ENVIRONMENT ENERGY TURBOTECH

Celebrating 25 Years of Innovation 1989 2014 TURBOTECH

TurboTech Precision Engineering (I) Pvt. Ltd.

Energy Conservation Steam Turbines
ECT™ Empowering Industry with Green Power

Who We Are ?

- **Incorporated in 1989 by a Technocrat Entrepreneur with Aerospace Engine Design background from USA**
- **In-house capability to Design, Engineer, Manufacture, Test.**
- **Erection, Commissioning Services and Extensive After Sales Support**
- **Located at Bengaluru, India. Manpower of around 100 people with 60 qualified engineers.**
- **Largely into Excellence in Engineering and Manufacturing of Turbo-Machinery**
- **Two decades of relationship with Indian Defence Organization through wide range of products and High End Consultancy Solutions (ADA, NAL, HAL, R&DE, NSTL, GTRE)**
- **One of world's few companies and India's only company to have developed small Gas Turbines on its own (50 kW and 500 kW)**
- **First in India to establish fully Indigenous over-hung, high-speed Steam Turbine on Saturated Steam Technology.**
- **First in India to establish an Induction Generator (IG) based Power Generation solution.**

3 MW CSP Atria Power Corpn., KA India

What We Do ?

1100°C

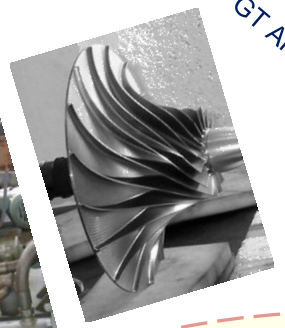
110 Bar(a)

60000 rpm

A Legacy of three decades

Delivering Indigenous Technology from First Principles successfully

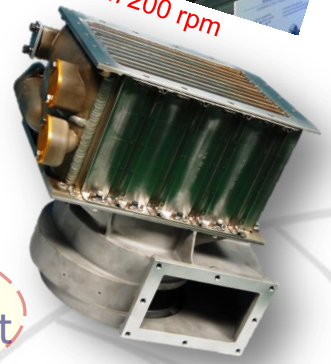
500 kW mini GT - 30000 rpm



Air Expander

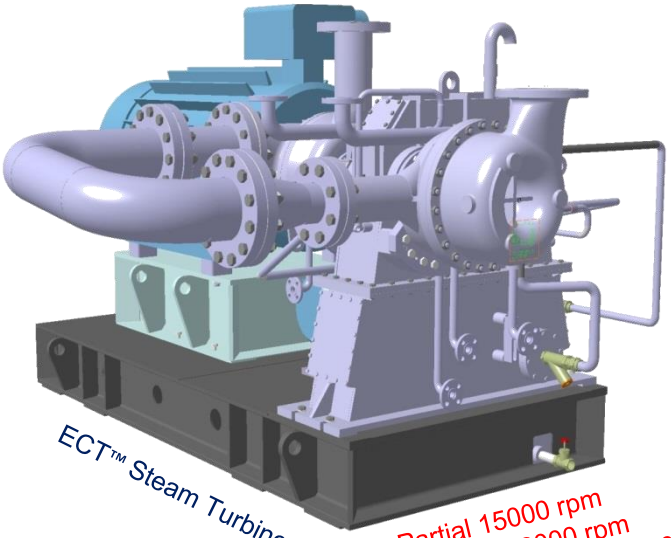
50 kW micro GT APU - 60000 rpm

OCS - 27200 rpm



At the Helm of Turbo Machinery Development

Kaveri Engine – Air Turbine Starter



ECT™ Steam Turbine

Partial 15000 rpm
Shaft @ 12000 rpm
Direct coupled @ 3000 rpm

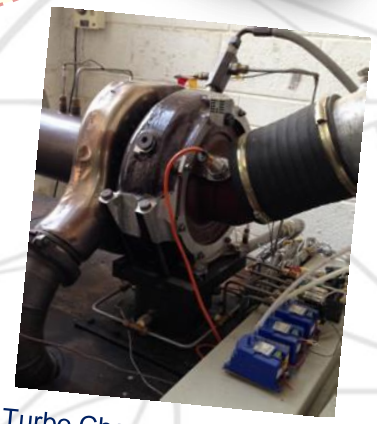
2 stage Turbo Compressor for Elgi

Gasifier

Arrestor Hooke Mechanism for Fighter A /

Wave Turbine

Ammonia turbine

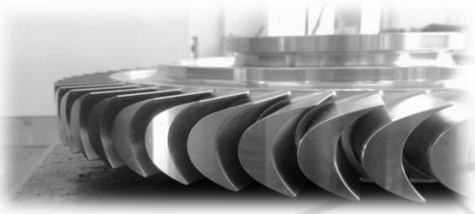


Turbo Charger - 53900 rpm

Our Enablers


Nelamangala
Manufacturing Facility


CNC 4 Axis Machining




Assembly shop

Balancing Facility


Testing Bay / Facility

ECT™ Installation Legacy

- **Wide Range of micro steam turbines ECT™** : 20 kW up to 5500 kW – Capable at low pressure, saturated steam and low flow - Best suited for medium quality heat
- **Time tested Designs** : Oldest operating ECT™ @ 15 years of continuous operation
- **Proven Technology** : 150+ Installations worldwide
- **Global Presence :** Turbines exported to Columbia, Chile, Dubai-UAE, South Korea, China, Nepal, Sri Lanka, Taiwan..
- **Established Applications** : Distillery, Rice Mills, Dairy Industry, Sugar, Pharmaceuticals, Tyres, Carbon Black, Activated Carbon, Waste Incineration Plants, IPP, Biomass power plant, CSP, Chemical, Pulp & Paper industry, Textile Process Units etc.
- **Esteemed Clientele** : Installations spread across PAN India UB Group, Ceat Tyres, Hindustan Unilever Ltd, Aditya Birla Group, BILT, JK Tyres, HIKAL, Somaiya Group, Atria Power, Kanoria Chem, GMR etc.

ATTS Inc. 1.5 MW St. Condensing ECT™ Colombia

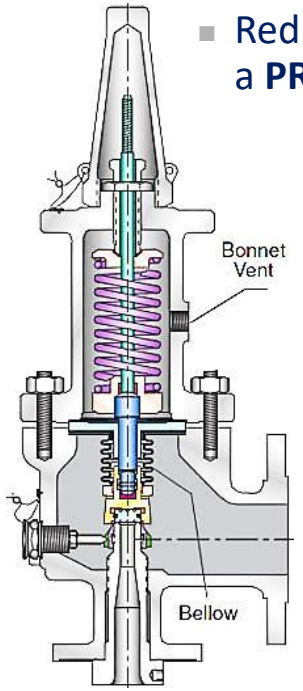
LS Industrial Systems South Korea 3MW waste incineration

ECT™ : Why Co-Generation

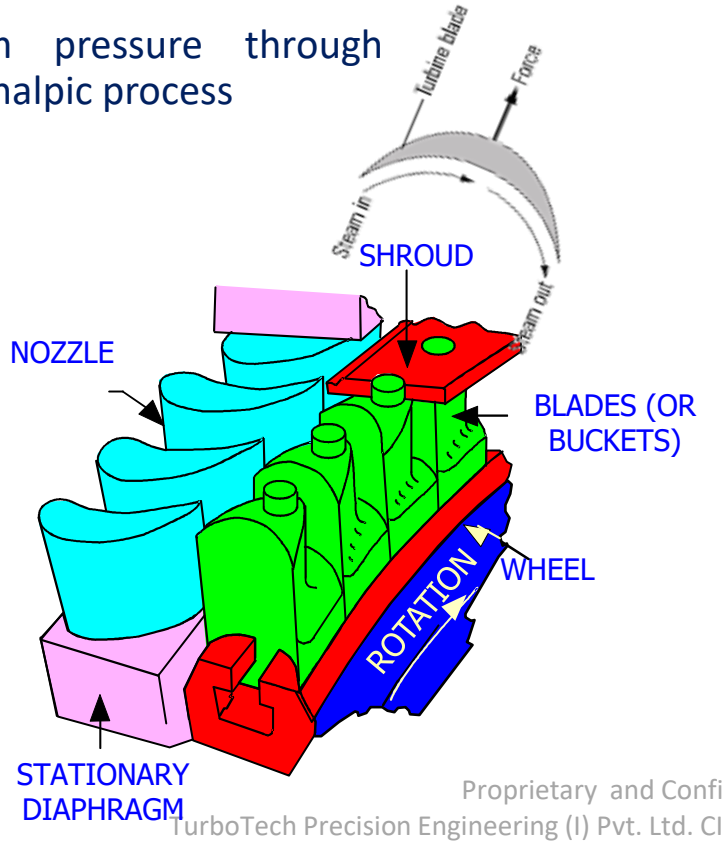
- **QUALITY RELIABLE POWER :**
  - Grid Power cost is continuously escalating
  - Uncertain, Unreliable and Poor Quality Power
  - Enforce demand charges despite Load shedding
- **OPERATIONAL SUITABILITY:**
  - High O & M cost of D.G. sets.
  - D.G. set not suitable for heavy inductive load starting.
- **BUSINESS OBJECTIVES:**
  - Competitive pressures on Realisation and Bottom-line
  - Need for Energy Conservation

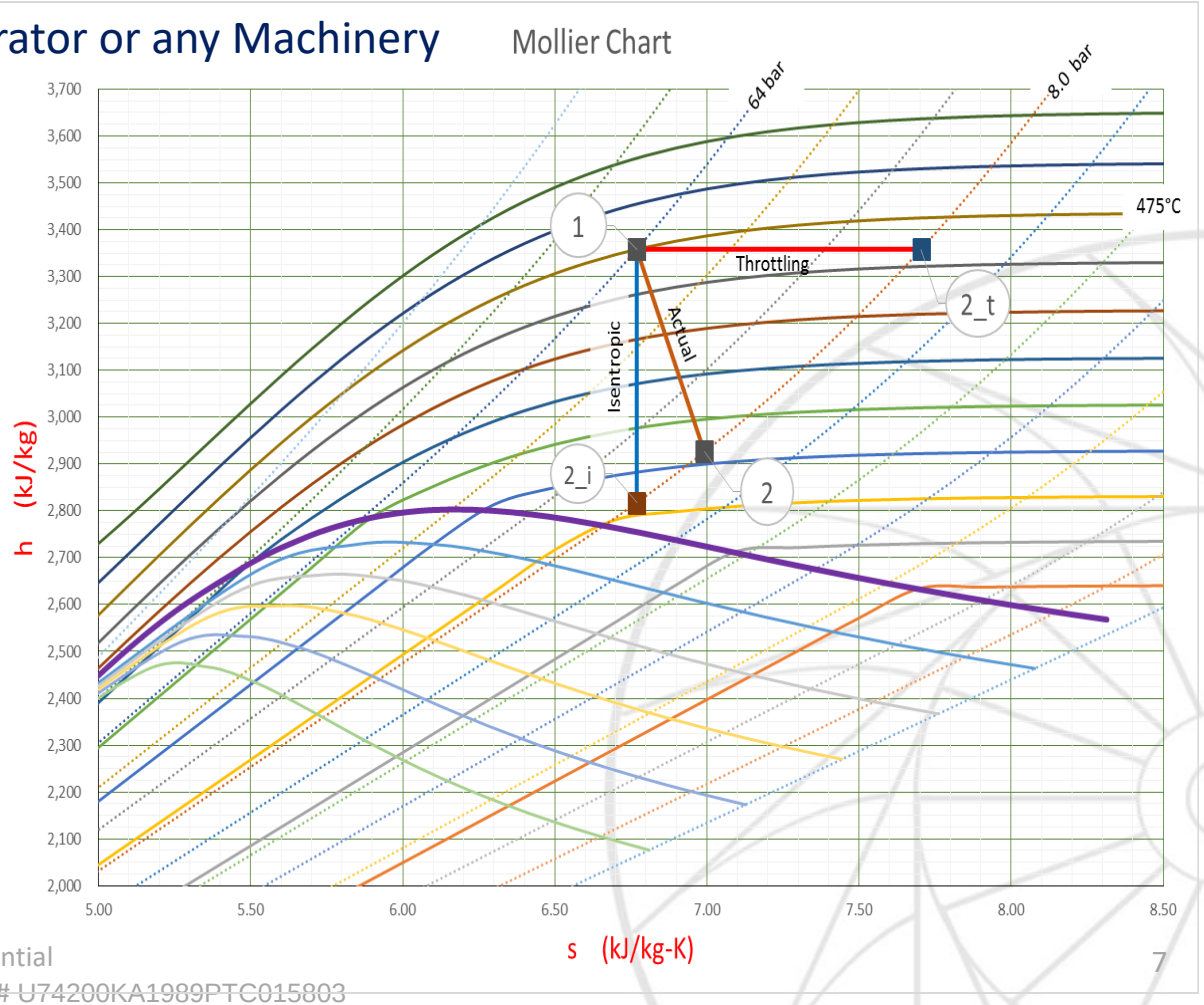
ECT™ Operating Principle

- Conserves, unutilized heat energy through pressure drop in a PRV/PRDS, otherwise throttled.
- The Nozzle of ECT™ drops Steam Pressure, and converts into high velocity steam imparting impulse to rotate the Turbine Wheel shaft
- Shaft mechanical power utilised as mechanical drive to Generator or any Machinery



- Reducing steam pressure through a **PRV** is an isenthalpic process





ECT™ : Essentials of Co-Generation

ESSENTIALS OF CO-GEN :

- Higher the Inlet pressure - Higher Power Gen. - Better is the Co-Gen Payback
- Lower the Back Pressure - Higher Power Gen. - Better is the Co-Gen Payback
- Higher is Process Demand - Higher Power Gen. - Better is the Payback

TURBINE SELECTION FACTORS :

- Steam Flow Max – Mean – Mode – Minimum
- Back Pressure
- Lower Inlet Pressure : Outlet Pressure lower the variation in inlet pressure
- Margin for Higher Flows

TURBINE EFFICIENCY FACTORS

- Specific Steam Consumption
- Turn Down Ratio
- Inlet Pressure : Outlet Pressure Ratio

POWER GENERATION FACTORS :

- Steam Flow Fluctuation & Seasonality
- Power Fluctuations

Increasing Back Pressure by 1 kg/cm² Is equivalent to increasing Boiler pressure by 6 kg/cm²

ECT™ - Wide Steam Conditions

Custom Engineered Steam Turbines Suitable for a variety of process Steam Conditions:

Steam Inlet Pressure:
2.5 bar (a) to 100 bar (a)

Steam Inlet Temperature:
Saturated (118°C- 218°C) to
540°C – Super Heated

Turbine Steam Exit Pressure:
0.08 Bar (a) to 25 Bar(a)

Turbine Steam Flow
2 TPH to 100 TPH

Dryness Factor of inlet steam can be as low as 95%

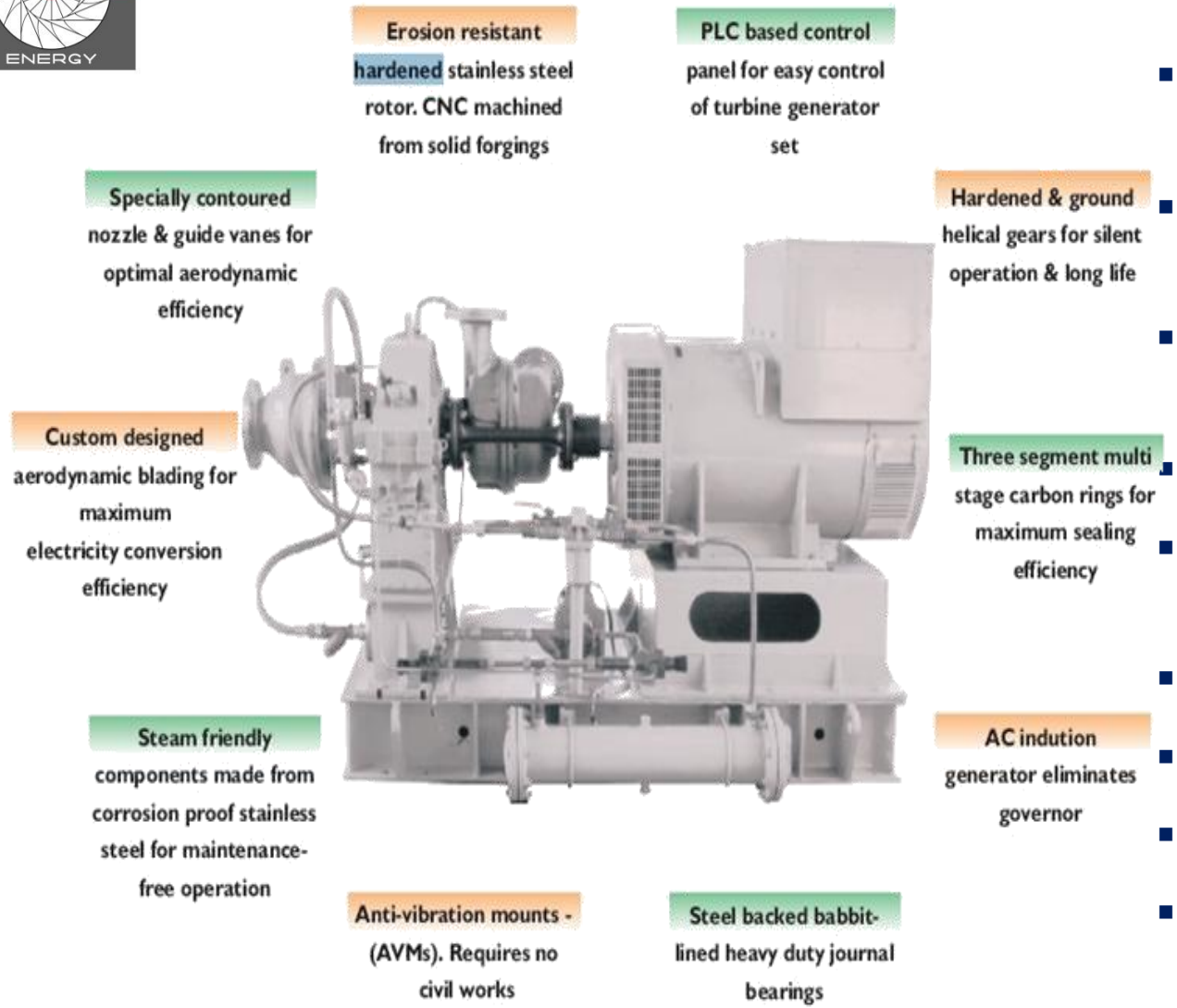
Wide band of inlet steam parameters offers flexibility for Boiler sizing

Variants of ECT™ Configurations

- Back Pressure
- Extraction Cum Back Pressure
- Straight Condensing
- Extraction Cum Condensing
- Extraction Bleed Cum Condensing
- Also available with Injection feature

2 MW Bharat Starch Industries 2MW

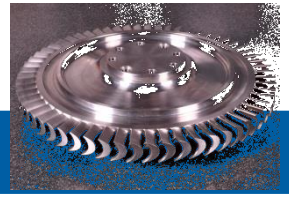
ECT™ Unique Features

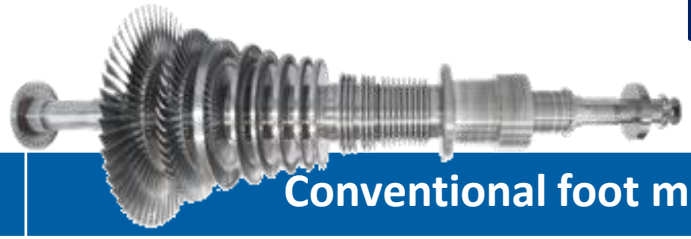


*ECT™ **Steam Turbine** : **High speed,** Over hung-compact design **wetted parts** mfgd. from Premium Aerospace grade MoC.*

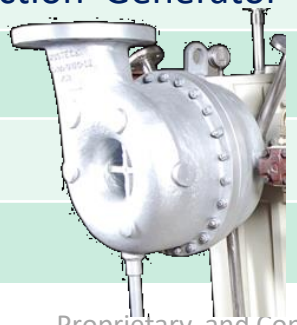
- **Customised Design** : Steam flow path for specific Steam parameters.
- **Fits into existing scheme of steam lines :** No need of change in existing process Boiler
- **Process centric config.** : Back pressure supersedes power generation.
- **Flexibility in operation** : Frequent and Quick starts – 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.

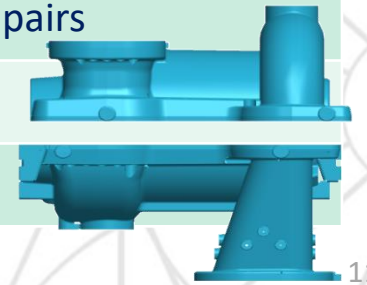
ECT™ : Benefits





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
Overhung Design above first critical operation Mounted on AVMs'	Horizontal split casing operation below first critical . Turn down flow ratio lower than vertical split overhung designs
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
Axial Exhaust enables Datum level Condenser	Radial exhaust not suitable for Datum level Condenser
Available with Alternator and ALSO with Induction Generator	Supplied only with Alternator un-suitable for large flow variation
In situ 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





ECT ™ : Service Support

TurboTech assures you to keep equipment performance high and maintenance cost low, by providing

Global Resources with a response as local.

Comprehensive service and support.

- ESCO services : Lease and Purchase of ECT™
- Installation start-ups, overhauls and repair of ECT™
- Genuine ECT™ spares
- Operation and Maintenance Services for ECT™
- Engineered Re-rates, upgrades,
- Relocation and Re-Application for ECT™

640 kW KWPS, South Korea

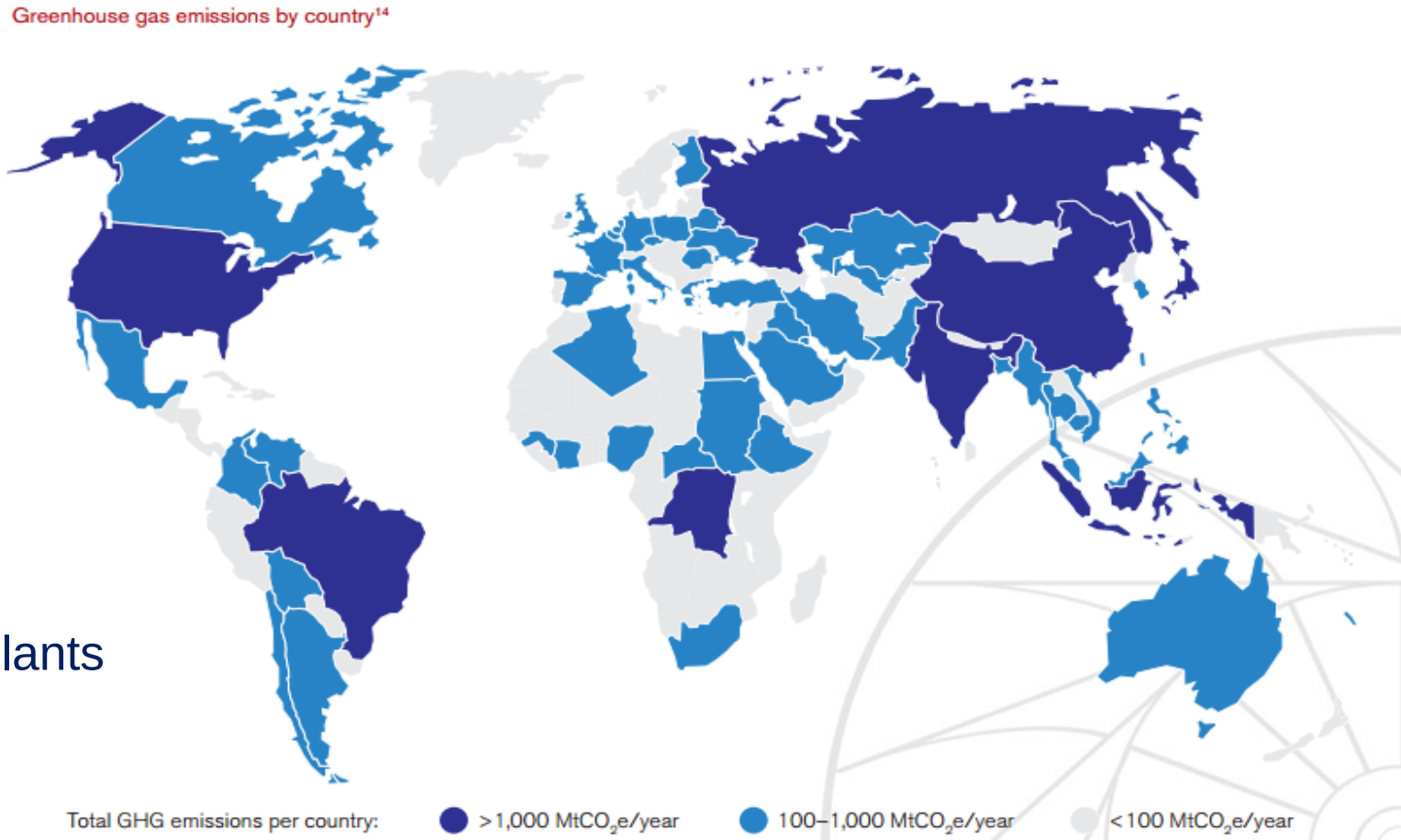
ECT™ : Demonstrated Applications

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)

Latest Technology Applications:

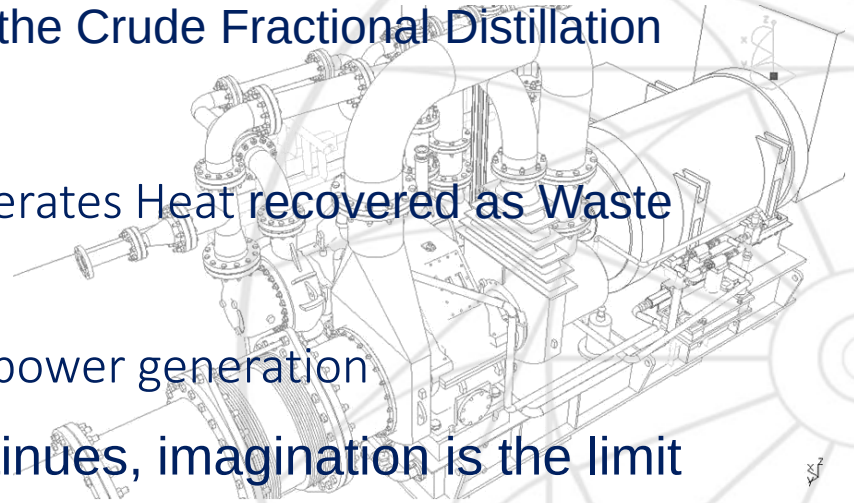
- Common Effluent Treatment Plants
- Dyeing Plants
- Concentrated Solar Power
- Incineration
- Activated Carbon



Source for national emissions: Joint Research Centre of the European Commission/PBL Netherlands Environmental Assessment Agency, *EDGAR Version 4.2 FT2010*, 2012, http://edgar.jrc.ec.europa.eu/index.php. Rounded to two significant digits.

ECT ™ : Application Areas

- Steam that is generated through ***Waste Heat from the Exhaust Flue Gas*** of a Natural Gas/Furnace Oil/LSHS (Low Sulphur, High Speed Diesel) Engine/ Distillate Oil / Gas Turbine
- ***MSW Incineration***
- ***Glass manufacturing*** : Melting furnaces, annealing ovens, and tempering furnaces
- ***Cement milling*** : Mining and quarrying, crushing, clinker production in Kilns, cement milling, rotary cement kilns using coal or natural gas
- ***Steel manufacturing*** : Coke ovens, blast furnaces, reheat furnaces, basic oxygen, and electric arc furnaces
- ***Petroleum refining*** : Petroleum Coke Calciners - **Heat Recovered during the Crude Fractional Distillation**
- Activated Carbon Kiln
- ***Chemical Processing*** : Thermal Oxidizers…. Exothermic Reaction that liberates Heat recovered as Waste Heat for producing Steam
- ***Food, Textile , Starch Plants and other Process Industry*** based incidental power generation



…… The list continues, imagination is the limit

ECT ™ : Application Areas

	Textile								Dyes	Tyre	WHR
Inlet Pressure	11.5 kg/cm²	8.0 kg/cm²	8.5 kg/cm²	8.0 kg/cm²	10.0 kg/cm²	8.5 kg/cm²	12.0 kg/cm²	8.0 kg/cm²	10.0 kg/cm²	19.0 kg/cm²	6.0 kg/cm²
Inlet Temperature	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	Tsat	182 °C	Tsat	Tsat
Back Pressure	3.5 kg/cm²	3.8 kg/cm²	4.0 kg/cm²	4.0 kg/cm²	4.0 kg/cm²	3.5 kg/cm²	4.0 kg/cm²	4.0 kg/cm²	3.0 kg/cm²	10.0 kg/cm²	0.1 ata
Eshaust 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/cm²	8.0 kg/cm²	3.3 kg/cm²	8.0 kg/cm²	9.0 kg/cm²	8.0 kg/cm²	8.5 kg/cm²	45.2 kg/cm²	30.0 kg/cm²	20.0 kg/cm²	64.0 kg/cm²
Temeprature	178 °C	Tsat	145 °C	175 °C	Tsat		179 °C	480 °C	380 °C	215 °C	485 °C
Extraction Pressure											3.8 kg/cm²
Flow											0.73 tph
Back Pressure	5.0 kg/cm²	2.5 kg/cm²	0.1 kg/cm²	3.5 kg/cm²	1.5 kg/cm²	3.5 kg/cm²	0.9 kg/cm²	2.5 kg/cm²	12.0 kg/cm²	0.1 ata	0.2 kg/cm²
Eshaust 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

ECT™ : Economics of Co-Gen

BACK PRESSURE TURBINE:

CONDENSING TURBINE:

EXTRACTION CONDENSING TURBINE:

ECT™ at Distillery

Back Pressure Steam Turbine installed parallel to PRV upstream of Process Header

Commissioned in the year 2003

Design Inlet Pressure : 8.5 kg/cm² (g)

Design Inlet Temp : 179°C **(Saturated)**

Design Inlet Flow : 1.8 tph

Design Exit Pressure : 0.9 kg/cm² (g)

Turbine Power Output : 30 kW

IG Generation 30 kW @ 415 V_{AC} /3Φ / 50 Hz

AMRUT DISTILLERIES LIMITED

(Jagdale Group)

KAMBIPURA, BANGALORE - 560 074. INDIA
Phone : 91-80-28437214 / 28437574 Fax : 91-80-28437107

Date: 28.6.2007

TO WHOMSOEVER IT MAY CONCERN

This is to certify that we have associated ourselves with M/s.Turbo Tech Precision Engineering(P) Ltd., Bangalore, in the field of testing their Energy Conservation Turbine(ECT). We have one installation of ECT at our factory at Kumbalgod, Bangalore-74 which is running successfully for the past one & a half years.

We are quite satisfied with the performance of the ECT and the after sales/service support provided by Turbo Tech.

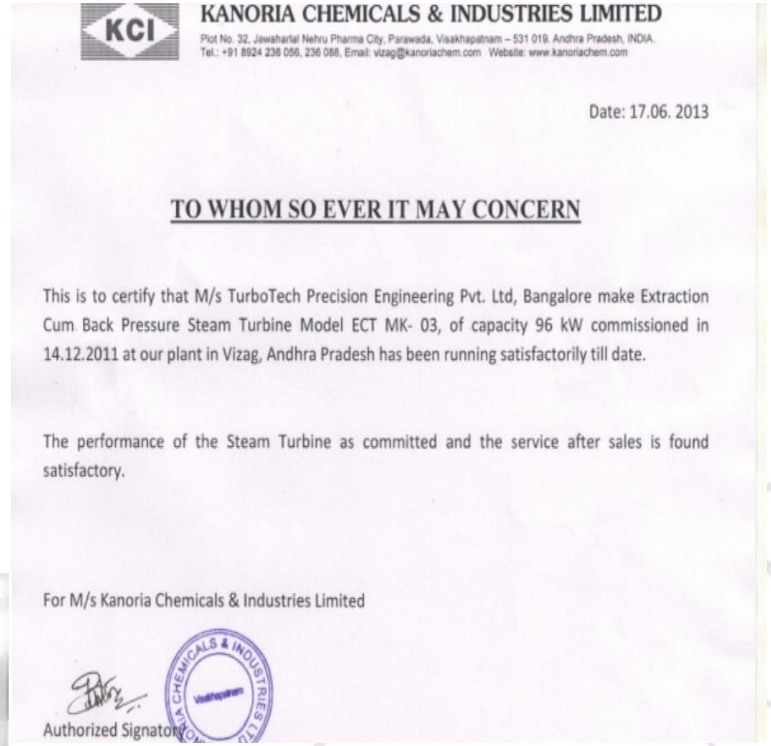
For AMRUT DISTILLERIES LIMITED

(SURRINDER KUMAR)
VICE PRESIDENT(PRODUCTION)

ECT™ at Chemical Industry

Kanoria Chemicals, Visakhapatnam, AP, India

- Manufacturers of Formaldehyde and Hexamine
- BP Steam Turbine in parallel to PRV upstream of Process Header
- 90 KW ECT™ single stage Steam Turbine Induction Generator
- Commissioned in 2010
- Mk3 single stage Induction Generator



KANORIA CHEMICALS & INDUSTRIES LIMITED

Plot No. 32, Jawaharlal Nehru Pharma City, Parawada, Visakhapatnam – 531 019. Andhra Pradesh, INDIA.
Tel.: +91 8924 236 056, 236 088, Email: vizag@kanoriachem.com Website: www.kanoriachem.com

Date: 17.06. 2013

TO WHOM SO EVER IT MAY CONCERN

This is to certify that M/s TurboTech Precision Engineering Pvt. Ltd, Bangalore make Extraction Cum Back Pressure Steam Turbine Model ECT MK- 03, of capacity 96 kW commissioned in 14.12.2011 at our plant in Vizag, Andhra Pradesh has been running satisfactorily till date.

The performance of the Steam Turbine as committed and the service after sales is found satisfactory.

For M/s Kanoria Chemicals & Industries Limited

Authorized Signatory

ECT™ for WHR at Diesel Power Plants

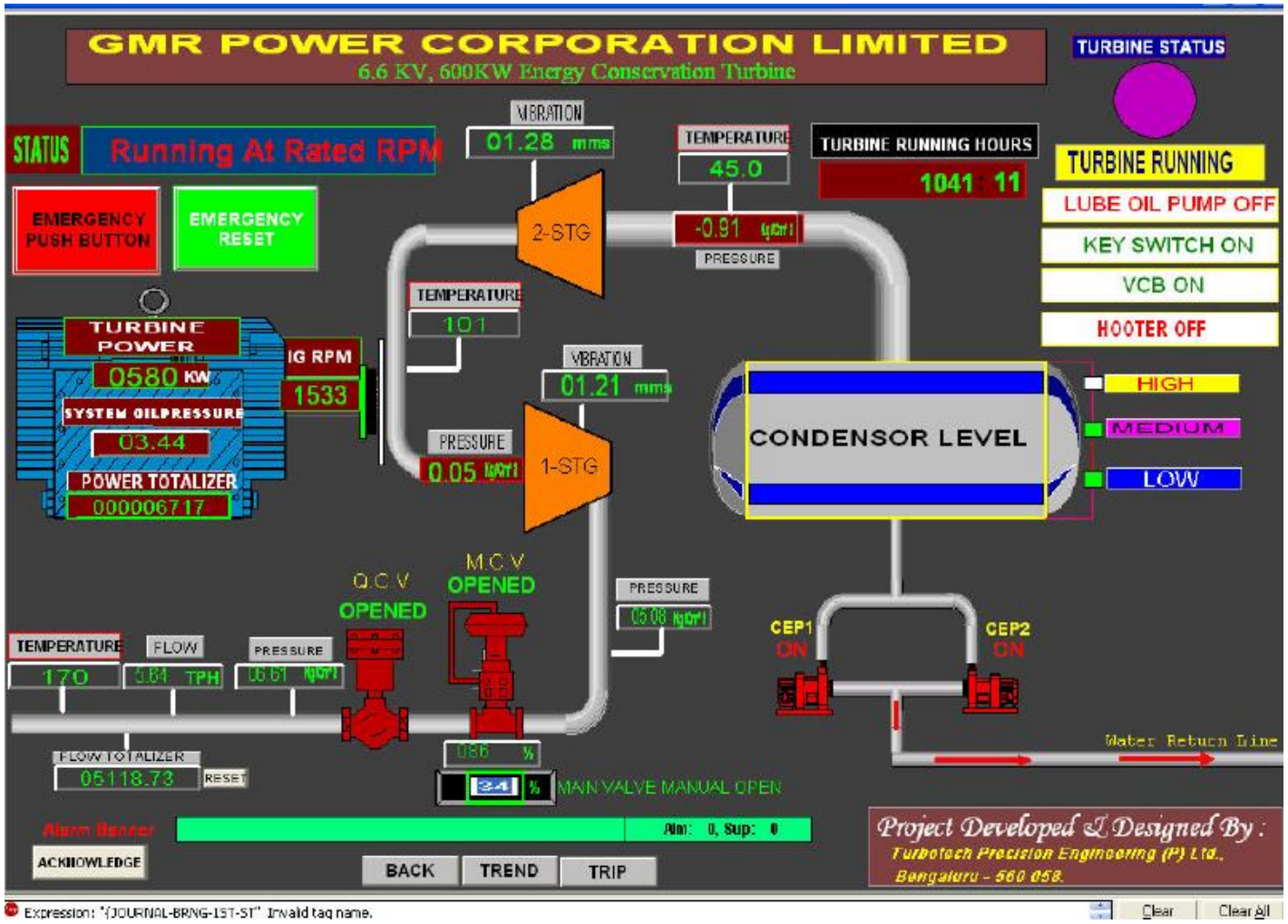
GMR, Chennai, India

- Worlds Largest Diesel Engine Based PP - 4 x 50 MW
- 2 Stroke, Inline 12 Cylinder 103 RPM Multi Fuel Diesel Engines
- Flue Gas @ 350°C
- Total Steam generated - 38 TPH * (HT+ VAM+PH)
- Excess steam - 6 TPH - earlier vented out
- 600 kW ECT™ 2 stage Steam Turbine - Induction Generator
- ECT™ commissioned in 2010

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

Inlet Pressure	Inlet Temperature	Inlet Flow	Exit Pressure	Power Output
6 kg/cm^2 (g)	Sat	6 TPH	0.1 ata	600 kW

ECT™ for WHR at Diesel Power Plants



Full Potential WHR
200 MW DG Set Based Power Plant

Heat Loss in Exhaust Gas

↓ ~ 40% x 200 MW

80 MW

Waste Heat Recovery Power Plant (HRSG + STG)

↓ η_{TH} ~ 15%

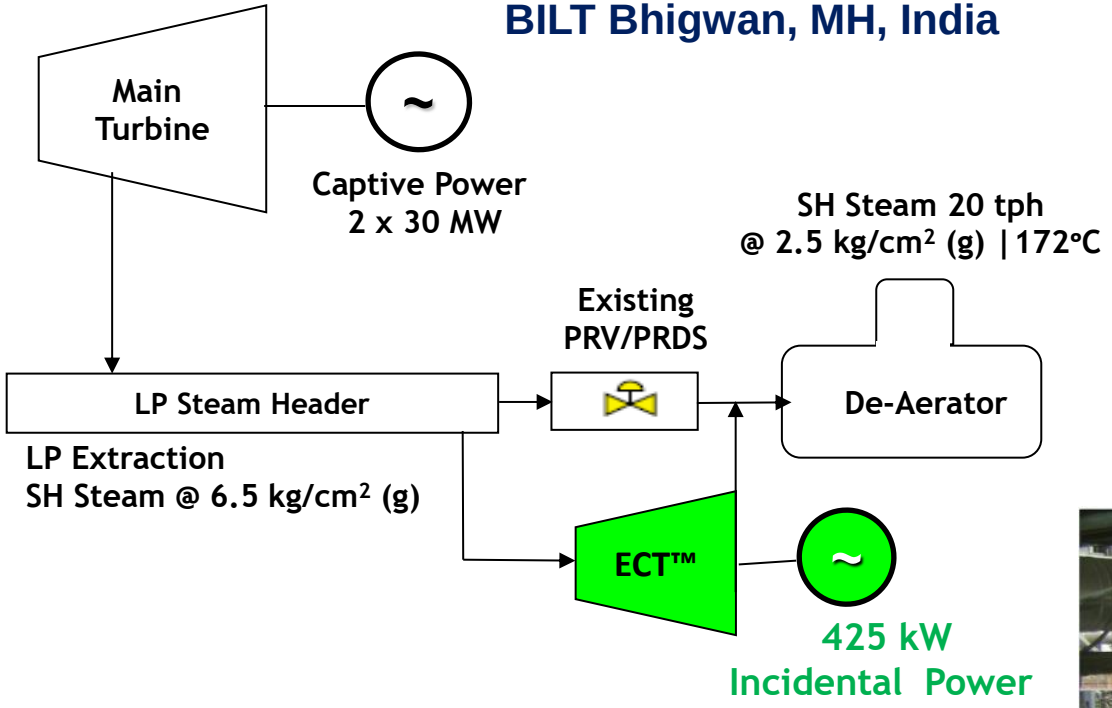
Overall : 12MW ~ 6% of 200 MW

Incidental, Free, Clean, and Green Electric Power

ECT™ at Captive Power Plant

ECT™ in tandem with De-Aerator-PRV / PRDS

BILT Bhigwan, MH, India



AVANTHA POWER

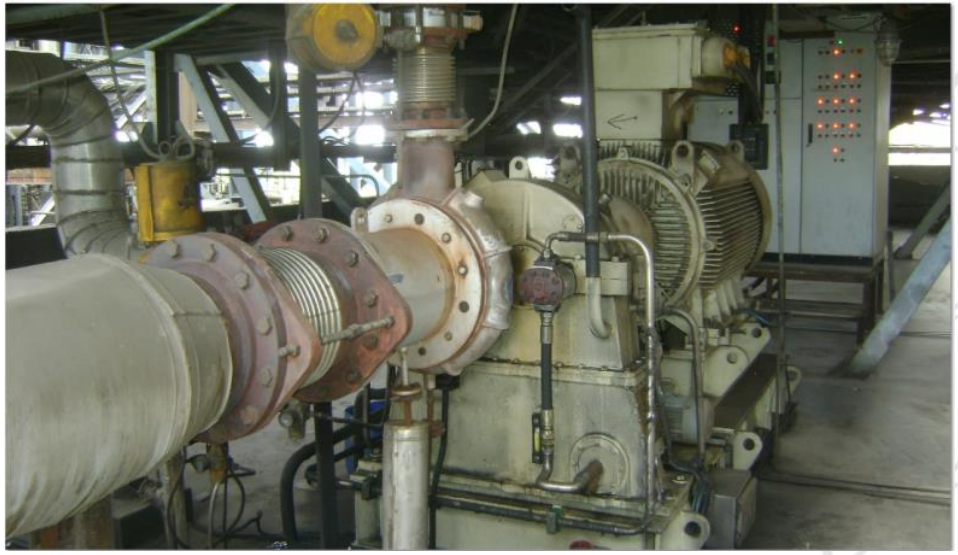
Date : 13/04/2011

To whom so ever it may concern

This is to mention here that the energy conservation turbine of 425 KW back pressure turbine supplied by Turbo Tech Precision Engineering (P) Ltd. Bangalore is performing satisfactorily according to the specifications in our plant. Service rendered by the personnel of Turbo Tech Precision Engineering (P) Ltd., Bangalore at our Plant is at satisfactory level.

For Avantha Power & Infrastructure Ltd.
Unit – Bhigwan

UDAY KUKDE
G.M. – Power Plant



Commissioned : Mar' 2008

Rating : 425 kWe

Annual Savings : 1,67,00,000 kWhr.

Reduction in CO_2 Emission : 1,670 tpa

ECT™ for Air : Turbo Expander

ADITYA BIRLA

THAI PEROXIDE

Turbo Expander with Air as the Medium

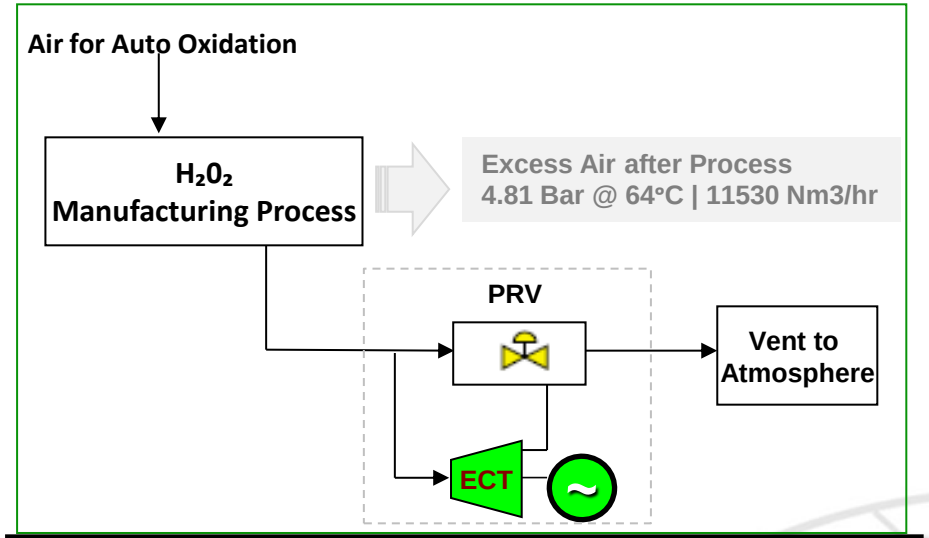
Thai Peroxide Limited, Thailand 250 KW

- JV - Aditya Birla Group and FMC Corpn. USA at Saraburi, Thailand
- 19,000 MTPA Hydrogen Peroxide of Standard and Food Grade

Highlights :

- Hydrogen Peroxide Manufacturing Process,
- The Air is used at 5 Bar Gauge at 12000 NM^3/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

Reduction of GHG Emissions by 1700 Tonnes of CO_2 per annum



Thai Peroxide Limited, Thailand 250 KW | 2008

ECT™ at Large Rice Mills

Large Rice Mills, Steam use on their PARBOILING Process for

- Process 1: Cooking
- Process 2: Drying

- Large Rice Mills Customer Procure Steam Turbines for CoGeneration to cater both their STEAM and ELECTRICITY needs.

- Reference TurboTech Turbine Running at:
  - Sunstar Overseas Limited, Amritsar, Punjab State, INDIA 2.5 MW
  - Amir Chand Jagdish Kumar Exports, Punjab State, INDIA 950 KW

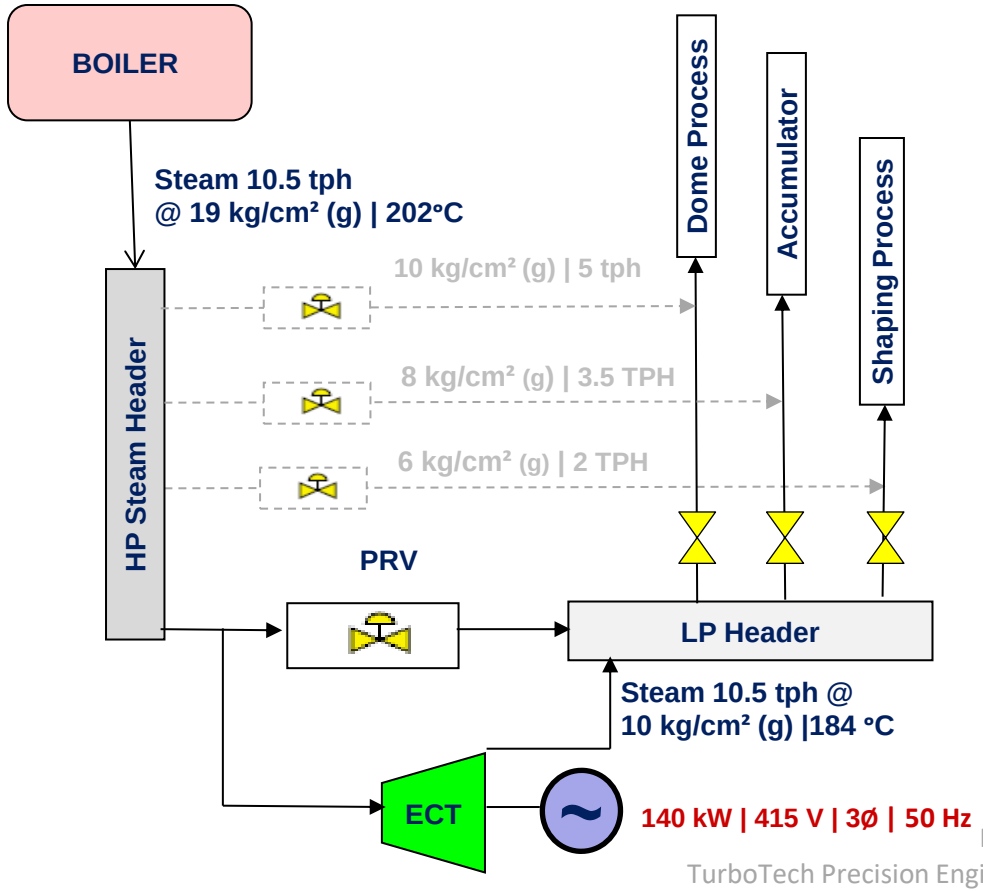
ECT™ at Tyre Industry

ABOUT JK TYRES

- Market Leader Estd. 1977, 20 Mln. tyres p.a. 6 plants-India + 3 plants, Mexico
- This Radial tyre plant at Mysore was acquired by JK from Vikrant Tyres in 1997

TYRE MANUFACTURING : Process of assembling rolled rubber sheets on to a tire building drum. End product is a cylindrical roll or Green Tyre (Rubber)

Steam Turbine installed parallel to PRV upstream of Process Header



- Heat energy in the form of steam is applied momentarily to stimulate chemical reaction between rubber and other materials.
- Characterised by high steam flow variation with intermittent operation of the Dome Process.

ECT™ at Textile Dyeing & Printing

Capacity : 20kW to 350kW | Direct Drive upto 100 kW

Durga Processors : 8.5 kg/cm²(g) 175ºC - 4 kg/cm²(g) 151ºC |16 tph : **285 kW**

Shailaja Text Prints : 8.5 kg/cm² (g) 175ºC - 3.5 kg/cm² (g) 147ºC |15 tph : **315 kW**

Durga Polyesters : 11.5 kg/cm² (g) 184ºC - 3.5 kg/cm² (g) 147ºC |13 tph : **360 kW**

Kalakruti Processors : 12 kg/cm² (g) 191ºC - 4 kg/cm² (g) 151ºC | 6 tph : **140 kW**

Jay Bharat : 8.5 kg/cm² (g) 175ºC - 3.5 kg/cm² (g) 147ºC | 9.5 tph : **175 kW**

ECT™ at Kraft Paper Mills

- Union Paper Mill is Estd. 1987, is the First Recycled Paper Plant in UAE Dubai, Al Quoz Industrial Area
- Primary raw material is waste paper and end products include Fluting, Test Liner and Core Board, can process 400 tpd.

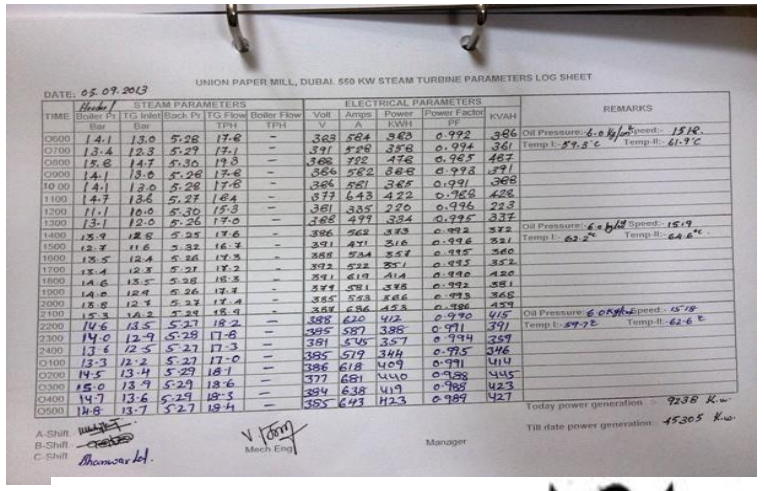
Design Inlet Pressure: 16 Bar (g)

Design Inlet Temp: 204 °C **(Saturated)**

Design Inlet Flow: 20 tph

Design Exit Pressure: 5 Bar (g)

Turbine Power Output : 550 kW



UNION PAPER MILL, DUBAI 550 KW STEAM TURBINE PARAMETERS LOG SHEET

DATE: 05.09.2013

TIME	STEAM PARAMETERS Boiler Pr Bar	TG Inlet Bar	Back Pr	TG Flow TPH	Boiler Flow TPH	ELECTRICAL PARAMETERS Volt V	Amps A	Power KWH	Power Factor PF	KVAH	REMARKS
0600	14.1	13.0	5.28	17.6	-	383	584	383	0.992	386	Oil Pressure:- 6.0 kg/cm² Speed:- 1518
0700	13.4	12.3	5.29	17.1	-	391	528	358	0.994	361	Temp I:- 59.8°C Temp II:- 61.9°C
0800	15.6	14.7	5.30	19.5	-	388	722	478	0.985	487	
0900	14.1	13.6	5.28	17.6	-	384	582	388	0.978	391	
1000	14.1	13.0	5.28	17.6	-	386	581	385	0.991	388	
1100	14.7	13.6	5.27	18.4	-	377	643	422	0.968	428	
1200	11.1	10.6	5.30	15.3	-	381	335	220	0.996	223	
1300	13.1	12.0	5.26	17.0	-	388	499	334	0.995	337	Oil Pressure:- 6.0 kg/cm² Speed:- 1519
1400	13.9	12.8	5.25	17.6	-	386	562	373	0.992	372	Temp I:- 62.2°C Temp II:- 64.6°C
1500	12.7	11.6	5.32	16.3	-	391	471	316	0.996	531	
1600	13.5	12.4	5.26	17.3	-	388	534	358	0.995	360	
1700	13.4	12.3	5.27	17.2	-	392	522	351	0.995	352	
1800	14.6	13.5	5.28	18.5	-	391	619	414	0.990	420	
1900	14.0	12.9	5.26	17.7	-	394	581	388	0.992	391	
2000	13.8	12.7	5.27	17.4	-	388	586	453	0.986	459	
2100	15.3	14.2	5.28	19.5	-	388	620	412	0.990	415	Oil Pressure:- 6.0 kg/cm² Speed:- 1518
2200	14.6	13.5	5.27	18.2	-	395	587	386	0.991	391	Temp I:- 64.7°C Temp II:- 62.6°C
2300	14.0	12.9	5.28	17.8	-	391	545	367	0.994	369	
2400	13.6	12.5	5.27	17.3	-	385	519	348	0.995	346	
0100	13.3	12.2	5.27	17.0	-	386	618	409	0.991	414	
0200	14.5	13.4	5.29	18.1	-	377	681	440	0.988	445	
0300	15.0	13.9	5.29	18.6	-	384	638	419	0.988	423	
0400	14.7	13.6	5.29	18.3	-	385	643	423	0.989	427	
0500	14.8	13.7	5.27	18.4	-						

Today power generation :- 9238 K.w.

Till date power generation :- 45305 K.w.

A-Shift
B-Shift
C-Shift

Mech Engg

Manager

Date : 17th October 2007

مصنع الاتحاد للصناعات الورقية
UNION PAPER MILLS

TO WHOMSOEVER IT MAY CONCERN

This is to certify that we initially procured the Energy Conservation Turbine ECT-MK 7 with a capacity of 250kW, indigenously designed, manufactured and commissioned by M/s TurboTech Precision Engineering Pvt. Ltd. Bangalore, India. The same is performing efficiently and satisfactorily in our plant at Dubai. Based on this performance we procured a second ECT rated at 520 KW which is also running to our satisfaction in Dubai. We are pleased and satisfied by both the products and their dedicated service support.

We hereby wish TurboTech continued success and recommend their products in many more installations around the world.

For United Paper Mills

K VENKATARAMAN
GENERAL MANAGER

ECT™ Environmental Benefits

- ECT's generate power by energy conservation, without burning fuel.
- TurboTech's fleet of over 100 ECT turbines prevent more than 120,000 Tons of CO_2 emission annually
- In addition, significant SO_2 emission is prevented

1 kWh Energy Generated Turbine **Prevents** **1.2 kg CO_2 Emission**

ECT™ Fiscal Benefits

Savings

- Low-Installation Investment
- High Utilization Factor (about 80-95%) equals best "bang for bunk" compared to others
- Under IT Act Renewable Energy qualifies for accelerated depreciation benefit of 80% in 1st year
- Clean Investments

Carbon Trading Opportunity

- 100 kW = 876 tons of CO_2
- 1 ton CO_2 ~ US$ 25 – US$ 30 in Carbon Credits

Thus,

100 kW = US$21,000 -$ 26,280 in Carbon credits,,

** Annual revenue will depend on Power Rating of Turbine*

TurboTech : Engagement and Value Add

Developer / User Industry
Sugar Mill, Process Plant, Metals Ind. etc. Consultants

DOMAIN

- Process steam requirements,
- Heat and Power requirements,
- Seasonality,
- Variations in process requirement
- Investment Policy – ROI / Pay back /

Engineering Procurement Construction (EPC) Contractor

ARCHITECTURE

- Compact Plant layout
- System Integration
- Cost optimisation
- Future Expansion

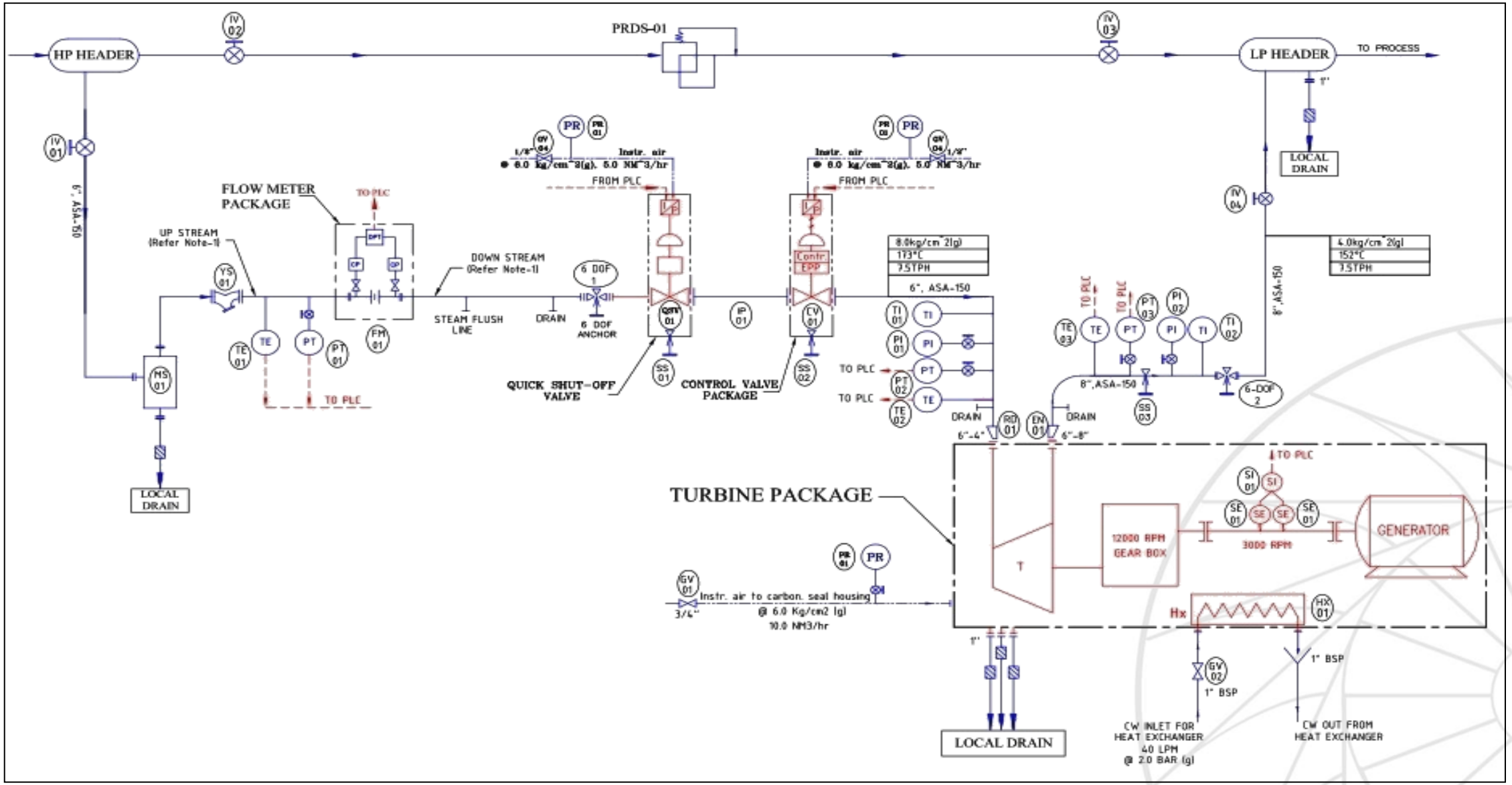
Equipment suppliers
Boiler, Steam Turbine, Generator, Auxiliaries, BoP

TECHNICAL

- Turbine System Configuration
- Inlet steam parameters and
- Process Variations - Operating range
- Extraction conditions & Exhaust flow
- Turbine Efficiency
- Robustness

- **Optimised CAPEX considering near future expansion,**
- **Funding Strategy – Qualifying for preferential funding sources**
- **Fulfilling the Payback and return on investment criteria**

ECT™ Power Plant : P&ID – Battery Limits



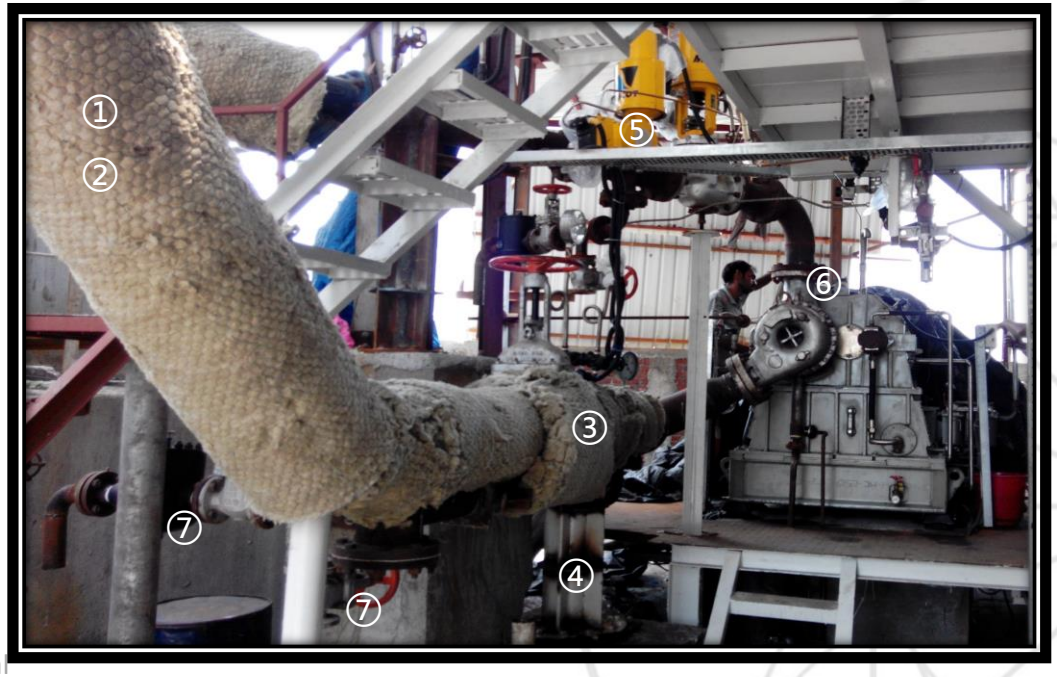
ECT™ Power Plant : Scope of Supply

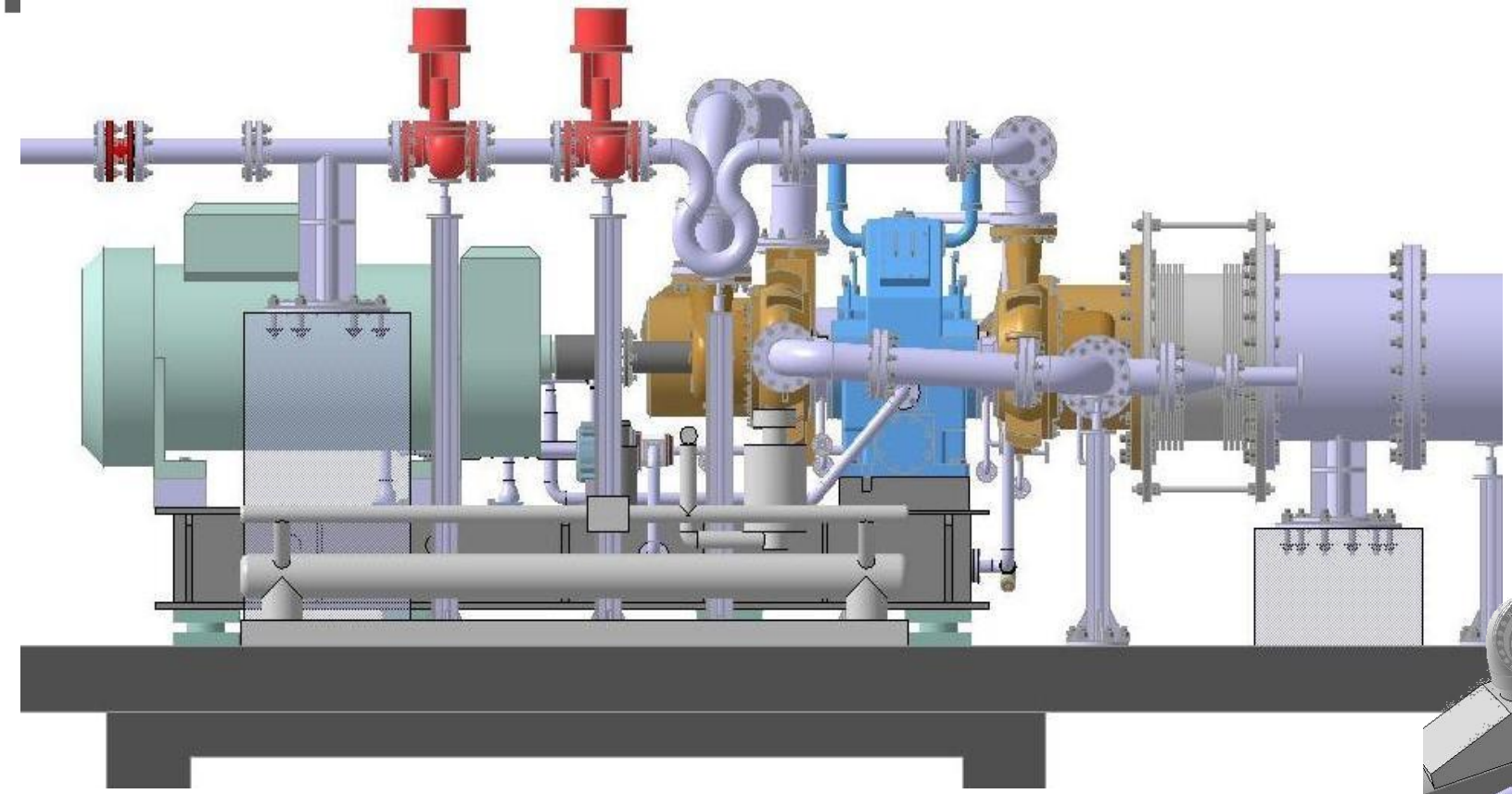
TurboTech Scope

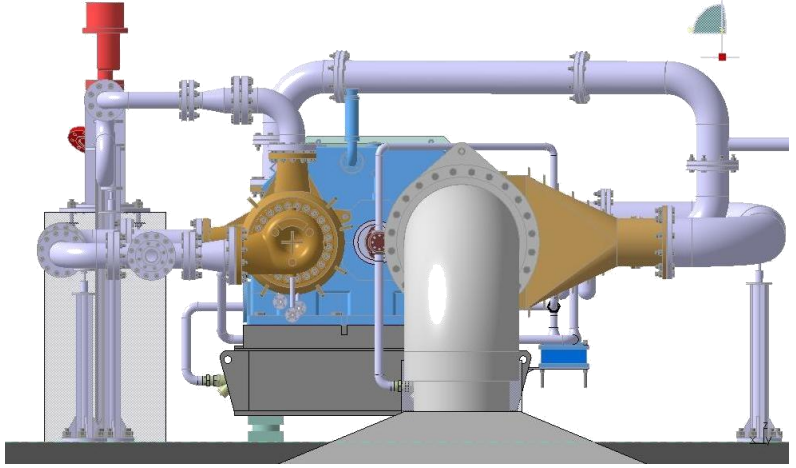
1. Turbine Module
2. Reduction Gear Box
3. Flexible Coupling
4. Induction Generator
5. Heat Exchanger
6. Lube System
7. Control Valve
8. Skid Module together with Stool for Generator
9. AVM Pads
10. Control Panel & PLC system
11. Temperature /Pressure Transmitters

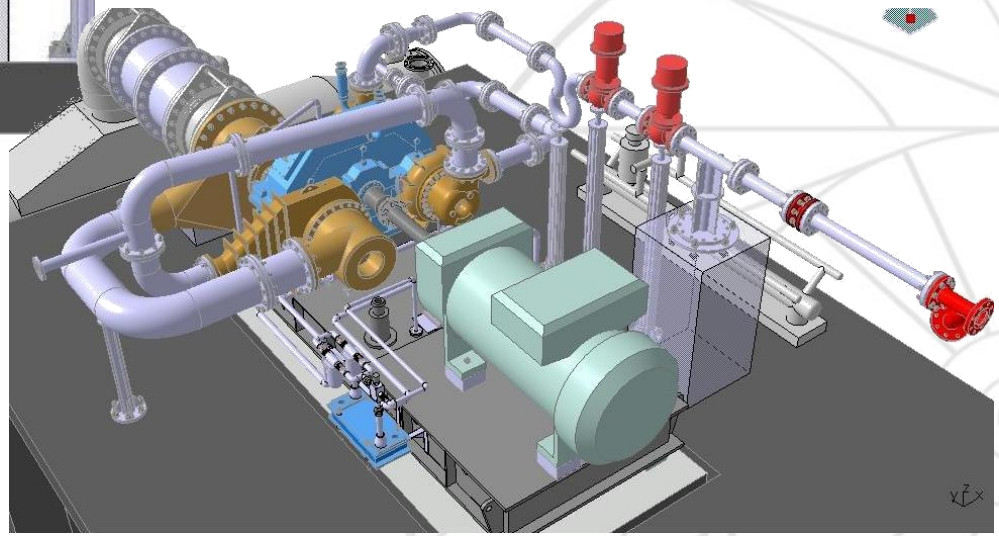
Customer Scope

1. Inlet Piping
2. Inlet Isolation Valve
3. Insulation
4. 6-DOF with Anchor
5. Quick Shut Off Valve
6. Mating Flanges
7. Gate Valves and Bucket Type TD Traps, Drains
8. Steam Flow Meter
9. Moisture separator if applicable









ECT™ Power Plant : Site Preparedness for E&C

Customer Scope of Activity

1.0 Civil Related

1.1 All Civil, Structural, Related Works

1.2 Crane, Gantry and Turbine House

2.0 Statutory

2.1 All Statutory Approvals, Licenses, Land Clearances Etc

2.2 IBR and Electrical Approvals

3.0 Electrical, Instrumentation and Control Systems

3.1 Cooling Tower, Piping, Routing, Valves, Instruments and Accessories

3.2 Tie Breaker System together with necessary instruments and accessories

3.3 All Control, Instrumentation cables and accessories

3.4 Cable trenches / cable trays / erection materials. Underground Earthing, Earth pit, Earth grid, Earthing Grounding Pads

ENVIRONMENT ENERGY TURBOTECH

With you always

……..to recover the lost energy !

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