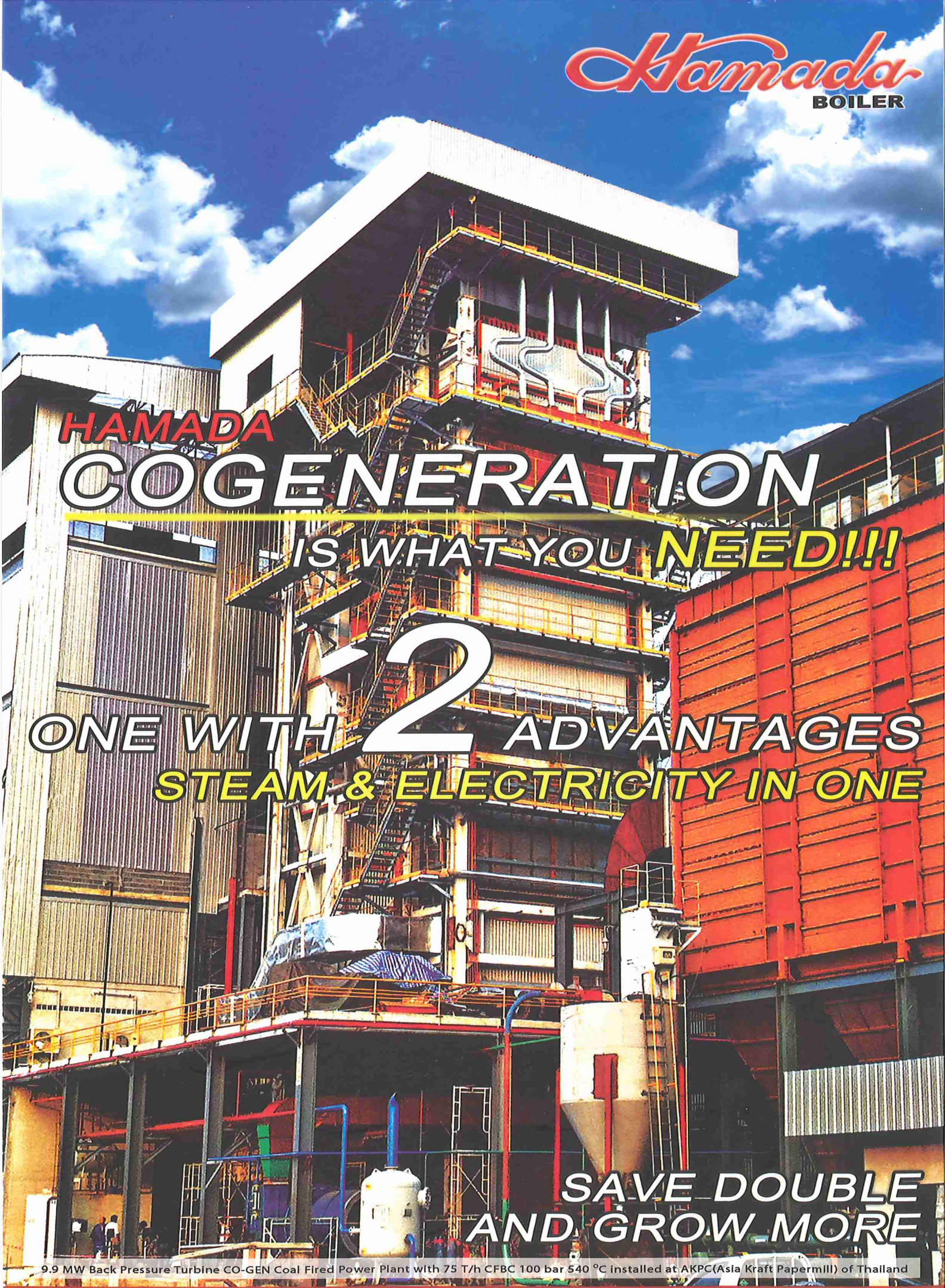
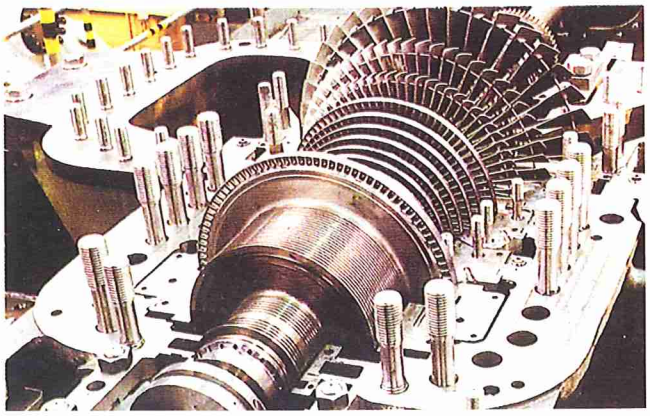

Hamada
BOILER
HAMADA
COGENERATION
IS WHAT YOU NEED!!!
ONE WITH 2 ADVANTAGES
STEAM & ELECTRICITY IN ONE
SAVE DOUBLE
AND GROW MORE
9.9 MW Back Pressure Turbine CO-GEN Coal Fired Power Plant with 75 T/h CFBC 100 bar 540 °C installed at AKPC(Asia Kraft Papermill) of Thailand
www.hamadaboiler.com

INTRODUCING HAMADA COGENERATION

Hamada Boiler, the pioneer and market leader in small and medium coal-fired process steam boiler in the Philippines, Indonesia and South East Asia, is again introducing another innovation in industrial steam and power generation. After successfully installing again another 10MW Coal-Fired Power Plant in Thailand in the last quarter of 2012, Kazuhiro Hamada, Chairman and CEO of Hamada Group of Companies, announces the launching of another pioneering product line in the market, namely the Hamada Semi-Packaged Cogeneration Coal-fired Power Plant.

This Coal-Fired Power Plant comes in two variants

The first uses a 35-ton Bubbling Fluidized Bed Boiler, operating at 25 bar and 400 deg. Centigrade superheated steam and using a back-pressure turbine-generator. This set-up is capable of delivering 35-ton/hr process steam for factory use at 6-8 bar with an extra 1800-2000 kw/hr of electricity.

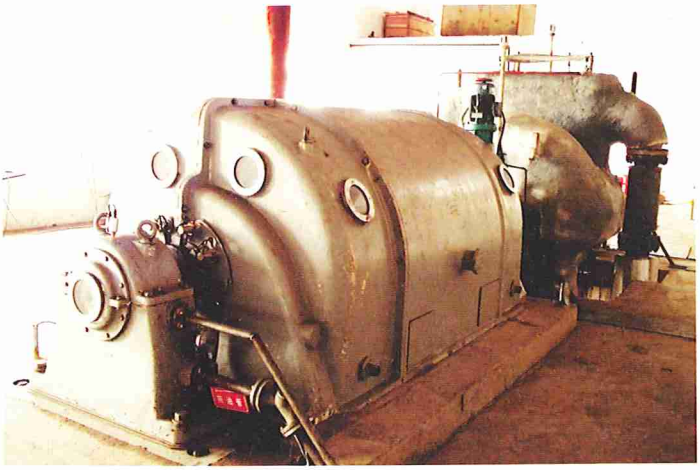


The second variant also uses the same boiler configuration but now using an extraction type turbine-generator. This set-up will deliver 4,500-5000 kw/hr of electricity and an extra 10-15 ton/hr of process steam.

What is unique in this power plant is that it is semi-packaged and therefore much easier and faster to install and can be made FULLY OPERATIONAL IN ONE (1) YEAR ONLY.

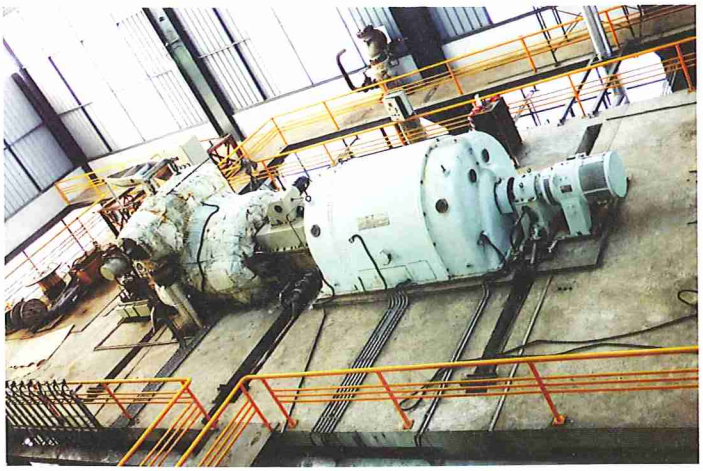
But the most interesting feature of this semi-packaged power plant is the huge total savings that it can generate from the combined saving on steam and electricity, which is conservatively placed at around 70%. Hence, with all major components and parts of the power plant priced below the present industry benchmark, payback is estimated TO BE LESS THAN ONE (1) YEAR ONLY.

As the many satisfied users of Hamada coal-fired boilers would testify, this new Hamada product is sure to once again help many companies to cushion the impact of high electricity and steam costs on their bottom line.



1800-2000KW Back Pressure Turbine/Generator
Boiler: 35ton 25bar 400 °C | Back Pressure for Process 35ton at 6 - 8bar

4500KW Extraction Condensing Turbine/Generator
Boiler: 35ton 25bar 400°C
Extraction for Process 15ton at 6 - 8bar



AKPC Asia Kraft Papermil(Thailand)
Boiler: 75ton 100bar 540°C CFB Boiler | 9.9MW Back Pressure Turbine/Generator | Installed in 2013 by Hamada Boiler

Hot Cyclone System of CFB Boiler 75ton 100bar 540°C

Cost of Energy and Savings, Calculations on Steam Cost for 3 Countries

INDONESIA — Exchange Rate : as Rp 9600/USD | Cost of Electricity : Rp900/KWH (US$0.09375/KWH)

COST OF STEAM PER TON							
KIND OF FUEL	HEAT VALUE	UNIT	PRICE	PRICE	CONSUMPTION	COST OF STEAM	SAVINGS %
	KCAL/unit		(RP)	US $	PER ton of steam	RP./ton STEAM	vs COAL
INDUSTRIAL Diesel	9063/liter	LITER	9500	0.9896	86.9 Liter	825,550	89.35%
GAS	8700/m3	M3	3300	0.3438	90.5 m3	298,650	70.58%
COAL 0-50 MM	5500/kg	KG	550	0.0573	143.2 Kg	78,760	

PHILIPPINES — Exchange Rate : as PhP 41/USD | Cost of Electricity : PhP12/KWH (US$0.29268/KWH)

COST OF STEAM PER TON							
KIND OF FUEL	HEAT VALUE	UNIT	PRICE	PRICE	CONSUMPTION	COST OF STEAM	SAVINGS %
	KCAL/unit		(PhP)	US $	PER TON/HR	PhP./ton STEAM	vs COAL
INDUSTRIAL Diesel	9063/Liter	LITER	41.00	1.0000	86.9 Liter	3,563	79.90%
BUNKER C	9200/KG	KG	32.00	0.7805	85.6 KG	2,739	73.86%
COAL 0-50 MM	5500/kg	KG	5.00	0.1220	143.2 Kg	716	

THAILAND — Exchange Rate : as THB 30/USD | Cost of Electricity : THB3.20/KWH (US$0.10666/KWH)

COST OF STEAM PER TON							
KIND OF FUEL	HEAT VALUE	UNIT	PRICE	PRICE	CONSUMPTION	COST OF STEAM	SAVINGS %
	KCAL/unit		(THB)	US $	PER TON/HR	THB./ton STEAM	vs COAL
INDUSTRIAL Diesel	9063/liter	LITER	35.00	1.1667	86.9 Liter	3,042	86.82%
BUNKER C	9200/KG	KG	26.00	0.8667	85.6 KG	2,226	81.98%
COAL 0-50 MM	5500/kg	KG	2.80	0.0933	143.2 Kg	401	

SUMMARY

	PER MONTH	4500 KW EXTRACTION-CONDENSING (15T Steam/h)			1800 KW BACK-PRESSURE (35T Steam/h)		
Saving on Steam		INDONESIA	PHILIPPINES	THAILAND	INDONESIA	PHILIPPINES	THAILAND
	VALUE OF STEAM BY	Rp3,225,420,000	Php 29,581,200	฿24,040,800.00	Rp7,525,980,000	Php 69,022,800	฿56,095,200.00
	OIL AND GAS	$ 335,981.25	$ 721,492.68	$ 801,360.00	$ 783,956.25	$ 1,683,482.93	$ 1,869,840.00
Saving on Electricity		INDONESIA	PHILIPPINES	THAILAND	INDONESIA	PHILIPPINES	THAILAND
	VALUE OF PRODUCED	Rp2,916,000,000	Php 38,880,000	฿10,368,000.00	Rp1,166,400,000	Php 15,552,000	฿ 4,147,200.00
	ELECTRICITY	$ 303,750.00	$ 948,292.68	$ 345,600.00	$ 121,500.00	$ 379,317.07	$ 138,240.00
	TOTAL GAIN (STEAM + ELECTRICITY)	$ 639,731.25	$ 1,669,785.37	$ 1,146,960.00	$ 905,456.25	$ 2,062,800.00	$ 2,008,080.00
	TOTAL OPERATING COST OF POWER PLANT	$ 255,282.50	$ 579,931.71	$ 393,622.40	$ 255,282.50	$ 579,931.71	$ 393,622.40
	NET SAVING OF CO-GEN	$ 384,448.75	$ 1,089,853.66	$ 753,337.60	$ 650,173.75	$ 1,482,868.29	$ 1,614,457.60

OPERATING COST OF HAMADA CO-GENERATION PLANT/MONTH					INDONESIA	PHILIPPINES	THAILAND
1)	COAL CONSUMPTION	143.2 Kg/ton	35 ton/H		$ 206,745.00	$ 440,078.05	$ 336,806.40
2)	STATION LOAD	620 KWH	/Hour		$ 41,850.00	$ 130,653.66	$ 47,616.00
3)	OPERATOR	6 Persons/Shift	3 Shifts		$ 4,687.50	$ 7,200.00	$ 7,200.00
4)	MAINTENANCE		/Month		$ 2,000.00	$ 2,000.00	$ 2,000.00
				TOTAL	$ 255,282.50	$ 579,931.71	$ 393,622.40

Fuel Consumption Calculation

Steam Pressure : 25kg/cm² 400°C
Feed Water Temperature : 104°C (w/ deaerator)
Evaporation : 1,000 kg/H
Hv: Coal : 5500 kcal/kg (Average Value)
hs = Enthalpy at steam 25 kg/cm² at 400 °C
= 773.5 Kcal/Kg
hf = Enthalpy of feed water
= 104 Kcal/Kg
Boiler Efficiency : 85 %

For One (1) Ton Evaporation of Steam at 25Kg/cm² 400 °C ;

$$\text{Coal Consumption} = \frac{(1{,}000\text{Kg of Steam/H}) \times (hs - hf)}{\text{Boiler Efficiency} \times Hv}$$

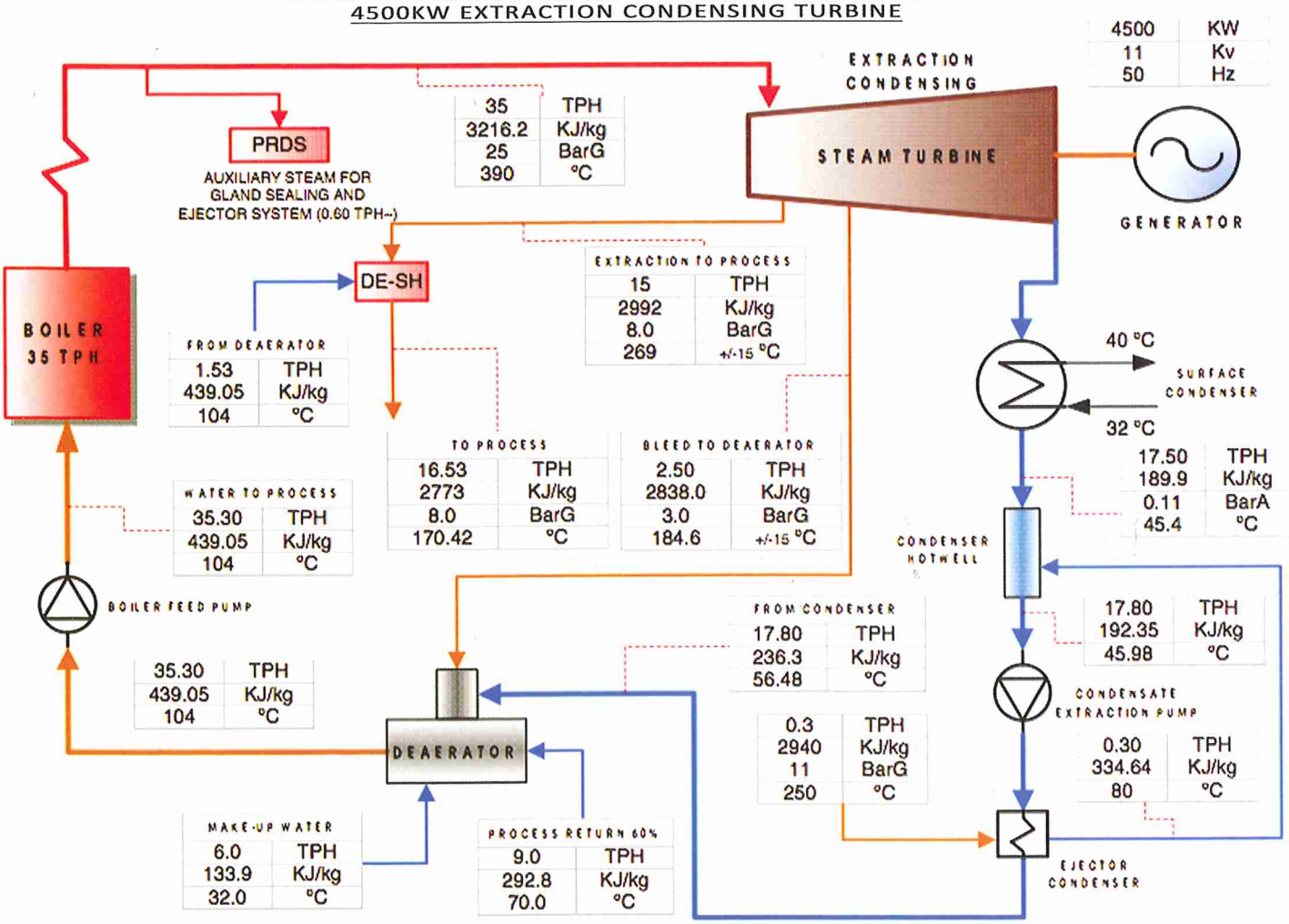
$$= \frac{1{,}000 \times (773.5\ \text{kcal/kg} - 104\ \text{kcal/kg})}{0.85 \times 5500\ \text{Kcal/kg}}$$

$$= \frac{669500}{4675}$$

= 143.2 Kg of Coal/ton of Steam

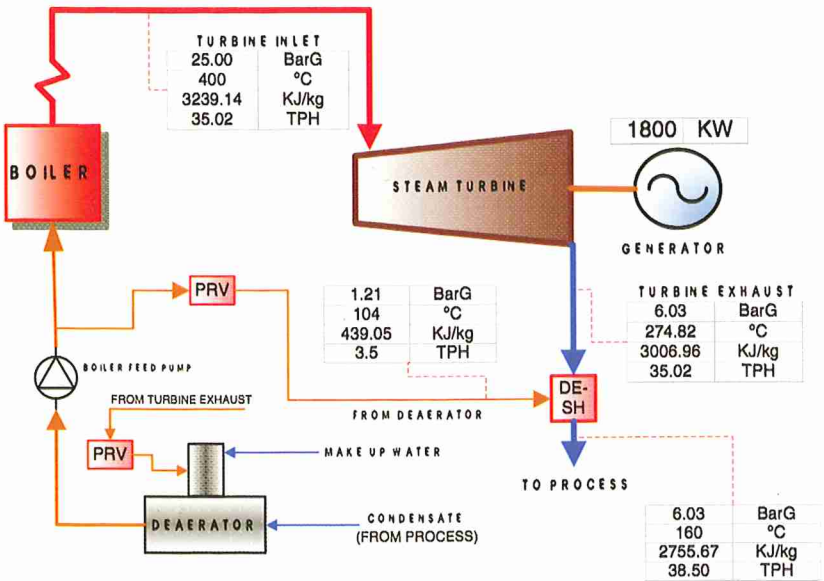
MASS AND ENERGY BALANCE DIAGRAM

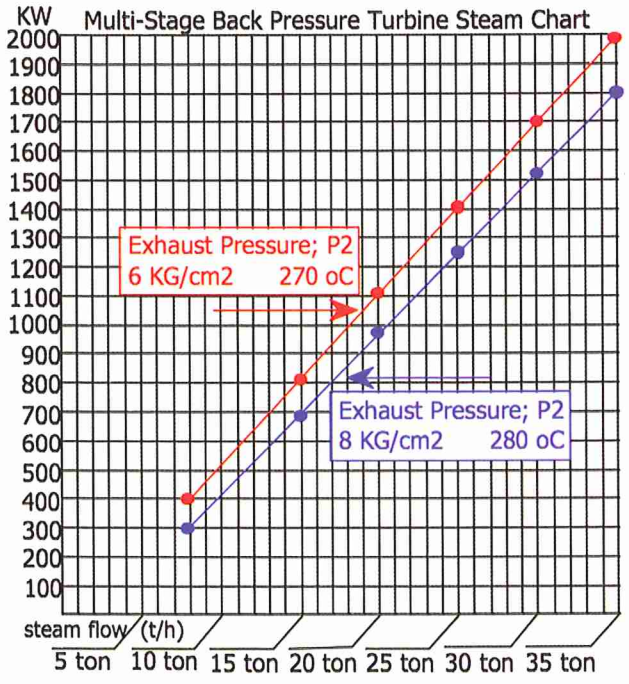
4500KW EXTRACTION CONDENSING TURBINE



MASS AND ENERGY BALANCE DIAGRAM

1800KW BACK PRESSURE TURBINE





10% gain in steam from Expansion of steam when de-superheated

When superheated steam will be de-superheated by Injection of water to the de-superheater, steam will expand its volume by about 10% which is another GAIN (SAVING).

CASE-1 Extraction condensing (10.2% gain in steam)

Extraction Steam	+	Injection Water	→	Saturated Steam
15T/h 8bar 280°C		1.53T/h 104 °C		16.53T/h 8bar 170.42°C

CASE-2 Back pressure (10% gain in steam)

Back Pressure Steam	+	Injection Water	→	Saturated Steam
35T/h 6bar 270°C		3.5 T/h 104 °C		38.5T/h 6bar 158.84°C

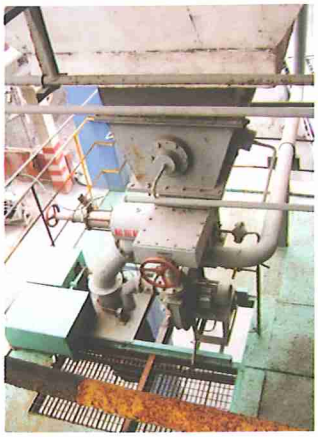
Cooling Water Requirements

	Case-1	Case-2
KW GENERATED	4500 KW	1800 ~ 2000 KW
SYSTEM	Extraction/Condensing	Backpressure
Total Circulating Water	1400 m3/h	300 m3/h
Make-up Water	16.8 m3/h	3.6 m3/h
Cooling Equipments	Condensate Water	N/A
	Air Cooler of Generator	
	Steam Cooler of Seal Steam	
	Oil Cooler of Turbine	

Electrostatic Precipitator (ESP)

Pneumatic Ash Pump

Ash Silo



Automatic Ash Disposal Valve

High Pressure Feed Water Pump

Ash Cooler System

High Pressure Steam Header

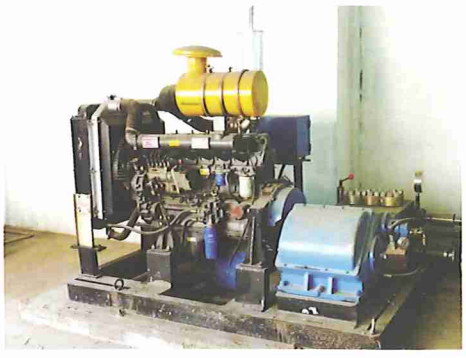
Cooling Tower for Condensate water

Condenser Unit

Coal Feeding System with Injection of Air

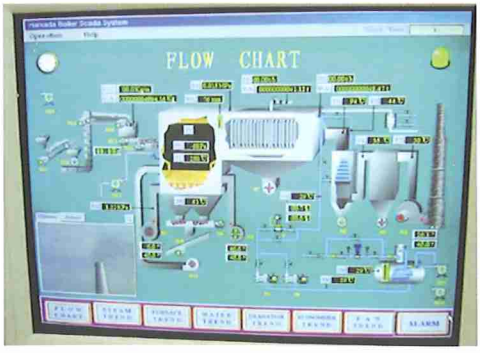
Deaerator Unit

Oil System



Diesel Engine Operated Emergency Pump

Oil Pump



PLC with SCADA

Cooling Tower Circulating Pump

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