



Thirumalai Chemicals Ltd Ranipet, India



History of Thirumalai Chemicals Limited

- Public limited Company
- Started in the Year 1973
- Sales Turnover Rs.400 crores
- Global Leader for all products
- TCL – India & TCL – Malaysia together has the largest capacity in the world to produce Maleic Anhydride

Our products & Applications

Phthalic Anhydride – 87, 000 Tons / Year



Paints



Plasticizers



Polyester Resins



Maleic Anhydride – 17, 750 Tons / Year



Polyester Resins



Pharmaceuticals



Paints

Malic Acid

Food Acids – 17, 000 Tons/Year

Soft Drinks



Candies



Pharmaceuticals



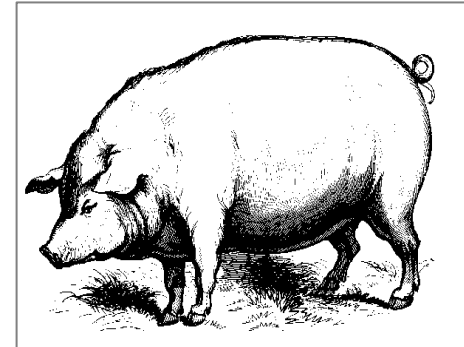
For Manufacturing Cheese



Fumaric Acid

Food Acids – 17, 000 Tons/Year

Soft Drinks



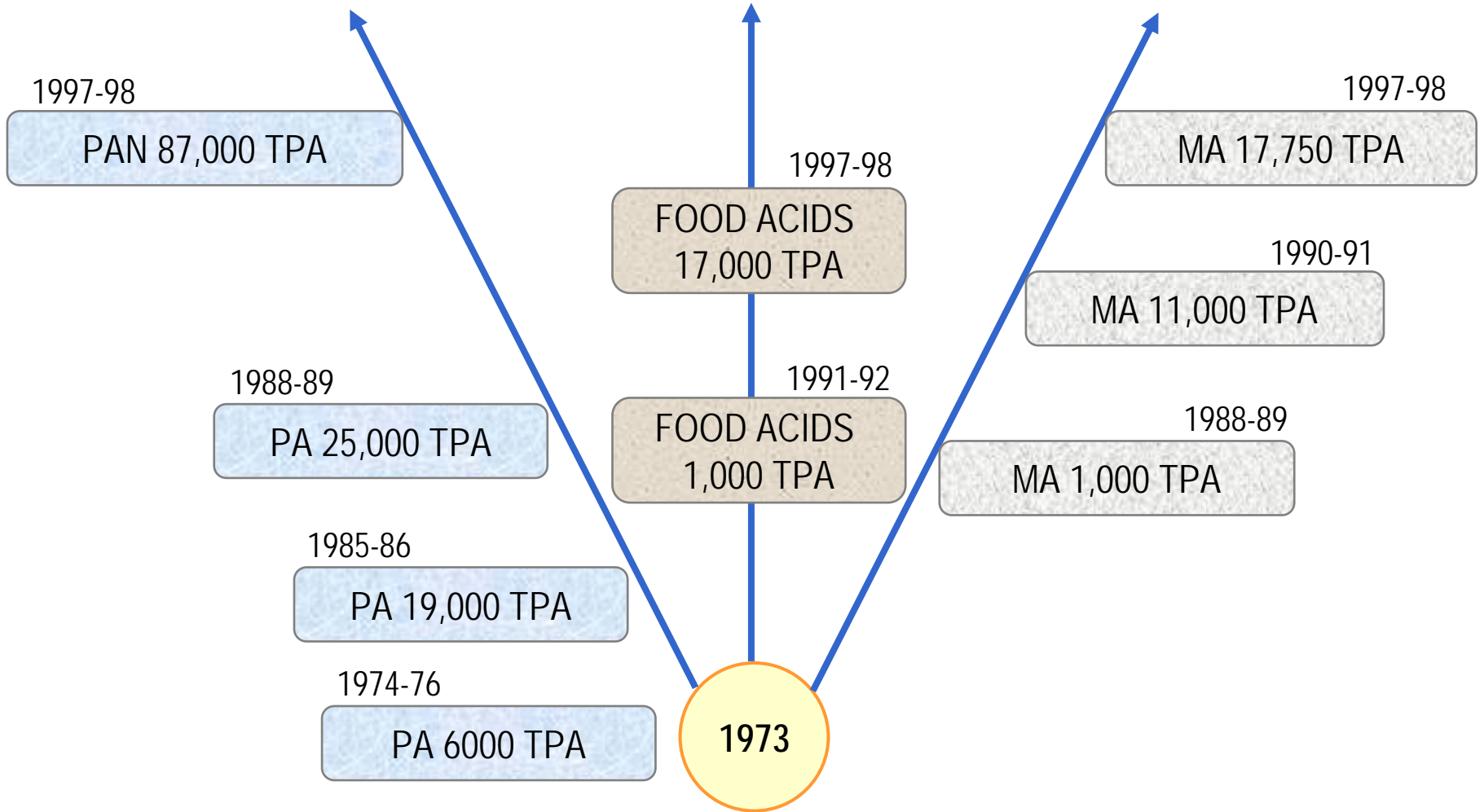
Animal Feed



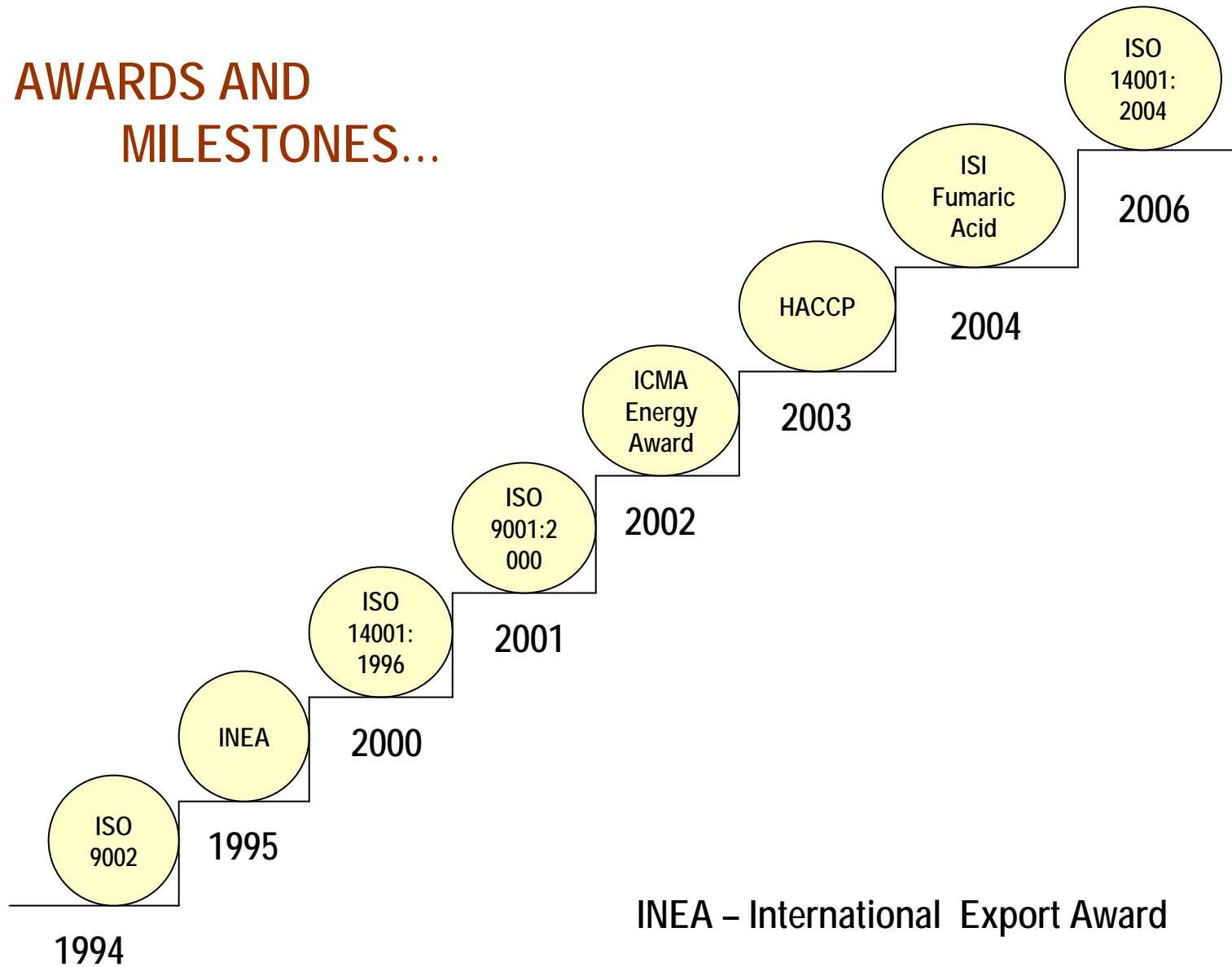
Candies



Organizational Growth



AWARDS AND MILESTONES...



INEA – International Export Award

Importance of Energy Management in TCL

Importance of Energy Management in TCL

- TCL, being a Petro chemical Industry, is energy Intensive.
- Energy cost contributes to about 3-4 % of the manufacturing costs and is next to raw material cost.
- The increased competition and raising prices of Power & Fuel demands cost reduction in all respects for survival.
- The prime focus is on Energy cost reduction through efficient waste heat recovery, conservation measures and productivity improvement.
- The main emphasis is towards **Generation, Distribution and Usage of Steam & Power** as efficiently as possible.

Establishment of Energy Cell in TCL

- Opportunities to implement energy conservation activities.
- Formed a separate energy cell in the Year 2000.
- Energy Cell comprises of an Energy Manager & Energy Engineer.

Activities of Energy Cell in TCL

Energy Cell's main role is to Facilitate Energy Conservation activities to optimize Energy Consumption

Activities:

1. Data collection:

- a. Steam generation & consumption
- b. Power generation & consumption
- c. Fuel consumption

2. Preparation of Steam & Power balance for entire network

3. Calculation of daily energy cost through a separate Energy Module for various products

4. Efficiency calculations of high energy generating equipments like Turbines, Turbo blowers & fired heaters.

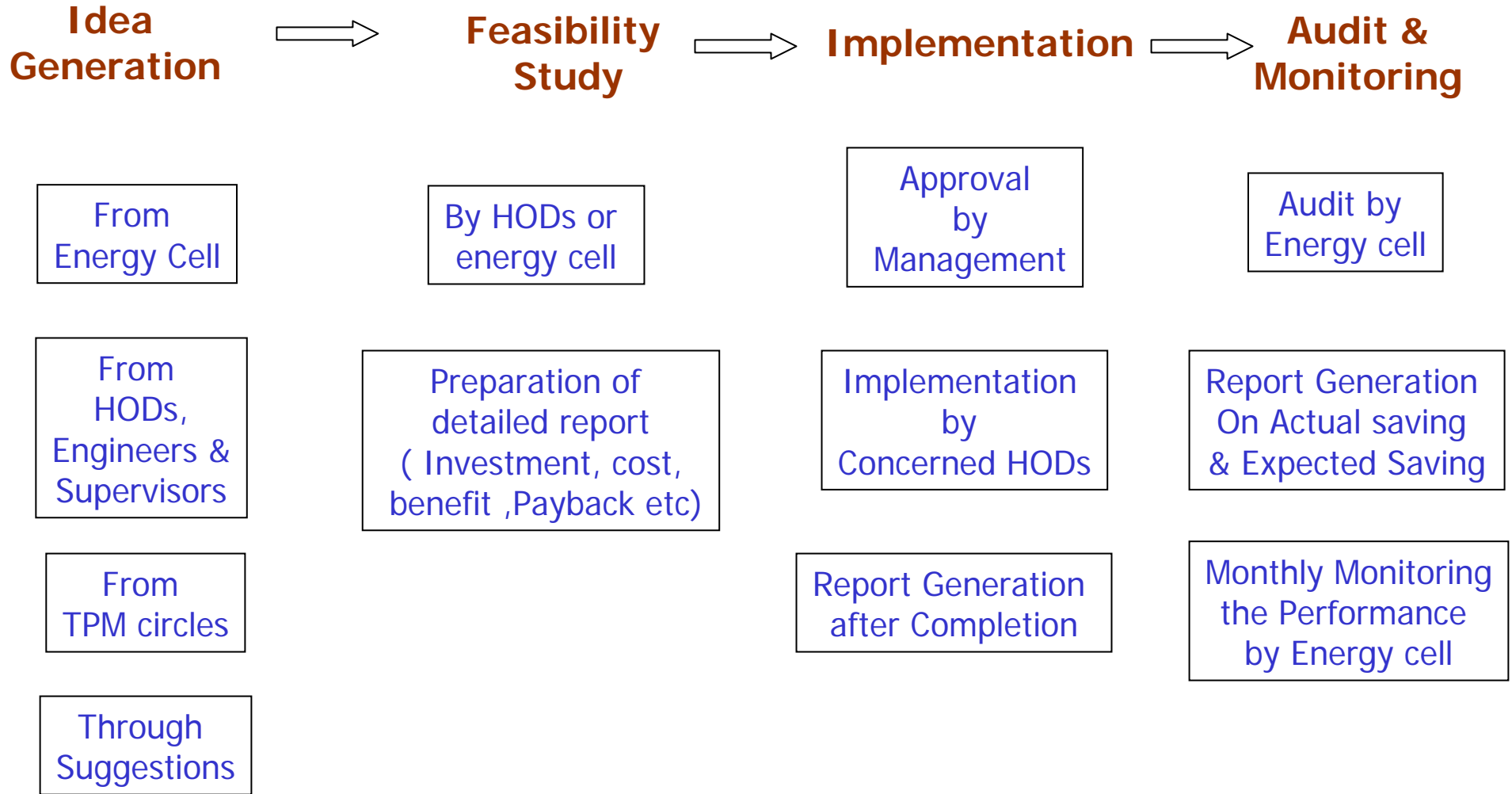
Activities of Energy Cell in TCL

Contd...

5. Analyzing & taking immediate Corrective actions for daily deviations
6. Monitoring of instrument air generation & consumption
7. Maintaining records for daily deviation to eliminate for future occurrences
8. Calculating daily losses (venting & failure losses)

ENCON Methodology

ENCON Methodology







Energy Conservation Activities
Carried out
in **Electrical** Systems

Energy Conservation Activities

1. Stoppage of unnecessary & Idle running drives
2. Conservation using V.F.D.
3. Power Reduction using Pulley Changing.
4. Capacitor provision to improve power factor
5. Frequency reduction in the generating point
6. Voltage Reduction in Feeder from 500V to 415V
7. Segregation of Low & High Head Cooling Water Pumps.
8. Installing Energy Efficiency Motor.
9. Energy efficient lamps
10. Providing LED Lamps for Panel Indication.

Various Power Reduction Activities

- ✍ Variable frequency drive
 - Speed Reduction 
- ✍ Downsizing the motors
 - Lower Capacity motor 
- ✍ Pulley size changing
 - Speed reduction of Drives 
- ✍ Energy Conservation in Cooling Water System 



Case Study –

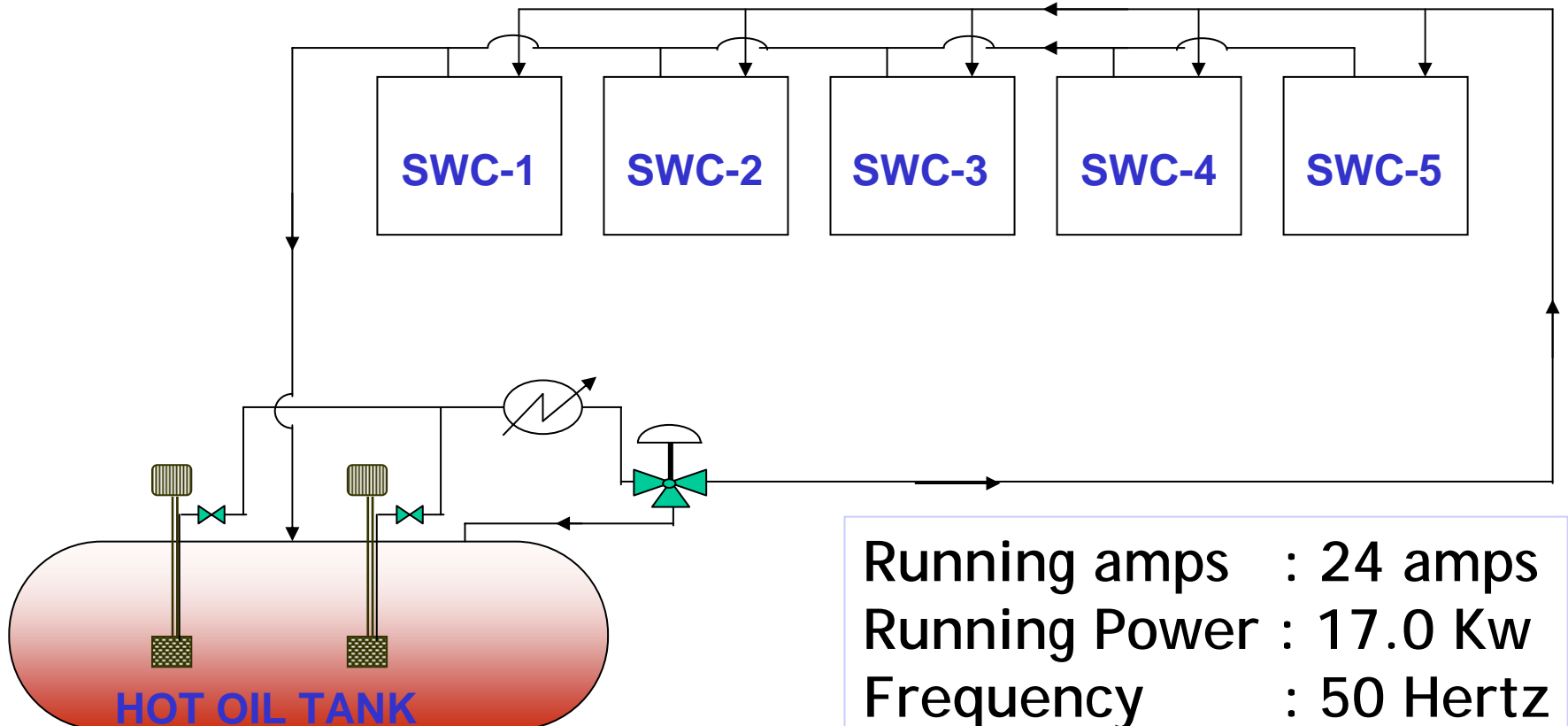
**Energy conservation in
Hot Oil Circulation Pump using VFD**

I - VFD Installation in Hot Oil Pump (PA Plant)

Before Condition:

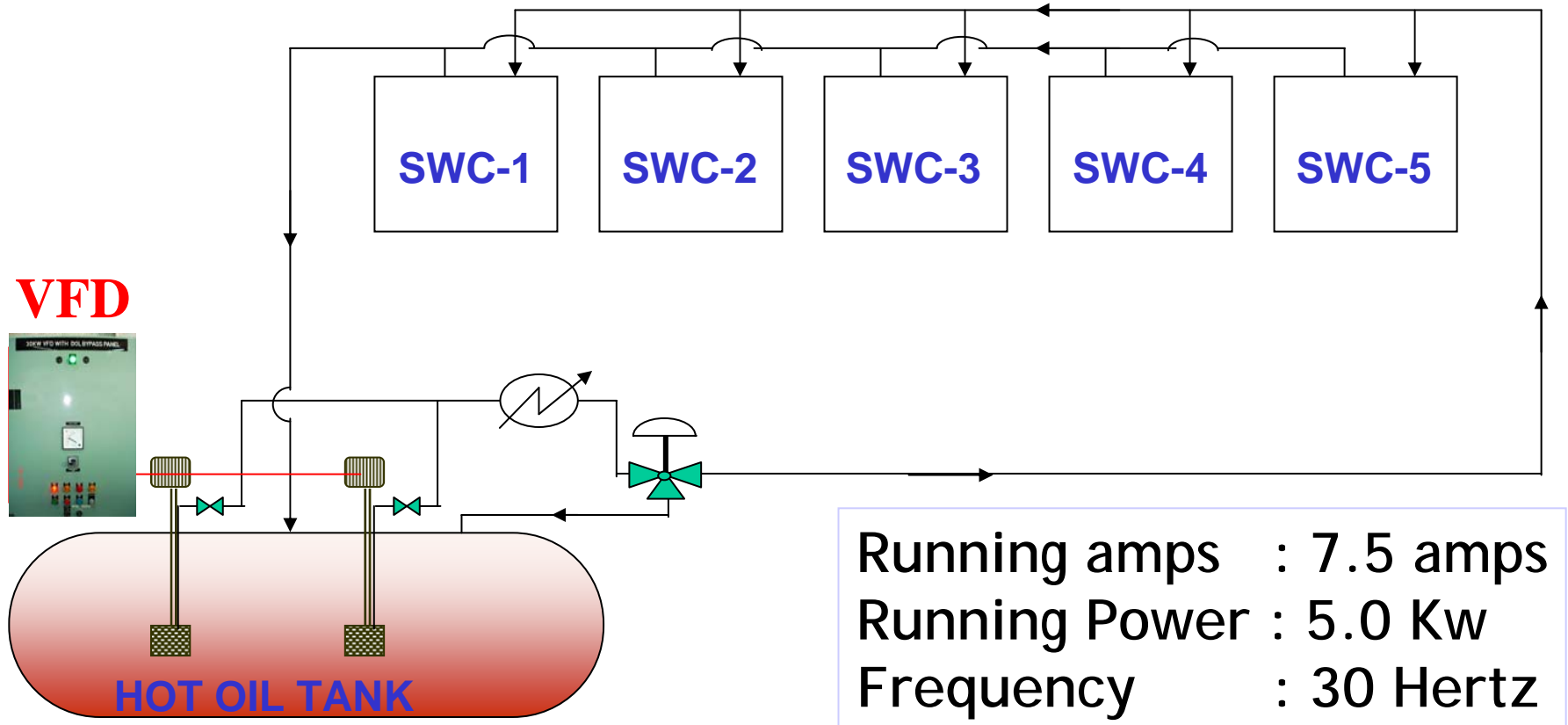
- * During re-cooling, hot oil is re-circulated bypassing SWC. Hence scope for Power reduction.

HOT OIL SYSTEM



After Condition:

- * Power reduction can be achieved by **reducing the speed** by reducing the frequency.
- * Interlocked with the recycle valve.
- * The flow at the reduced speed is sufficient to maintain the hot oil temperature.



RESULT

MELTING CYCLE

Running amps : 24 amps

Running Power : 17.0 Kw

Frequency : 50 Hertz

RECOOLING CYCLE

Running amps : 7.5 amps

Running Power : 5.0 Kw

Frequency : 30 Hertz

Power Savings : 12 KwHR = 0.288 Lakh kwh/Annum



Energy management

Case Study

Elimination of Power Loss in MA plant

BEFORE

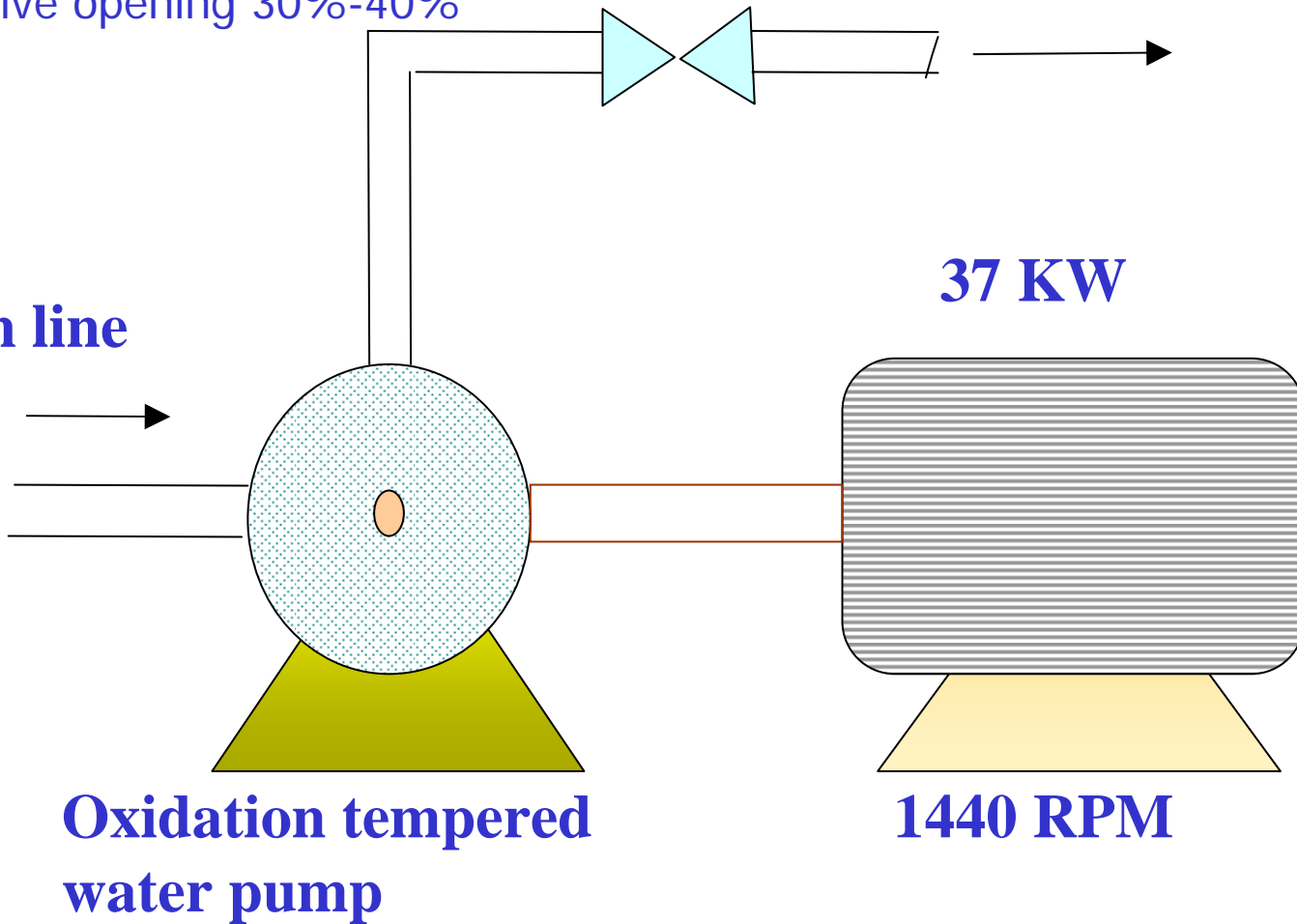
Speed 1440 rpm

Motor 37 KW

Discharge valve opening 30%-40%

30-40 %

Suction line



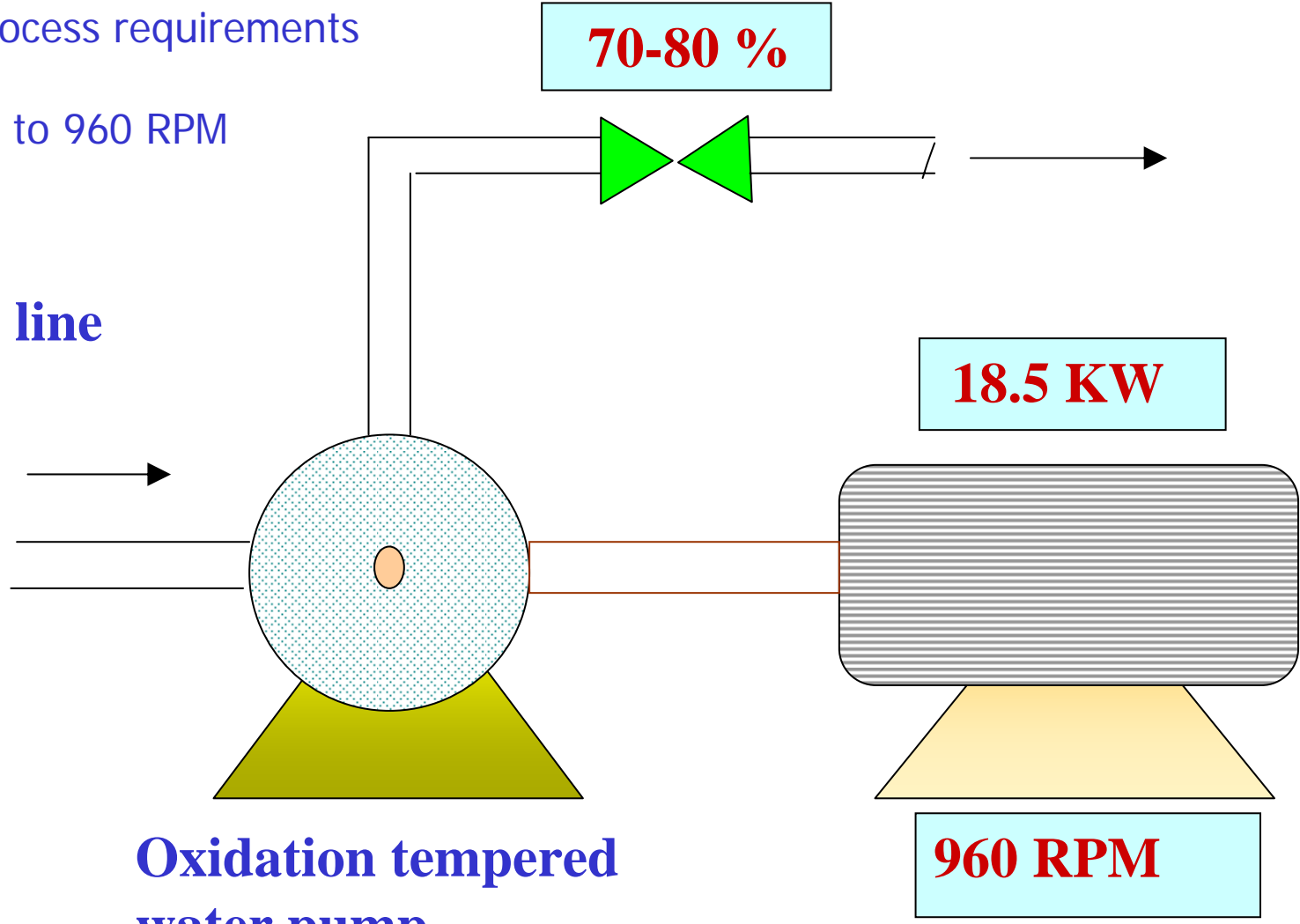
AFTER

Using VFD RPM reduced to 960

Satisfies the process requirements

Motor changed to 960 RPM

Suction line



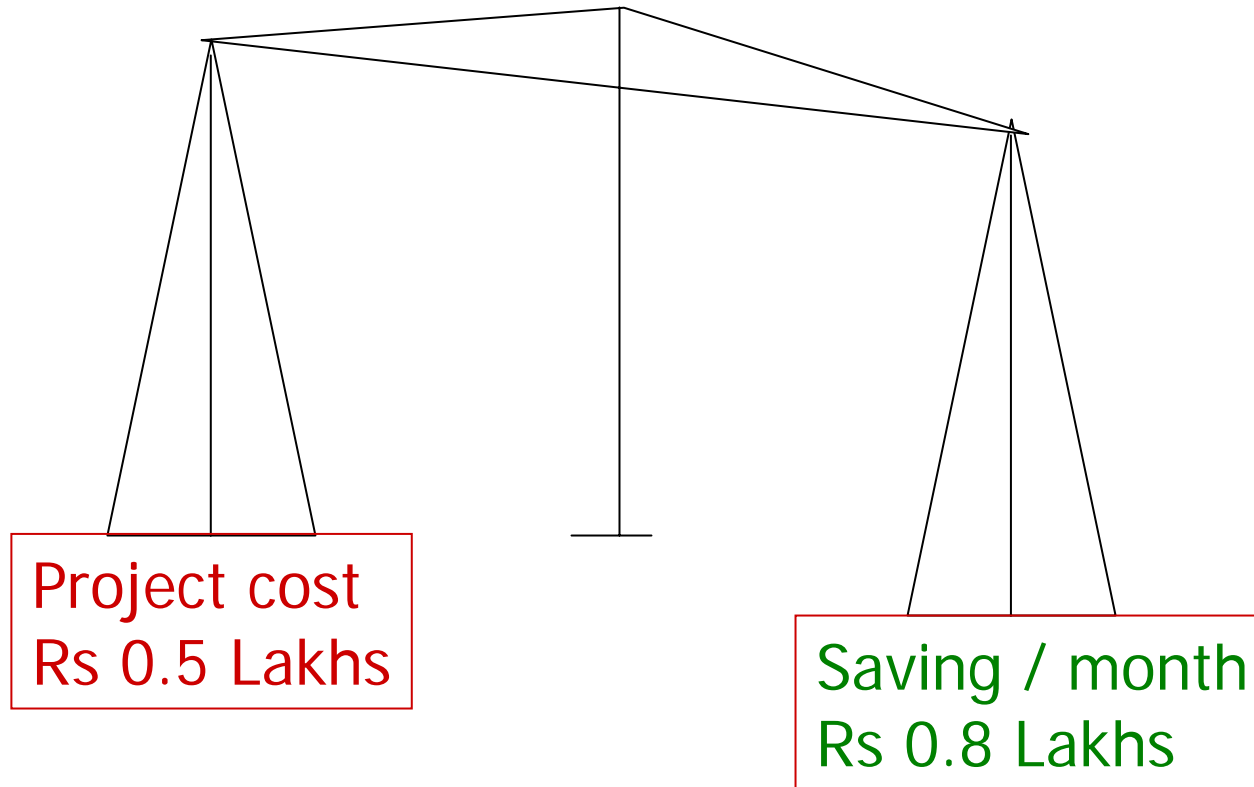
Oxidation tempered
water pump

18.5 KW

960 RPM

70-80 %

COST BENEFIT



Pay back 20 days



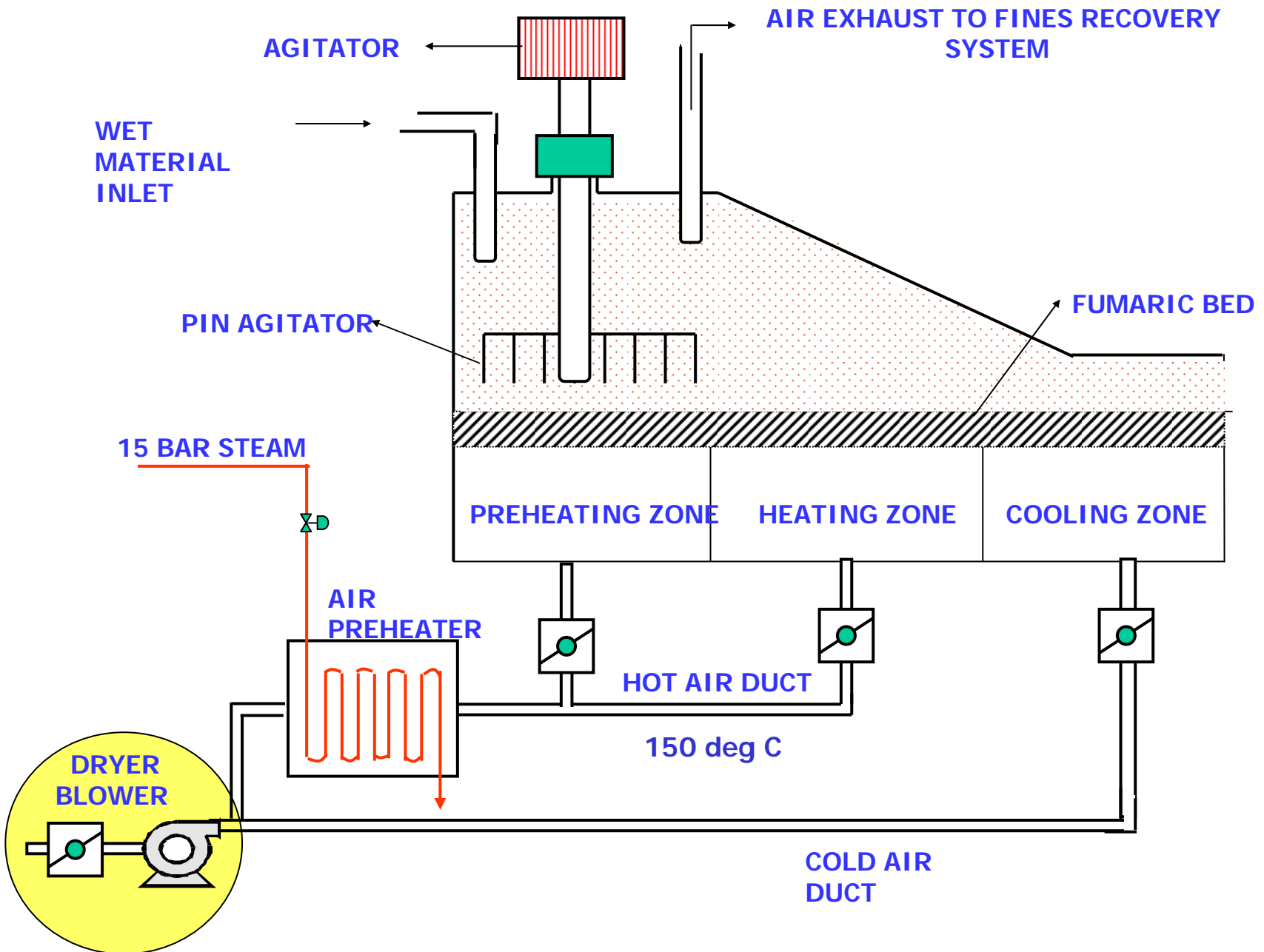
Energy management

Case Study

Power Reduction in Blowers

(FUMARIC ACID PLANT)

Process of Fumaric Acid Drying

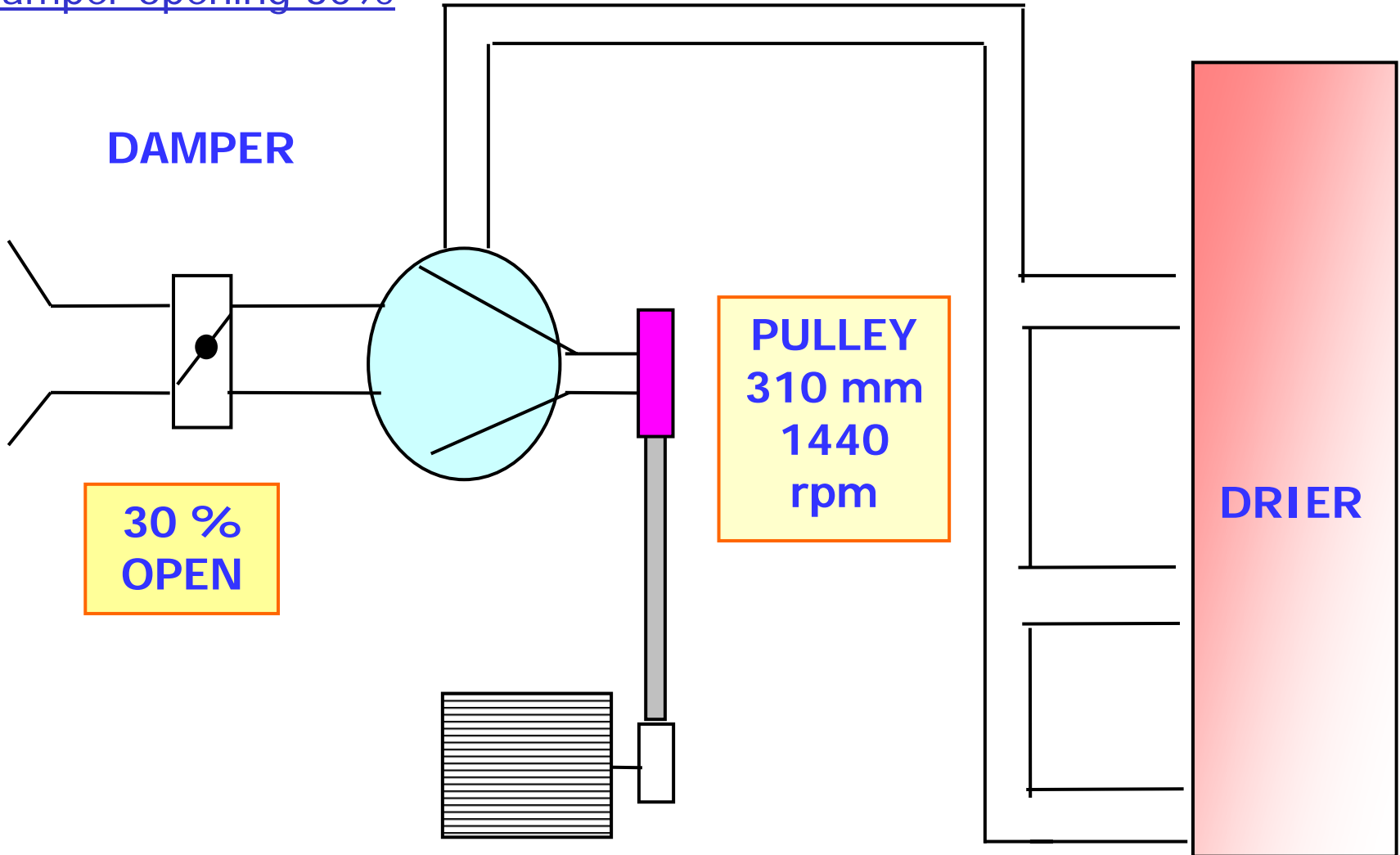


BEFORE

HIGHER CAPACITY OF BLOWER

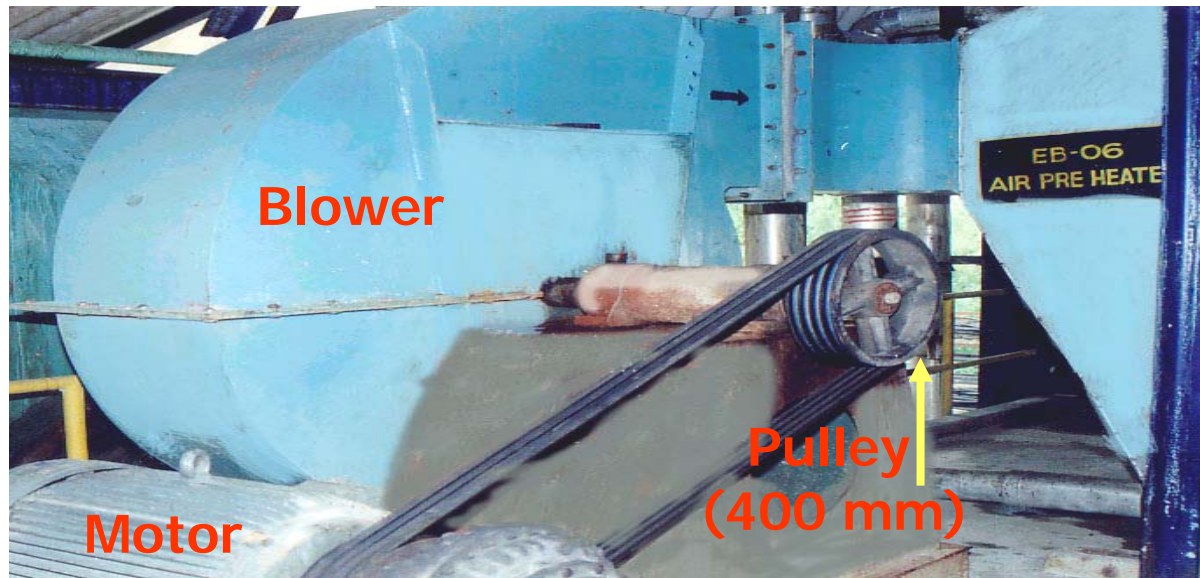
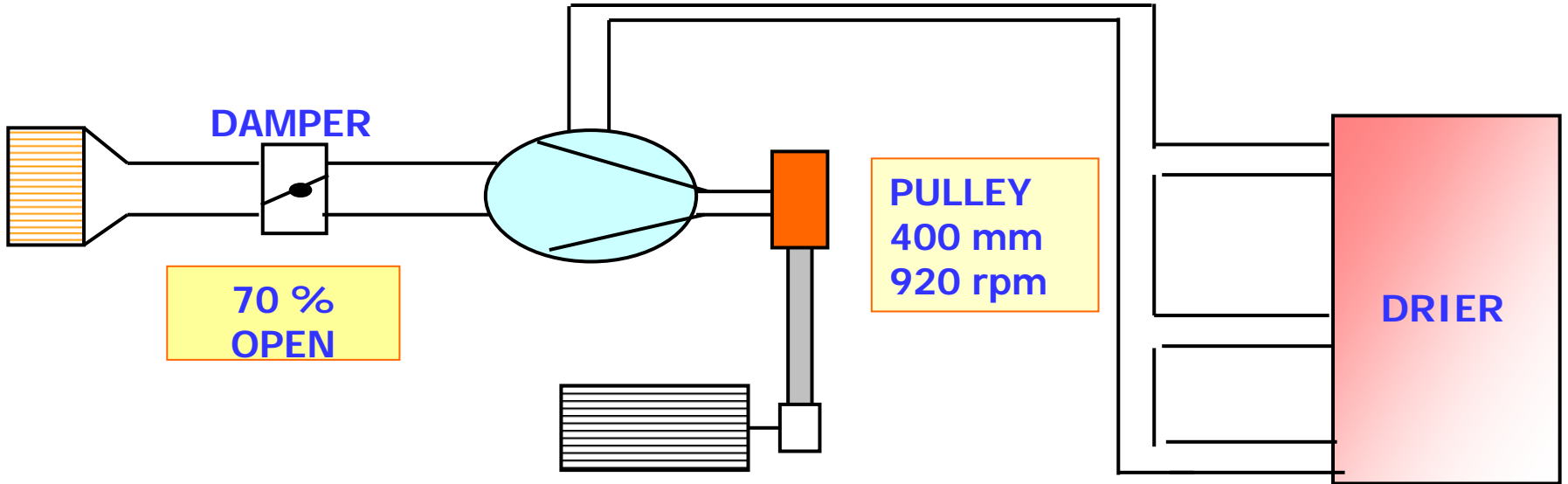
SPEED-1440 RPM

Damper opening 30%



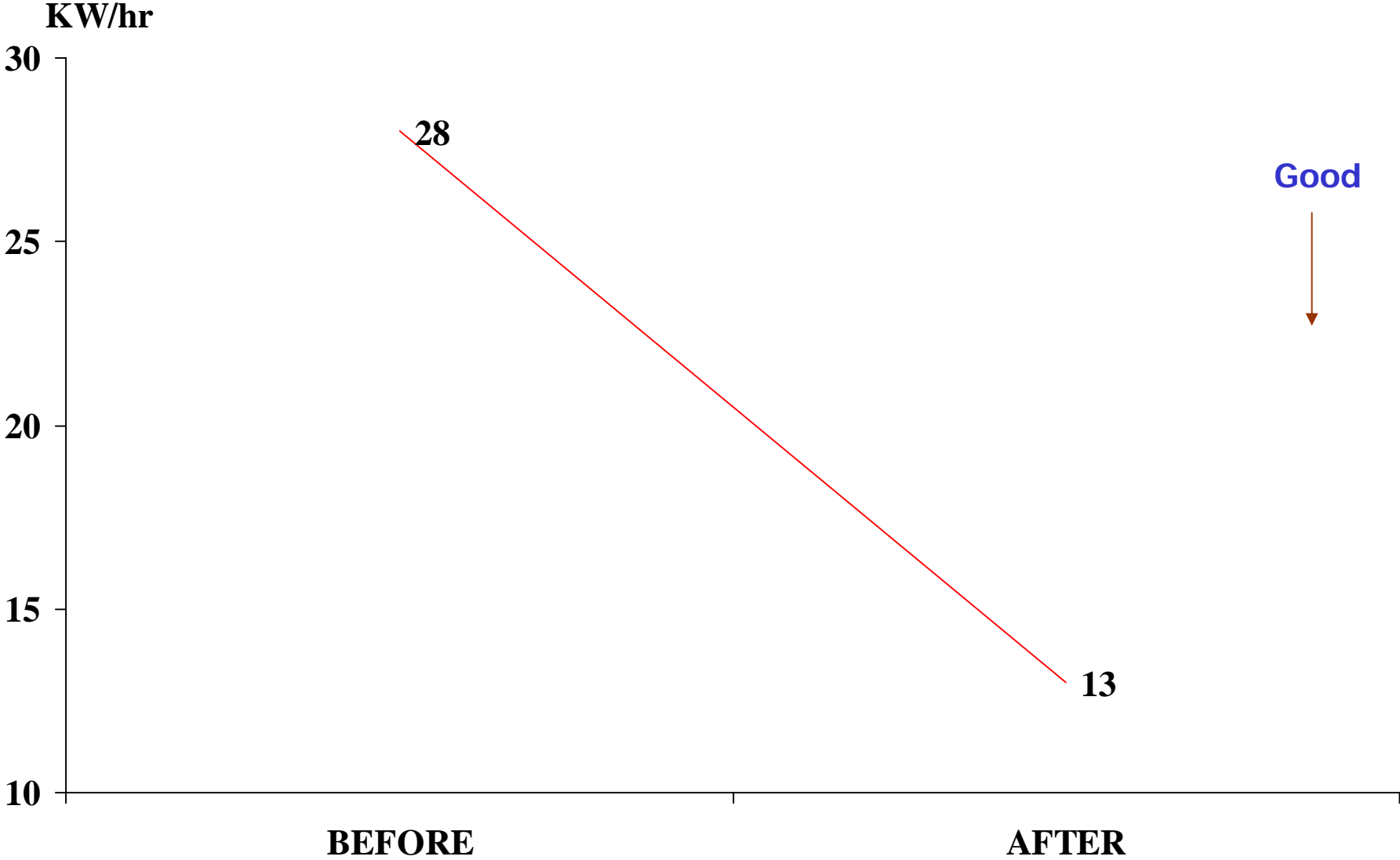
AFTER

DAMPER OPENING INCREASED TO 70% BY REDUCING THE SPEED TO 920 RPM BY CHANGING THE PULLEY SIZE TO 400 MM

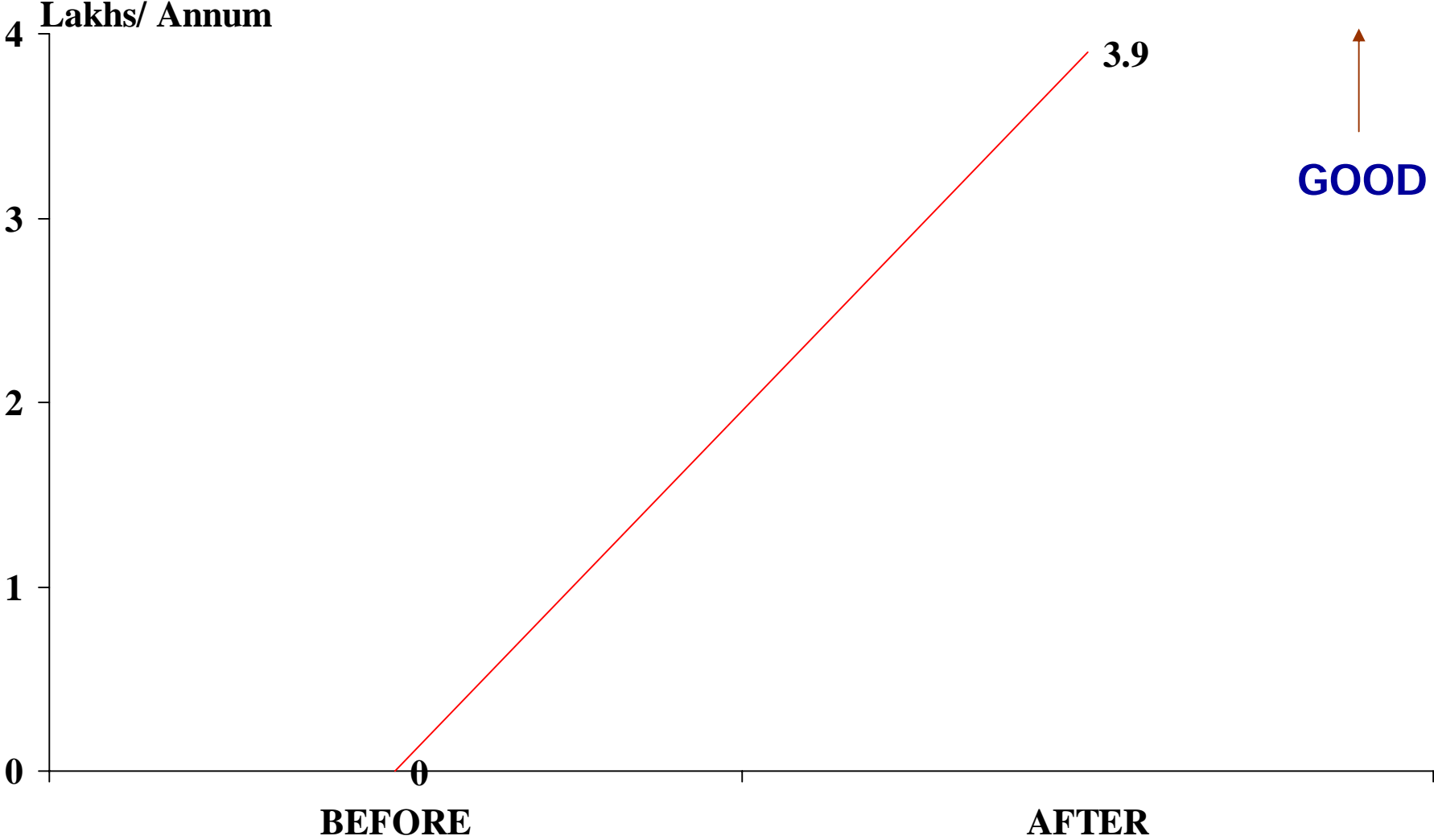


RESULTS

REDUCTION IN POWER CONSUMPTION



BENEFIT



ROI



ENERGY MANAGEMENT

Case Study –

**Energy conservation in
Cooling water system**

BACKGROUND

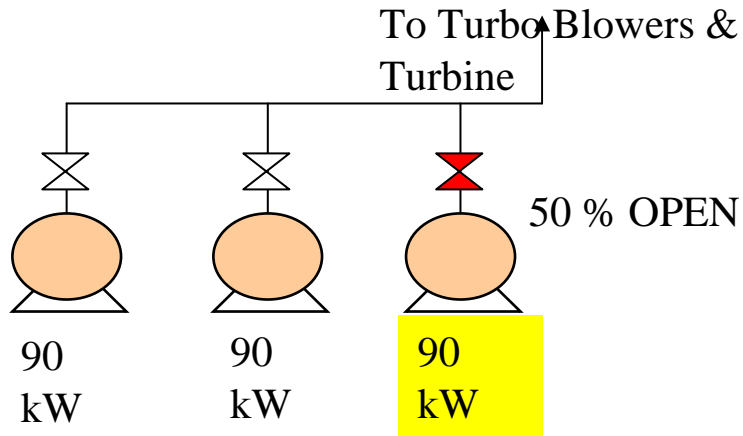
High Power consumption in Utility cooling water system during part load operation

ANALYSIS

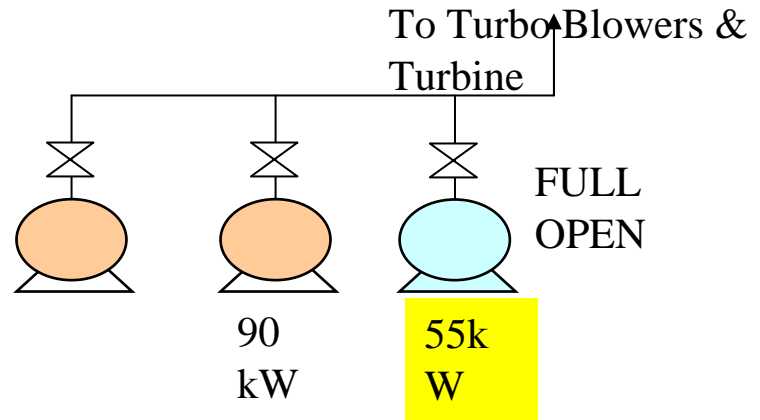
- ❖ Three High capacity (90 kW) Cooling water pumps are in operation for serving Two Turbo Blowers & one Turbine generator.
- ❖ During Part load operation (One TG & One Turbo blower) all three high capacity pumps has to run.
- ❖ No Low capacity pumps is available to satisfy part load operation
- ❖ System studied and provided one low capacity 55 kW cooling water Pump.

KAIZENS

Before

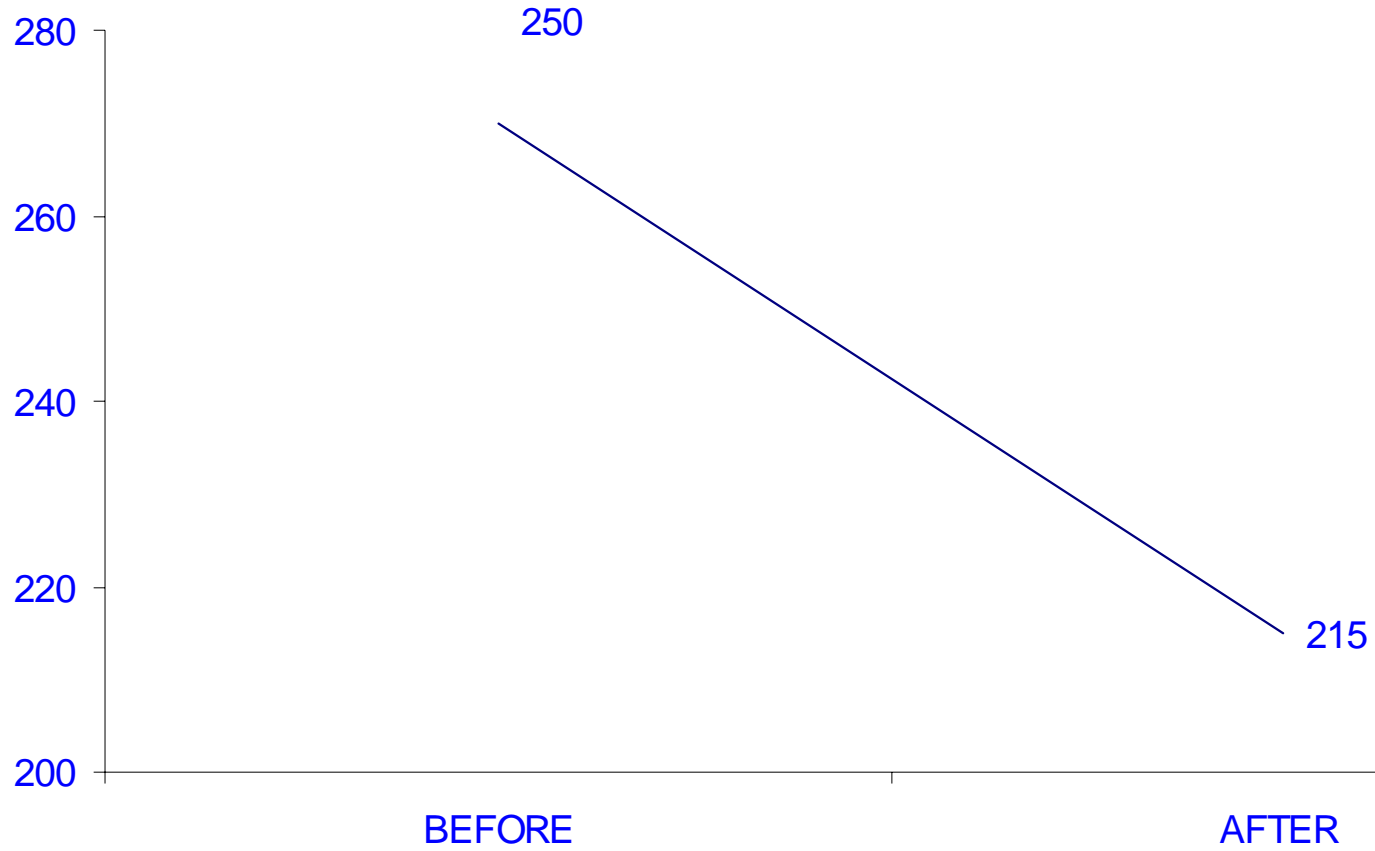


After

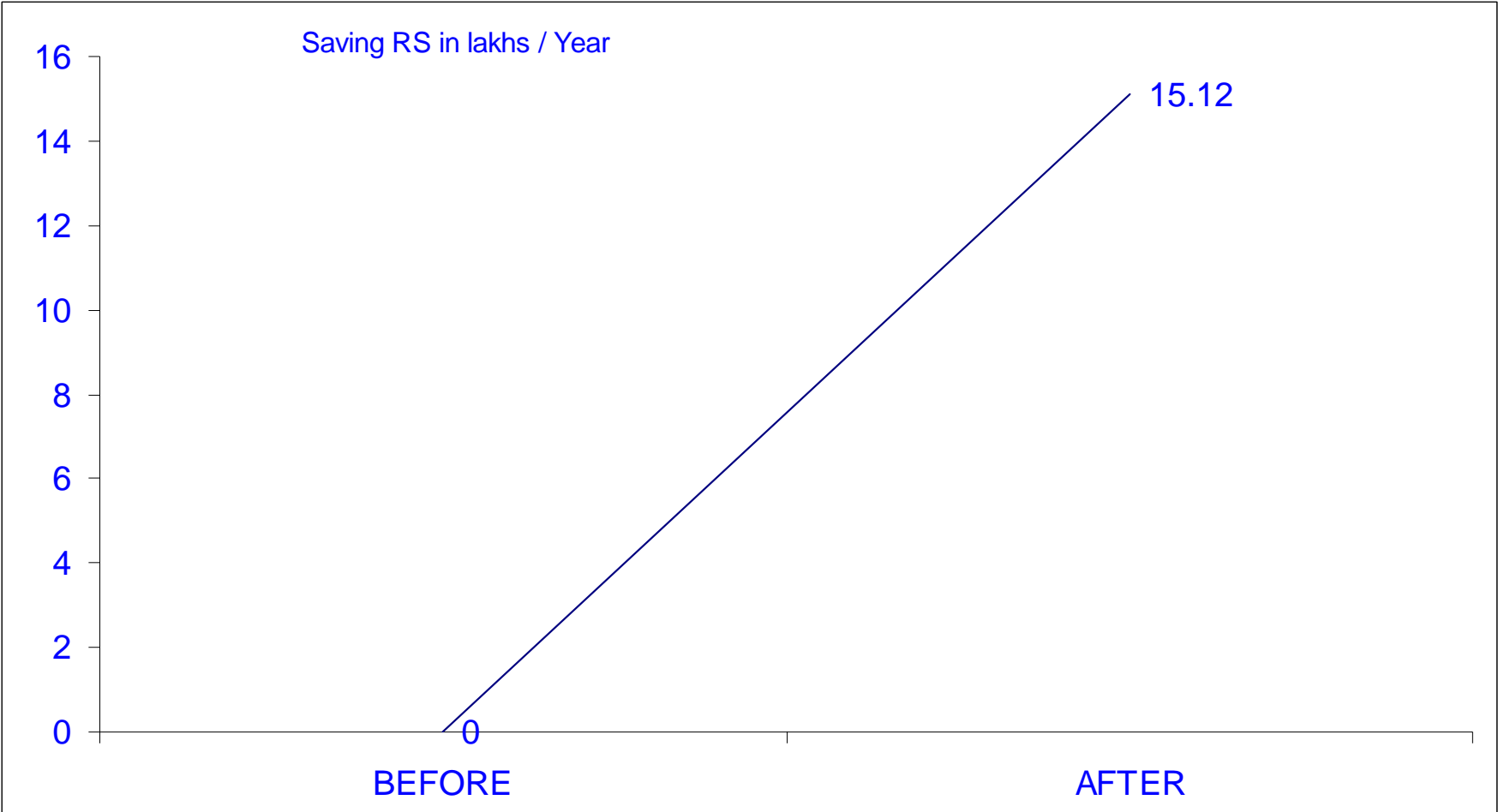


RESULTS

Power Consumption
kW / hr



BENEFIT



Energy Conservation Activities
Carried out
in Thermal Systems

Energy Conservation Activities

- Implementation of Co-Generation System
- Introducing new Flash Drums
- Insulation of Chimney
 - To Reduce Flue Gas Temperature from 220°C to 200°C
- Increasing Productivity thereby increasing Steam Generation
- Steam Trap Performance Checking using Ultra Probe-2000
- Process Modification in Distillation Batches
 - Reduction in Steam Consumption
- Optimizing Air PreHeater Steam Consumption.
- Steam Leak Arresting using a separate Team



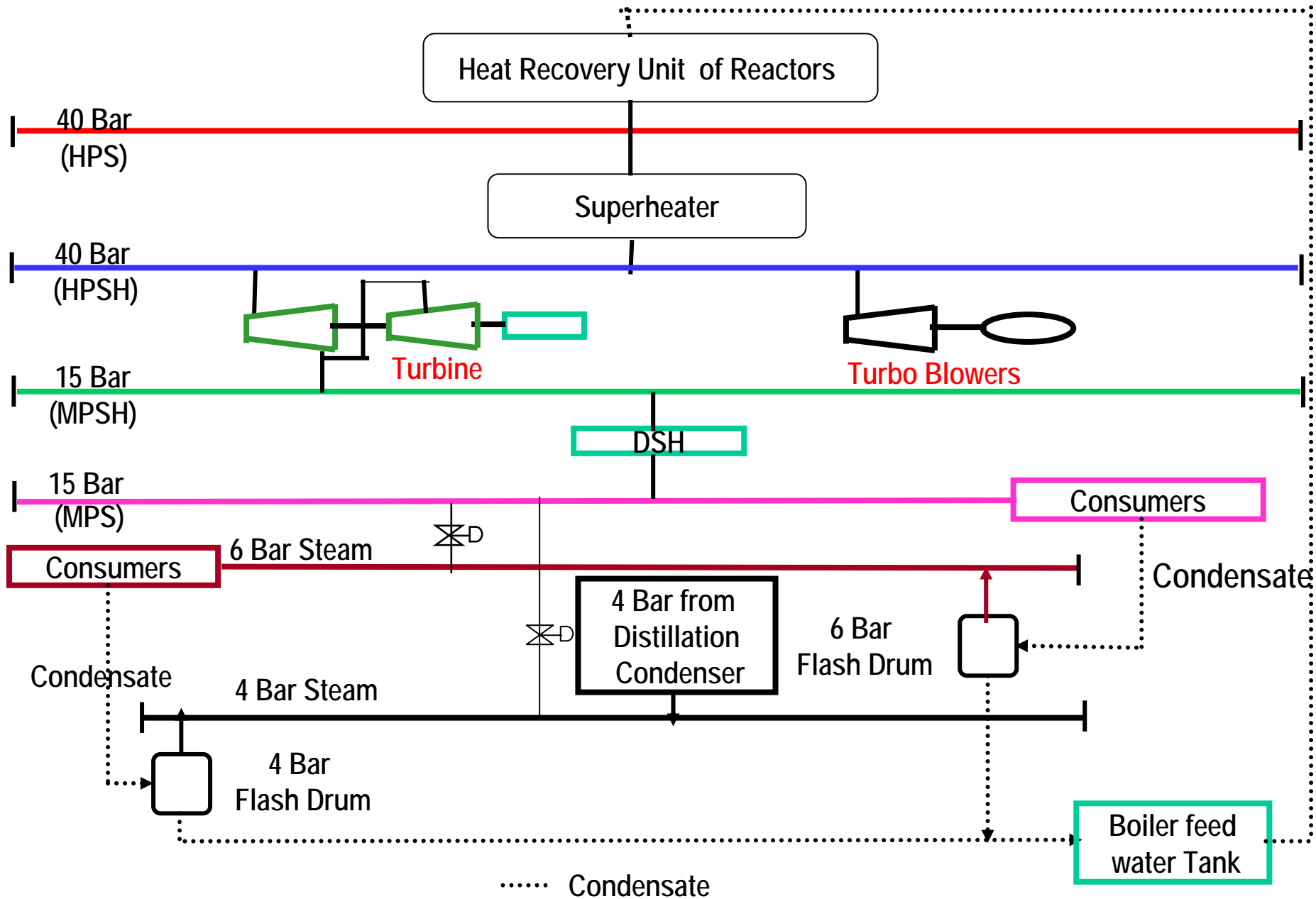
Energy management

Case Study

Implementation of Co-Generation System

Co-generation system in TCL

Contd...



Co-generation system

Contd...

- Our processes are designed to utilise all heat liberated from exothermic reaction
- Generation of high pressure steam (40 bar)
- Meets both Process heating & Power requirements
- Our process requires steam at various Pressures.
- Installed a 5 MW Turbo generator (Extraction cum Condensing)
- The extraction steam meets process requirements.

Best Practices in Co-generation system

- Steam driven Turbo blowers meet our process air requirement
- Medium pressure flash drums in condensate network, to recover steam at 6 bar.
- Generation of 4 bar steam from distillation condenser
- Recovery of 4 bar steam from Medium pressure condensate, through flash drum
- 4 bar steam is used for process heating
- All the steam condensate after heat recovery is diverted to Boiler feed water tank in order to utilize the sensible heat.



Case Study

Energy conservation in Steam Network

Implementation of New HP Flash Drum

BACKGROUND

- Generation of 4bar Steam from 40bar, 15 bar condensates.
- Generation of 4 bar steam is in excess.
- Venting of 4 bar steam.

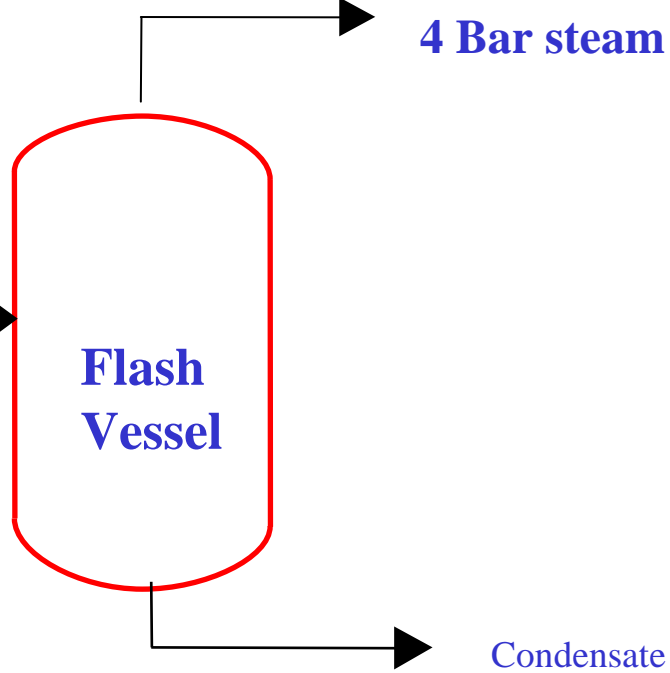
ANALYSIS

- In normal Plant operation, venting of 4 bar is resulted.
- During the shutdown period of downstream plants, venting of 4bar steam is high.
- 6 bar demand for plant heating is met by letting down from 15bar to 6 bar .
- So it is planned to flash 40,15bar condensates into a new Medium pressure flash drum to generate 6 bar steam.

Before:
4 Bar Steam Vented to Atmosphere

High Pressure Condensate

Low Pressure Condensate



After:
6 Bar Flash Drum Introduced

Low Pressure
Condensate

**4 Bar
Flash
Vessel**

High Pressure
Condensate

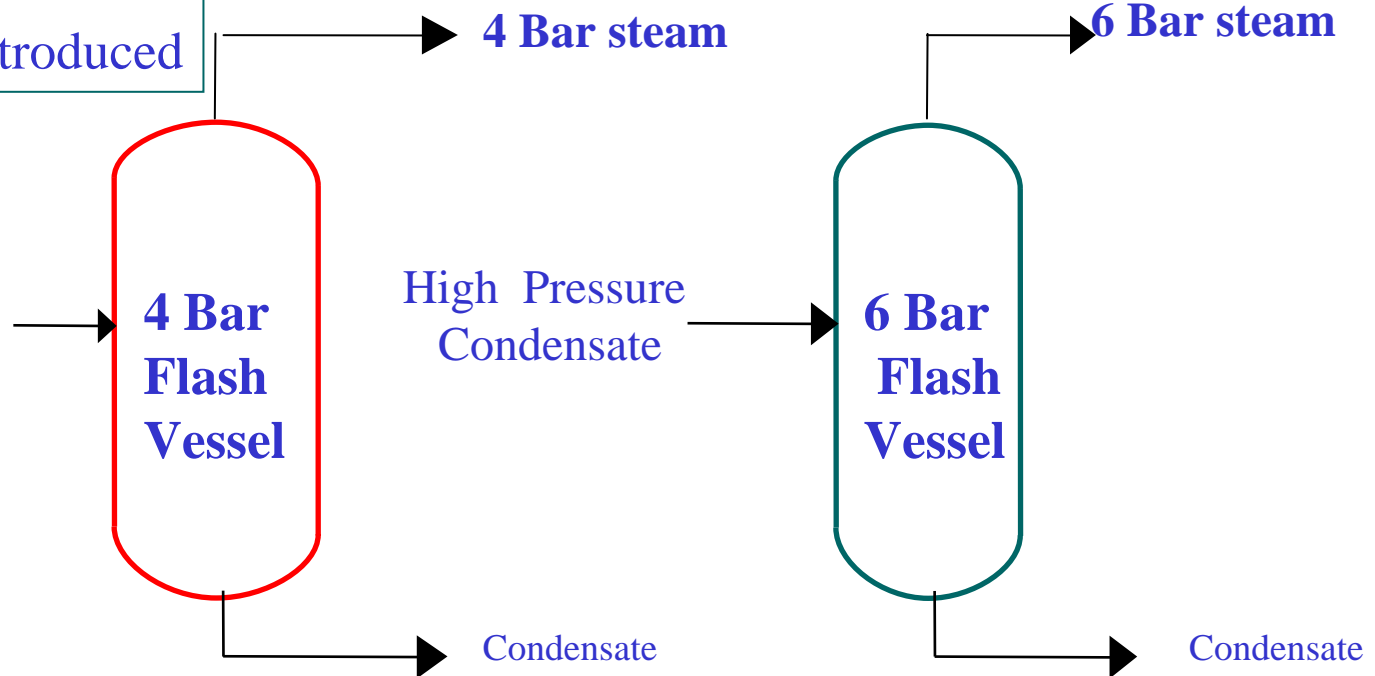
**6 Bar
Flash
Vessel**

4 Bar steam

6 Bar steam

Condensate

Condensate



RESULTS

- Venting of 4 bar steam is minimized
- Cost Saving is Rs.3.5lakhs/month.
- Horizontal Implementation in another Plant.

BENEFIT



Extent of Team Work in ENCON Activities

Contribution of Workmen / Supervisors

- Identifying / eliminating energy related abnormalities through O&M

Concept

- Monitoring & taking corrective actions through Daily Work management
- Concept of Small group activities has given a clear approach & idea on

loss elimination techniques

- Most of the abnormalities like steam leaks, Instrument air leaks,

Condensate leaks are attended by Operators themselves

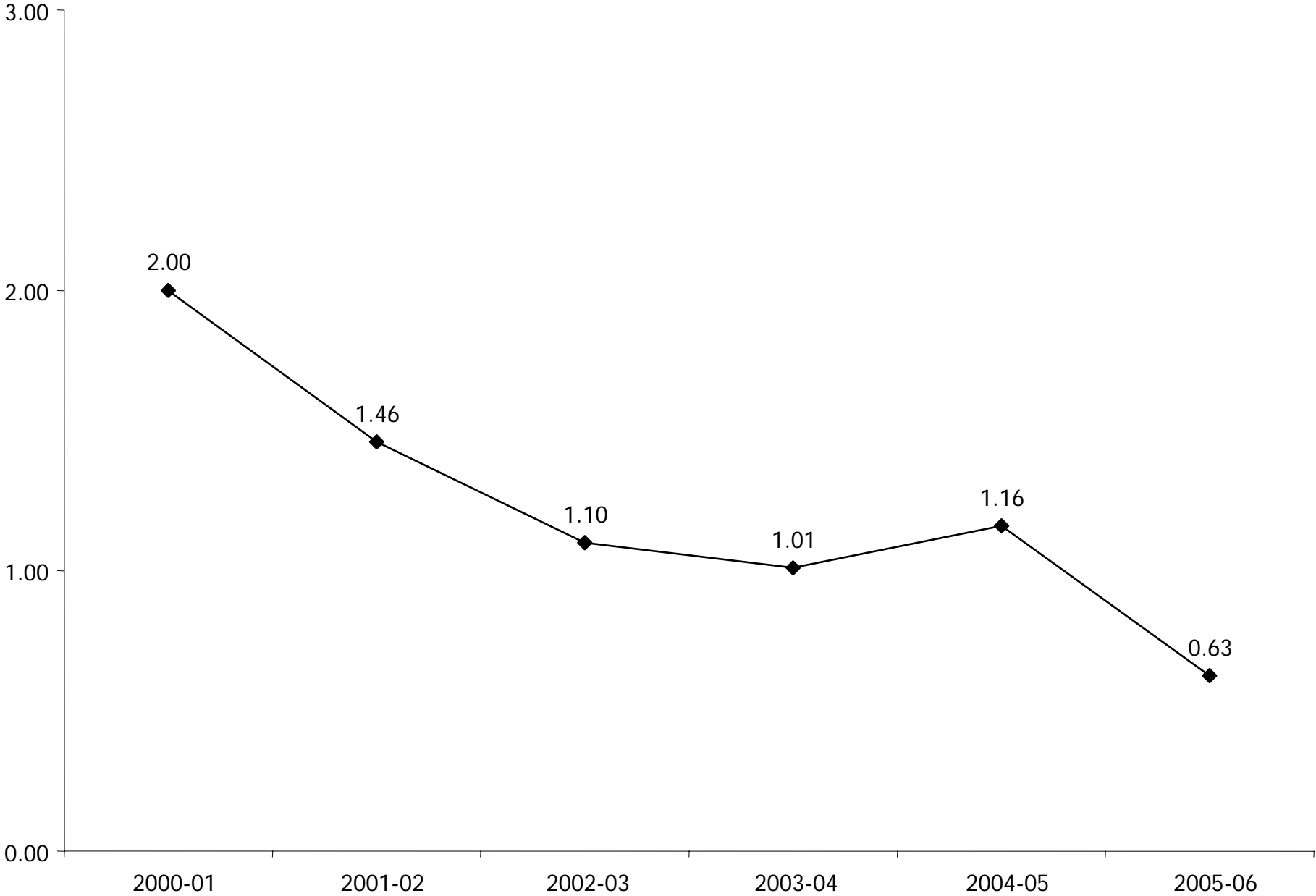
Contribution of Workmen / Supervisors **Contd..**

- Steam traps inspection & skin temperature measurements are being carried out by respective plant supervisors
- Energy week & Suggestion scheme motivates our employees to give innovative & creative suggestions
- Every employee is involved in one or other of the energy conservation activities implemented in his plant which gives them a sense of accomplishment

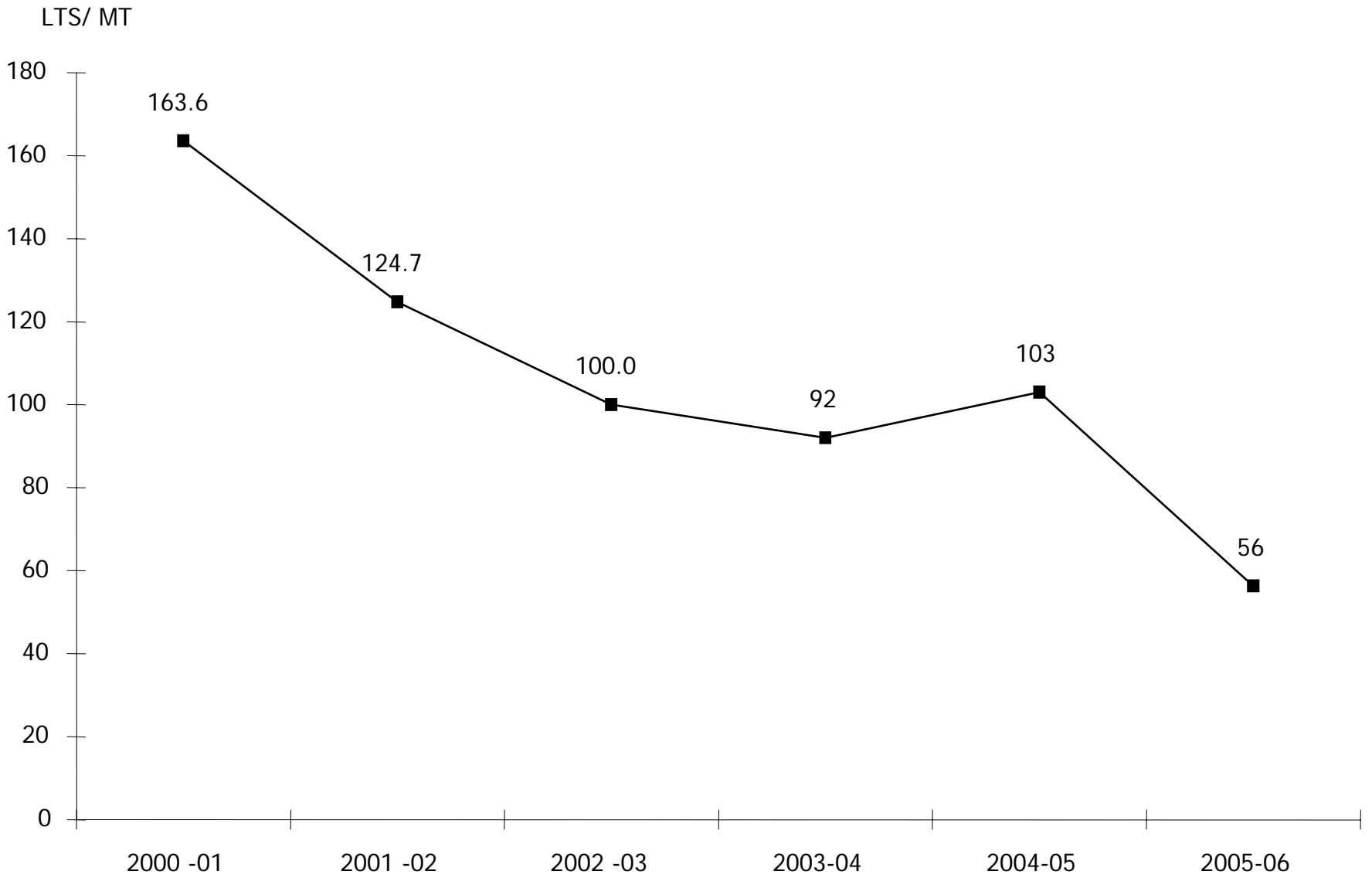
Overall Results

Specific Energy Consumption in Million K.cals / MT of Product

MILLION K.cals / MT

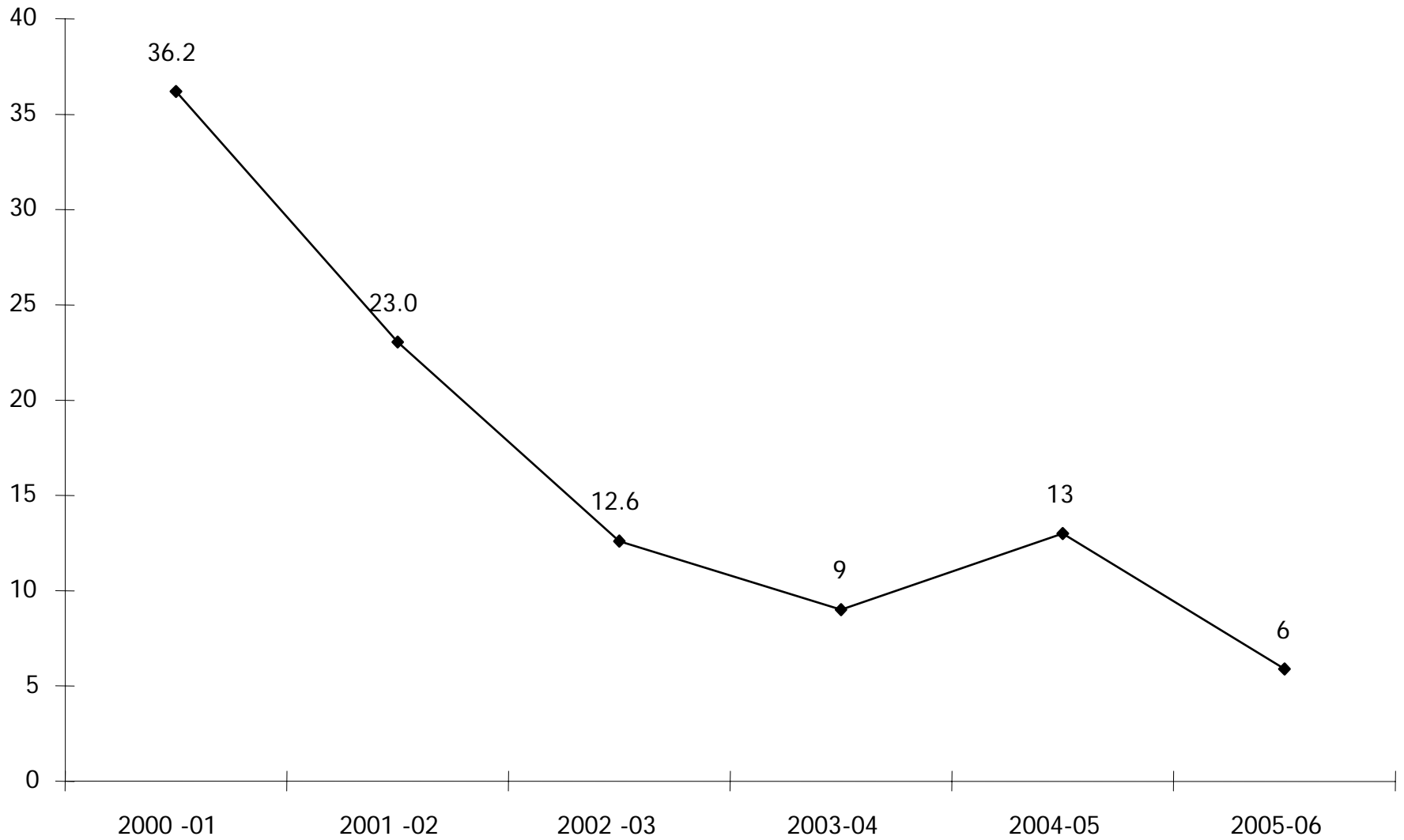


Specific F.O Consumption (Lit/MT)



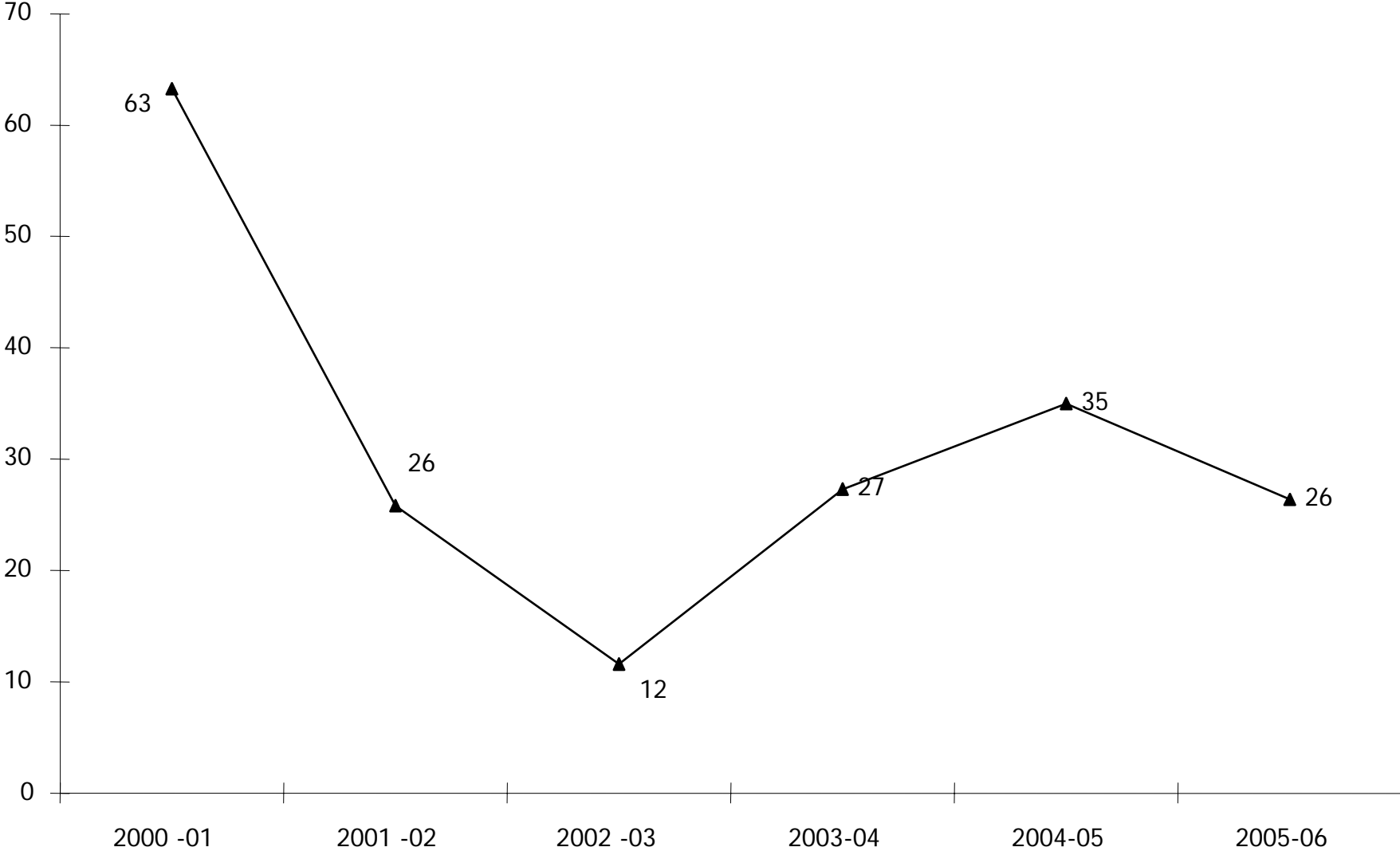
Specific H.S.D Consumption (Lit/MT)

LTS/ MT



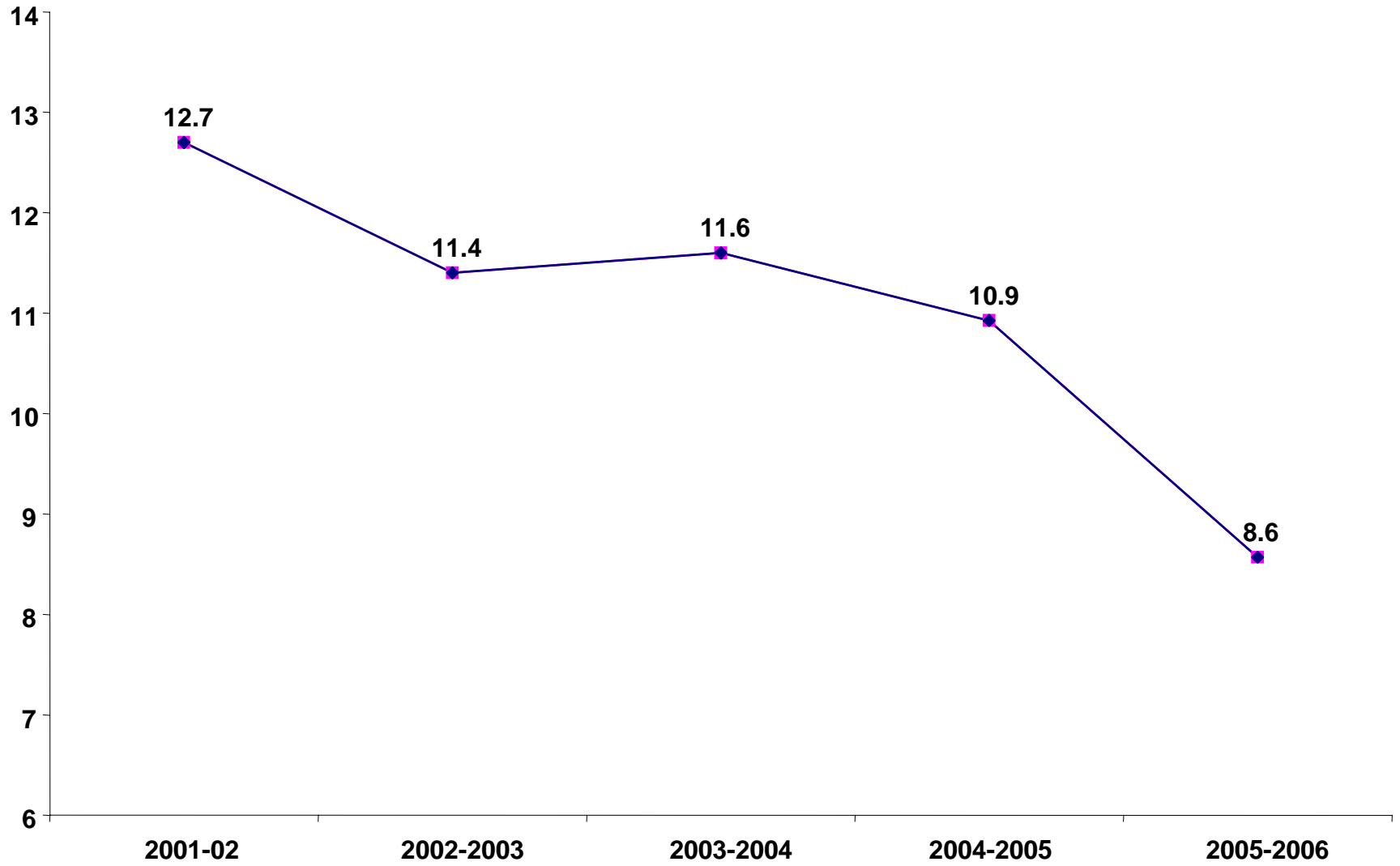
Specific Consumption - EB

KW/ MT



Specific Water Consumption (KL/MT)

(KL/MT)



Future Improvements

- To eliminate 4 bar venting (excess) steam, Planned to install a new boiler feed water preheater
- Horizontal Implementation of High & Low Head Cooling Water Segregation in another Plant.
- Installation of new SBC to increase the productivity
- Replacement of Electric heater with Steam heater in the Air drier unit

Thank you