



Energy Solutions

REACHING CUSTOMER'S HEART

THROUGH

LIFETIME RELATIONSHIP

CUSTOMISED SERVICE

• &

QUALITY

Empowering Industry with Green Power

- More than 200 Installation across the 13 countries generating more than 500000 MW/Hr.
- Captive Power and Energy Conservation in Process industries, CHP, Concentrated Solar Power (CSP), Waste Incineration, Waste heat recovery, Renewable energy
- **Units Generated - 2744893 MW-Hr**
- **CO2 Prevented - 3348782032 Kgs**



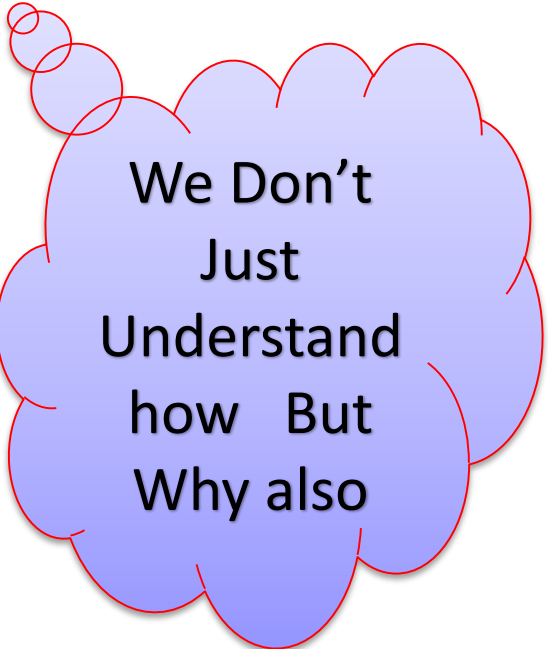
Users Industries- Textile, Paper, Distillery, Rice
Sugar, Chemical, food processing, Power Plant

- Incorporated in 1989 at Bangalore by a technocrat from USA
- First in India for Indigenously designed Overhung Steam Turbines of up to 5MW Power and having USA patent for saturated steam scheme
- First in India for developing 500 kWe Multi fuel gas turbine
- First for establishing Induction Generator based Power generation in India
- First to Have indigenously developed Turbochargers, Helicopter Oil cooling system Helicopter, UP-Lock system and other items for Organisations like ADA, NAL, HAL, GTRE , NSTL etc.



- ECT Steam Turbine 15000 / 1500 RPM; Back Pressure up-to 25 Kg/cm²
- Air Expander - Air Expander up to 5000 KW
- Gas Turbine- 30000 RPM, 500Kwe Capacity
- Oil Cooling system for helicopter Engines
- Turbocharger for tanks
- Wave Turbine
- Ammonia Turbine
- 50 KW micro gas turbine, 60000RPM
- Air Starter for Jet Engines
- 2 stage Turbo compressor
- Solar Trough for steam generation





We Don't
Just
Understand
how But
Why also

- Engineered solution for specific steam load conditions
- Customised made to specific industry requirement.
- Designed to user's friendly operation not needing high skilled worker
- Complete solution for
 - Saturated and Super Heated Steam
 - BP and Condensing turbine power starting from 30 KW - 6000 KW
 - combined Cycle Plant with Gas turbine , HRSG and steam turbine
 - Engineering, procurement and construction.

Auto opening of steam Valve for steam flow

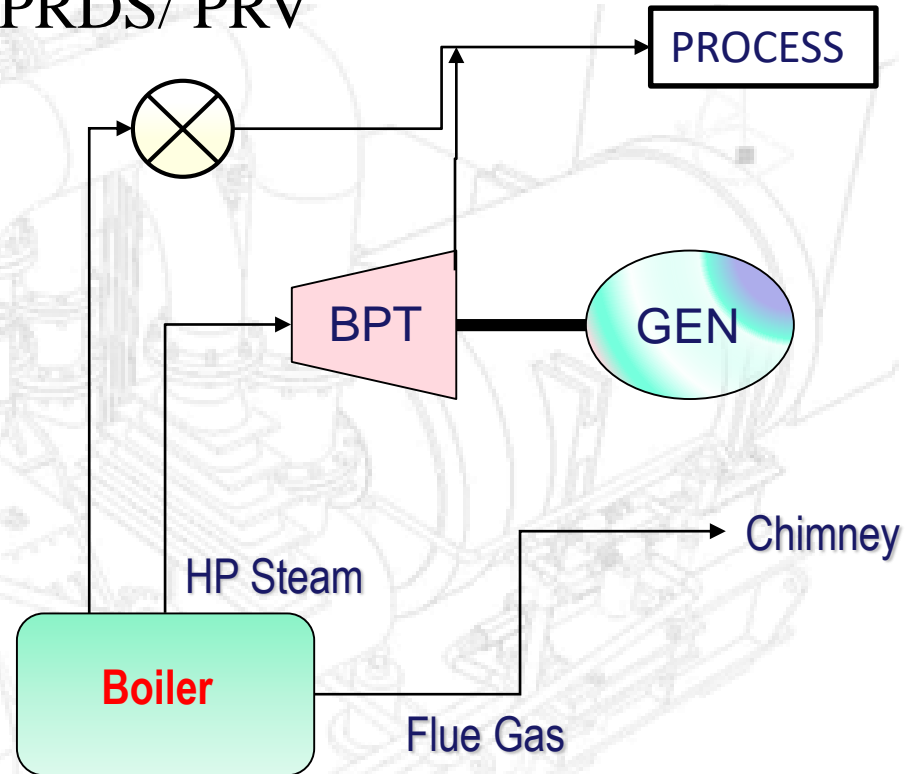
IG attaining the motoring speed

Energizing of the contactor to soft start taking machine to generating speed

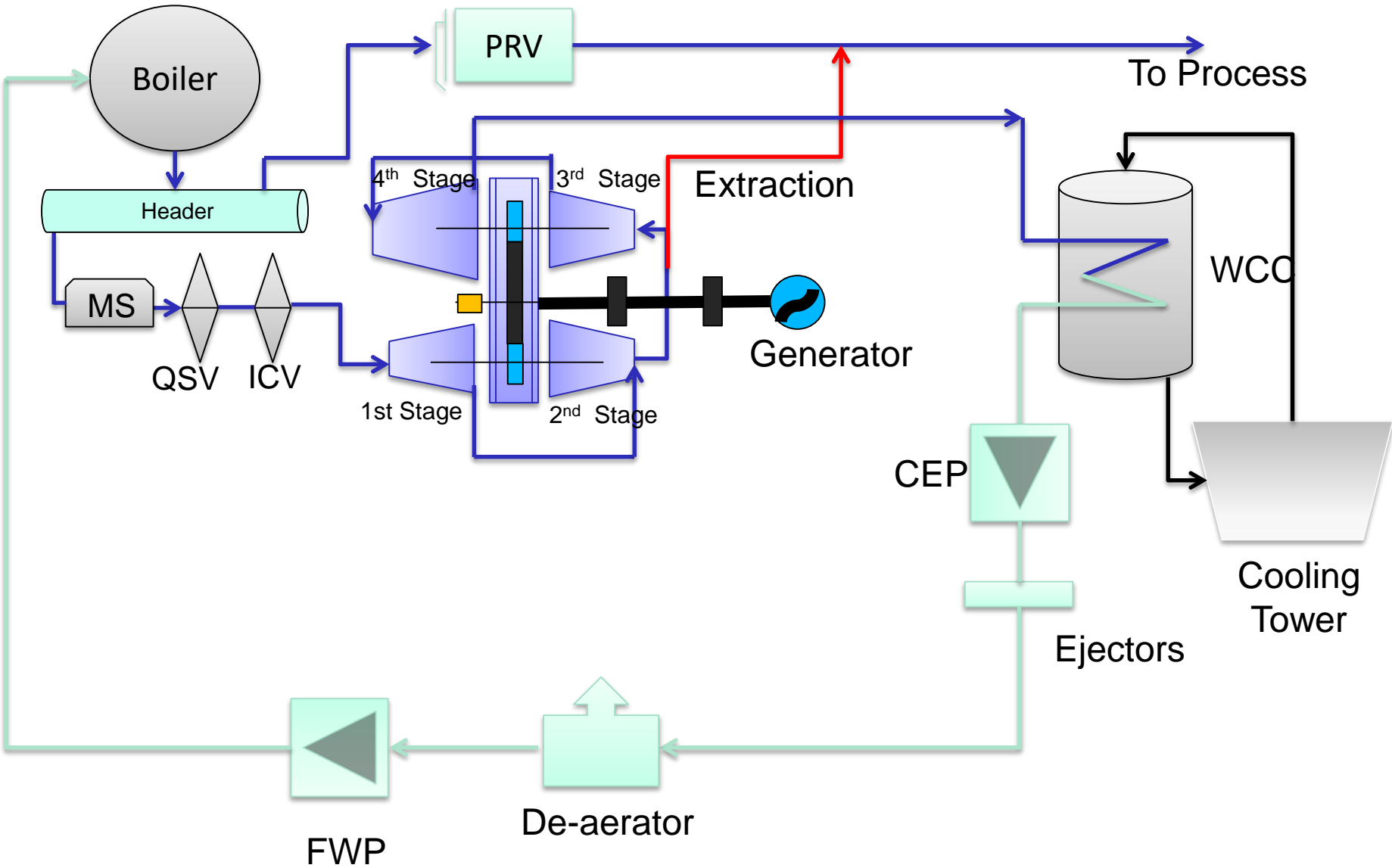
Grid Excitation to control the speed

IG is connected to LT distribution system automatically shares the grid

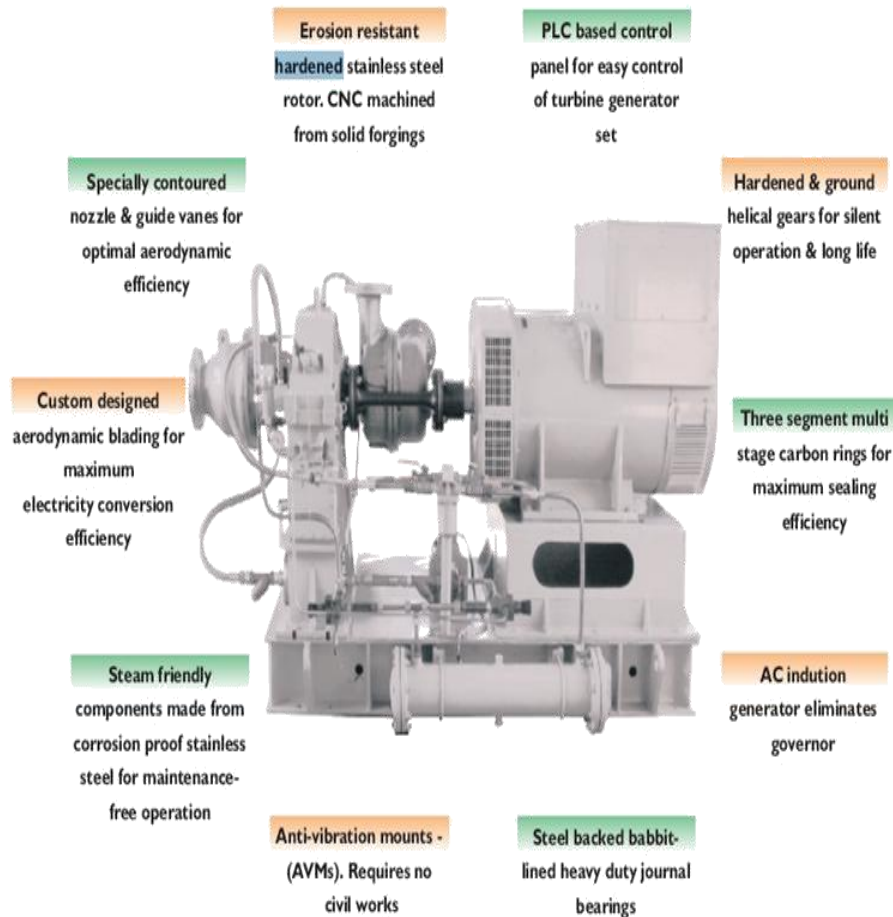
PRDS/ PRV



Suitable also for small co generation plant < 1 MW



ECT™ Unique Features



- **Customised Design** : Steam flow path for specific Steam parameters.
- **Fits into existing scheme of steam lines** : No need of change in existing process Boiler
- **Flexibility in operation** : Frequent and Quick starts – stops
- **Minimum Civil works** - Skid mounted with AVM, Axial Exhaust for condensing machines.
- **Fully Automated** : PLC programmed, Simple- Robust design
- **Extended life** : even for saturated steam operations.
- **Marginal Auxiliary Power** : > kW - panels & display.
- **On-site Easier Maintenance** : Modular Design, minimum parts, standard tools, supports in minimum time.
- **Fits well into scheduled plant shut downs** : Complete overhaul of turbine possible in 1-2 days.

ECT™	Conventional foot mounted HSC
Integral designed Blisk made from Stainless Steel : Higher strength and better resistance to corrosion - Better life	Built up multi stage rotor manufactured from Alloy Steel
Suitable for Saturated as well as Superheated Steam	Suitable for Superheated Steam
High Speed enables higher stage loading and better efficiency and compact machines	Lower speed characterize with lower stage loading leads to higher number of stages
PLC programmed operation ease to operate	Requires skilled operators for O&M
Integral to Reduction Gear Box eliminates HS coupling	Discrete to Reduction Gear Box coupled through HS coupling
Available with Alternator and also with Induction Generator	Supplied only with Alternator un-suitable for large flow variation
In site maintenance is easier	Rotor has to be brought back to factory for repairs
No barring required enables quick start stops	Barring required for almost 30-45 minutes
Pneumatic Controls	Hydraulic Controls

LCGT – 500 kWe - Low Cost Gas Turbine



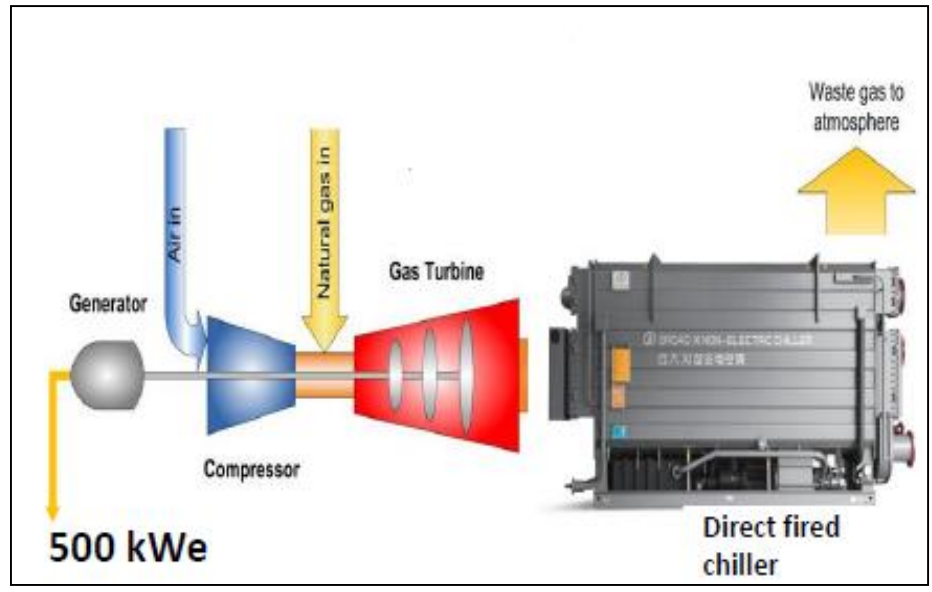
Any Gaseous and liquid fuel with low Sulphur

LCGT designed and developed for multi-gas & liquid fuel input and high efficiencies through cogeneration and trigeneration.

Salient Features of TurboTech LCGT

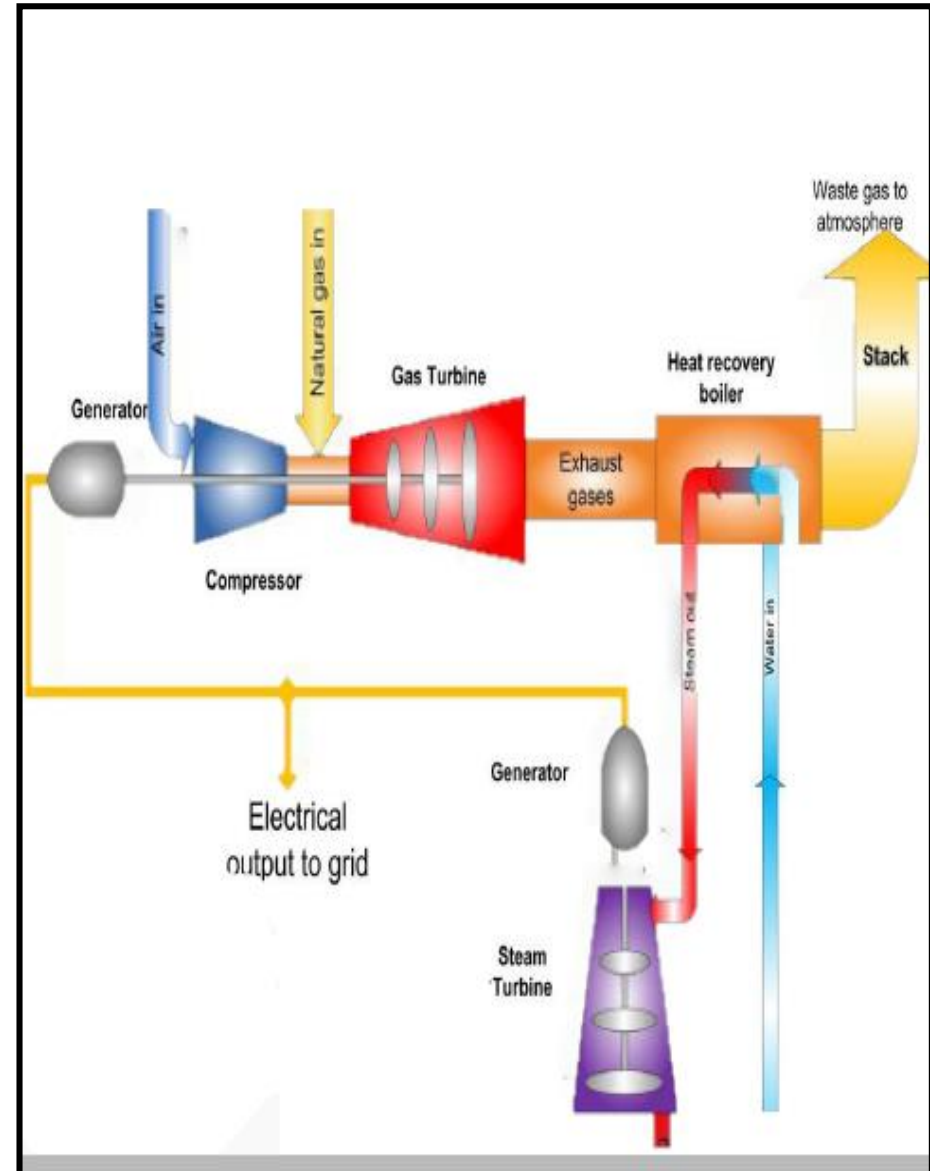
- Combined Heat, Power and Cooling with 75+% efficiency
- Simple, rugged and reliable design with multi fuel capability (Gaseous and Liquid)
- Aerospace grade material and technology, No costly imported spares or long waiting period
- Value engineered parts consisting of single stage compressor, single can silo combustor and single stage turbine wheel, coupled through an integral step-down gearbox to a 4-pole generator
- Compact and Packaged in Container
- Trouble free maintenance and repair

- **Combined Cooling, Heating and Power (CCHP 5)** - combined power and air conditioning.
- Ideal for IT parks and Hotels, that required Power and Air conditioning with Hot water.
- 500 Kwe from LCGT and 900 TR of cooling capacity from direct fired absorption chiller.
- CCHP 5 system includes a Gas compressor to increase pressure of gas before entering the LCGT.
- Hot water can also be provided.

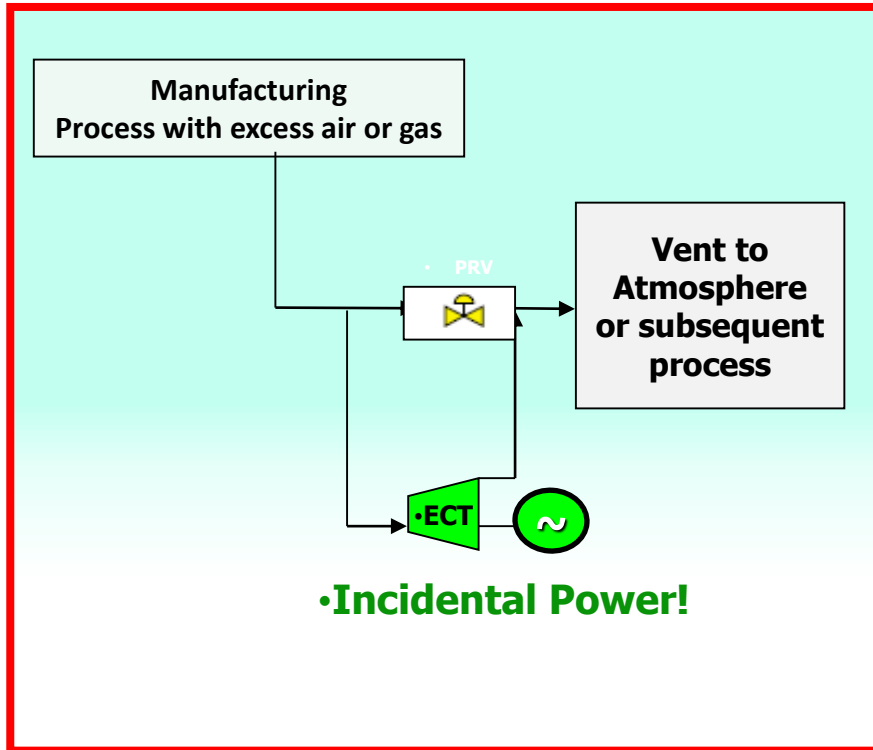


Model	BE 281X600-37/32-d-300	
Quantity	Unit	1
Cooling capacity	RT	929
Cooling capacity	KW	3267
Cooling capacity	104 Kcal/hr	281

- **Combined Cycle Power Plant (CCGT 10)** provides total of 1000 Kwe as electrical output to Grid with steam for process application.
- Ideal for process industries requiring power and steam.
- 500 Kwe from LCGT and 500 Kwe from ECT (Steam Turbine).
- CCGT 10 system includes a Gas compressor to increase pressure of gas before entering the LCGT.
- Steam at 2.5 bar for process application i from steam turbine.



Turboexpander



•Case Study for Thai Peroxide Plant - 250 KW

- 19,000 MTPA Hydrogen Peroxide of Standard and Food Grade

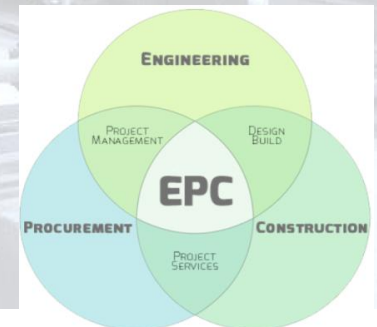
•Highlights :

- ❖ The Air is used at 5 Bar Gauge at 12000 NM³/hr
- ❖ After Usage the air was vented out in atmosphere.
- ❖ A Back Pressure Turbine was installed to reduce Pressure from 5 Bar Gauge to 1 Bar Gauge
- ❖ The Back Pressure ECT™ turbine generates @ 250 kW of Incidental Electrical Power

EPC SERVICES

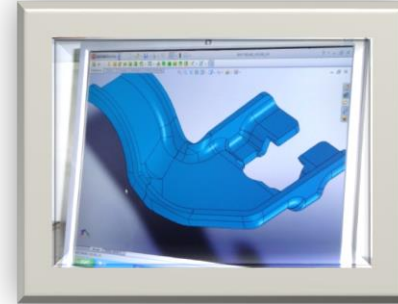
- Single point solution to the execution of plants including project Engineering, Procurement construction and commissioning
- From proposal engineering to post commissioning , start up services – We handle it all
- We execute Turnkey projects in steel , cement, power , refineries, Oil and gas, general industries and other sectors
- We have specialist in all branches of engineering , finance and contract management

**one – Stop – Shop
for the Energy
Industry**

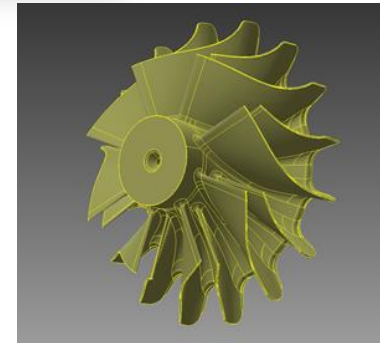


A Highly experienced (Collectively 120 Years) team strives for the best techno commercial solution to the customer

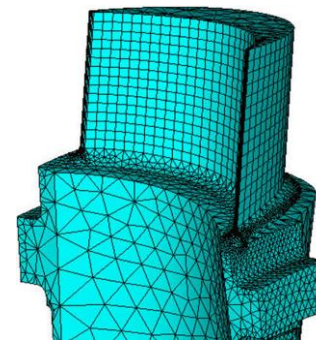
- Optimum Design using software like Inventor, Auto cad and CFD (2D /3D modeling).
- Engineered to suit specific variable steam flow
- Solid bladed wheel with PH Material to handle saturated steam leading to 2/3 times better life than inserted Blades
 - o Turbine speed with up to 15000 RPM to optimize the efficiency , size and weight of system.
 - o No civil foundation, only on AVM
 - o Quick Start- Push button and Infinite number of starts and stops.
 - o Condensate out let at each stage to take out residual condensed steam
 - o Space needed is almost half than conventional Turbines



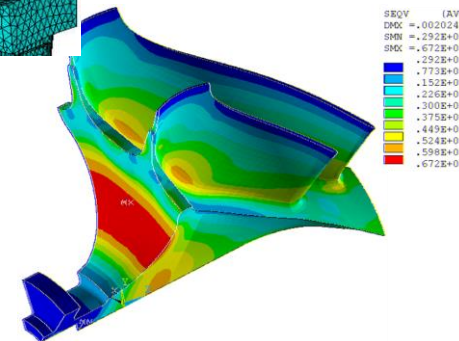
3-D Modelling



Finite Element Analysis



Stress Analysis



4- axis CNC Milling machine shop



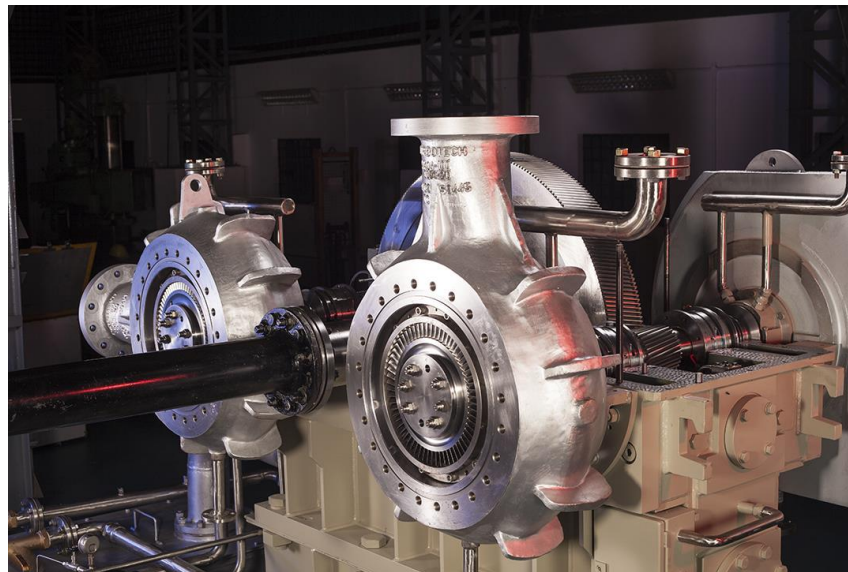
Nozzle Blades under Machining



1.8 MW Condensing Turbine under Assembly



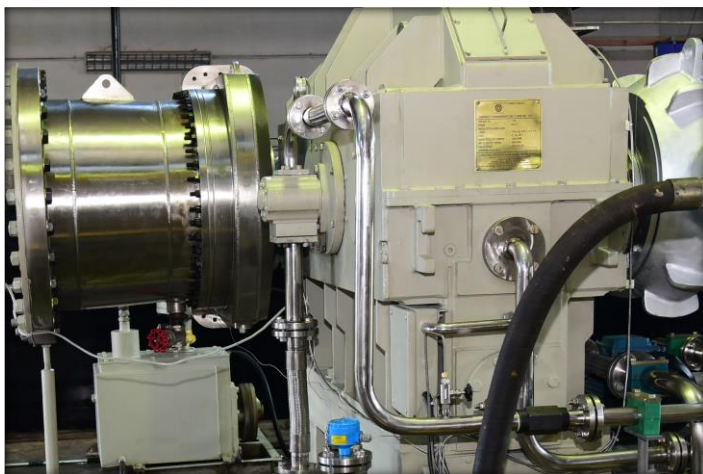
3 MW GB In Assembly



1.8 MW Condensing Turbine under assembly



2MW Turbine - Condensing



1.8 MW Turbo drive for Compressor



2.5 MW Turbine – Condensing



•Traditional Applications:

- ❖ Waste Heat Recovery
- ❖ Kraft Paper Industry (24x7)
- ❖ Captive Thermal Power Plants
- ❖ Petro Chemical (24x7)
- ❖ Starch Production (24x7)
- ❖ Turbo Expander (24x7)
- ❖ Large Rice Mills (24x7)
Common Effluent Treatment Plants
- ❖ Dyeing Plants
- ❖ Concentrated Solar Power
- ❖ Incineration
- ❖ Activated Carbon

Installations world wide



INDIA
SOUTH KOREA
COLOMBIA
CHILE
TAIWAN
THAILAND
UAE
USA
CHINA
SRI LANKA
MYANMAR
NEPAL
KENYA
ISRAEL



1.5 MW St. Condensing ECT™ Colombia



360KW Turbine at Durga Textile



250 KW Air Turboexpander at Thai Peroxide - Thailand



South Korea 3MW waste incineration



3 MW condensing Turbine at Harihar



640 kW Turbiner at Chemical Plant



600 kW St. condensing GMR, Diesel PP Basin Bridge, Chennai

ECT™ : Application Areas

	Textile								Dyes	Tyre	WHR
Inlet Pressure	11.5 kg/cm ²	8.0 kg/cm ²	8.5 kg/cm ²	8.0 kg/cm ²	10.0 kg/cm ²	8.5 kg/cm ²	12.0 kg/cm ²	8.0 kg/cm ²	10.0 kg/cm ²	19.0 kg/cm ²	6.0 kg/cm ²
Inlet Temperature	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	182 °C	Tsat	Tsat
Back Pressure	3.5 kg/cm ²	3.8 kg/cm ²	4.0 kg/cm ²	4.0 kg/cm ²	4.0 kg/cm ²	3.5 kg/cm ²	4.0 kg/cm ²	4.0 kg/cm ²	3.0 kg/cm ²	10.0 kg/cm ²	0.1 ata
Eshhaust Temperature	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	143 °C	Tsat	46 °C
Flow	11 tph	16 tph	15 tph	16 tph	11 tph	10 tph	6 tph	8 tph	8 tph	10.50 tph	6 tph
Power Output	360 kWe	290 kWe	285 kWe	275 kWe	225 kWe	175 kWe	140 kWe	110 kWe	200 kWe	140 kWe	600 kWe

	Paper	Chemical	Fertilisers	Beverages	Rice	Pharma	Distillery	Sugar	Veg Oil Refinery	Glass	Steel
Inlet Pressure	16.0 kg/cm ²	8.0 kg/cm ²	3.3 kg/cm ²	8.0 kg/cm ²	9.0 kg/cm ²	8.0 kg/cm ²	8.5 kg/cm ²	45.2 kg/cm ²	30.0 kg/cm ²	20.0 kg/cm ²	64.0 kg/cm ²
Tempeprature	178 °C	Tsat	145 °C	175 °C	Tsat		179 °C	480 °C	380 °C	215 °C	485 °C
Extraction Pressure											3.8 kg/cm ²
Flow											0.73 tph
Back Pressure	5.0 kg/cm ²	2.5 kg/cm ²	0.1 kg/cm ²	3.5 kg/cm ²	1.5 kg/cm ²	3.5 kg/cm ²	0.9 kg/cm ²	2.5 kg/cm ²	12.0 kg/cm ²	0.1 ata	0.2 kg/cm ²
Eshhaust Temperature	158 °C		46 °C	147 °C	Tsat		Tsat	204 °C	289 °C	46 °C	58 °C
Flow	20 tph	2 tph	4.05 tph	7 tph	9.5 tph	3 tph	1.80 tph	22.30 tph	15.00 tph	15.6 tph	10.90 tph
Power Output	550 kWe	20 kWe	315 kWe	120 kWe	375 kWe	27 kWe	30 kWe	3,135 kWe	600 kWe	2,255 kWe	2,100 kWe



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