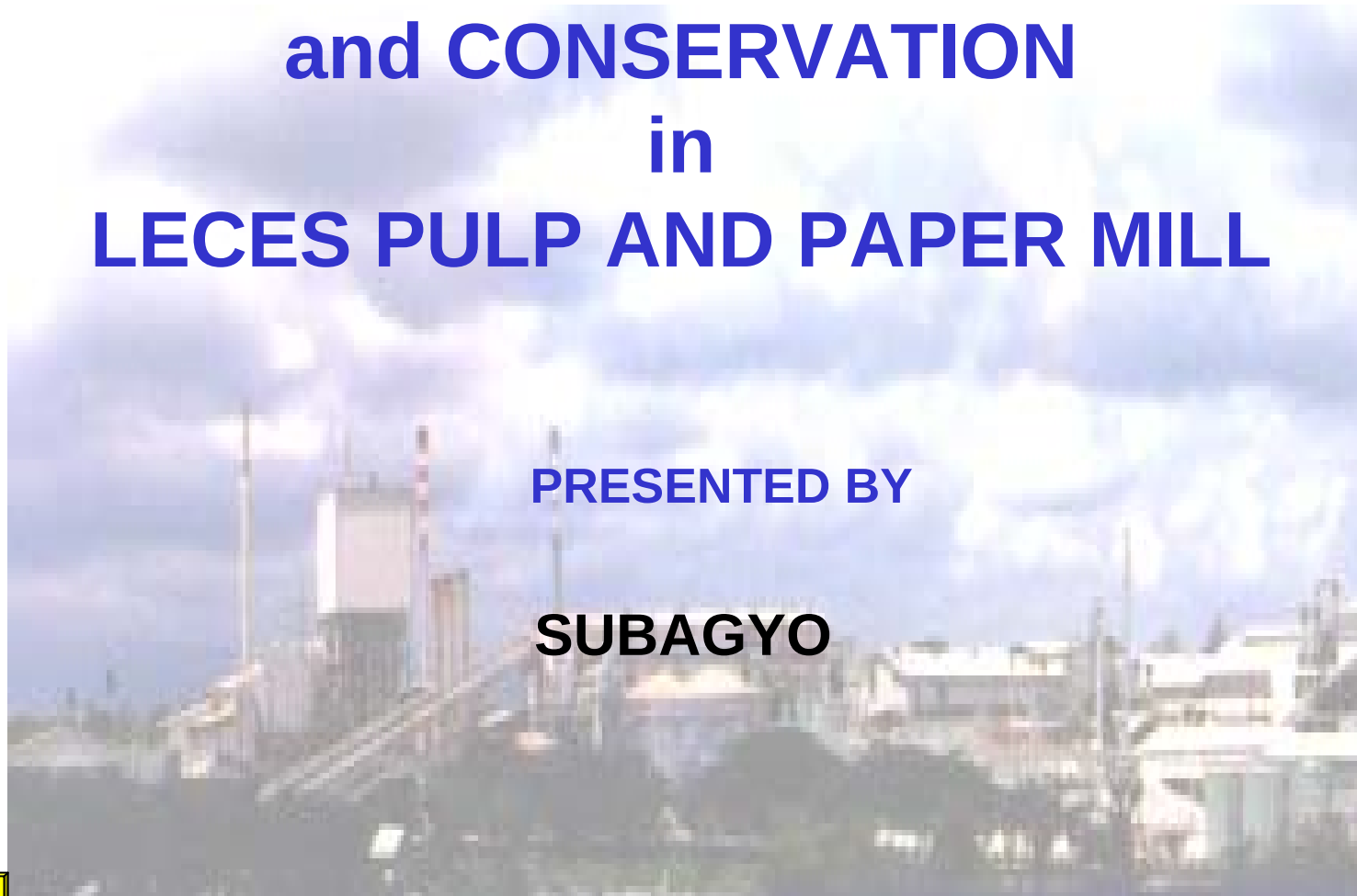
EXPERIENCE and APPLICATION of ENERGY EFFICIENCY and CONSERVATION in LECES PULP AND PAPER MILL



PRESENTED BY

SUBAGYO

COVER

MILL OVERVIEW

Location

Mill

Production

POWER PLANT OVERVIEW

ENERGY CONSERVATION

CONCLUSION

LECES PULP & PAPER MILL LOCATION

COVER

MILL OVERVIEW

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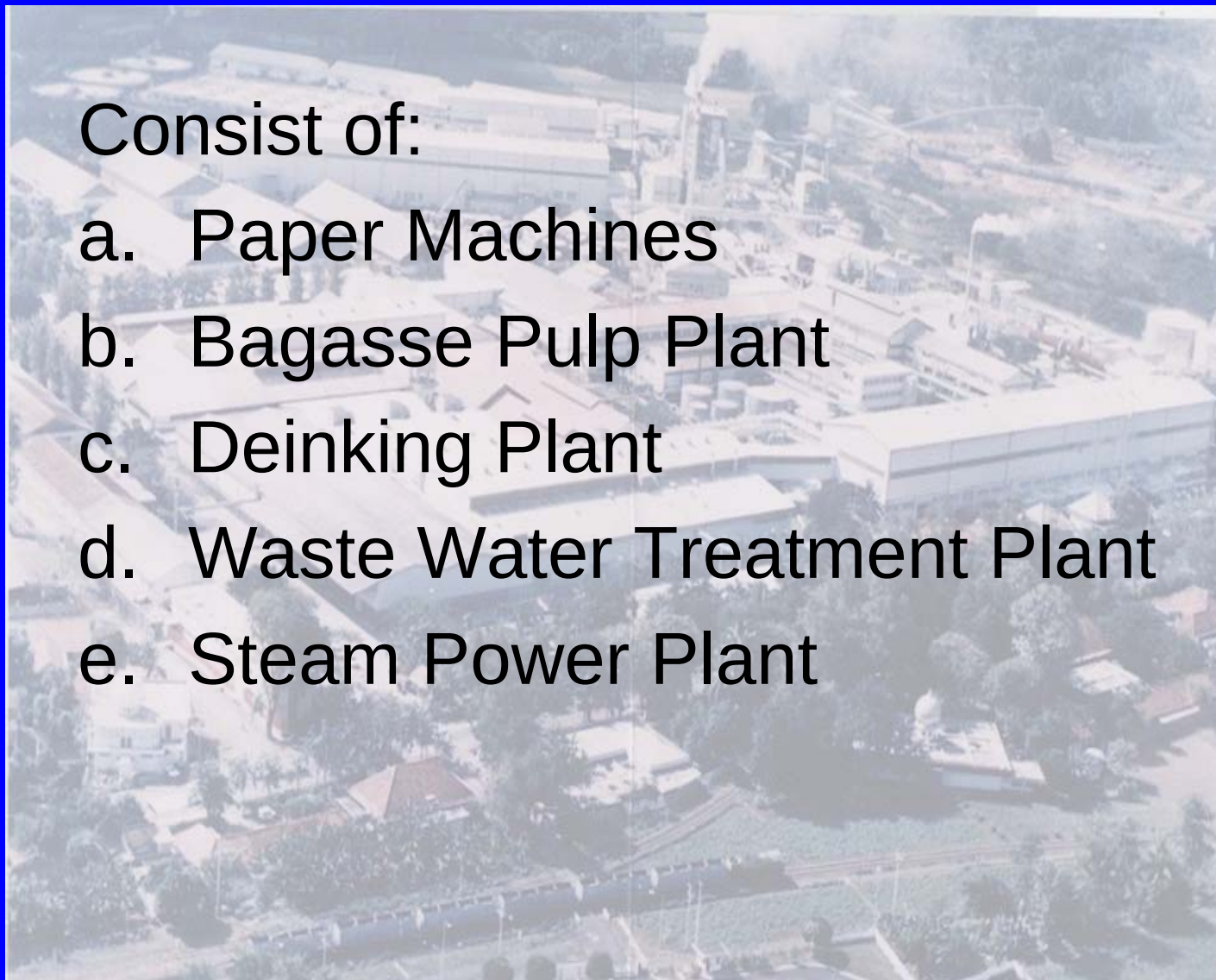
LECES PULP & PAPER MILL
OVERVIEW



Consist of:

a. Paper Machines
b. Bagasse Pulp Plant
c. Deinking Plant
d. Waste Water Treatment Plant
e. Steam Power Plant

COVER

MILL OVERVIEW

Location

Mill

Production

POWER PLANT OVERVIEW

ENERGY CONSERVATION

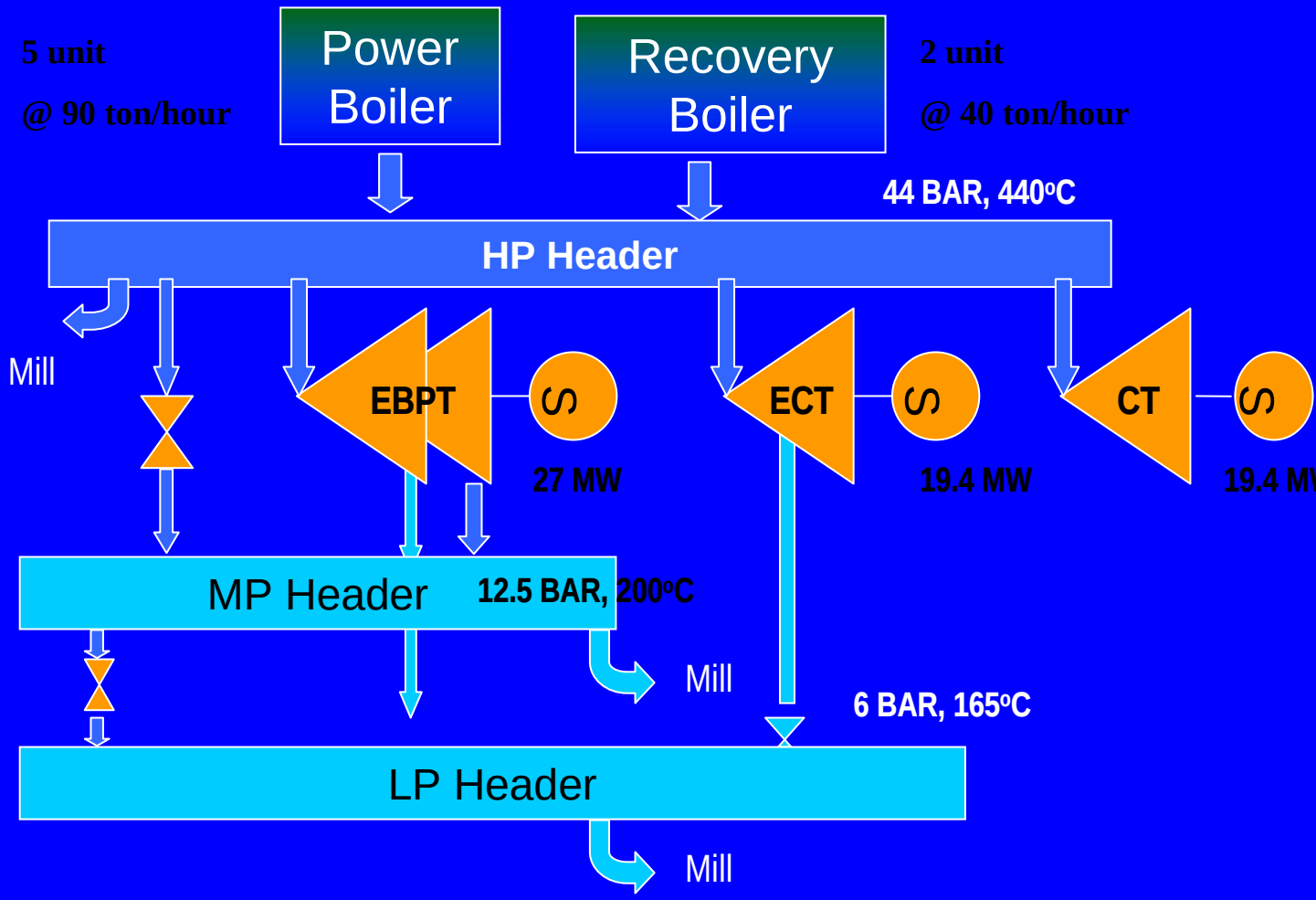
CONCLUSION

MILL MAIN PRODUCTION

Paper Machine	Kind of Product	Capacit
Paper Machine 1	Liner	30 ton/day
Paper Machine 2	Industrial paper, Writing paper	60 ton/day
Paper Machine 3	Writing & Printing paper	175 ton/day
Paper Machine 4	Tissue	30 ton day
Paper Machine 5	Newsprint, Writing & Printing paper	275 ton/day

COVER
MILL OVERVIEW
POWER PLANT OVERVIEW
Diagram
Demand
ENERGY CONSERVATION
CONCLUSION

ENERGY GENERATION AND DISTRIBUTION DIAGRAM



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MILL OVERVIEW

POWER PLANT OVERVIEW

Diagram

Demand

ENERGY CONSERVATION

CONCLUSION

ENERGY GENERATION and CONSUMPTION

HP Steam Generation

Mill Operation	ton/hour
Maximum	264
Normal	172

Energy Consumption

Mill Operation	Electricity	Steam (ton/hour)		
	MW	6 barg	12 barg	33 barg
Maximum	33.87	100.10	25.80	4.40
Normal	24.55	65.00	2.20	4.40

COVER

ENERGY CONSERVATION

Aim

Background

Planning

Implementation

CONCLUSION

ENERGY CONSERVATION

Aim :

Decreasing excess energy used

Improved efficiency of the equipment

Background

1. Energy cost 24% of production cost
2. Government policy
3. Environment issue
4. Power Plant performance

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ENERGY CONSERVATION By PTKL

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Background

Government Policy

Power Plant Performance

Planning

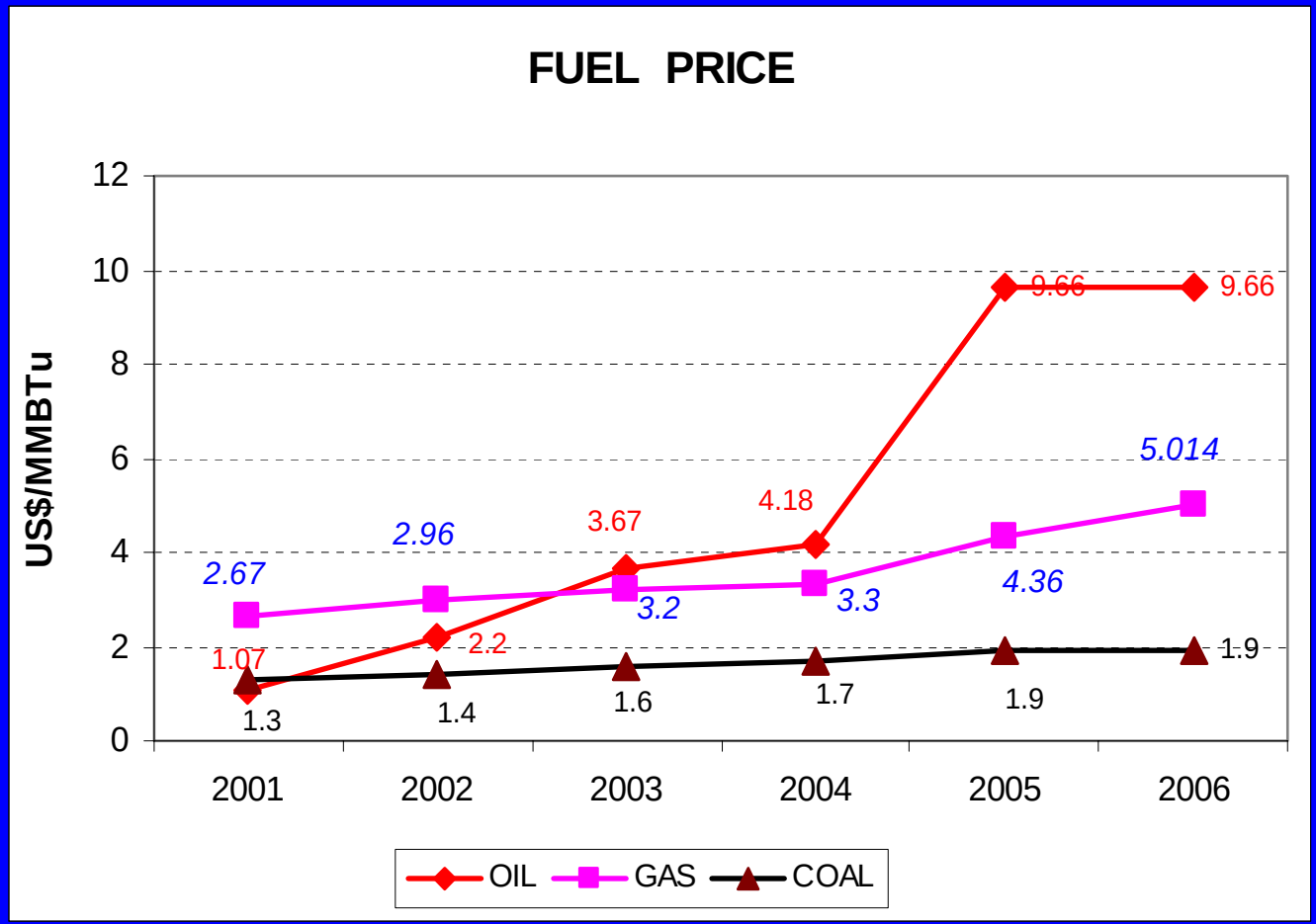
Implementation

CONCLUSION

Government Policy

Indonesian Government Policy:

Decreased the subsidy of the fuel oil (since 2001)

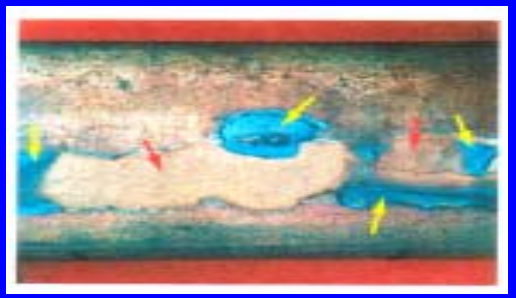


POWER PLANT PERFORMANCE

Efficiency Power Plant decrease, caused by:

1. Boiler Deterioation
2. Steam Turbine Deterioration
3. Low Power factor

BOILER DETERIORATION



1. **SLAG AND DEPOSIT AT FIRE SIDE**

   DUE TO LOW QUALITY OF OIL

2. **SCALE AND FLAKE AT FIRESIDE**

   HIGH TEMPERATURE CORROSION

3. **RUPTURE**

   OVERHEATING

STEAM TURBINE DETERIORATION

- ✓ Capacity of Extraction Steam Turbine (ECT) is 27 MW.
- ✓ Due to cracking at shaft of ECT, this turbine operate maximum at 16 MW, so to fulfill electricity demand the Power Plant should operate ECT and CT
- ✓ The operation of ECT and CT need more steam about 8 ton/hour
- ✓ Potensial loss USD 1 million/year

LOW POWER FACTOR

- ✓ At 2000 the power factor at Power Plant was 0.74 (at power generation)
- ✓ Operation steam turbine could not optimize
- ✓ More motor and electricity equipment burnt

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Comparison of Gas and Coal

Implementation Major

Implementation Minor

CONCLUSION

Planning

A. Major

1. Short term

    1a. Modified from oil burner to gas burner (done, 2002-2003)

    1b. Retubing (done, 2002)

2. Long term (future expansion, 2007-2009), Changing the fuel from gas to coal

3. Repair Extraction Steam Turbine (ECT, 2007)

4. Install/adding capacitor (in progress)

B. Minor

1. Adding Economizer (done)

2. Operation Pressure Reducing Valve (PRV, done)

3. Extract Steam Control (done)

4. Replace and or repair steam traps were not working properly, piping system were leak (in progress)

Comparison of the Gas Fired and Coal Fired Boiler

No	Description	Unit	Existing (Gas Fired Boiler)**	Coal Fired Boiler
1	Efficiency system	%	54.2	51.6
2	Fuel cost	US$/year (million)	14	8.8
3	Saving	US$/year (million)	-	5.2
4	Investment	US$ (million)	-	17

** Initial, after modified from oil fired

IMPLEMENTATION

MAJOR

SHORT TERM

MODIFIED OIL FIRED BOILER to GAS FIRED BOILER (Fuel Conversion, had been done)

Technical Aspect

1. No need atomizing and heater for gas

   steam demand for no load decrease from 50 ton/hour to 42.5 ton/hour
2. The superheater and evaporator more clean
   - Efficiency the boiler increase
   - Maintenance cost decrease
   - Availability increase
3. The quality of gas remaining constant

COVER

ENERGY CONSERVATION By PTKL

Aim

Background

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Implementation

Gas Fired Boiler

Technical Aspect

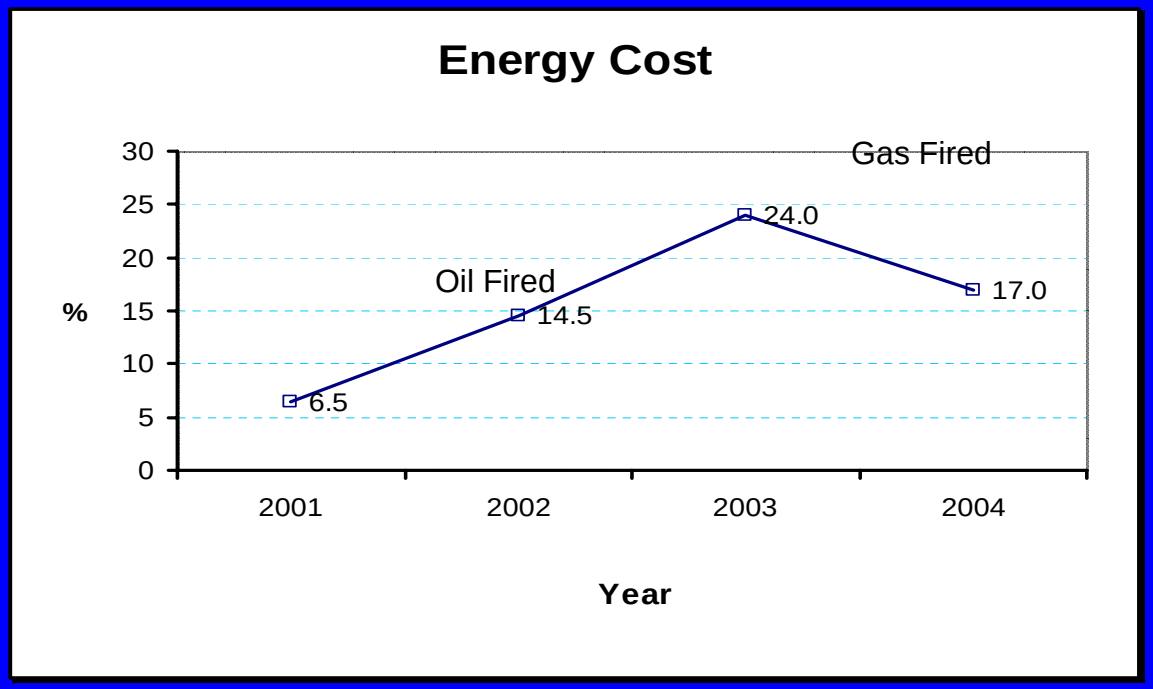
Economic Aspect

Environment Aspect

Minor

CONCLUSION

Economic Aspect



Investment :

USD 1,600,000
(5 power boilers)

Saving :

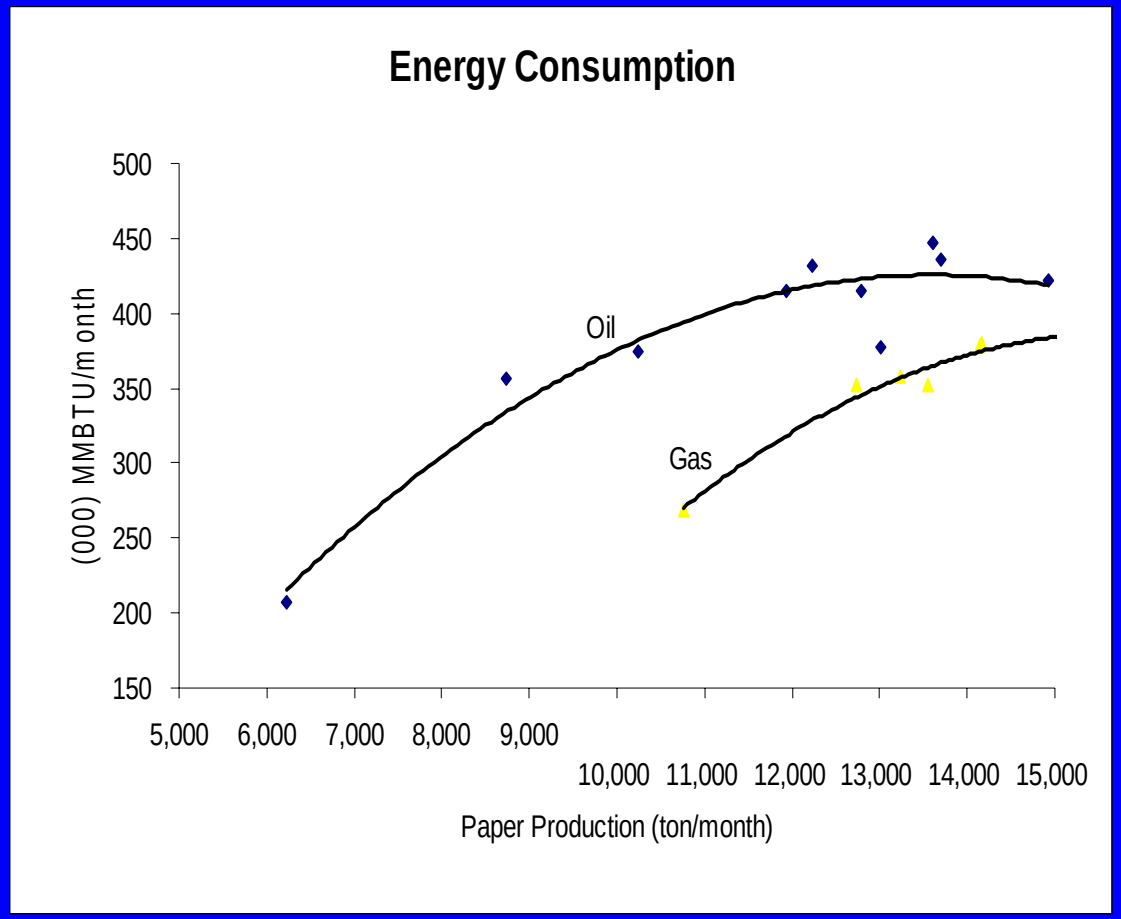
USD 11,400,000/year

Payback period:

± 2 months

Environment Aspect

1. Reduce energy consumption



COVER

ENERGY CONSERVATION By PTKL

Aim

Background

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Implementation

Gas Fired Boiler

Technical Aspect

Economic Aspect

Environment Aspect

Capacitor

CONCLUSION

Environment Aspect

2. Reduce green house effect by reducing CO_2 emission

Lesser CO_2 emission occurred by;

1. Carbon content in gas is about 71%, otherwise 86% in oil
2. Increasing efficiency at steam generation

Paper production	**ton/year**	**140,000**
Fuel Consumption		
Oil	**MMBtu/ton**	**33.50**
	m^3/ton	**0.87**
Natural gas	**MMBtu/ton**	**25.82**
	(000)Nm^3/ton	**0.73**

Kind of Fuel	Fuel Consumption		CO_2 emission
	m^3	(000)Nm^3	ton
Oil	121,280		357,612
Natural gas		101,615	181,732
			175,879

COVER

ENERGY CONSERVATION By PTKL

Aim

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Implementation Major

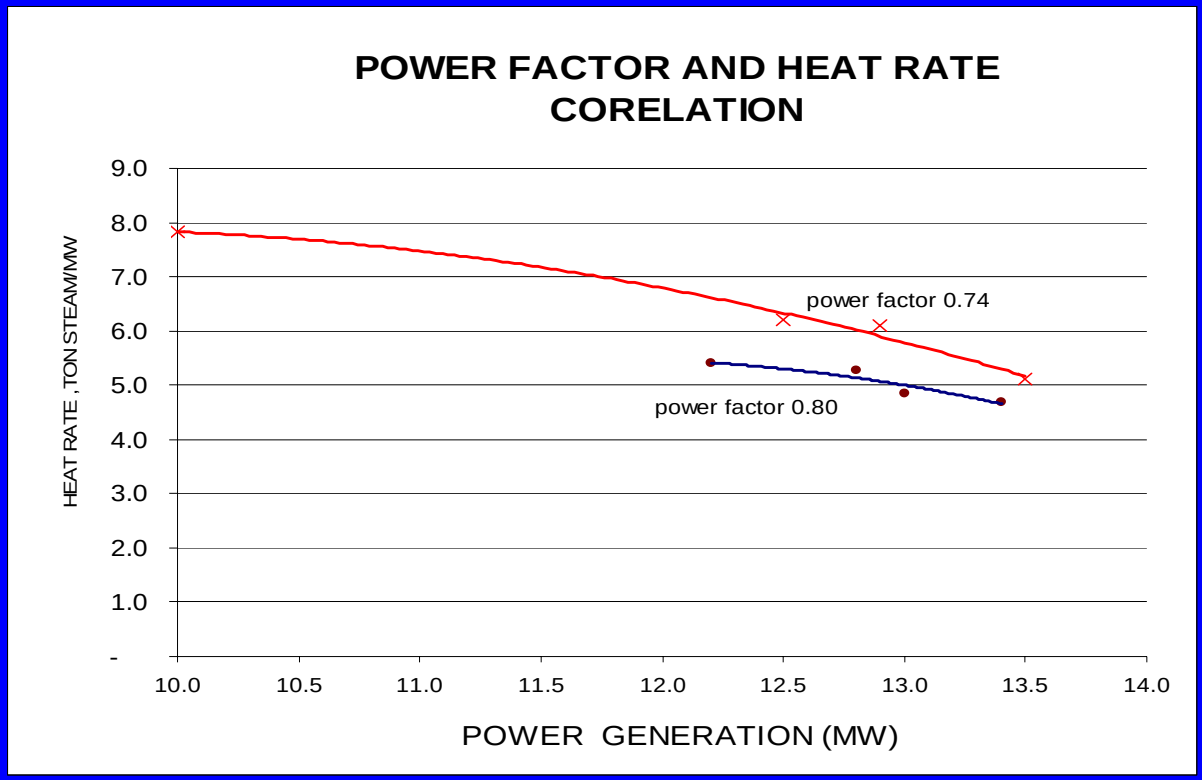
Gas Fired Boiler

Capacitor

Implementation Minor

CONCLUSION

INSTALL/ADDING CAPACITOR



Technical Aspect

1. Less steam consumption, less fuel
2. Turbine operate optimum
3. Less Motor & equipment burn

Economic Aspect

Investment : USD 200,000
Saving : USD 800,000/year
Payback period: ± 3 months

ENERGY CONSERVATION

MINOR

COVER

ENERGY CONSERVATION By PTKL

Aim

Background

Planning

Implementation

Major

Minor

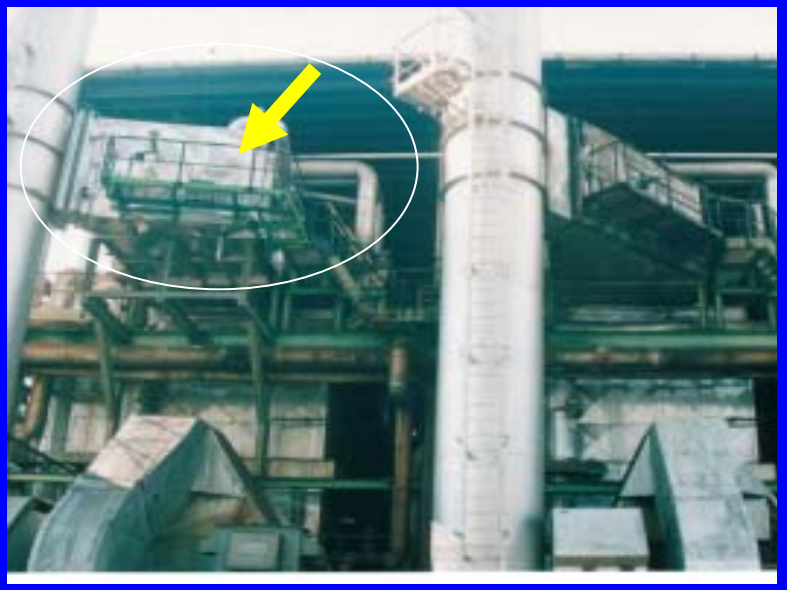
Adding Economizer

Operation PRV

Extract Steam Control

CONCLUSION

ADDING ECONOMIZER



done at 5 power boiler

Stack temperature

Before : 180 °C

After : 160 °C

Efficiency increase: 1%

Each boiler

Investment USD 78,000

Saving USD 28,600/year

Payback period 2.7 years

OPERATION PRV

Problem

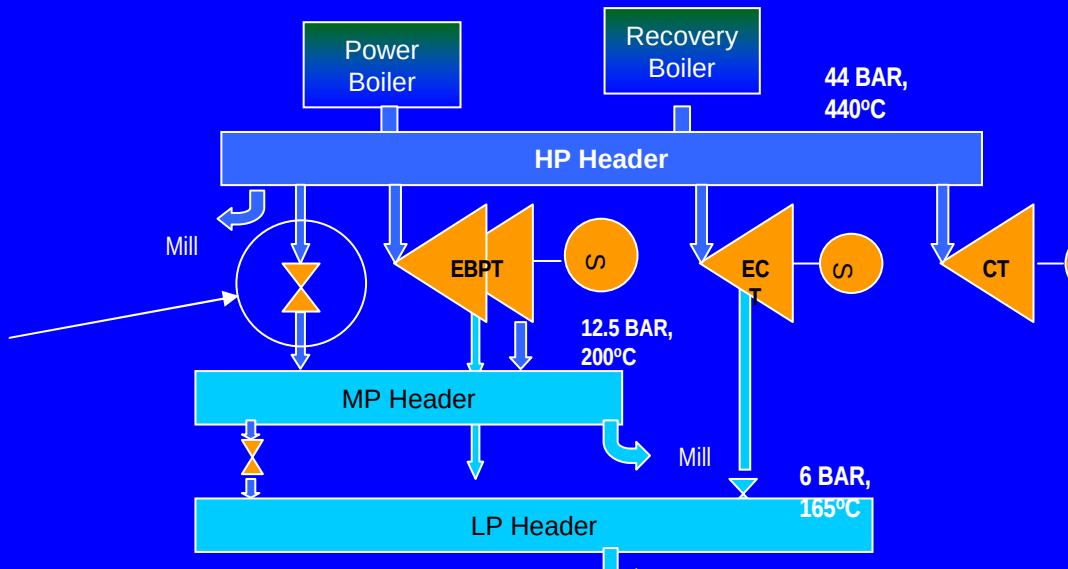
- ✓ Valve slightly sticky and difficult to open once it is closed.
- ✓ Kept manually opened ± 20%, higher than actual demand
- ✓ PRV MP to LP also opened 20% automatically

Program (done)

Repair PRV HP to MP

Result

- ✓ PRV MP to LP closed, efficiency of ECT improve
- ✓ Save expected 1 ton steam HP/hour equal USD 12/hour



EXTRACT STEAM CONTROL

Problem

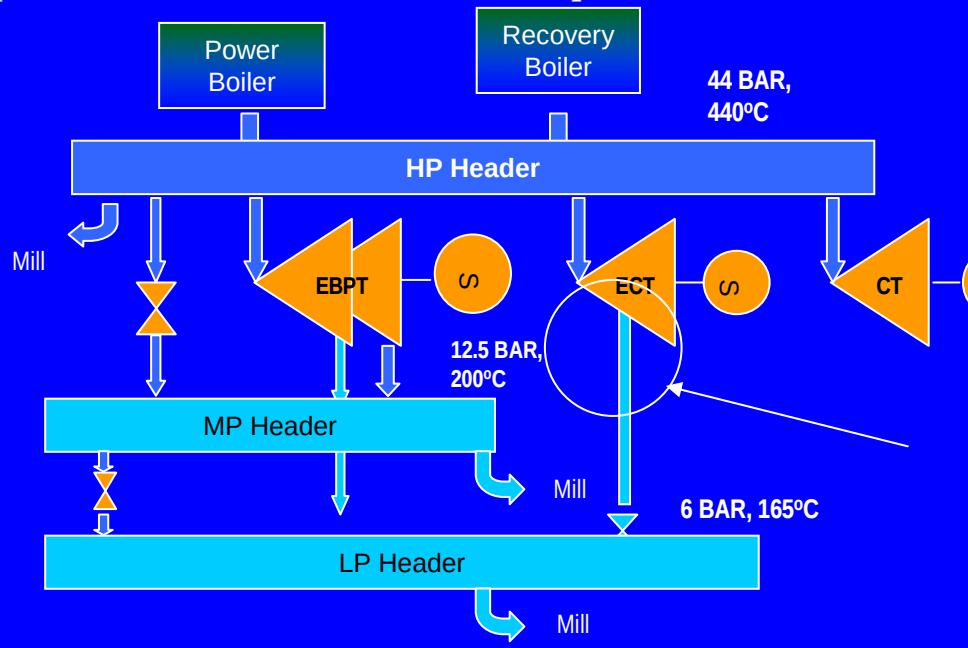
- ✓ Extract steam controlled about 6.5 bar
- ✓ Steam required at paper mill 2.5 bar; 140°C

Program (done)

Reduced pressure controlled to 6.0 bar

Result

- ✓ Improve efficiency of ECT
- ✓ Save expected 1 ton steam HP/hour equal US$ 12/hour



COVER
MILL OVERVIEW
POWER PLANT OVERVIEW
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CONCLUSION

1. Program in energy conversion from fuel oil to gas had been done, apparently to reduce the energy cost from USD 22.05 million/year to USD 11.45 million/year.
2. The future expansionis is changing the fuel from gas to coal
3. Increasing power factor from 0.74 to 0.80 reduce heat rate of power generator up to 6%.
4. Improve power factor by installing new capacitor, target from 0.80 to 0.90 is still in progress.
5. Due to tight production and marketing schedule repairing the shaft of ECT will be done after coal fired boiler build.