Revised Emission Norms and their Impact on Power Plant
&
Possible Mitigation options

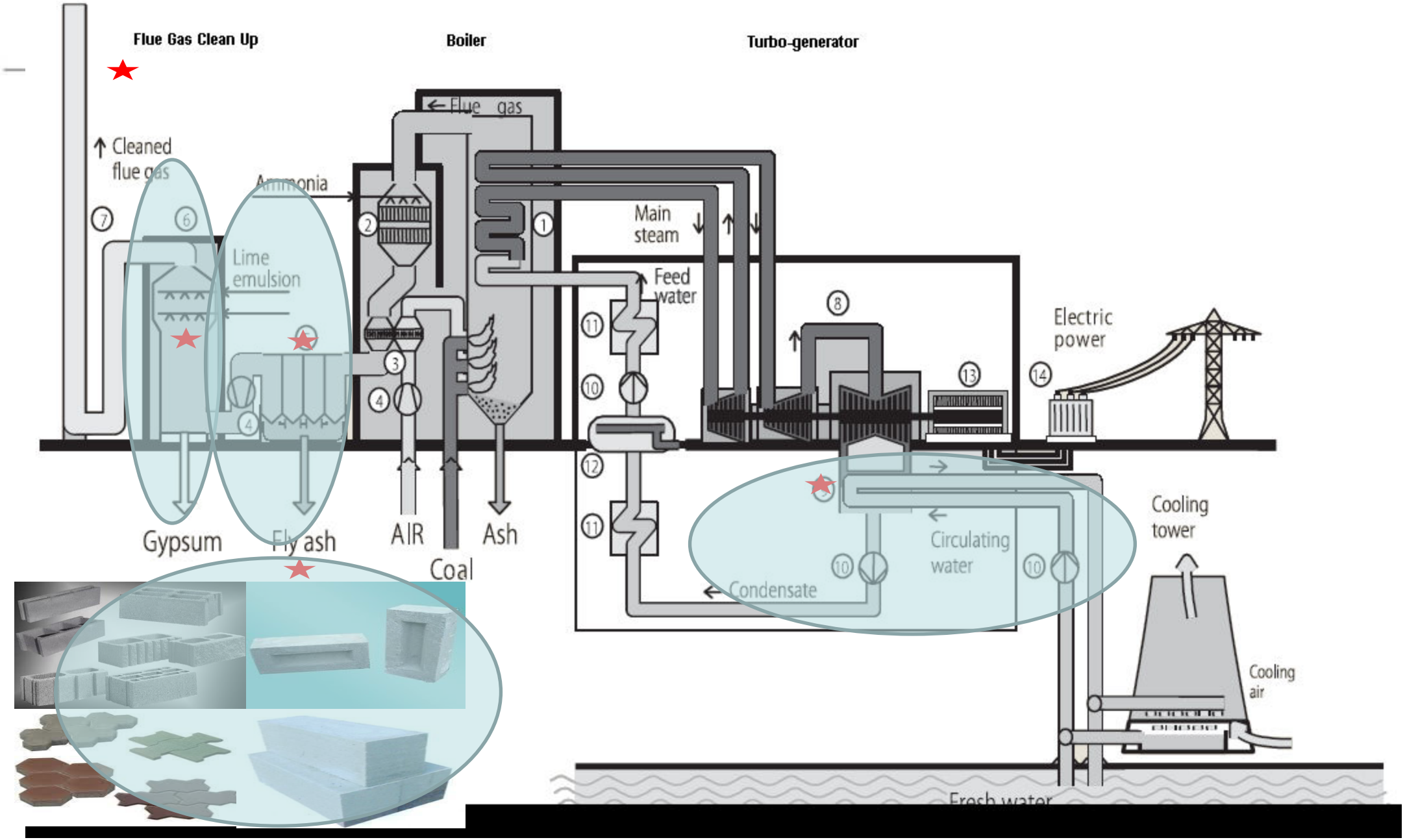
- Vivek Taneja

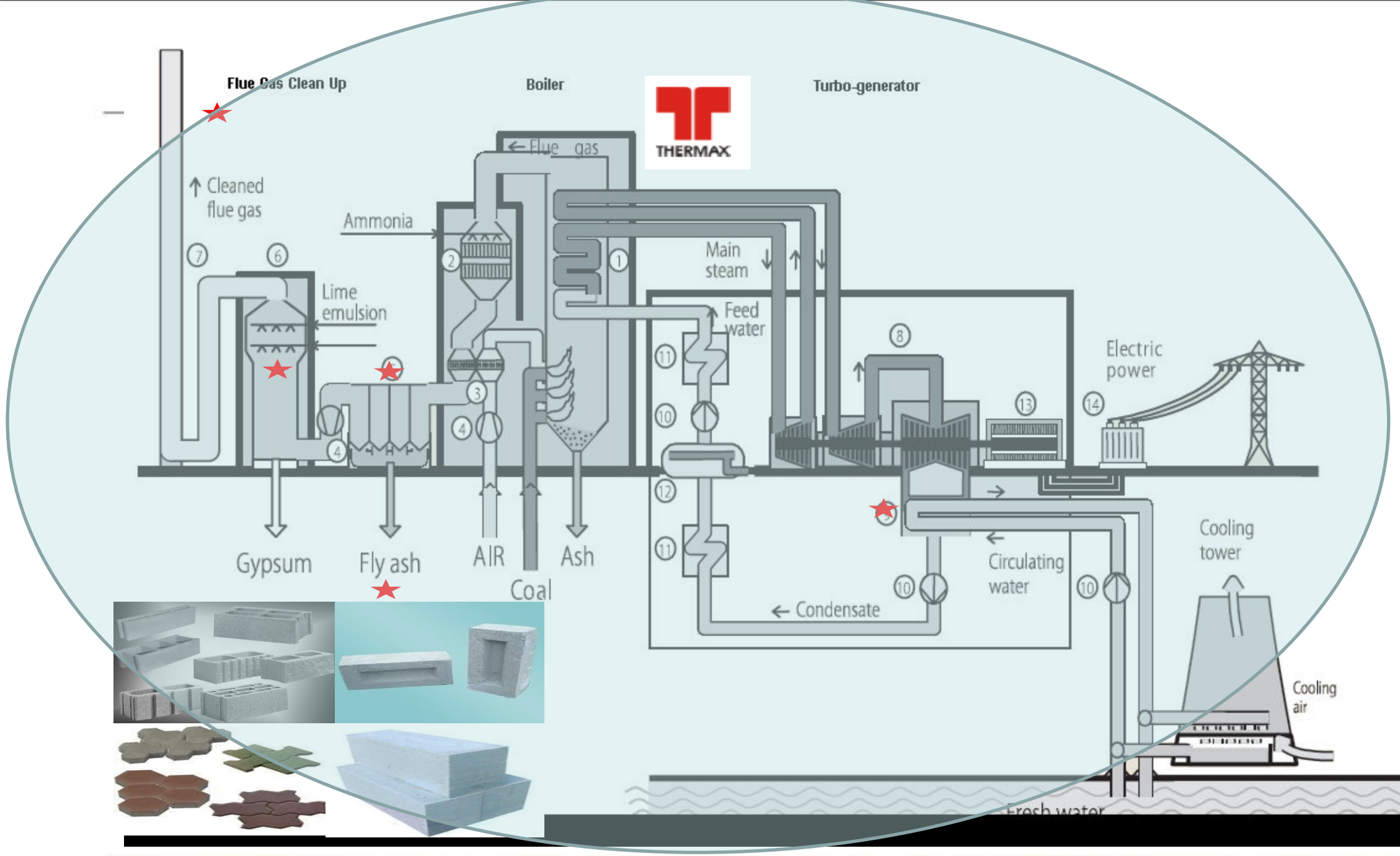
Revised Emission Norms

- The Ministry of Environment, Forest & Climate Change has notified the revised standards for coal-based Thermal Power Plants in the country, with the primary aim of minimizing pollution.
- Thermal power plants are categorized into 3 categories, namely those:-
  - (i) Installed before 31st December, 2003
  - (ii) Installed after 2003 up to 31st December, 2016 and
  - (iii) Installed after 31st December, 2016.

These new standards aimed at reducing the emission of/by :

- Particulate Matter : 30 mg/Nm3
- SOx Emission : 100 mg/Nm3
- NOx Emission : 100 mg/Nm3
- Water Consumption : 3.5 mg/Nm3


Flue Gas Clean Up
Boiler
Turbo-generator
Cleaned flue gas
Ammonia
Flue gas
Lime emulsion
Main steam
Feed water
Electric power
Gypsum
Fly ash
AIR
Coal
Ash
Condensate
Circulating water
Cooling tower
Cooling air
Fresh water


Flue Gas Clean Up
Boiler
Turbo-generator
THERMAX
Flue gas
Cleaned flue gas
Ammonia
Lime emulsion
Main steam
Feed water
Electric power
Gypsum
Fly ash
AIR
Coal
Ash
Condensate
Circulating water
Cooling tower
Cooling air
Fresh water

Offerings – To look for

	Thermax
Design	
Detailed Engineering	
Supply	
Project Management	
Supervisioning Of E&C	
O&M Management	
Performance Guarantee	
On Site Training	

- RISK MITIGATION
- SINGLE POINT CONTACT
- WORLD CLASS EQUIPMENTS & SERVICES

Thermax has consistently demonstrated its capability to deliver results over the entire value chain.

Who are we?

- 1.2 Billion USD Company.
  Zero Debt with high cash reserves
- Indian Multinational
- Business Tempered by Social Responsibility
- Technology intensive
- Delivers Shareholder Value (23% CAGR)
- Long term outlook “Stable” with
  AA+rating by ICRA
- Featured in Forbes Asia List consistently

What we offer?

Boiler & Heater

Boiler & Heater

- Packaged boilers
- Large capacity power boilers
- Thermal oil / water heaters
- Energy recovery systems

Cooling & Heating

Cooling

- Exhaust & mulri-energy fired chillers
- Steam fired chillers
- Hot water fired chillers
- Direct fired chillers

Heating

- Steam boilers for power generation (upto 30 TPH)
- Packaged boilers, thermal oil heaters & hot water generators suitable for solid/ oil/ gaseous fuel
- Engine exhaust waste heat recovery boilers

Power Generation

Turnkey power plants

- Solid fuel based
- Gas based combined cycle
- Waste heat recovery based
- Renewable energy based (biomass, waste heat, solar)
- Power plant management services

Chemicals & Water

Chemicals

- Ion exchange resins
- Cooling water chemicals
- Fireside chemicals
- Polyelectrolyte

Water and wastewater

- Wastewater & effluent water treatment systems
- Water recycling
- Waste management

Air Pollution Control

Enviro

- ESP & bag filters
- Scrubbers
- Air purification
- Retrofit & revamp

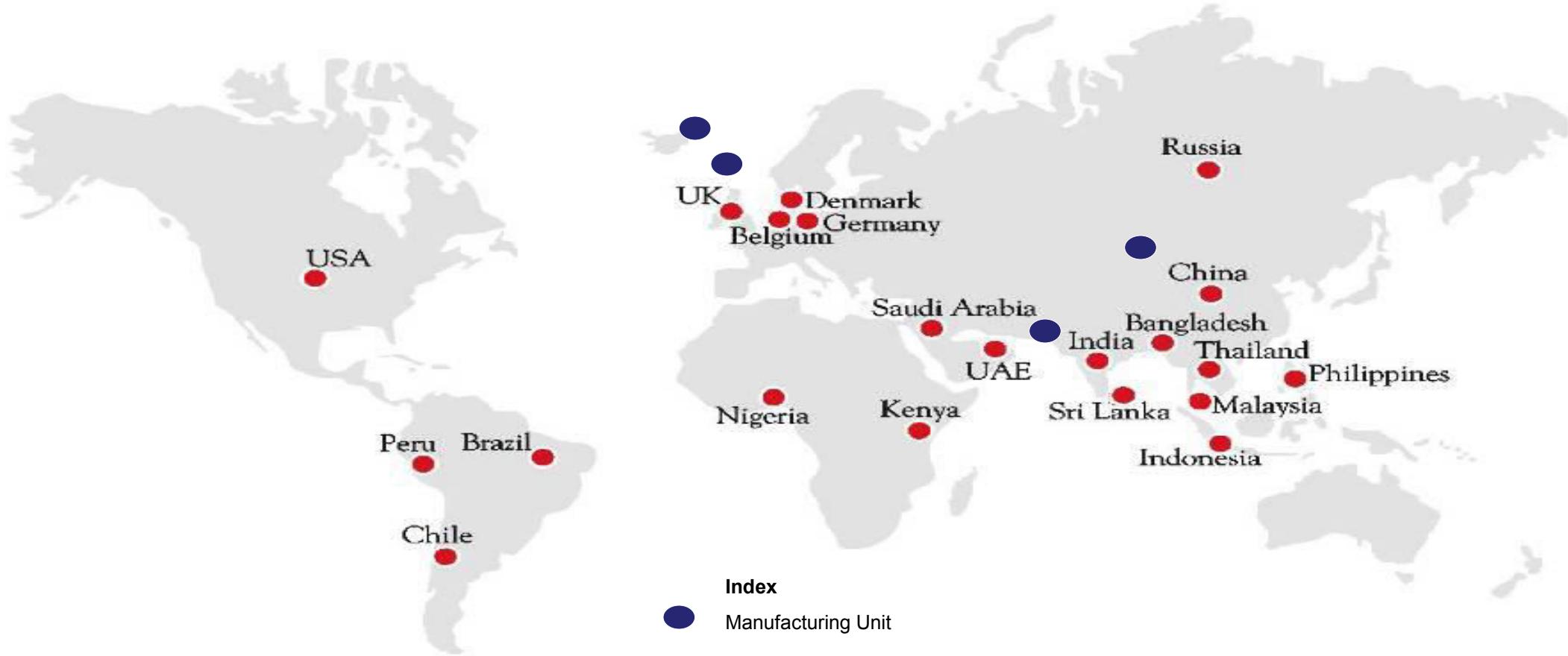
Renewable Energy

Solar

- Heating
- Cooling (Combining solar and thermal energy for client applications)

Services Group - Operations and Maintenance, Steam on Hire, Renovation & Modernization,…

Our Global Presence



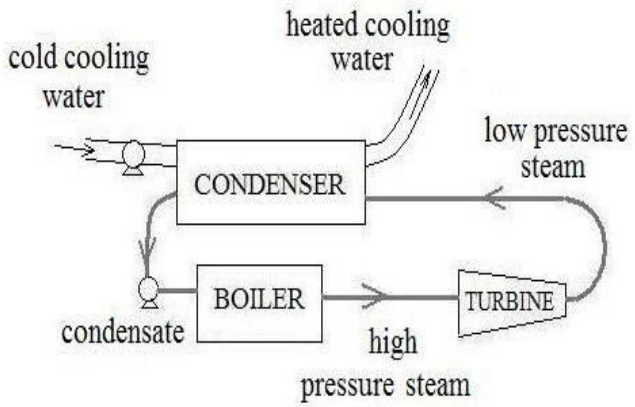
For More Details:

www.thermaxindia.com

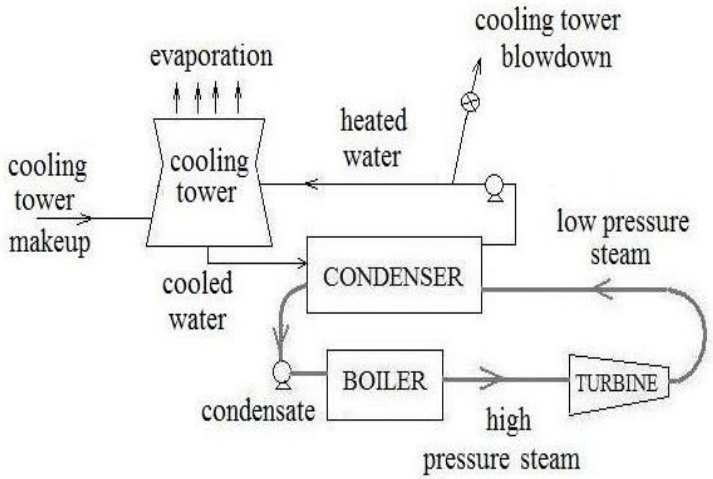
Vivek Taneja
Head of Business Development
Power Division
+91 20 25541010 / 9823099955
Vivek.taneja@thermaxglobal.com

Condenser Cooling Alternatives

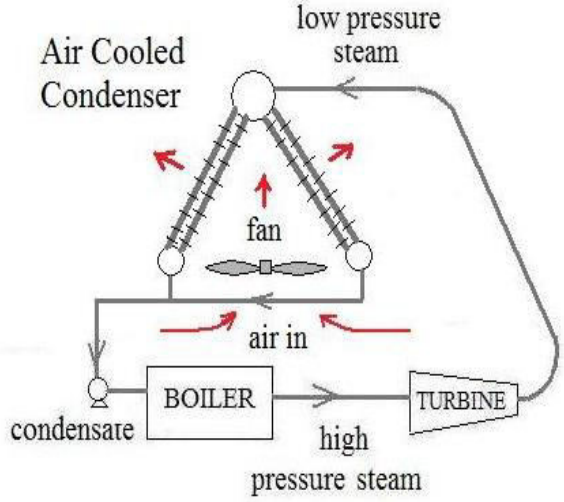
Once Through



Wet Cooling Tower (WCC)



Dry Cooling Tower (ACC)



The below mentioned comparison is based on 500 MW gas-fired, combined-cycle plants and for 350 MW steam plants

Comparison Parameter	Once Through	Wet Tower	Dry Cooling
Capital Cost	Base	Base + 0.4%	Base + 12.5%
Cooling System Power	Base	Base + 2.5 MW	Base + 3.0 MW
Plant Heat Rate	Base	Base + 0.4%	Base + 4.0 %
Power Production Cost	Base	Base + 1.9%	Base + 4.9 %

Reference : Comparison of Alternate Cooling Technologies for U.S. Power Plants by EPRI , 2012

- Once through cooling had least initial and least operating cost.

- Both the wet cooling tower system and the air cooled condenser (dry cooling) system have:
    1. higher capital cost,
    2. higher power requirement (and thus higher operating cost),leading to approximately 1.9 % higher cost of electricity due to use of a wet cooling tower,
    3. approximately 4.9 % higher cost of electricity for air cooled condenser

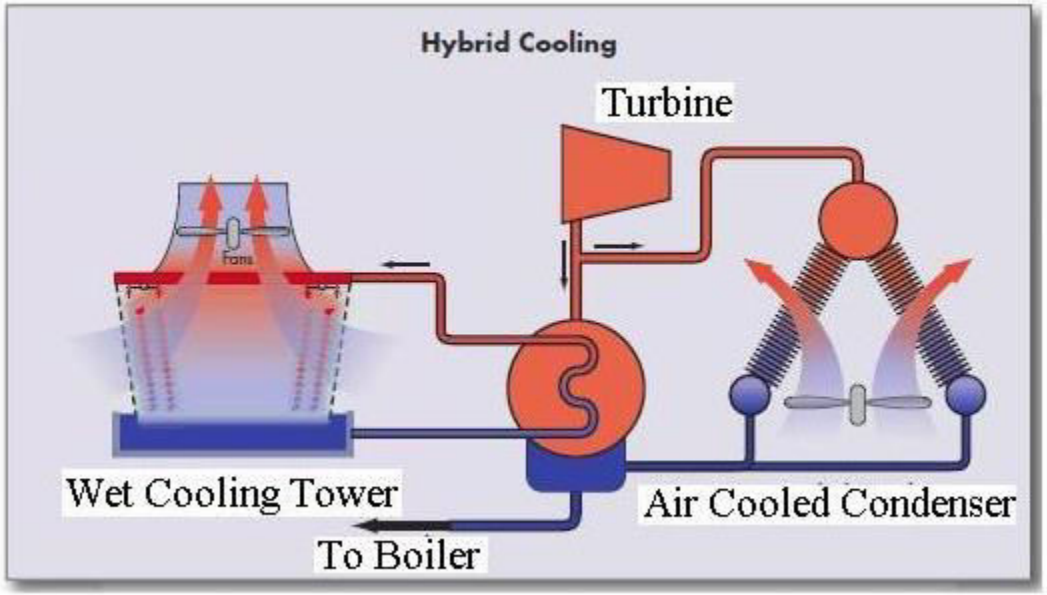
Hybrid Wet and Dry Cooling for Water Conservation

Hybrid Wet and Dry Cooling

Single Tower Hybrid Cooling

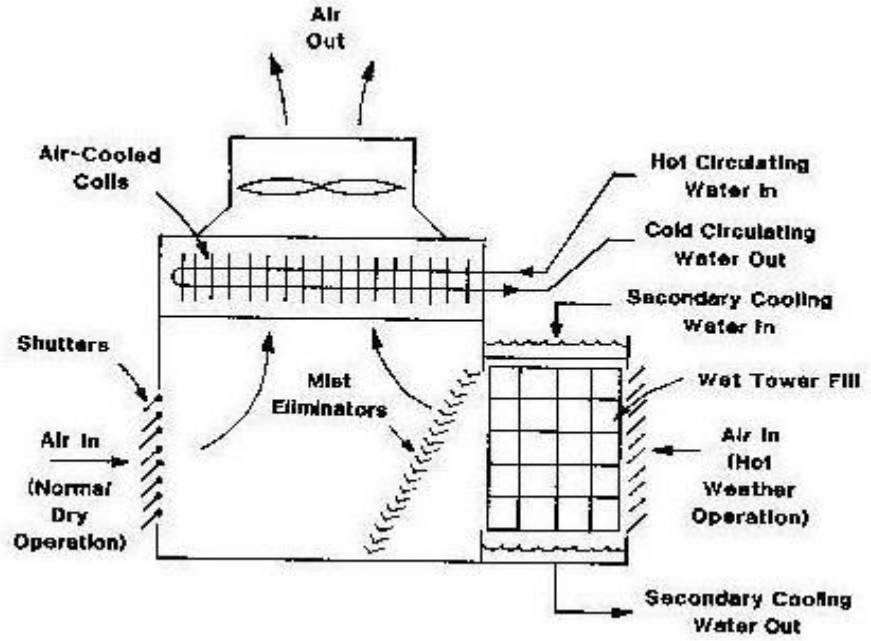
Hybrid Wet and Dry Cooling

- Hybrid cooling system tower and air cooled condenser as separate structures.
- The air cooled condenser handle all of the cooling load except for the hottest periods, when part of the cooling load would be handled by the wet cooling tower.



Single Tower Hybrid Cooling

- Low capital cost alternative
- Spraying water in ACC / deluging air cooled surface with water for short periods.



Hybrid wet and dry cooling systems can reduce water usage from 5% to 80%

References

Project Name	Client Name	Type of Plant	Location	Plant MW	No. of Installs	Year of Install	Type	Make of Turbine
India Cements Ltd	Thermax Ltd - Power Division	Captive Power Plant	Vishnupuram Andhra Pradesh	50	1	2013	Multi Row - Extruded	BHEL
J K Cements Ltd	Thermax Ltd - Power Division	Captive Power Plant	Mangrol Rajasthan	25	1	2014	Multi Row - Extruded	HTC
J K Cements Ltd	Thermax Ltd - Power Division	WHR	Mangrol Rajasthan	10	1	2014	Multi Row - Extruded	HTC
Sanvira Inds Ltd	Sanvira Inds Ltd	Captive Power Plant	Vizag, Andhra Pradesh	8	2	2015	Multi Row - Extruded	Triveni
Benue Cement Co	Thermax Ltd - Power Division	Captive Power Plant	Nigeria	30	3	2016	Multi Row - Extruded	Siemens
Udaipur Cement	LNV Technology- Chennai	WHR	Rajasthan	5.5	1	2016	Multi Row - Extruded	Sinoma
Dr. Reddy Labs	Thermax Ltd – Power Division	Captive Power Plant	Andhra Pradesh	7.7	1	2016	Multi Row Knurled	Triveni
Noble Tech Steel Ltd	Noble Tech Steel Ltd	Captive Power Plant	Chennai	4	1	2016	Multi Row Knurled	Max Watt

ZLD - Benefits

Meets permissible environmental conditions	Improved water recycling efficiency
Beneficial in lack of water availability conditions	No water to discharge
maximizing wastewater reuse.	Purified water from wastewater for reuse

- Zero Liquid Discharge facility is surely a good option of wastewater recycle.
- Meeting different regulatory guidelines, these ZLD Systems are extensively employed in various industries such as :

1. Power production
2. Semiconductor manufacturing,
3. Textile
4. Steel
5. Food and beverage industries etc.

Flue-gas desulfurization (**FGD**)

Set of technologies to remove sulphur dioxide (SO2)

WET Scrubbing

- Passes the flue gas through a spray-dryer type of absorber
- Finely atomized slurry /solution of reagent feed contact.
- SO2 absorbed into the alkaline droplets of water, which is simultaneously evaporated.

Lime Spray Dryer/Absorber

- Uses lime slurry for scrubbing SO2
- Produces a dry by- product
- Current generation systems are capable of removing as much as 95 percent SO2.