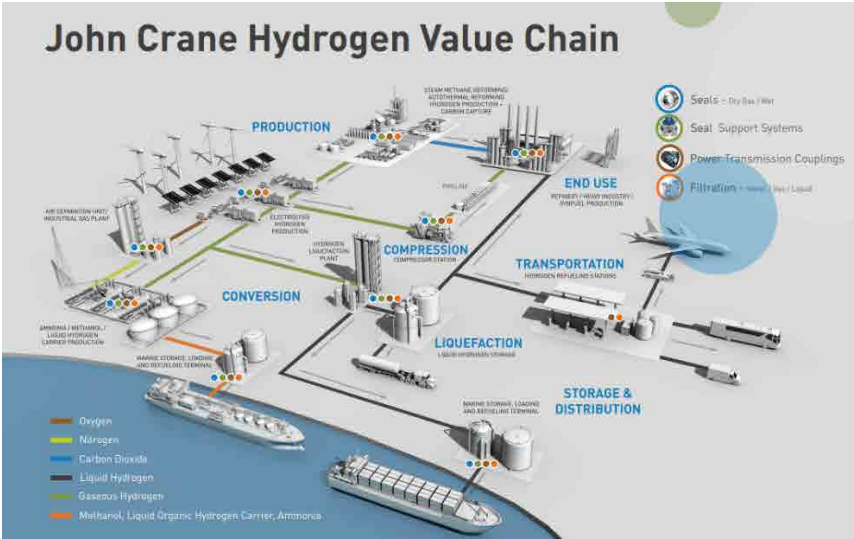


Accelerating the Energy Transition with Market-Ready Solutions

At John Crane, we recognize the importance of accelerating energy transition efforts to build a reliable, secure, and sustainable new energy system. We have invested heavily in solutions that equip the energy and process industries to navigate future challenges with sustainability and reliability at the forefront. Our New Energy Solutions support a wide range of energy transition initiatives, from enhancing efficiency and decarbonizing existing operations to scaling up new markets in hydrogen and carbon capture. We believe that energy efficiency provides one of the quickest, most cost-effective routes to curbing greenhouse gas (GHG) emissions and enhancing energy security. Our market-leading technologies use less energy, drive increased efficiency, extend equipment lifespans, and reduce operational costs. Reducing GHG fugitive emissions — with a focus on methane— offers a cost-effective, viable approach to decarbonizing the oil and gas industry. We offer a broad range of proven solutions that are well-established in reducing emissions today. For energy transition strategies such as hydrogen production and carbon capture, utilization, and storage (CCUS) and sustainable fuel

production increasing the efficiency and reducing water consumption are critical to scalable adoption.

As John Crane enters its 107th year, we are committed to developing the solutions that shape our industry's next century. This includes the hydrogen sealing and filtration technologies of the future, leading-edge digital solutions and hydrogen-ready services that support our industry in achieving its ambitious decarbonization goals.




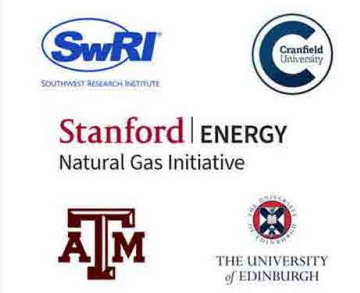
John Crane also believes that it is important to reduce the carbon footprint of existing energy infrastructure to achieve ambitious net zero goals. To enable the transition, we are delivering innovative solutions that enhance the scalability and affordability of carbon capture, utilization, and storage (CCUS). Carbon capture solutions are central to John Crane's vision for the energy industry's sustainable future. We are working alongside oil and gas leaders and OEM partners to accelerate the deployment of scalable CCUS initiatives while enabling some of the most innovative carbon capture projects around the world. Approximately 80%

of the CO₂ injected underground in existing CCUS sites use John Crane's dry gas seals for sequestration and enhanced oil recovery (EOR). Since our first CCUS application three decades ago, we've more than 1,100 references in CO₂ sealing and related applications, including supercritical fluid conditions — supporting our industry's critical decarbonization goals. While new carbon dioxide capture technologies are paramount to successful CCUS deployment, investing in reliable, safe transport and storage infrastructure for CO₂ is equally critical. We are actively investing in new carbon dioxide sealing and filtration technologies that accelerate CCUS progress, including next generation sealing for supercritical CO₂ and liquid removal from CO₂ fluid streams. As CCUS systems become more complex — and more fundamental to the energy ecosystem — John Crane is committed to pioneering reliable, world-changing solutions.

John Crane plays a pivotal role in advancing sustainable fuel production through state-of-the-art sealing and filtration technologies. These cutting-edge innovations enhance the efficiency and reliability of biofuel and e-fuel manufacturing processes. Just as they benefit existing oil and gas facilities, John Crane solutions contribute to emissions reduction, energy optimization, and extended equipment lifespans, ensuring sustainable operations for both new and revamped facilities. Our unwavering commitment to driving innovation aligns seamlessly with the transition to greener energy sources and global decarbonization efforts. Leveraging our expertise in mechanical seals, couplings, and filtration systems, we proudly serve as a key partner in the sustainable fuels sector.

Strategic Partnerships

AA strategic partnership for John Crane signifies a collaborative alliance with another organization, built upon shared goals and complementary strengths. These partnerships are carefully crafted to create value, enhance competitiveness, and contribute long-term sustainability and resilience. Through collaborations with Hydrogen Europe and other hydrogen pioneers, we are actively accelerating and scaling the new hydrogen ecosystem pivotal to our industry's future.

Trade Associations	Decarbonization	Academia and Research
<p>Partnering with peers to advance industry goals of achieving high reliability, safety, and sustainability</p> 	<p>Leading organization committed to moving towards a sustainable and low carbon energy future</p> 	<p>Collaborating on new technology advancement and innovation</p> 

Value John Crane Offers

We are the market leader in hydrogen compression sealing technologies with over 40+ years of experience in applications such as refining, ammonia, and other end markets. We also have extensive experience in sealing solutions for carbon dioxide in gaseous, liquid, and supercritical fluid phase. Today, rotating equipment such as compressors, pumps, and systems could represent upwards of 25-30% of the total capital and operating cost for large-scale hydrogen production and transport facility. Reducing the total cost of ownership across these mission-critical equipment could significantly improve the cost competitiveness of hydrogen versus alternative fuels. Mechanical seals play an essential role in the operational performance, reliability, and energy efficiency of rotating equipment. Without highly engineered

Compression & pumping				Filtration
Gas seals	Systems	Wet seals	Couplings	Filtration
				

mechanical sealing solutions, these equipment’s could experience significant leakage, higher energy consumption, and increased maintenance needs, contributing to higher operating cost and increased carbon intensity. Advanced filtration solutions are required to protect these expensive machinery and capture contamination in the fluid stream by removing particles, water, and other harmful materials. Ultimately these products are also critical to improve worker and operator safety.

John Crane has solutions, products, and services for every part of the Energy Transition value chain and has also gained a deep understanding over the past few years. We see that most of the projects in the pipeline can be realized with state-of-the art technology John Crane offers. At the same time through new product developments, we are supporting our customers and partners working on the next generation technology that will reduce carbon footprints and increase efficiencies.

We advocate for upscaling projects and developing the market using available technology. This is where governmental support may be necessary to cover the higher capital expenditure (CAPEX) associated with state-of-the-art technology. Simultaneously, to facilitate the scaling of the hydrogen and CCUS ecosystem, we are investing millions in advanced technologies and solutions that will form the foundation for the next generation of mission-critical machinery.

These innovations include ultra-high-speed gas seal solutions for new compressors, advanced materials and coatings that enhance resistance to hydrogen embrittlement and corrosion, diamond-coated sealing technologies designed for intermittent operating conditions, and state-of-the-art filtration solutions that efficiently remove liquids and vapors while minimizing pressure losses. These novel solutions will enable equipment to handle more demanding operating conditions, thereby enhancing reliability, energy efficiency, and overall cost-effectiveness. Additionally, we are actively integrating advanced digital and Internet of Things (IoT) capabilities into our products, empowering operators to accurately predict equipment lifespan, increase plant availability, and reduce overall costs.

Our Collaboration Goals

We are keen to build our stakeholder network in the budding Energy Transition Value Chain. We are open to dialogues with organizations that can offer long term value to our customers. Such collaboration could be in the form of

- Information exchange which is of non-confidential in nature. Discuss with us about projects and opportunities of interest to both parties. If required, we may sign NDA or MoU to facilitate more intense discussion and exchange of information.
- Collaborative participation in national or international projects of interest to both parties. These projects may be supported by Governmental or other agencies or in collaboration with other stakeholders in the area. For understanding John Crane's priorities, please discuss with us.
- Webinars. John Crane offers webinars on our technology. If you are interested, we can arrange a webinar for your colleagues. We are also keen to learn from you if you offer any such services.
- Visit us: If you are in our stakeholder network, you are welcome to visit us to learn more about us and our culture of innovation.

Further Resources

For more information about John Crane's investments into new hydrogen sealing, filtration, digital solutions, and service technologies to support industry in achieving its hydrogen roadmaps, visit our website at: <https://www.johncrane.com/en/new-energy>



LanzaTech

Recycling Carbon with Biology for a Circular Carbon Economy



Introduction

About LanzaTech

Headquartered in the United States, LanzaTech Global, Inc. (NASDAQ: LNZA) is a carbon recycling company that transforms waste carbon into sustainable raw materials for everyday products. Using its biorecycling technology, LanzaTech captures the carbon generated by energy-intensive industries at the source, preventing it from being emitted into the air. LanzaTech then gives the captured carbon a new life as a clean replacement for virgin fossil carbon in everything from household cleaners and clothing fibers to packaging and fuels. LanzaTech’s process is producing ethanol at commercial scale with six global commercial facilities currently in operation, including one facility at the Panipat Refinery in India. These six commercial facilities will have a combined production capacity of 300,000 tonnes (~100 million gallons) of annual ethanol production, which equates to 500,000 tonnes of CO₂ abated.

LanzaTech’s process transforms waste carbon into more sustainable versions of widely-used chemical building blocks, which are key ingredients in everyday products that are typically made from fossil fuels. Today at commercial scale the process makes ethanol, which can be converted into an array of commodity chemicals, including fuels, textiles, packaging and more. This approach to carbon abatement turns a climate liability into a profitable, environmentally-friendly revenue driver, accelerating the potential for a gigatonne-scale solution that the planet urgently needs.



Figure 1 Six commercial-scale facilities using LanzaTech’s process

Contributions to the Indian Economy

LanzaTech’s presence in India underscores our commitment to resource security, economic development, and climate innovation and support for India’s Make in India initiative. LanzaTech’s India office is located in Gurugram (Haryana) with 34 employees. LanzaTech’s India team focuses on forming regional commercial partnerships to accelerate India’s decarbonization and economic growth goals through the use of LanzaTech’s technology;

helping inform policy that aligns economic and environmental incentives; and training and supporting commercial and demonstration scale operations with partners using LanzaTech's carbon recycling technology.

LanzaTech in India

Carbon Capture and Utilization Technology Deployment

IndianOil Corporation: In 2023, after over a decade of partnership, LanzaTech and IndianOil Corporation (IOC) started up a global, first-of-a-kind 11.2 million gallon per year ethanol unit to capture and convert refinery off gases, including CO₂, to fuel-grade ethanol, at IndianOil's 300,000 barrels per day Panipat refinery. An excellent example of India-U.S. collaboration, this facility received funding from the USTDA in 2018 to fund the initial feasibility study.

A testament to IndianOil's sustainable energy objective and built with LanzaTech's proprietary gas fermentation technology, this plant will go a long way in supporting the goals of the U.S.-India Strategic Clean Energy partnership while augmenting India's biofuels supply pool.

In addition, IndianOil has entered into a joint venture with LanzaTech's sister company, LanzaJet, to explore the development of sustainable aviation fuel (SAF) production in India using the LanzaJet Process™, their alcohol to jet (ATJ) technology platform, which was developed by LanzaTech and U.S. Pacific Northwest National Laboratory (PNNL) with the support from the U.S. Department of Energy.



Figure 2 Carbon recycling facility at IndianOil's Panipat refinery

GAIL (India) Limited: In May 2023, India's largest natural gas company GAIL and LanzaTech partnered to combine LanzaTech's carbon recycling technology with GAIL's renewable H₂ and CO₂ gas streams for a demonstration-scale CO₂ capture and utilization project. The project has the potential to be a role model for converting CO₂ from industrial sources into useful materials instead of emitting it to the atmosphere. GAIL intends for this partnership

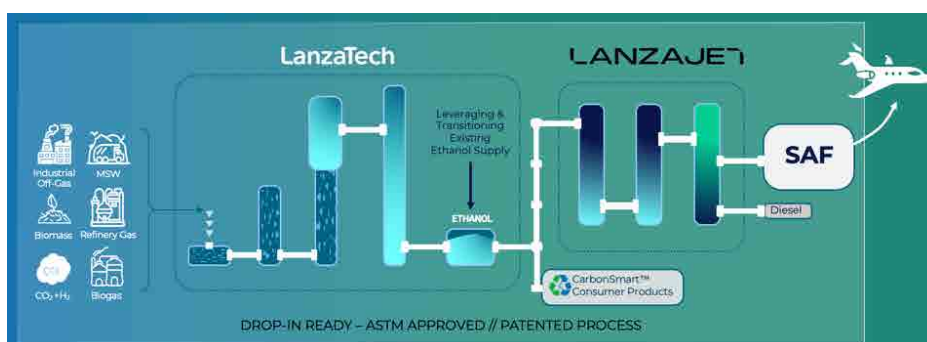


Figure 3 Integrated, waste-to-SAF solution with LanzaJet

to advance its Net Zero 2040 goals and have the potential to support wider decarbonization applications globally.

NTPC: NTPC, India's Maharatna PSU company, is setting up a 10 TPD demonstration-scale plant at NTPC Lara for converting CO₂ (ex. power plant flue gas) to ethanol utilising LanzaTech's CCU technology.

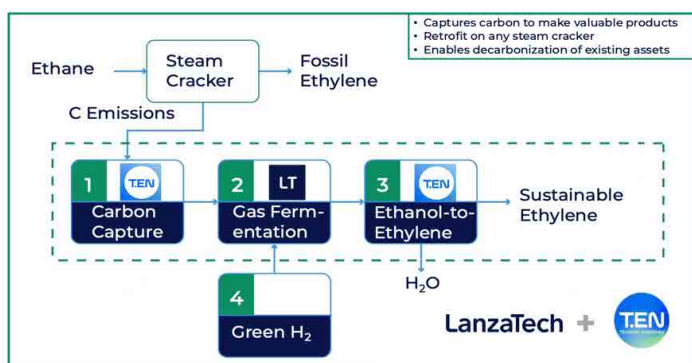


Figure 4 LanzaTech & Technip Energies's joint solution to make sustainable ethylene

Sustainable Ethylene: LanzaTech, in partnership with Technip Energies, has developed a commercial pathway to capture CO₂ emissions from traditional ethylene production to make sustainable ethylene, with significant replication potential in India.

Lower Carbon Supply Chains and Products

India Glycols Limited: LanzaTech and Indian Glycols have partnered to upgrade LanzaTech's ethanol into MEG (monoethylene glycol) and PET (polyester) for use in its CarbonSmart business lines that are globally distributed. This partnership has enabled ethanol to be a building block for everyday products, including dishwashing liquid for Unilever, surfactants for Dow, party dresses for Zara, and Adidas's Australian Open tennis apparel collection.



Figure 5 Fleece by Craghoppers, laundry detergent by Unilever and H&M Move workout top, all of which relied on India Glycols Limited as a key supply chain step

Road Ahead

LanzaTech's contributions are aligned with Prime Minister Modi's Make in India initiative, with a particular emphasis on empowering the fabric of innovation, an inclusive energy transition, and self-reliant supply chains. By providing technology to adopt CCU and produce sustainable fuels in India, LanzaTech is playing a part in fulfilling India's Panchamrit Climate Action Pledge made at COP26 to reach Net Zero.

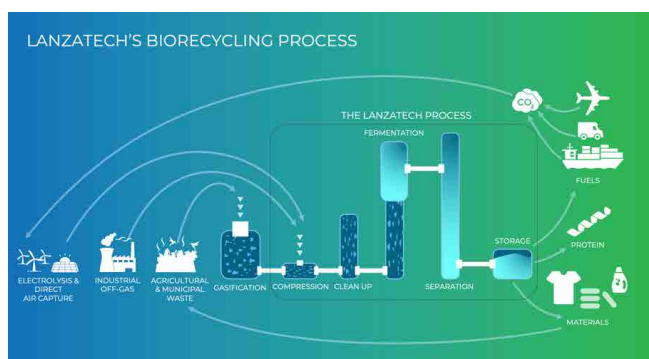


Figure 6 LanzaTech's biorecycling technology is enabling a circular carbon economy

LanzaTech continues to pursue opportunities with Indian partners that align environmental stewardship with economic vibrancy - a blueprint for a sustainable tomorrow, today.







About Rockwell Automation

Rockwell Automation, Inc. (NYSE: ROK) is a global leader in industrial automation and digital transformation. We connect the imaginations of people with the potential of technology to expand what is humanly possible, making the world more productive and more sustainable. Headquartered in Milwaukee, Wisconsin, Rockwell Automation employs approximately 29,000 problem solvers dedicated to our customers in more than 100 countries.

Automation is our foundation. We are dedicated innovators and engineers delivering smarter, connected solutions to the world around us. Our future is propelled by our long legacy of creating integrated control and information solutions that make our customers' businesses as productive as possible. We expand what is possible for our customers, by combining the best of industrial automation with the latest digital technology. This pairing brings together data, systems and processes across an entire organization to provide leaders with relevant, reliable information. The result? A Connected Enterprise that creates a more productive, efficient, nimble business.

We're a team of makers driven to create solutions the automation world doesn't yet know it needs — expanding the potential of the Connected Enterprise. While others might take a broad approach to innovation, we narrow our focus to bring the smartest innovations to the world of automation. We take the knowledge we have gained over the last century and build what's next.

Our mission is to improve the quality of life by making the world more productive and sustainable. We are committed to enabling the next generation of smart manufacturing. With the right strategy, talented people, and our substantial financial strength, we are dedicated to deliver value to our customers.

To learn more about how we are bringing The Connected Enterprise to life across industrial enterprises, visit <https://www.rockwellautomation.com/en-in.html>

At Rockwell Automation, we are expanding human possibility.

Rockwell Automation in India

In India, Rockwell Automation has completed 40 years of its journey in 2023. Currently, we employ nearly 4,400 people across our 17 office locations and 2 manufacturing and assembling units.

Recently, we have also announced the launch of our brand-new manufacturing facility near Chennai in Tamil Nadu, which is expected to commence operation in 2025.

Role of Rockwell Automation in India's Energy Sector

Rockwell Automation is playing a pivotal role in providing latest and globally benchmarked technologies to support India's efforts in energy transition and achieve net zero goals.

We are a trusted partner for many prominent players in the Indian energy industry, covering both conventional and renewable energy sector. Our world-class automation technologies and digital transformation solutions are helping several customers to achieve higher efficiency gains and productivity outcome in their operations, while rationalizing cost and most importantly, reducing their environmental impacts.

Areas of Focus

- **Optimize Production:** Rockwell Automation helps companies improve production efficiency and output.
- **Empower People:** We provide solutions to enhance workforce productivity and collaboration.
- **Build Resilience:** We help organizations become more resilient in the face of challenges.
- **Drive Sustainability:** We support sustainable practices and environmental stewardship.
- **Accelerate Digital Transformation:** We enable companies to embrace digital technologies for growth and innovation.

Sustainability is central to our purpose to make the world more productive and sustainable, and to our promise of expanding human possibility. Under the three sustainability pillars of Environment, Social and Governance (ESG), we prioritize the topics we believe will create the most value for our company, customers and communities, and we have defined as material. Our sustainability strategy focuses on three outcomes: Sustainable Customers, Sustainable Company and Sustainable Communities.

We've been improving the efficiency of industrial processes for more than 120 years, which includes making the most of scarce resources. Today, our technology and expertise help

manufacturers in diverse industries address the complex challenge of making high-quality products at scale while minimizing negative impacts on the environment. Our job is to understand those specific challenges and simplify the business of automation and digital transformation for the benefit of both people and the planet.

The good news is that much of the same technology used for process control can be used simultaneously to manage energy requirements and limit waste. We are proud of the role we play to increase the efficiency of traditional industrial applications and to help decarbonize our environment.

Creating automation solutions for manufacturers requires fresh thinking to address the needs of a changing world. While technology plays an enabling role, people are still the stars. When a human-centric approach is applied to technology implementation, we see improvement in nearly every aspect of the manufacturing operation — from efficiency to worker safety — delivering results that have a positive impact on both the bottom line and sustainability.

It may sound unusual for an automation and digital transformation company to talk about people as much as we do, but we know the winning hand is enabled, energized people who are comfortable interacting with technology. And in a time when workforce and skill shortages impact manufacturers in every industry, enabling people to become comfortable with the newest technology and giving them opportunities to upskill along the way can be the difference between success and failure.

We know we can't do it all by ourselves. That's where our network of partners, both from within our industry and across the communities where we work and live, have a critical role. Our technology partners — distributors, system integrators, machine builders, and more — help us to create solutions that address dynamic needs. Our community partners — academic institutions, government, and nonprofit organizations — help us to build and attract the talent needed to fill workforce gaps.



Sustainability – Net Zero Carbon / Water & Energy Balance

- **Energy Management Software** – This is a tool designed to track energy consumption, emissions & varied sustainability metrics across the production cycle. Enables deep dive into the causal & sources having maximum impact on emissions. Also facilitates data capturing & reporting in line with Scope 1 & Scope 2 definitions.
- **Energy Management Systems** – These enable optimized WAGES (Water, Air, Gas, Electricity & Steam) use. Cross referencing with production (in an industrial environment) or time of year consumption in commercial spaces (climate control). Empowers user with software & hardware tools to mix power sources (in case of, multiple electrical generation sources viz, thermal, solar, wind etc.) to minimize GHG emission & impact while keeping the operational values intact.
- **Life Cycle Assessment** – Software that help companies assess the environmental impact of a product across its lifecycle right from manufacturing, distribution, usage, remanufacturing/repairing (if needed) till the time its scrapped or recycled. For e.g., these tools can help raw material substitution during a product development phase, empower a more sustainable inbound & outbound supply chain during distribution phase, give predictive insights using condition monitoring techniques to keep the equipment in its optimal state, thereby enhancing the life span of the equipment. The cumulative result helps in reducing the overall impact that a product can have on sustainability goals of a company.
- **Demand Response Systems** – A combination of hardware & software designed to help electrical energy consumers optimize their power consumption, based on time of the day, season, peak production & off-peak production hours. Also, can be utilized to switch between different power sources based on the production demand on the shop floor or occupancy, in case of a commercial building like malls, hotels etc. for e.g., a manufacturer can switch to renewable power during the break periods in production or low occupancy in case of a hotel.
- **Model Based Controls for Process Optimization** – The MPC technology helps production companies mitigate process variability challenges. This is achieved by deploying mathematical models to keep a check (and correct, if needed) the various parameters & factors affecting the final product/output. This helps to reduce wastage, rework & scrap, which in turn contribute to reducing the environmental impact of the process.
- **Data Visualization & Trend Analytics** – These tools are designed to provide context to the data & offer actionable insights. It achieves this by acting as a repository of various forms of data generated by dissimilar sources in an industrial environment. Once the data is scrubbed & contextualized, it creates customized dashboards e.g. line efficiency & also gives actionable insights for e.g., key variables affecting,

efficiency figures, between identical plants spread across various geographies. The horizon of actionable insights is quite broad & are customizable as per roles, responsibilities & personas.

- **Condition Monitoring Systems** – These tools are machine learning based models designed & deployed to predict anomalies in rotating equipment's. Vibration & current signature analysis provide back bone to the technology & ML tools are utilized for bench marking of steady state condition of the equipment. This technology deployment is point based & helps in keeping the mechanical & electrical movers in optimal condition to reduce power consumption, saves unplanned downtime, prolongs machine life, thereby having a positive impact on emissions.
- **Autonomous Mobile Robots** – An autonomous vehicle with varied payload capacities utilized for material movement on shop floor usually assembly lines, or distribution warehouses for material shifting, stacking, retrieval, etc. Power is provided through batteries, usually recharged using renewable power. This provides an excellent opportunity for GHG emission reduction by directly impacting fuel consumption.
- **Variable Frequency Drives** – This hardware is an electrical power device for rotating equipment. Globally, fans & pumps consume 80% of the electrical energy demand & variable frequency drives perfect the energy consumption by regulating the speed of the rotating machine. These VFD's (an abbreviation used in industry parlance) help in controlling maximum power demand, support good power factor, reduced energy consumption & best process control. All the above when factored in, have a positive impact on the GHG emission per ton of finished goods.





The American Chamber of Commerce in India (AMCHAM) is the apex chamber of U.S. industry in India. Established in 1992, AMCHAM has over 400 members spread all over the country. The incumbent U.S. Ambassador to India is the Honorary President of AMCHAM. The chamber enjoys a very close relationship with U.S. Embassy officials and receives tremendous support in fulfilling its objectives. The chamber's mission is to assist member companies to succeed in India through advocacy, information, networking and business support services. AMCHAM is headquartered in New Delhi and has regional chapters in Bengaluru, Chennai, Hyderabad, Kolkata and Mumbai.





AMERICAN CHAMBER OF COMMERCE IN INDIA

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