



5. Business Segments of the Company

Energy and economic development go hand in hand, forming the foundation of growth, progress and sound economic development. As India aims to transform into a leading and one of the fastest growing global economies, while fulfilling its carbon commitments, it will have to shift from fossil-based energy production to cleaner fuels to maintain growth. A recent report by Deutsche Bank stated that the Indian economy is set to double its current annual GDP of close to USD 3.5 tn to USD 7 tn by 2030, based on the

achievement of the goals on rapid financialisation, clean energy transition and the digital revolution.

In FY 2022-23, Thermax has taken a strategic decision to realign the disclosure related to Ind AS 108 'Operating Segment', formerly Energy, Environment, and Chemical, into four distinct categories: Industrial Products, Industrial Infra, Green Solutions and Chemical. This is to align the disclosures in line with the allocation of resources and assessment of business performance by the Managing Director and CEO. This aims

to disclose the new energy solutions businesses such as Thermax Onsite Energy Solutions Limited (TOESL) and First Energy Private Limited (FEPL), under the build-own-operate model for industrial energy and utility. The reclassification of businesses under each segment is based on several factors, including the nature of the business offering, customer base, capital employed, and risk, to name a few. This strategic step aligns with Thermax's future priorities and the changing energy and environment requirements to provide sustainable solutions for a better tomorrow.

Industrial Products

Overview

The Company's Industrial Products segment comprises its largest portfolio.

Under Clean Energy, this segment supplies packaged boilers and fired heaters, besides turnkey solutions for process heating, through a range of heating media, such as steam, thermic fluid, hot water and hot air. Furthermore, it also provides biomass-fired equipment for the combustion of green fuels, including agricultural waste and industrial process waste, as well as heat recovery solutions for clean energy production. It is complimented by steam engineering products and accessories.

In order to provide environment-friendly cooling and heating products and services to industries and commercial complexes, it uses energy-efficient vapour absorption machines and process cooling equipment.

Under Clean Air, Thermax provides air pollution control systems for both particulate and gaseous exhaust. It offers broad-based, single-source expertise and flange-to-flange solutions in all areas of environment protection – from products and systems for air pollution control (APC) to retrofit and rebuild services. Tie-ups with technology majors and extensive work with diverse industry sectors facilitate the Company in taking up turnkey environment-related projects from concept to commissioning. The APC business has successfully completed over 27,000 installations up to FY 2022-23 across a wide range of industries.

In line with our brand promise of conserving resources and preserving

the future, the Company's Water and Waste Solutions (WWS) business assists industrial and commercial establishments with products and services to reuse and recycle water and treat sewage and effluents. It also provides seawater desalination solutions, reducing freshwater consumption and contributing to water conservation. Till date, the WWS business has completed more than 27,000 standard installations and 600 industrial large-scale installations.

Our Growth Drivers

- Emphasis on clean energy driving a shift in energy mix, creating opportunities for greenfield projects and brownfield replacements
- Growth in industries like food, pharma, chemicals, cement, and steel, given the encouraging policies and macro-economic factors
- A key impetus on local manufacturing by the government under the 'Make in India' initiative
- Insufficient clean water in India
- Stringent regulatory norms for water and effluent treatment
- Market demand for modularised/ plug-and-play water and wastewater treatment products
- Increased investment by cement and steel industries for new and existing projects
- Global enforcement of air pollution emission norms

Our Key Focus Areas

- Strengthening the green portfolio with waste heat recovery and

waste-to-energy solutions cater to growing market demand

- Continued focus on digitalisation and remote monitoring of equipment
- Modularisation of new products
- Focus on urban and commercial segments to offer sewage recycling solutions with newer, compact products based on membrane bioreactor (MBR) and sequential batch reactor (SBR) technologies
- Emphasis on zero liquid discharge (ZLD) systems with advanced multi-effect evaporator (MEE) and mechanical vapour recompression (MVR) technologies developed in-house
- Development of new air pollution control technologies to manage diverse versions of gaseous pollutants and enable agro-based fuel combustion
- Product development for near zero emission guarantee (<5 mg/Nm³)
- Retrofitting and upgradation of old industrial plants with industrial air pollution control solutions to meet stringent regulatory norms of the government
- Need to strengthen presence in the overseas markets

Key Risks

- Impact of commodity price increase
- Disruption in global supply chain
- Dependency on single source vendors for critical products
- Change in government policy affects the demand for our customers' products
- Impact of energy transition on certain product offerings

The MDA covers significant subsidiaries impacting segmental performance. The following subsidiaries are part of the Industrial Products segment. For detailed information on each subsidiary, please refer to AOC-1 on page 244.

Danstoker Group

Based in Herning, Denmark	
Key solutions provided	<ul style="list-style-type: none"> • Solid fuel-fired (biofuels) boiler • Electric boiler • Waste heat recovery boiler • Oil/gas-fired boiler
Sustainable growth plan	<ul style="list-style-type: none"> • To expand the business with waste biomass as a fuel which is expected to experience huge demand in Europe in the years ahead. The growing demand is a consequence of Europe's plan to be independent of Russian gas supply • To leverage the growing demand in Europe for biomass boilers and electric boilers
Business performance*	The subsidiary's revenue grew by 25.1% in FY 2022-23 (FY 2021-22 saw a degrowth of 7%), while the order booking grew by 52.7% (FY 2021-22 saw a degrowth of 2%). The revenue from the overseas business has increased owing to high activity in the biomass/waste market. A growth ranging between 50% and 70% is projected in the segment.
Key industries	<ul style="list-style-type: none"> • Automotive • Breweries • Crematories • Dairies • District Heating • Food & Beverages • Pharmaceuticals • Wood
Geographical footprint	<ul style="list-style-type: none"> • Denmark • Poland • Norway, Sweden, Finland • Baltic countries • Western Europe (France, Germany, Netherlands, and Belgium)
Highlights	<ul style="list-style-type: none"> • Received a contract for two large waste-fired boilers in Norway, leading to a breakthrough in this technology

* The figures mentioned in () are for FY 2021-22.

PT Thermax International, Indonesia (PT TII)

Based in Jakarta, Indonesia	
Key solutions provided	<ul style="list-style-type: none"> • Offers process heating equipment such as steam boilers, hot water and hot air generators, thermic fluid heaters and thermosyphon • Emerges as a one-stop solution for process plants with heating product ranging from steam generation (boilers) to condensate recovery systems (steam accessories), along with fuel and ash handling systems • Complements the heating portfolio with air pollution control equipment, steam engineering and services
Sustainable growth plan	<ul style="list-style-type: none"> • To streamline local manufacturing facilities and increase the capacity utilisation • To penetrate the market with aggressive selling and marketing activities and with competitive products and pricing • To strengthen the services business by revamping and retrofitting boilers, heaters and air pollution control equipment • To remain focussed on customer service and retention • To develop a network of channel partners & dealers and increase customer reach and visibility • To conduct marketing campaigns on sustainability, enabling fuel shift from fossil fuels to green biomass fuels

Business performance*	The subsidiary registered 83.3% (19%) growth in revenue and 61.7% (3%) growth in order booking, with the highest order book achieved for products and services. This growth can be attributed to strengthening of the team personnel and ensuring improved coordination with the front-end. Another key reason has been the fuel shift to biomass and an increased focus on efficiency, owing to an increase in fuel prices.		
Key industries	<ul style="list-style-type: none"> ● Agriculture & Allied ● Chemicals ● Food & Beverages ● Palm Oil 	<ul style="list-style-type: none"> ● Paper & Packaging ● Petrochemicals ● Pharmaceuticals ● Rubber 	<ul style="list-style-type: none"> ● Textiles ● Tobacco
Geographical footprint	<ul style="list-style-type: none"> ● Indonesia ● South-East Asia 		
Highlights	<ul style="list-style-type: none"> ● Received an order from an American multinational tobacco company. This marks several significant firsts: first order for an Ultrapac reciprocating grate boiler in Indonesia, first project with this customer globally, and first turnkey project outside TOESL ● Received an order from a global lubricant supplier in Indonesia backed by continued association with the customer in India ● First breakthrough order from one of the largest food & beverage companies in Indonesia 		

* The figures mentioned in () are for FY 2021-22.

Thermax Europe

Based in Bletchley, United Kingdom

Key solutions provided	<ul style="list-style-type: none"> ● Installs absorption chillers and heat pumps with a capacity of 35 kW to 12,000 kW ● Facilitates chillers and heat pumps driven by hot water, steam, oil & gas and waste energy, making them more energy-efficient, innovative and sustainable ● Leverages technology for cooling commercial establishments and industrial processes, and other district heating applications 		
Sustainable growth plan	<ul style="list-style-type: none"> ● To focus on the industrial waste heat recovery absorption chiller and heaters for various applications 		
Business performance*	Registered higher year-on-year performance in line with expectations. During the year, order booking was 23.8% (27%) lower than the previous year owing to continuously changing economic conditions and shortage of fuels in Europe, affecting the inflow of new contracts. However, the revenue increased by 9.4% (-16%).		
Key industries	<ul style="list-style-type: none"> ● District Heating ● Power 		
Geographical footprint	<ul style="list-style-type: none"> ● United Kingdom ● Denmark ● Germany 	<ul style="list-style-type: none"> ● Italy ● Poland ● Scandinavia 	
Highlights	<ul style="list-style-type: none"> ● The chiller business continued to be driven by the on-site power generation market in Italy, Germany, Spain and the United Kingdom ● The heat pump business was driven by the district heating segment and the commitment made by select European countries to reduce dependency on fossil fuels and increase energy efficiency ● Received large heat pump orders from Denmark and Poland; and chiller orders received from a large confectionery company in the United Kingdom ● Exceeded performance expectations in the service & spare parts business owing to large orders received for spare parts 		

* The figures mentioned in () are for FY 2021-22.

Success Story



Thermax Caters to the District Heating Needs of Hamburg, Germany

As part of its waste to energy project, a district heating plant in Borsigstraße, Hamburg, Germany, Müllverwertung Borsigstraße (MVB), required heat pumps to meet the district heating needs and ensure its stable and secure supply, especially during market price fluctuations witnessed by fossil fuels. For the same, Thermax supplied three single-effect steam-fired heat pumps.

This innovative project enhanced the efficiency of heat generation from waste at MVB's waste recycling plant. This efficient use of waste heat contributed to Hamburg's climate neutrality journey by way of decarbonisation of district heating and helped save 1,04,000 tonnes of CO₂ annually. MVB has thus emerged as one of the significant suppliers of climate-friendly energy for the region without using additional fuel.

The infrastructure will feed an additional 3,50,000 MWh/a of heat into the performance network of Hamburger Energiewerke, and assist in supplying climate-neutral energy and meeting the heat requirements of 35,000 more households from the waste recycling process.

This unique nationwide project comprising the heat pumps has been awarded the German Renewables Award 2021. To watch the video, click here: https://www.youtube.com/watch?v=NwjwULu_sMU/

Thermax Inc., USA

Based in Houston, Texas, United States

Key solutions provided	<ul style="list-style-type: none"> • Sale of absorption chillers and heat pumps
Sustainable growth plan	<ul style="list-style-type: none"> • To focus on promoting absorption heat pumps in the United States, with markets inclined towards heat pumps and hybrid chillers
Business performance	<ul style="list-style-type: none"> • Despite stiff competition, the Cooling business has maintained a consistent performance at par with last year in terms of order booking as a holistic service provider. Markets have shown an inclination towards heat pumps/hybrid chillers, giving us a good opportunity to promote our absorption heat pumps across the USA
Key industries	<ul style="list-style-type: none"> • Commercial • Electronics • Food & Beverages • Paper • Urban
Geographical footprint	<ul style="list-style-type: none"> • North America
Highlights	<ul style="list-style-type: none"> • Received new orders from the hospitality sector • Good traction continued in orders from Puerto Rico and Mexican regions

Performance of Industrial Products Segment in FY 2022-23

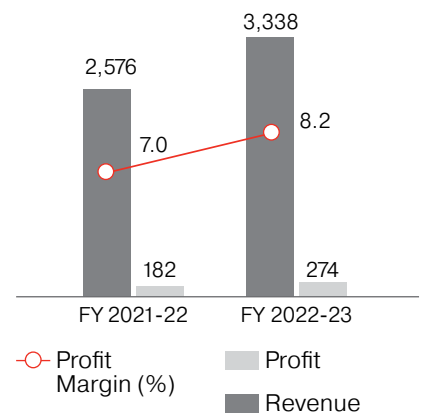
In FY 2022-23, the Industrial Products segment accounted for 40.2% (40.8% in FY 2021-22) of the Group's gross operating revenue.

The operating revenue (net) stood at Rs. 3,338 crore (Rs. 2,576 crore), while segment profit* was Rs. 274 crore (Rs. 182 crore) for the same period. In FY 2022-23, order booking was Rs. 4,172 crore, up from Rs. 2,891 crore in the previous year.

The higher revenue can be attributed to the favourable momentum in the Indian economy, increasing demand for green energy, and a strong emphasis on the development of sustainable products and services.

**Note: Segment profit – Profit before interest, tax, and other unallocable income, net of unallocable expenditure.*

Financial Performance – Industrial Products Segment (Rs. crore)



Industrial Infra

Overview

Optimising resource utilisation has always been an integral part of Thermax's DNA. The new segment – Industrial Infra covers our Projects and Energy Solutions (P&ES) and Thermax Babcock & Wilcox Energy Solutions (TBWES) businesses.

P&ES offers captive power plants, cogeneration systems, waste heat recovery power plants and independent power plants in the utility space on EPC basis.

The business provides captive and independent power plants operating on a variety of renewable fuels. It also offers equipment and solutions based on conventional fuels (solid, liquid and gaseous).

Cogeneration is a system that produces heat and electricity in a single plant powered by a single energy source. This drives savings in cost as well as resources for customers. Waste heat recovery power plants use waste heat from various processes in large industries such as steel and cement and convert these to power, thereby reducing consumption of fossil fuels.

Additionally, P&ES includes the installation of sulphur recovery block on EPC basis. It also offers flue gas desulphurisation (FGD) systems for fossil fuel-based power plants, which aid in capturing SOx (sulphur oxides) emissions.

TBWES, a wholly owned subsidiary, provides steam generation for process and power needs, as well as waste heat recovery solutions. It also retrofits boilers and process furnaces.

➔ For more details on the subsidiary, refer to page 32.

Our Growth Drivers

- Emphasis on clean energy driving shift in the energy mix, creating opportunities for greenfield projects and brownfield replacements
- Increasing demand for EPC, renewable energy, waste-to-energy, waste heat recovery plants and biofuels with focus on sustainability and energy-efficient solutions
- Government mandate to power companies to install FGD systems within a stipulated timeframe to mitigate SOx emissions

Our Key Focus Areas

- To diversify EPC offering into international markets, unconventional fuels and renewable energy
- To strengthen our green portfolio with waste heat recovery and waste-to-energy solutions and to cater to growing market demand
- To continue making investments in value-added service offerings, such as Industrial Internet of Things (IIoT) solutions, remote assistance technology and automation
- Modularisation
- Need to strengthen presence in the overseas markets

Key Risks

- For our EPC business, availability of skilled manpower is a challenge
- Coal-based power projects are on the decline
- Recession outside India is affecting our export business
- Execution risk on large projects

The MDA covers significant subsidiaries impacting segmental performance. The following subsidiaries are part of the Industrial Infra segment. For detailed information on each subsidiary, please refer to AOC-1 on page 244.

Thermax Babcock & Wilcox Energy Solutions Limited (TBWES)

Based in Pune, Maharashtra, India	
Key solutions provided	<ul style="list-style-type: none"> Offers equipment and solutions for generating steam for process and power through the combustion of various solid, liquid and gaseous fuels and through heat recovery from turbine/engine exhaust and (waste) heat recovery from industrial processes Offers heaters for various applications in chemical, petrochemical and refinery segments The Services arm offers spares, plant services and performance improvement projects for boilers and heaters
Sustainable growth plan	<ul style="list-style-type: none"> To expand its green portfolio in conjunction with the trend towards clean energy, TBWES has formed strategic partnerships and developed newer technologies focussed on waste to energy, municipal solid waste (MSW) incineration and waste heat recovery To develop and deploy multiple green energy solutions and continue to focus on plant improvement projects that increase capacity, reliability, emissions performance, useful lives and the efficiency of existing plants
Business performance*	<p>Achieved 15.7% (64%) growth in order booking and 31.6% (31%) growth in revenue, in comparison with its performance in the previous year. TBWES received orders from the Indian oil refining sector, which continued capacity and value addition projects.</p> <p>It also received orders for waste heat recovery projects from the cement and steel sectors as Indian manufacturing companies invested in energy efficiency improvement.</p>
Key industries	<ul style="list-style-type: none"> Cement Chemicals Distillery Fertilisers Non-Ferrous Metals Paper Petrochemicals Power Refinery Steel Sugar Textiles
Geographical footprint	<ul style="list-style-type: none"> Asia South-East Asia Middle East Africa Latin America Europe
Highlights	<ul style="list-style-type: none"> Received an EPC order for the design, manufacture, supply, erection and commissioning of 2 x 260 TPH utility boilers for a major refinery and petrochemicals complex Received an order for the design, manufacture and supply of 4 x 125 TPH waste heat recovery boilers on the largest sponge iron kiln block Received an EPC order for the design, manufacture, supply, erection and commissioning of five fired heaters for a major refinery in eastern India

* The figures mentioned in () are for FY 2021-22.

Success Story

Thermax Delivers One of the Largest Assembled Flue Gas Coolers to a Mexican Customer on Schedule

One of the largest assembled flue gas coolers was timely delivered to a Mexican customer due to the enhanced modularisation capabilities of TBWES. This saved considerable construction time at the site. The overall structure of the flue gas cooler was massive, weighing approximately 1,600 tonnes in total, and hence was supplied in two modules that were assembled at the Mundra manufacturing facility. The project faced several challenges,

such as assembling five convection modules with a super heater on the base frame with tube expansion, a massive bolted structure with approximately 14,000 bolts, about 3,600-inch diameter welding, and stringent inspection requirements.

However, the collaborative efforts of the team helped overcome these challenges successfully.

Thermax booked a break bulk vessel one year in advance from the proposed shipment plan to optimise the cost of shipping. The transportation of these modules was carried out through self-propelled modular transport (SPMT) from the Mundra manufacturing facility to the port. Thermax also selected a faster vessel with a 'last in-first out' basis, enabling 36 days of transit instead of the regular 55 days.

With the excellent planning, execution, and teamwork, Thermax successfully delivered the flue gas cooler to the customer in Mexico on the agreed schedule. This success is a testament to Thermax's expertise in providing innovative and efficient solutions to complex challenges in the energy and environment sector.



Thermax Bioenergy Solutions Private Limited (TBSPL)

Based in Pune, Maharashtra, India

Key solutions provided	<ul style="list-style-type: none"> Offers solutions to generate bio-CNG (compressed biogas) from wastes like biomass, agricultural waste, municipal solid waste and food processing waste Ensures availability of clean and sustainable energy, while contributing to a circular economy
Sustainable growth plan	<ul style="list-style-type: none"> To expand manufacturing and geographical footprint by deepening the business presence in domestic markets and extending solutions in select international markets To engage in strategic partnerships and promote sustainable energy, offering a one-stop solution for bio-CNG and contributing to a circular economy To generate employment opportunities for the local communities
Business performance	NA (The entity started operations during the year under review)
Key industries	<ul style="list-style-type: none"> Oil & gas Transportation
Geographical footprint	<ul style="list-style-type: none"> Punjab Uttar Pradesh Gujarat Parts of Delhi
Highlights	<ul style="list-style-type: none"> Setting up a bio-CNG plant for a municipal corporation in North India Projects under-execution in Punjab, Uttar Pradesh and Gujarat

Performance of Industrial Infra Segment in FY 2022-23

In FY 2022-23, the Industrial Infra segment accounted for 47.3% (47.3% in FY 2021-22) of the Group's gross operating revenue.

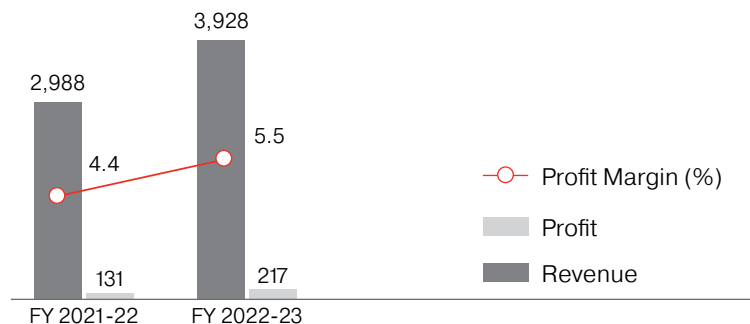
The operating revenue (net) stood at Rs. 3,928 crore (Rs. 2,988 crore), while segment profit was Rs. 217 crore (Rs. 131 crore) for the same period. The growth in revenue is attributed to the improved order balance, primarily driven by orders received in the previous year for Projects and Energy Solutions, TBWES, and flue gas desulphurisation solutions.

In FY 2022-23, order booking was Rs. 3,779 crore, down from Rs. 5,820 crore in the previous year.

The decline in order booking during the current year can be attributed to the absence of significant large orders, unlike last year, which saw

major orders - two worth Rs. 1,376 crore from the FGD business, and one worth Rs. 1,176 crore secured for a sulphur recovery block.

Financial Highlights – Industrial Infra Segment (Rs. crore)



Green Solutions

Overview

Energy transition is a continuous commitment that requires a reliable partner. With India's focus on renewable energy and hydrogen, Green Solutions is set to take centre stage in the years ahead. Thermax stands as a partner for customers seeking a comprehensive energy solutions provider who will diligently address their energy needs. The Green Solutions segment includes Thermax Onsite Energy Solutions Limited (TOESL) which provides green utilities such as steam, heat, treated water, chilled water, and cogeneration power, along with other utilities on a long-term basis (build-own-operate model).

In addition, Thermax has expanded its offerings in the renewable space on an EPC basis, constructing solar, wind and hybrid farms (and storage) based on the opex/BOO model, through its subsidiary First Energy Private Limited (FEPL). It positions Thermax as an energy manager, offering customised off-grid solutions, helping the customers go from 'behind the meter' to 'beyond the meter' in the long run.

Thermax recently entered into a partnership for green hydrogen projects for commercial and industrial customers in India. The production of green hydrogen at an industrial scale would be a major step forward in decarbonising hard-to-abate industries such as refineries, fertilisers and steel.

Thermax's integrated Energy Management Solutions offer guaranteed energy savings to our customers across sectors, including cement, steel, paper etc. Equipped with a cutting-edge digital solution, the offerings help customers with higher energy efficiency, reduced

carbon footprint and improved sustainability.

Our Growth Drivers

- Energy transition and action on climate change are key priorities of governments globally; the Indian Government's target is to reduce carbon emissions intensity by 45% by 2030
- Gradual shift from capex to opex-based models
- Government's push for energy security in India; favourable policies and key incentives announced in the Union Budget
- Shift from coal to biomass and other agro-based fuels

Our Key Focus Areas

- To continue the momentum in opex-based renewable energy solutions, including in international markets
- Enter into business development partnerships with industry associations, OEMs, process licensors and consultants in key markets
- To diversify into other green avenues such as biomass gasification

Key Risks

- Dependency on government policies/cash starved state utilities
- High dependency on biomass waste
- International markets with low price competition from local players



A glimpse of FEPL's wind-solar hybrid project in Gujarat

The MDA covers significant subsidiaries impacting segmental performance. The following subsidiaries are part of the Green Solutions segment. For detailed information on each subsidiary, please refer to AOC-1 on page 244.

Thermax Onsite Energy Solutions Limited (TOESL)

Based in Pune, Maharashtra, India

Key solutions provided	<ul style="list-style-type: none"> Supplies utilities such as steam, heat, treated water and cogeneration power through the build-own-operate (BOO) business model Invests in the capital, sets up and operates utility plant for the entire lifecycle at the customer's premise Undertakes comprehensive operations & maintenance, also handles supply chain management of fuel, spares and consumables Helps customers focus more on core manufacturing processes, rather than owning and running such utilities
Sustainable growth plan	<ul style="list-style-type: none"> TOESL aims to offer 100% green solutions and to help its customers reduce their carbon footprint by replacing fossil fuel consumption. To date, it has enabled customers to reduce nearly 1 million tonnes of CO₂ equivalent To strengthen its current portfolio through backward integration, digitalisation and strategic business development To tap new markets through selective internationalisation by capitalising on its present strengths To diversify the portfolio with a focus on bio-CNG, biomass gasification and water & wastewater treatment solutions under the build-own-operate model
Business performance*	Registered satisfactory performance, with revenue growing by 60.5% (75%) and profits increasing by 13.8% (22%). During the financial year, biomass fuel prices, a market-driven cost element, have significantly increased over 58%. However, absolute margins remain intact due to fuel pass-through agreement with customers.
Key industries	<ul style="list-style-type: none"> Chemicals Food & Beverages Pharmaceuticals Textiles
Geographical footprint	<ul style="list-style-type: none"> South Asia (India, Sri Lanka, and Bangladesh) South East Asia (Indonesia, Philippines, Vietnam, Thailand, and Malaysia) Africa (Kenya, Nigeria, and Ghana)
Highlights	<ul style="list-style-type: none"> Received its maiden order in Sri Lanka for steam supply to a Swiss-based food & beverage company. Received two other steam supply orders for two of its plants in India Received a maiden project for biomass-based hot water generation and supply from a global manufacturing company for its first and upcoming plant at Erode, Tamil Nadu, India Bagged two orders for steam supply from chemical companies Received another steam supply order from a US-based multinational pharmaceutical company

* The figures mentioned within () are for FY 2021-22.

Success Story



TOESL Secures a Hot Water Supply Project from a Global Safety Solutions Expert

A global safety solutions expert based in Malaysia approached TOESL to implement a 100% agro-waste biomass fuel-fired hot water generator for its greenfield project in Tamil Nadu, India. Despite the customer having existing working hot water generators from a competitor OEM in Sri Lanka and Thailand, continuous engagement with the customer and visits to TOESL's project sites instilled their confidence in our solutions and operations, leading to TOESL winning the order.

The project was unique as it was for a new product and application and for the customer's first plant of glove manufacturing in India. The biomass-based hot water generator is highly efficient for 100% biomass-based combustion, resulting in significant cost savings for the customer.

With the implementation of this model, the customer shall save approximately Rs. 9.5 crore on committed offtake and has the potential to save up to Rs. 20 crore with a rise in consumption. Additionally, it enables the customer to achieve an estimated CO₂ reduction of over 17,000 tonnes annually against furnace oil. A dedicated biomass fuel supply chain was developed, ensuring consistent quantity and quality at the right price.

First Energy Private Limited (FEPL)

Based in Pune, Maharashtra, India

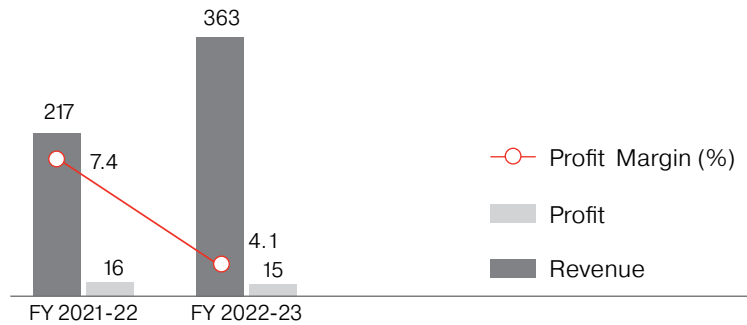
Key solutions provided	<ul style="list-style-type: none"> Understands the unique energy matrix and designs custom-made solutions to suit different industries, applications and energy management goals Manages the entire energy corridor – from behind to beyond the meter – assuring dependable and reliable round-the-clock (24 x 7 x 365) green power to customers
Sustainable growth plan	<ul style="list-style-type: none"> To set up renewable captive power plants (solar, wind, hybrid and storage) to tackle renewable power requirements, providing a sustainable solution for industries and reducing India's carbon footprint To explore the option of connecting large power projects with CTU in the future To collaborate with credible partners To explore additional revenue sources such as carbon market exchanges To adopt new technologies and automate business processes
Business performance	Registered 27.5 MWp of captive renewable power projects in India in FY 2022-2023, along with 45.8 MW wind-solar hybrid capacity projects nearing commissioning. Additionally, it is also working on a 129 MWp solar-wind bundled renewable power project in Tamil Nadu. The projects are expected to be commissioned in FY 2023-24.
Key industries	All industrial clusters
Geographical footprint	<ul style="list-style-type: none"> Maharashtra Gujarat Tamil Nadu
Highlights	Concluded a ~180 MWp captive renewable power project for industrial consumers

Performance of Green Solutions Segment in FY 2022-23

In FY 2022-23, the Green Solutions segment accounted for 4.4% (3.4% in FY 2021-22) of the Group's gross operating revenue. The operating revenue (net) stood at Rs. 363 crore (Rs. 217 crore), while segment profit was Rs. 15 crore (Rs. 16 crore) for the same period. In FY 2022-23, order booking was Rs. 195 crore, up from Rs. 127 crore in the previous year.

An increase in revenue is mainly due to growth in the TOESL business. However, segment profits are lower due to initial set up costs in FEPL.

Financial Highlights – Green Solutions Segment (Rs. crore)



Success Story



FEPL Successfully Commissions an Open Access Solar PV Plant in Tamil Nadu, India

FEPL had undertaken the commissioning of a 16 MWp solar PV power generation plant under open access at Mangudi village of Sivagangai district in Tamil Nadu with the aim of exporting power generated at the 110/22 kv Manamadurai substation of Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO).

However, during the mid-execution stage, the identified project land had to be changed due to a stay from the Supreme Court. This led to a delay in the project schedule and posed challenges to the execution of the project.

To mitigate the risks, the project team identified another piece of land in Pillur and Kovanur village of Sivagangai district, exporting power generated at the 110/22 kv Idayamelur substation and targeted block-wise commissioning of the plant to minimise the impact of adverse weather conditions.

Another challenge during the construction phase was the Right of Way (RoW) issue observed while laying transmission lines. Moreover, creating safety awareness among local villagers and addressing their concerns was also a major challenge.

With the team's efforts, construction and commissioning were completed in compliance with all statutory requirements. Regular safety induction and training, toolbox talks, and subjective training helped improve awareness, and the team managed to complete the job in >78,000 safe man-hours.

The solar PV power generation plant has helped meet the region's energy needs and contributed to a reduction in carbon emissions.

Chemical

Overview

The Chemical segment manufactures and markets a wide range of specialty chemicals to help improve processes and water use efficiency across a spectrum of industries. Thermax is recognised as Asia's leading manufacturer and exporter of ion exchange resins and is a pioneer in water and wastewater treatment chemicals. It also manufactures construction and oil-field chemicals. With these specialty chemicals and its strong dealer network, it serves a number of industrial sectors and customers globally. We are equipped with modern research, state-of-the-art manufacturing facilities and qualified professionals to offer customised solutions. The USA is an important market for this business.

Our Growth Drivers

- Increase in demand for solvent-free and low total organic carbon (TOC) resins for ultrapure water applications in food, pharma and electronics industries

- Increasing emphasis and government push towards water recycling in the wake of worldwide water crisis and severe regulatory criteria for water and wastewater treatment
- Rise in demand for reverse osmosis (RO), multi-effect evaporator (MEE) and incinerators to boost water treatment chemicals aiding in zero liquid discharge and effluent treatment
- Investment in petrochemicals sector leading to opportunities for monoethylene glycol (MEG) and catalyst resins
- New demand from infrastructure segments (cement and steel), supported by infrastructure expansion and government policies
- India becoming a reliable manufacturing hub with global standards and compliances
- Increasing government investments in infrastructure projects, especially in power generation

Our Key Focus Areas

- To enhance market presence and broaden our portfolio of specialty resins, building references for specialty applications
- To expand our global market presence through a dealer network and collaborate with industrial licensors and consultants
- To widen the market reach of water treatment chemicals by focussing on digitalisation and remote monitoring of water treatment products and systems
- To focus on the polyelectrolytes business

Key Risks

- Fluctuation in commodity prices
- Geopolitical situations

The MDA covers significant subsidiaries impacting segmental performance. The following subsidiary is part of the Chemical segment. For detailed information on the below subsidiary, please refer to AOC-1 on page 244.

Thermax Inc., USA

Based in Houston, Texas, United States

Key solutions provided	Sale of chemicals (ion exchange resins)			
Sustainable growth plan	To expand into Canada, Mexico, and Latin America markets through our distribution channel with a focus on mix bed application in the North American market. We are collaborating with a technology partner for our catalyst product line and to develop lithium, PFOS/PFOA removal applications.			
Business performance*	Thermax Inc. experienced a 29.60% (60%) growth in revenue compared to the previous year due to orders from industrial deionisation and mix bed applications, accompanied by a slight rise in profitability.			
Key industries	<ul style="list-style-type: none"> • Chemical • Commercial 	<ul style="list-style-type: none"> • Electronics • Food & Beverages 	<ul style="list-style-type: none"> • Oil & Gas • Paper 	<ul style="list-style-type: none"> • Petrochemicals • Urban
Geographical footprint	North America			
Highlights	<ul style="list-style-type: none"> • Received an order for MEG processing from a large petrochemical giant • Received an order for high-purity resins and mixed bed resins • Partnered with the US-based ChemPoint for distribution and sales & marketing of ion exchange resins in North America 			

* The figures mentioned within () are for FY 2021-22.

Success Story



Thermax Facilitates Maltodextrin Purification Using Tulsion® Resins

One of our customers in India from the food industry was using imported resins for maltodextrin purification but was looking for a domestic manufacturer as a substitute. The customer had unique challenges with various process parameters, such as colour impurities, natural salt or inorganic impurities, and protein content in starch. The customer wanted to ensure that the resin would perform well on colour, pH, conductivity, pressure drop, chemical consumption, and other parameters without compromising its life.

Thermax provided a solution by suggesting its carefully chosen ion exchange resins for maltodextrin purification, applicable specifically to the food production industry. These resins offered many advantages that met the customer's requirements. The maltodextrin syrup was purified using a cationic resin, which has high protein adsorption capacity due to its dual porosity and assists in the exchange of alkali & alkaline earth metals with hydrogen ions. This was followed by the usage of a premium grade resin which has higher adsorption of colour-causing impurities, also enabling the exchange of anionic (mineral acidic) ions.

The performance of Tulsion resins with excellent outlet quality as per requirements was highly appreciated by the customer. Based on achieving the desired results, the customer was convinced to replicate the same solution in other vessels too.

Performance of Chemical Segment FY 2022-23

The segment accounted for 8.1% (8.5% in FY 2021-22) of the Group's gross operating revenues in FY 2022-23. The Chemical business posted an operating revenue of Rs. 673 crore (Rs. 539 crore in FY 2021-22). Segment profit for the year stood at Rs. 86 crore, compared to Rs. 62 crore in the previous year.

The revenue increase primarily stems from the export markets, while on the margin side, the stabilisation of commodity costs after September 2022 has led to improved profit margins.

Financial Highlights – Chemical Segment (Rs. crore)

