Sustainable Energy Transition Solutions towards Net Zero

Thermax Limited

27 June 2024

Conserving Resources, Preserving the Future.

Conserving Resources, Preserving the Future.

Solutions

Power

Heating

Cooling

Water Treatment

Chemical

Utilities

Raw Material

Desired Product

Waste

Hazardous Waste Treatment

Wastewater Treatment

Air Pollution Control

Waste to Energy Generation

Accelerating Decarbonisation

THERMAX

Sustainable Energy & Environment Solutions

(Capex / O&M)

Green Utility Solutions under Build-Own-Operate

From investment to lifecycle responsibility

Green Hydrogen

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Green Hydrogen

Sustainable Solutions by Thermax

Clean Air

Clean Water

Clean Energy

Sustainable Solutions by Thermax

Clean Energy

- Process Heating
- Steam Engineering
- Cooling & Heating

Energy And Water Savings Products

Hybrid Heat Pump
Achieve 40% Cost Savings

Capacity: From 400 KW- 40 MW
Hot Water Output: Upto 120°C
Water Savings: Upto 30%
Direct Fuel/Energy Savings: Upto 40%
Simultaneous Cooling generation capacity
Upto 30% of heating capacity

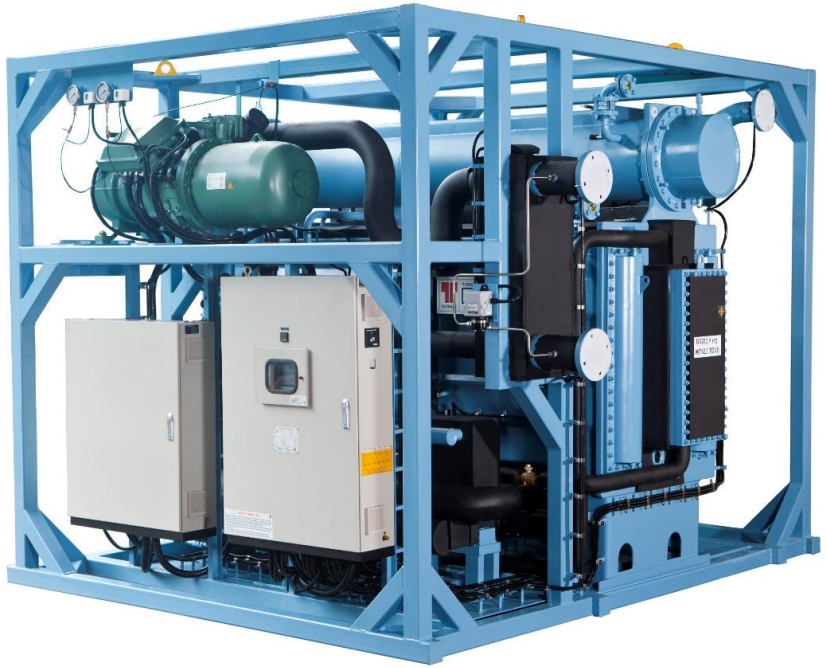
Closed Loop Cooling Tower
Achieve upto 10% Water Savings

Capacity: From 10 CMH to 400 CMH (In a Single Unit)
Temperature Range : Inlet 55 Deg C (Max)
Delta T : 25 Deg C
Casing : ZAM / AZ 150 / SS 304
Tubes : SS 304
Fans : Std Axial Fan & Motor / EC Fans

Adiabatic Cooling Tower
Achieve upto 95% Water Savings

Capacity: From 100 KW to 1 MW (In a Single Unit)
Temperature Range : 48 Deg C (Max)
Delta T : 7 – 8 Deg C (Typical) / 10 Deg C (Max)
Casing : ZAM / AZ 150 / SS 304
Tubes : SS 304
Fans : Std Axial Fan & Motor / EC Fans

Case Study 1 - Hybrid Heat Pump In A Chemical Industry



Capacity: 650 kW
Input: Power and Steam

Problem Statement:

Customer was looking to reduce carbon emission & operation cost by optimizing steam consumption & water consumption

Solution:

Thermax offered end to end Hybrid Heat Pump solution to Reduce steam consumption, water consumption & carbon emission. The solution produces hot water at temperatures up to 120°C and chilled water upto 7°C, ensuring cost savings of up to **40%** compared to traditional methods, while also generating cooling capacity, solutions

Result:

1	Steam Savings per Year in Tons	4489
2	Co2 Emission Reduced Per Year in Tons	698
3	Water Savings / Year in M3	2841
4	Overall Operational Savings / Year in Lakhs	152

Case Study 2 - Closed Loop Cooling Towers For One IT Major

Problem Statement:
Leading IT premise facing issues of:

- Higher energy HVAC Cost
- Lower Process Efficiency

Solution

Solution is CLCT

Power Saving - 25%

Water Saving 10%

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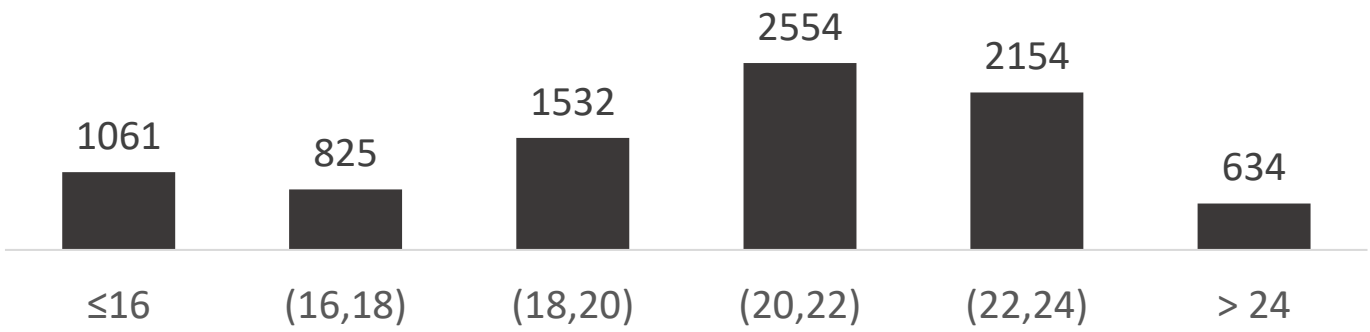
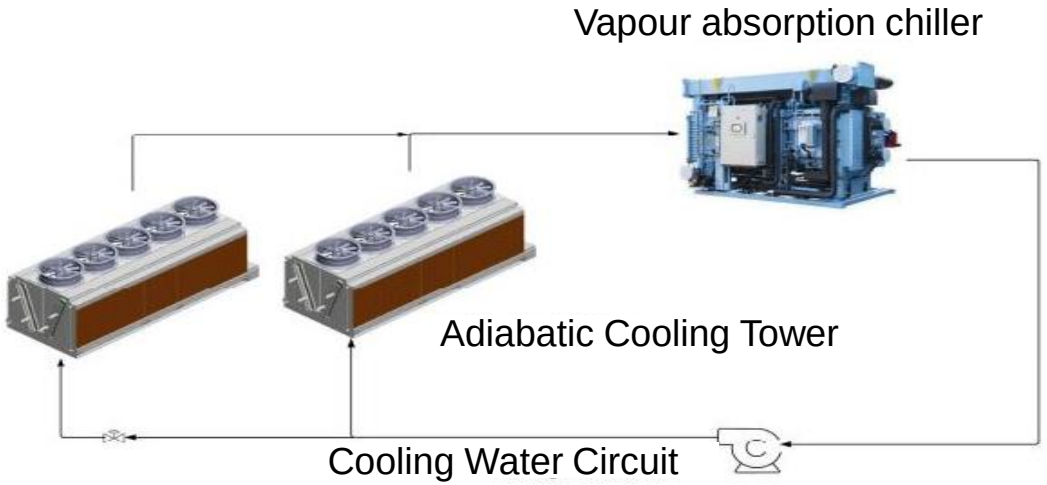
Annual Hours Occurrence of WBT



FREE CHILLING

Result:
Reduction in energy cost and improved overall cooling efficiency & reducing maintenance cost.

Case Study 3 - Adiabatic Cooling Towers For F&B Major



Capacity Range:

789Kw X 8 nos

Application:

Process Cooling by ADCT for leading beverage manufacturer

Adiabatic Cooling Towers are utilized for process cooling.

- require less water
- Low energy

During the night time, the Adiabatic Cooling Tower shifts to dry mode when ambient temperatures are lower, resulting in zero water consumption.

Highlights

Customer achieved effective cooling through the addition of spray water across cooling pads as it operates in wet mode during the daytime

The customer successfully achieved **water savings of up to 70%** with scale-free water along with efficient and sustainable cooling operations.

Biomass-Based Heating Technologies

- 55+ years of understanding heating needs of the process industries
- 30+ years of biomass-based solutions expertise
- Technologies to combust 100+ biomass fuels
- Persistent research and innovation to meet ever-changing market demands
- Thermax Biomass Centre of Excellence's commitment towards technology leadership


Rice Straw


Mustard Stalk


Coffee Husk


Bamboo


Empty Fruit Bunch


Briquettes


Pellets

100+ more

Challenges of Biomass Combustion

- Lower bulk density and lower calorific value
- Higher moisture level
- Fouling and slagging characteristics of biomass ash
- Seasonal variation in biomass fuel

Common biomasses and their classifications

Fibrous and low-density biomass


Rice Straw


Mustard Straw


Jaggary Bagasse

Shredded Biomass


Mustard Stalk


Cotton Stalk


Rice Husk

Nut Shell Biomass


Cashew Shell


Palm Kernel Shell


Groundnut Shell

Fine or Dust Biomass


Mustard Husk


Saw Dust


Coffee Husk

Woody Biomass


Wood Chips


Bamboo

Bunch Biomass


Empty Fruit Bunch


Corn Cobs

Processed Biomass


Briquettes


Pellets

DOC / Process by-product


Groundnut DOC


Spent Coffee

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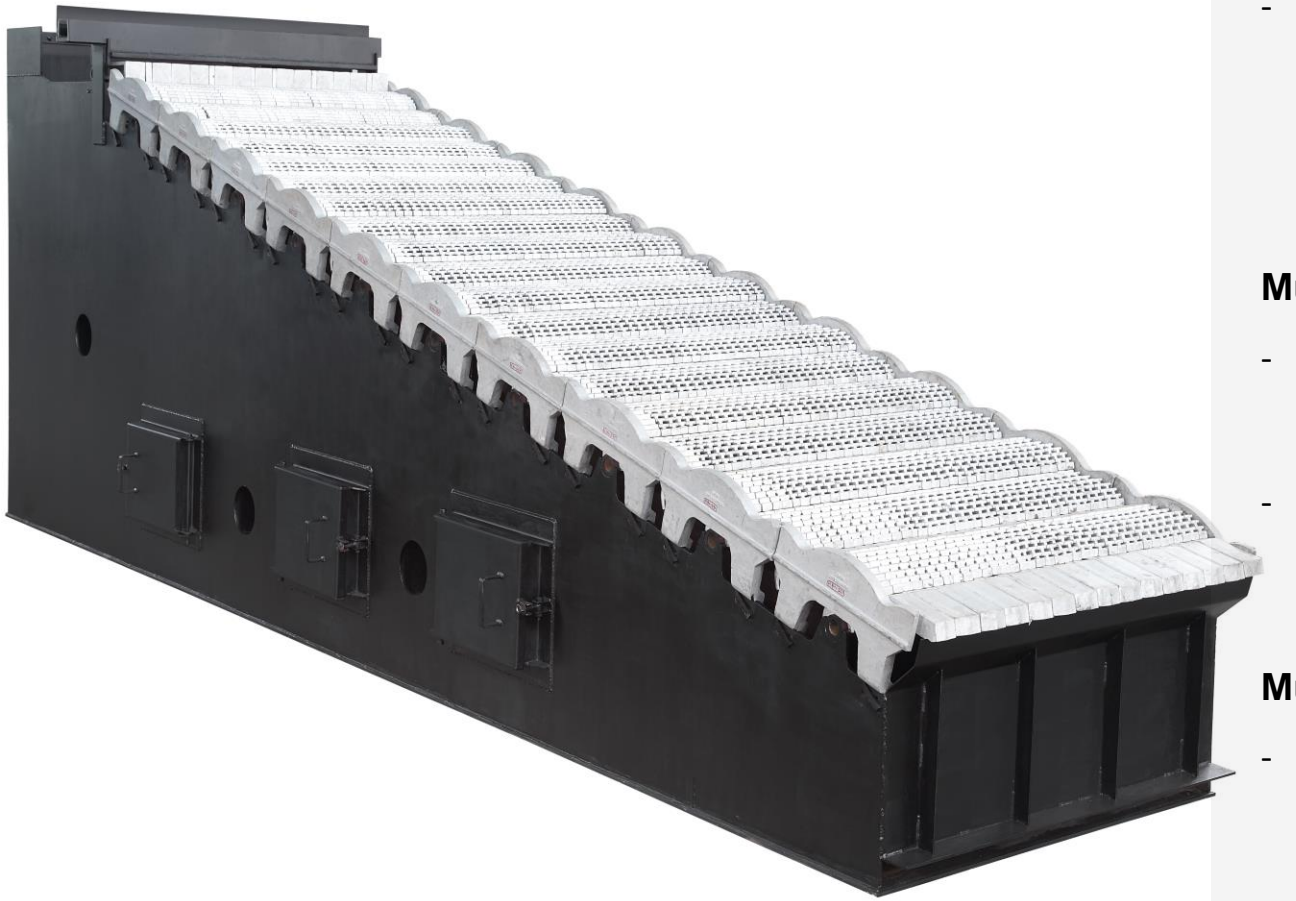
Reciprocating Grate Technology for Biomass Fuels



Features of Reciprocating Grate Technology

Reciprocating Motion

- Reciprocating action of the alternate grate pushes fuel into different combustion zones causing toppling and intermixing of the fuel to achieve effective combustion, even for bulky and high moisture fuels

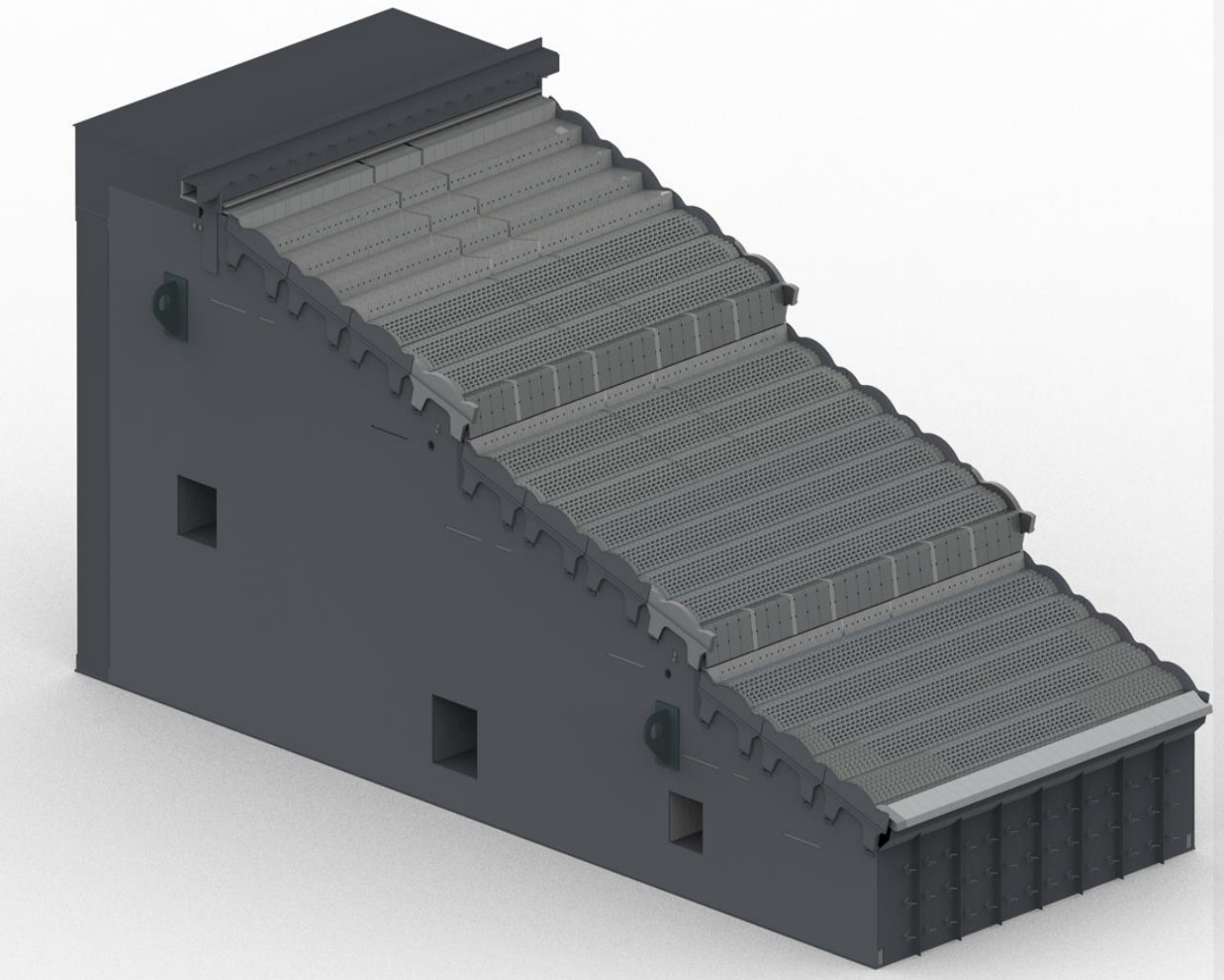
Multiple Trolley

- Multiple trolleys controlled by independent hydraulic cylinders operate at different speeds to meet the time requirement of different combustion stages
- Multiple trolleys provided with different air connections to ensure independent zone-wise air distribution

Multiple grate bar geometry

- Multiple grate bar geometries, namely block, full nozzle, half nozzle, and side plates for width and length-wise air control within the same trolley
- Avoids tongue effect

Introducing Universal Bio Grate



Universal Bio-Grate Technology

THERMAX

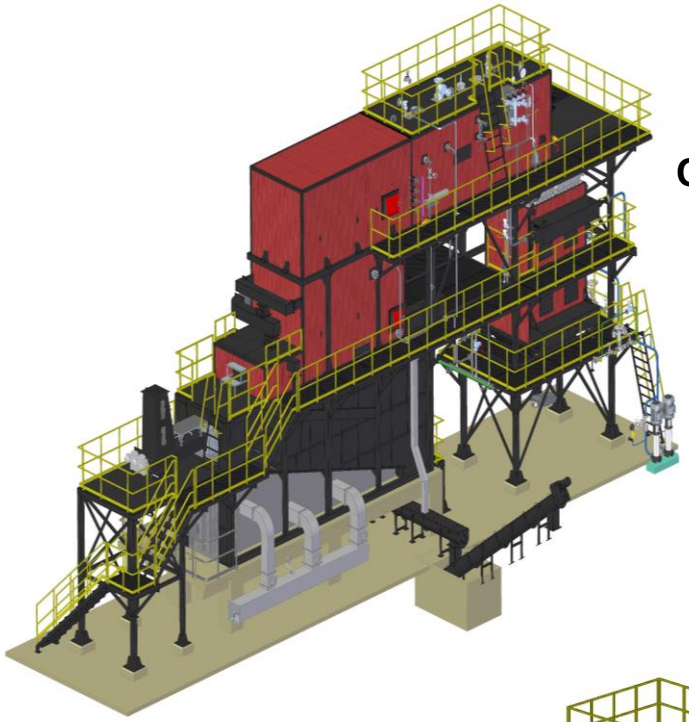
Enhancing 3Ts of Combustion

- Sharp step between trolley promotes intermixing of the fuel due to tumbling action
- Proper stage-wise residence time for complete combustion
- Tumbling of fuel for exposing unburnt portion to proper ignition temperature

Optimal Use of block grate bar

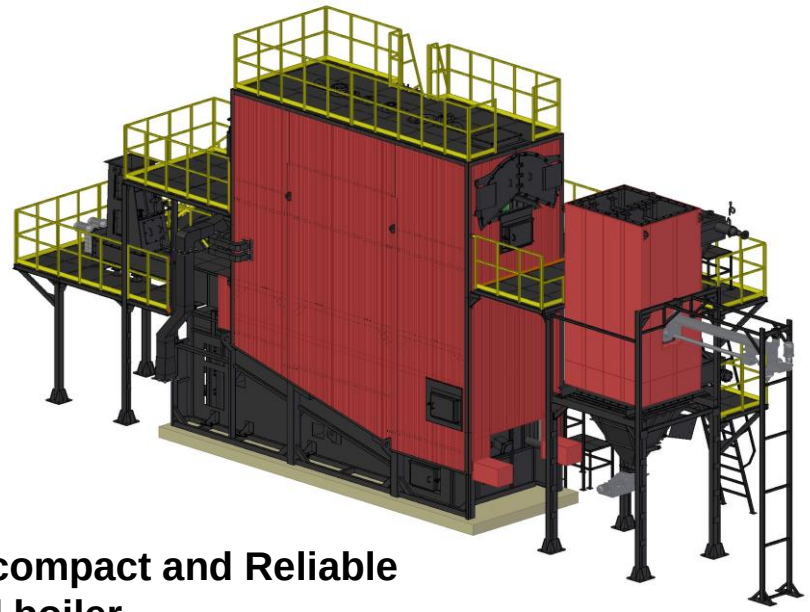
- Initial section that is made of a sharp block grate bar maximizes force for effective pushing of tall fuel layer to reduce accumulation. Other sections of the grate is made of full nozzle grate to accelerate combustion.

An advanced combustion technology suitable for all biomass fuels, even for the fibrous and low bulk density fuels like Rice straw



CPRG – Biomass-fired hybrid boiler

HTRG – Biomass-fired Thermal oil heater



UPRG – Ultracompact and Reliable Biomass-fired boiler

Case Study 1 – Bamboo Chips Fired boiler for Cogen

Bamboo – A sustainable energy source

Customer had a option of firing coal as Fuel for this boiler, but wants to reduce Carbon emissions. Thermax experts team suggested to go with Bamboo fired boiler based on the availability.

Challenges of Bamboo chips combustion

- Seasonal moisture content variation affecting calorific values
- Uneven chips size issues resulting in the possibility of incomplete combustion

Introduction to the case

Thermax partnered with a bio-ethanol major for carbon footprint reduction

Location: Assam

Thermax's Solution

Boiler Model: BDRG 260/45 bar/450°C

Solution: 26 TPH, 45 bar, Bi-Drum Boiler based on Thermax's Reciprocating Grate Technology handled the challenges of bamboo chips combustion effectively.

Benefits: 2.9 Lakh Tonnes of CO_2e

Representative image of BDRG solution

Sustainable Solutions by Thermax

Clean Air

Air pollution control

Gas Purification and Clean Air Solutions

Renewable Energy

Biogas Purification and Upgradation

- Pressure Swing Adsorption (PSA)
- Vacuum Pressure Swing Adsorption (VPSA)
- Water Scrubbing System
- Amine Scrubbing

Solar Energy

Process Exhaust System for Solar Cell and Module Manufacturing

Waste to Energy

Flue Gas Cleaning System (FGCS)

- Non-Recyclable Solid Waste (NRSW) based Power Plant in Paper & Pulp Industry
- Bio Medical Waste Incinerators in Hospitals
- Municipal Solid Waste Fired Power Plants
- Hazardous Waste Incinerators

Case Study - Flue Gas Cleaning System (FGCS) for Waste to Energy Plant

THERMAX

- **System Supplied :** FGCS for 2 X 600 TPD Municipal Solid Waste (MSW) Fire Boiler off gases
- **Flue gas at the inlet of FGCS :** 1,50,000 Nm3/hr
- **Temperature :** 210 Deg.C

Performance Report

Parameters	Inlet Parameters	Outlet Emissions
HCl	1000	20
So_x	800	50
HF	10	4
Total dioxins & furans	10 ngTEQ/Nm^3	0.1 ngTEQ/Nm^3
Hg and its compounds	0.07	0.02

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Green Utility Solutions under Build-Own-Operate

From investment to lifecycle responsibility

Green Hydrogen

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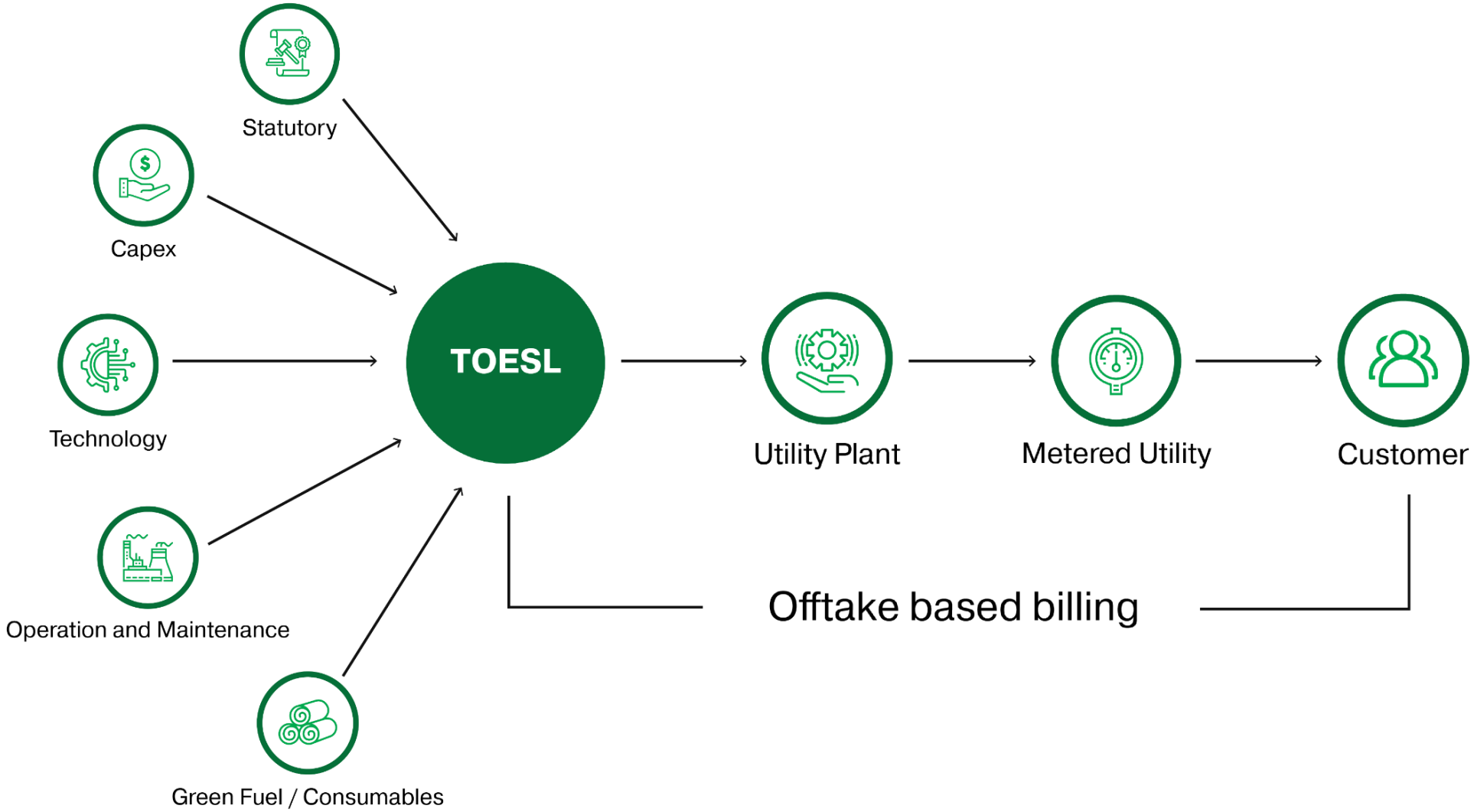
Thermax Onsite Energy Solutions Limited (TOESL) – championing sustainable solutions in industries



Utility Delivery Solutions

- **Steam & Heat** (Boiler & Heater)
- **Chilled Water** (Cooling & Heating)
- **Treated Water** (Water & Wastewater Treatment)
- **Co-generation** (Power)
- **Multi utility** (Above + Comp. Air, CT, Elec Chiller, DG, etc.)
- **BioCNG, Gasification**

From investment to lifecycle responsibility

10+ Years	**25+ Accounts**	**45+ Installations**
Of experience in utility solutions	Partnered globally	In India, Sri Lanka and Indonesia
2500+ Tons/Day	**> 1.3 M Tons**	**> 140 M Litres**
Biomass supply chain in India	Reduction in CO_2e for clients	Of water treated till date
100+ Utility Assets	**Global Presence**	**Diverse Workforce**
Owned & managed across sites	South Asia, South-East Asia	> 650* employees

Multiple Sectors Addressed

Pharma | Food | Chemicals | Tyre | Paint | Textile | Packaging | Confectionery | Tobacco | Metal…….

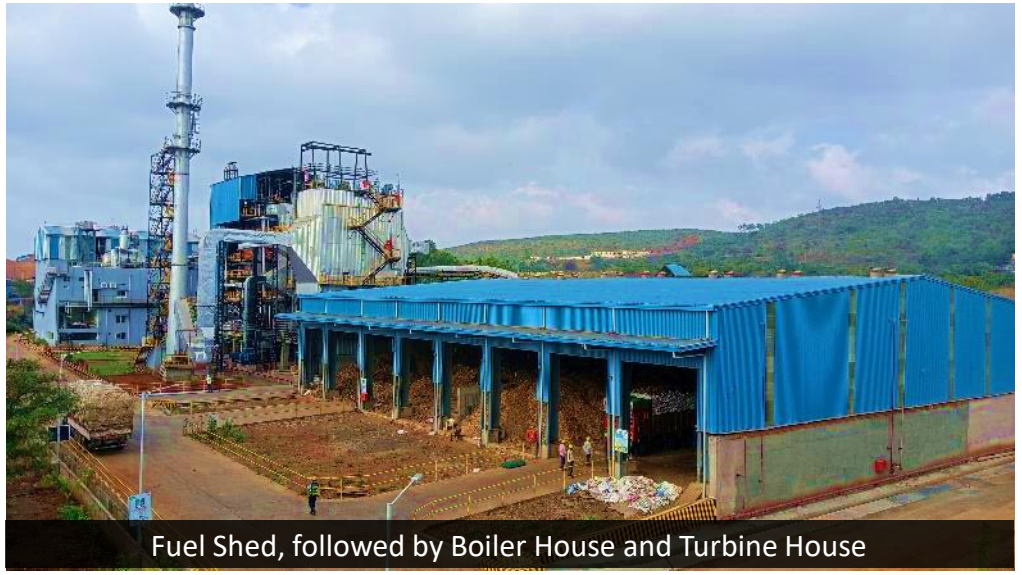
* Includes employees with third party contracts

Values Delivered

- 100% Green Solutions
- Asset Light
- Cost Effective
- Guaranteed Performance & Uptime

TOESL relieves its clients from the responsibility of utility management, enabling them **to focus more on their core manufacturing processes and partner with them to achieve ESG targets.**

Biomass based Cogen under Build-Own-Operate



Fuel Shed, followed by Boiler House and Turbine House

Condensate Polishing Unit

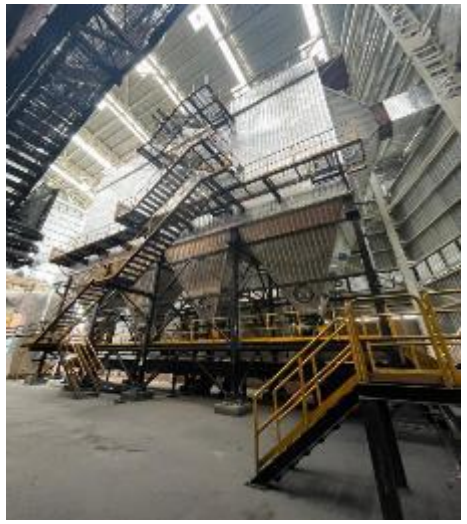
PROJECT:

- **Industry:** Aluminium
- **Location:** Belagavi, Karnataka.
- **Solution: Water tube design Bi-drum Boiler** with Thermax reciprocating grate
- **Project Capacity:** 33 TPH MCR / 67 kg/cm^2(g) / 450 ± 5 °C | 4 MW Power
- **Fuel:** Agro-waste Biomass Briquettes + Loose Biomass

BENEFITS:

- Reliable steam & power supply from 100% agro-waste biomass based cogen plant for producing **green alumina**.
- Guaranteed supply of 200 TPD quality biomass for round the year operation.
- Annual cost savings: **~INR 40 Crores** (against FO).
- Est. **CO2e reduction: ~48,000 tons/year** against FO.
  (Equivalent to 1 lakh barrels of oil consumed)
- 100% safety and uptime delivered as per commitments.
- Capital investment for the utility plant by TOESL

Green Steam Supply to Vaccine Mfr, Bengaluru



PROJECT:

- **Location:** Bengaluru, Karnataka.
- **Solution: Hybrid boiler with reciprocating grate** installed by TOESL in a limited space of 966 m^2 with a **'G+1' layout** (ground floor fuel storage, first floor boiler plant)
- **Boiler Capacity (F&A 100°C):** 30 TPH MCR / 17.5 kg/cm^2 (g)

BENEFITS:

- Reliable steam supply from 100% agro-waste biomass fired boiler in compromised space.
- Guaranteed supply of quality biomass for round the year operation.
- Est. **CO2e reduction**: **~30,000 tons/year** against gas.
  (Equivalent to ~72,000 barrels of oil consumed)
- 100% HSE compliance and uptime delivered as per commitments.

PARTNERSHIP WITH LEADING VACCINE MANUFACTURER

- Received constant customer **appreciation for execution** of large capacity biomass fired boiler plant on 'G+1' layout, enabling Biocon towards **energy transition and cost savings.**

“Profit is not only a set of figures, but of values.”

Rohinton D. Aga
Chairman, Thermax
(1935 - 1996)

Boundlessly bridging the gap between energy availability and sustainability

Thank You

Conserving Resources, Preserving the Future.

For more information about Thermax:

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