ENERGY CONSERVED IS MORE THAN ENERGY PRODUCED

"Energy conservation through SGA"

Objective:

Reduction of fuel oil consumption for anode paste production from a level of 25 L/Mt to 10 L/Mt.

Team :

Mr. P.K. Mohanty (Leader)

Mr. S.K. Tripathy

Mr. P.K. Dash

Mr. S.K. Panda

Mr. J. Behera

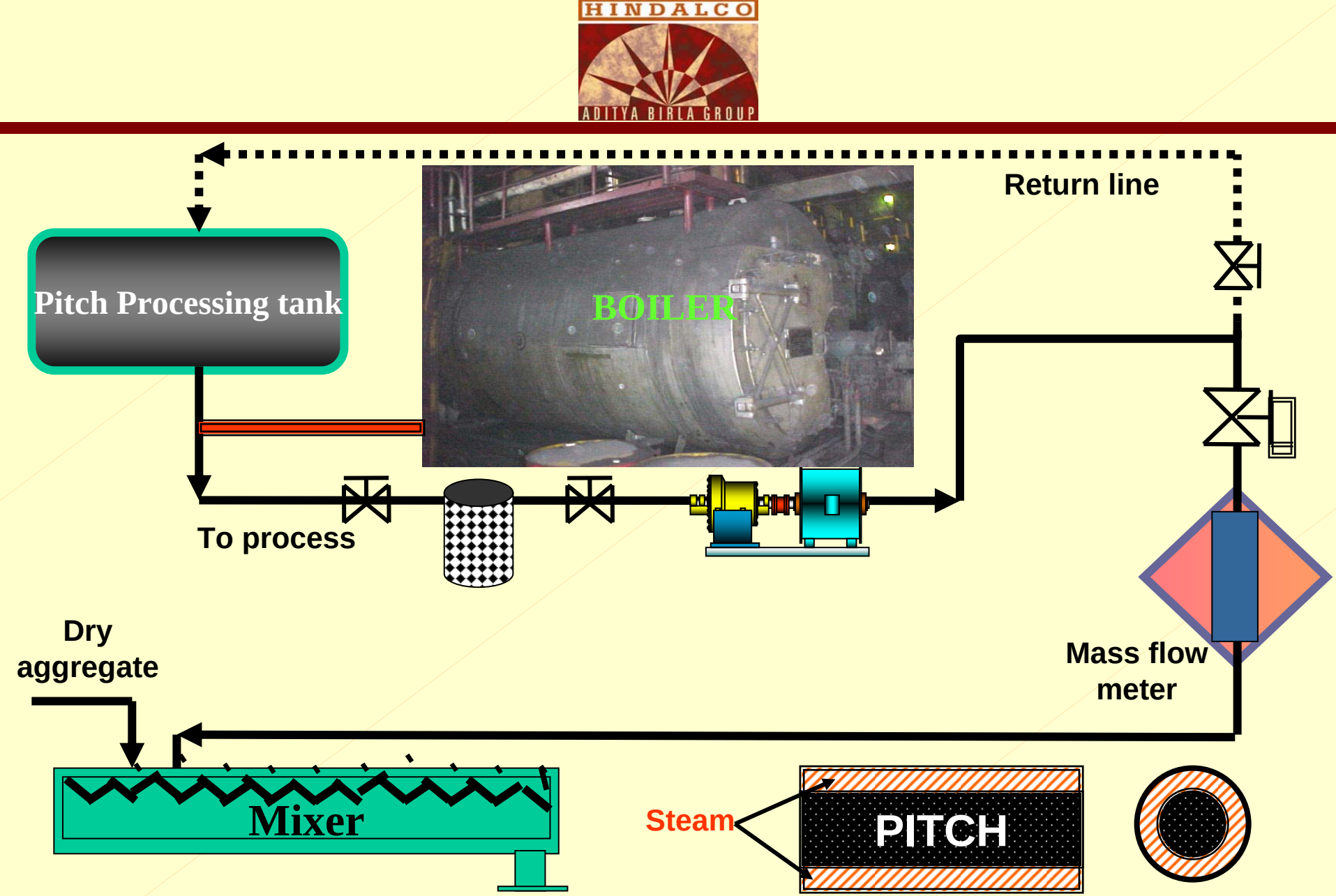
Mr. N. Kulu

What is S G A?

- It is a multi functional team.
- It involves necessarily shop floor people who are real owner of facilities.
- Responsibilities are either voluntarily taken or assigned based on individual's skill & capabilities.

How S G A has benefited us?

- It creates a challenging & passionate platform for T E I.
- It makes use of more than one brain.
- It enhances the technical capabilities of individuals.
- It brings about the completeness of the success.



SCHEMATIC OF PITCH FLOW


Make : IAEC SILLER
Capacity : 3000Kg./Hr.
Type : UN 75
W.P : 13Kg/Cm2
Yr. manf : 1969

BOILER

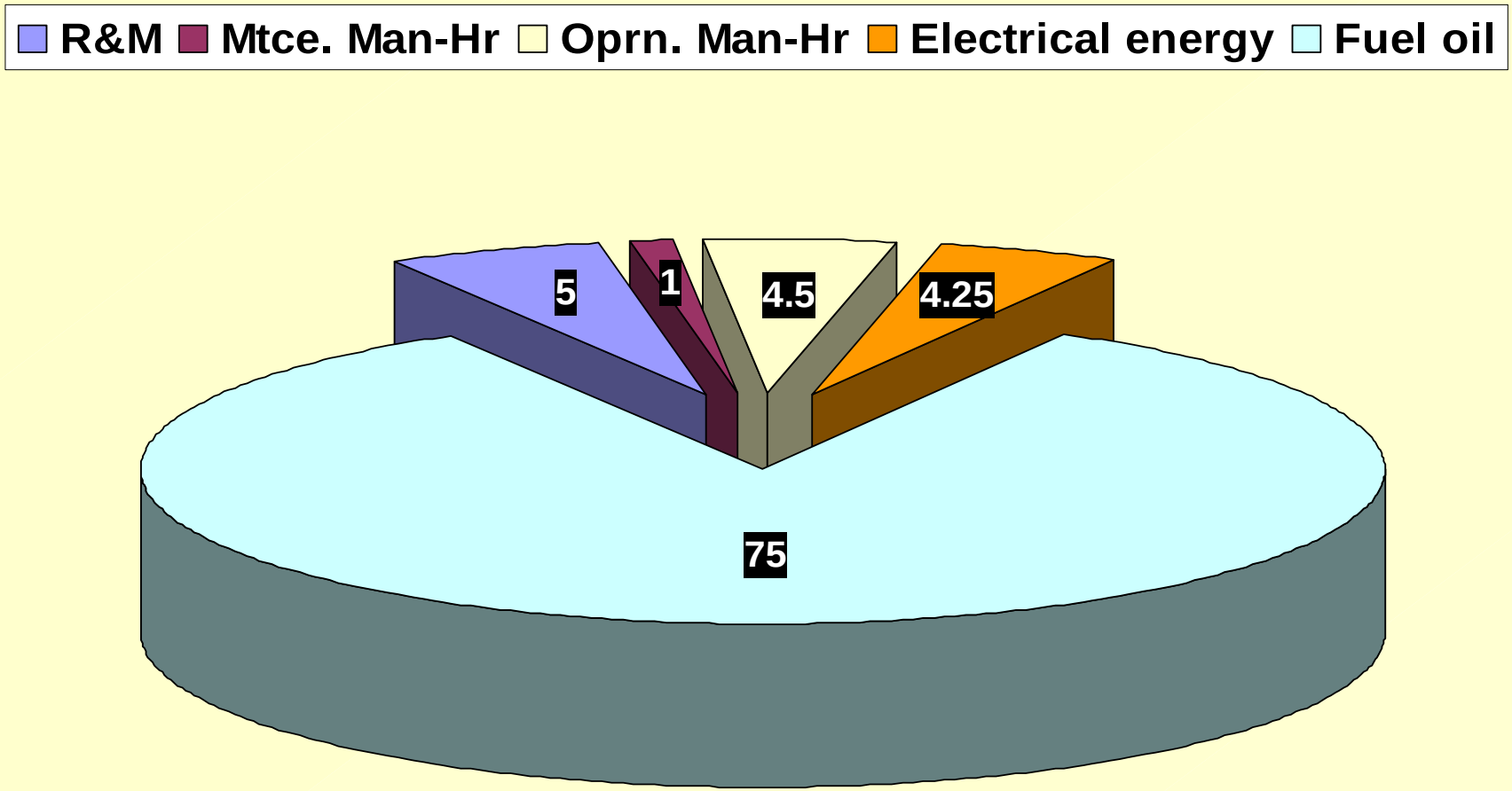
Maintenance cost

R & M	5,54,750
Manpower engaged in Mtce.	1,20,850
Statutory fees	7,500
Quality assurance requirement	9,700
Other misc. mtce. Charges viz insln. lagging	59,800

Operation cost

Quality loss/Rejection @0.25% PA	32,000
Production loss due to break down (1.2%)	38,000
Production loss due to sch. stoppage @ 7-days PA	87,000
Man power engaged for Boiler operation (3-Shift)	5,95,125
Direct electrical energy @ 35.5Kw/Hr & 19Hr/day	4,24,935
Fuel oil (15L/MT, for 42KT paste production)	75,50,000
Cost of cleansol, Salt, Caustic soda, HCl etc	85,000
Cost of lubricant	14,000
Other operating consumable item viz. Economics	25,000
	96,03,660

Running cost analysis



Major cost contribution

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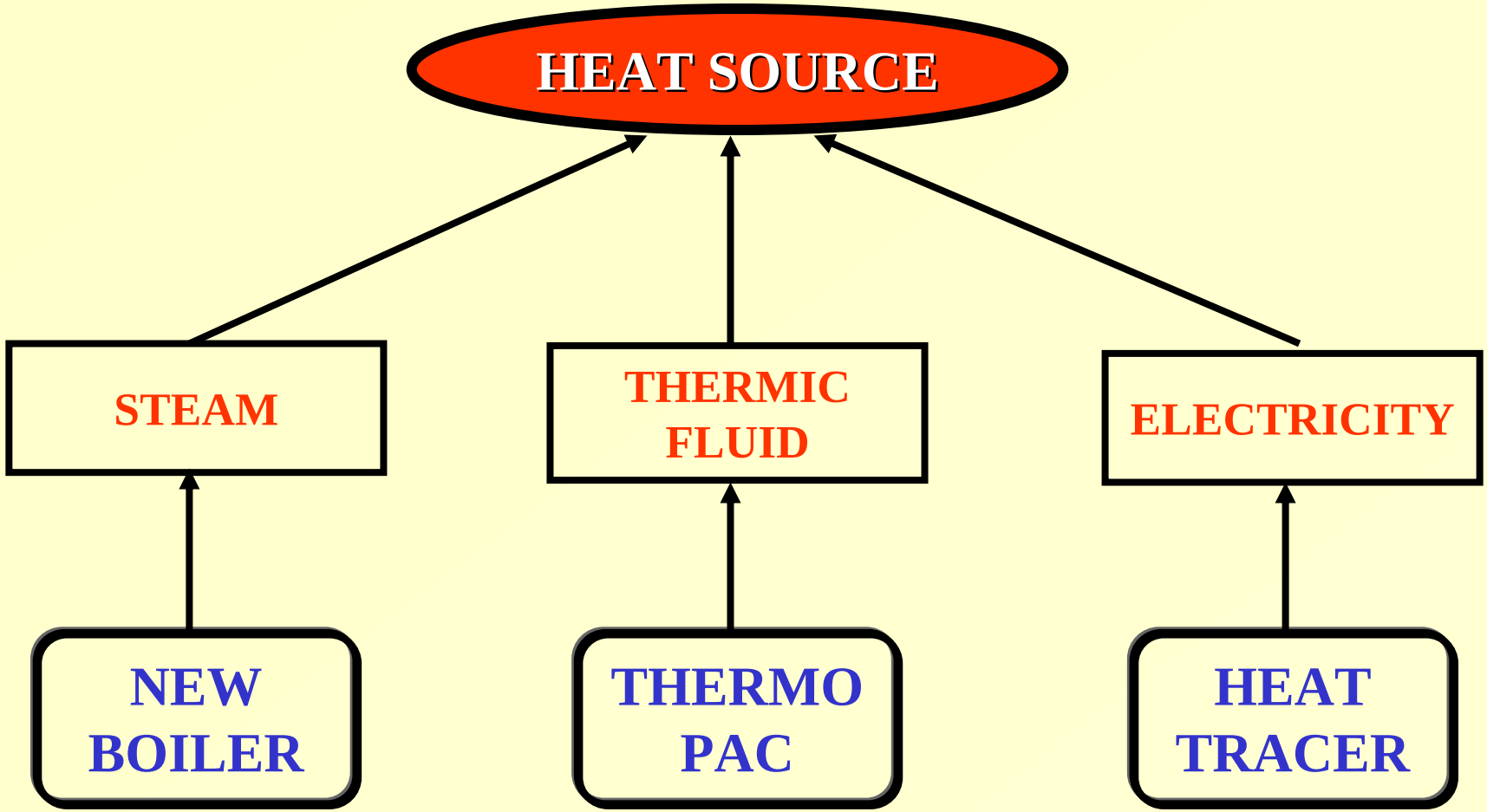
☞ **Year of service** : 35 Yrs

	Designed	Actual	Remark
☞ Boiler thermal efficiency	75%	31.07%	Poor
☞ Oil consumption	40 Lit/hr.	90 Lit/hr.	Very high

Condition :

	Designed	Actual		
➔ Thickness of Shell	20mm	16mm	20%	- Poor
➔ Thickness of Fire tube	6.2mm	5.9mm	4.83%	- Acc.
➔ System heat loss	< 3%	>11%	Needs replace	

Recommendation: Boiler needs replacement with higher capacity



Brain storming for Replacement of Boiler

Major Cost head	Steam Boiler	Fluid Thermopac	Electrical Heat tracer
☞ Initial cost	35,00,000	14,00,000	16,00,000
Running cost			
☞ Maintenance cost			
R & M	1,00,000	50,000	30,000
Mtce. Manpower (Sch + BD)	46,560	35,000	5,000
Statutory fee	0	0	0
☞ Operation cost			
Production loss due to sch. stoppage	80,000	0	0
Operation Man power	5,50,000	3,50,000	0
Direct electrical energy	4,25,000	3,51,000	2,98,935
Fuel oil	75,50,000	21,12,000	0
	87,51,560	42,98,000	19,33,938

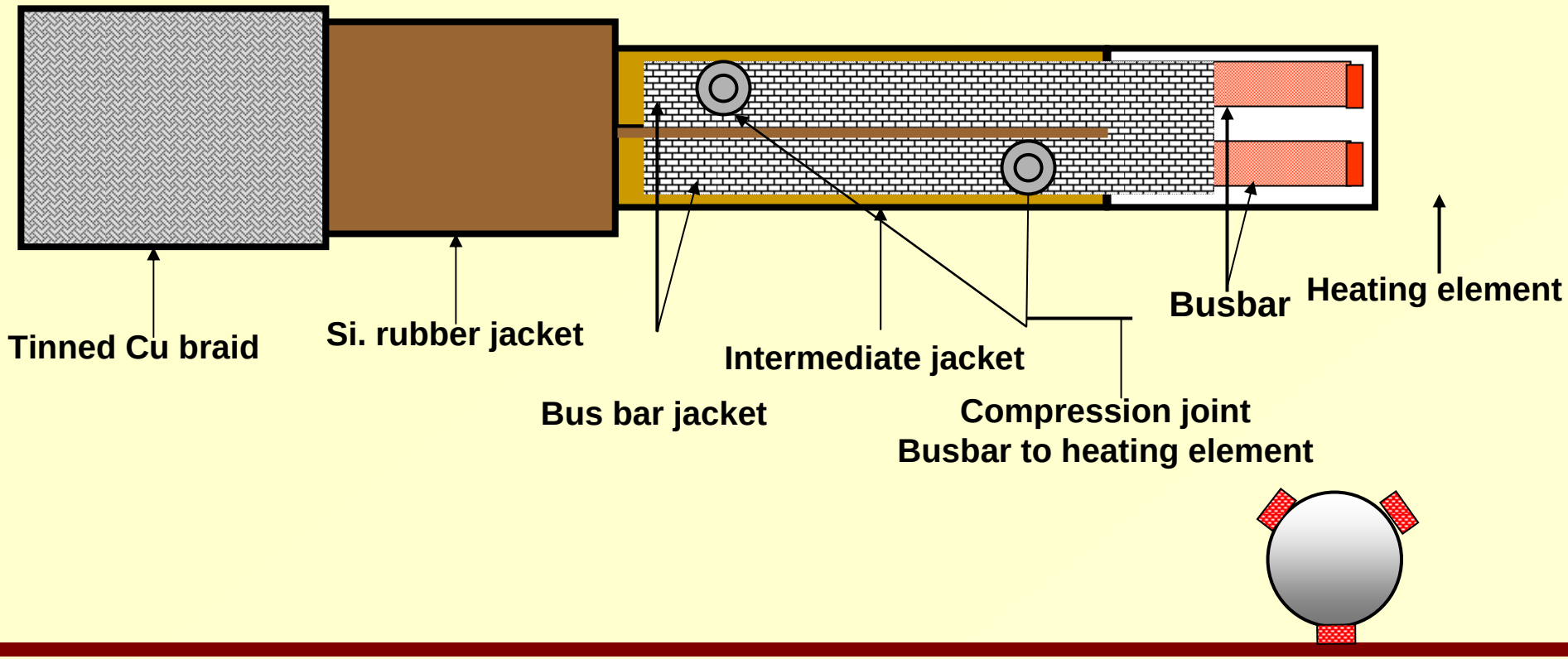
Exploration of alternatives - Cost comparison

Aspects	Boiler	Thermopac	Heat tracer
☞ Energy			
Electrical energy	High	Moderate	Low
Fuel oil	High	Moderate	Zero
☞ Environment			
Lubricant consumption	Moderate	High	Zero
Flue gas emission	High	Moderate	Zero
☞ Safety			
Statutory requirement	Applicable	NA	NA
Explosion	High risk	Moderate risk	Low risk
Fire hazard	Low risk	High risk	High risk
Electrical hazard	Moderate	Moderate	Moderate

Risk analysis

☞ **Heat tracer not found used in Pitch heating application (180^0 C) any where in India, except in Furnace oil & tar upto 110 deg.C.**

Parallel resistance, constant wattage, wide profile type heat tracer tape



Heat tracer?

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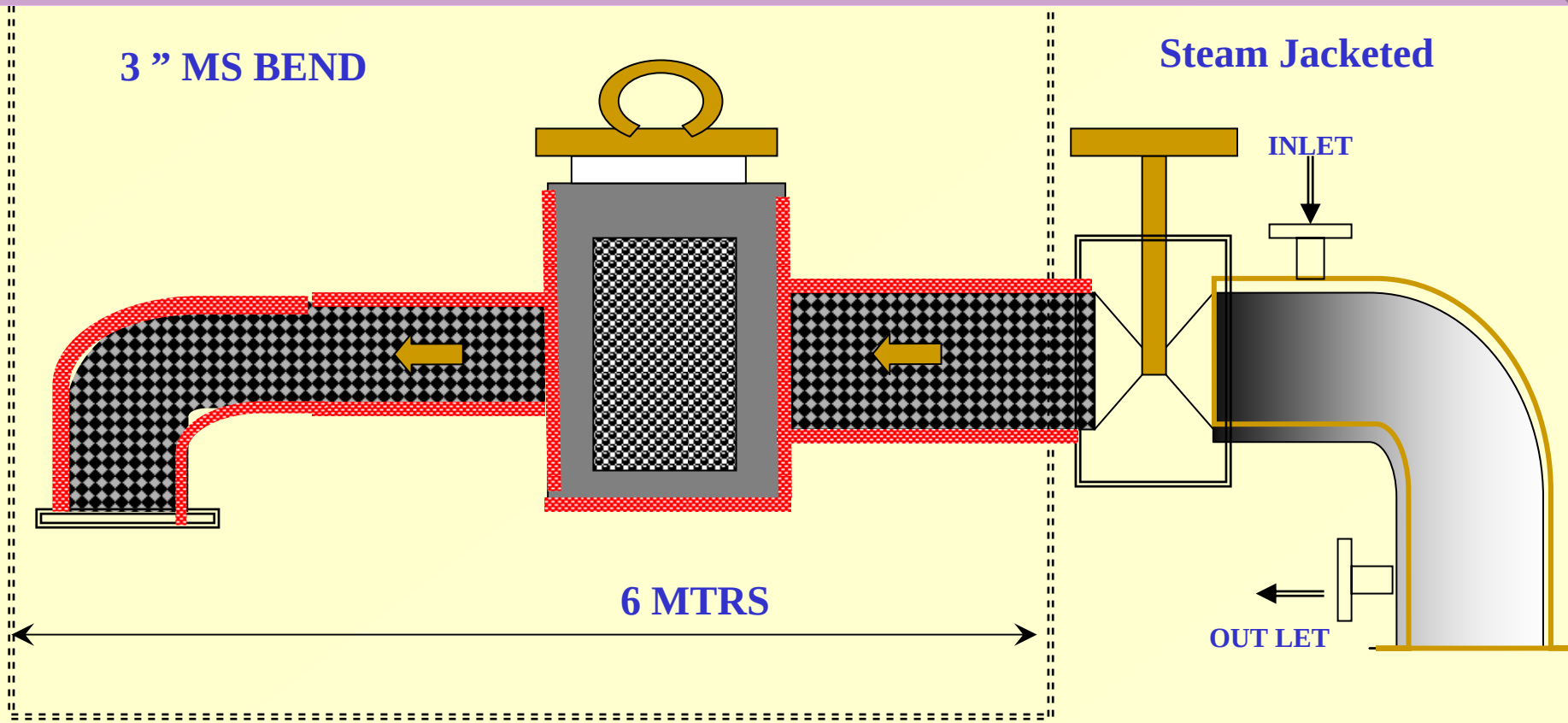


Experiment with Prototype Arrangement

Type selection and tape laying configuration was decided based on the heat input requirement for the process.

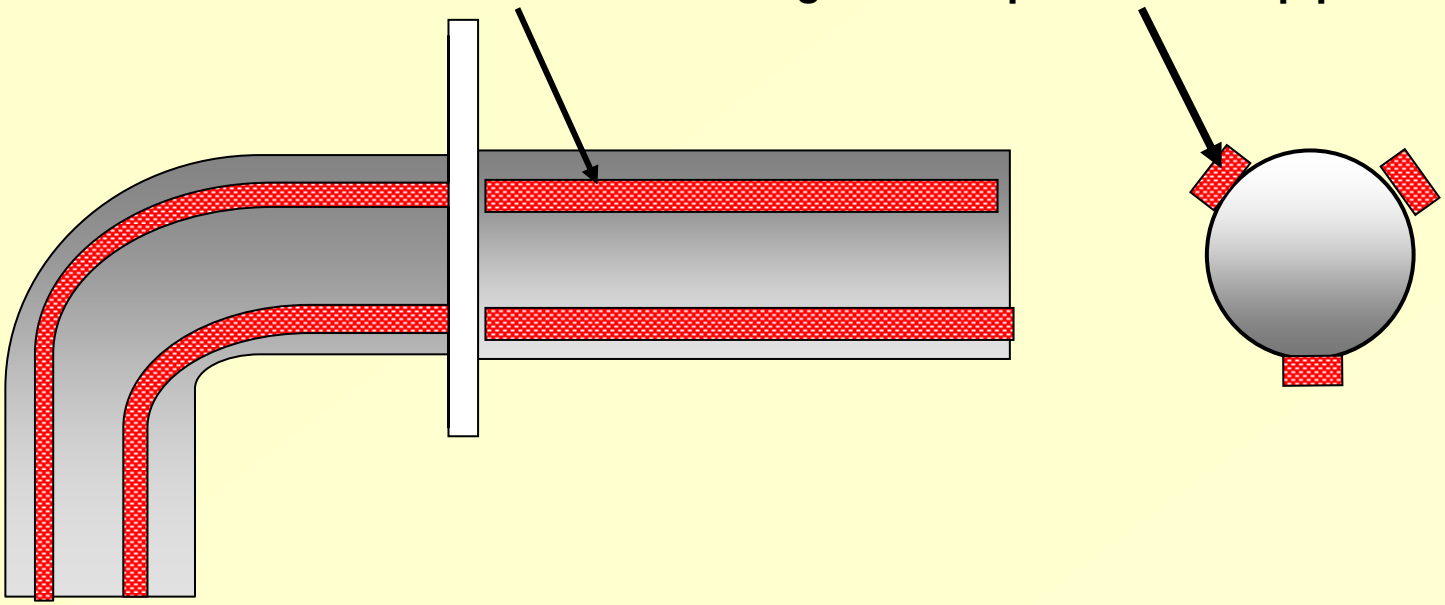
Type:

Max. continuous expose temperature : 230 deg.C

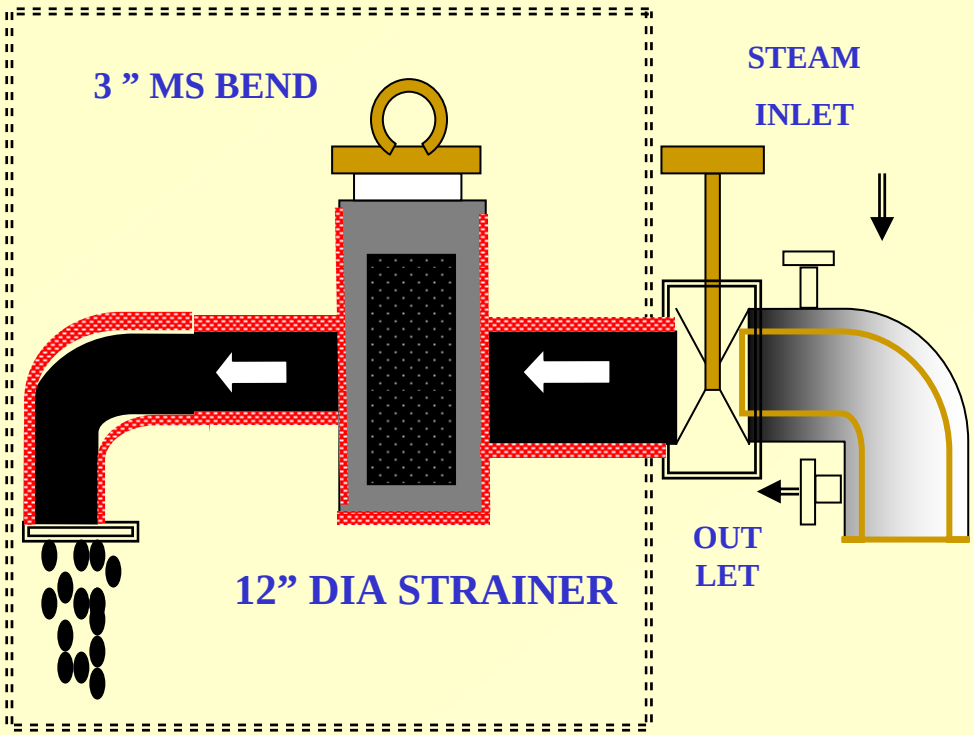
Heating element : 240V, 23Watt / mtr. (Total length required = 1200mtr.)

Laying Configuration

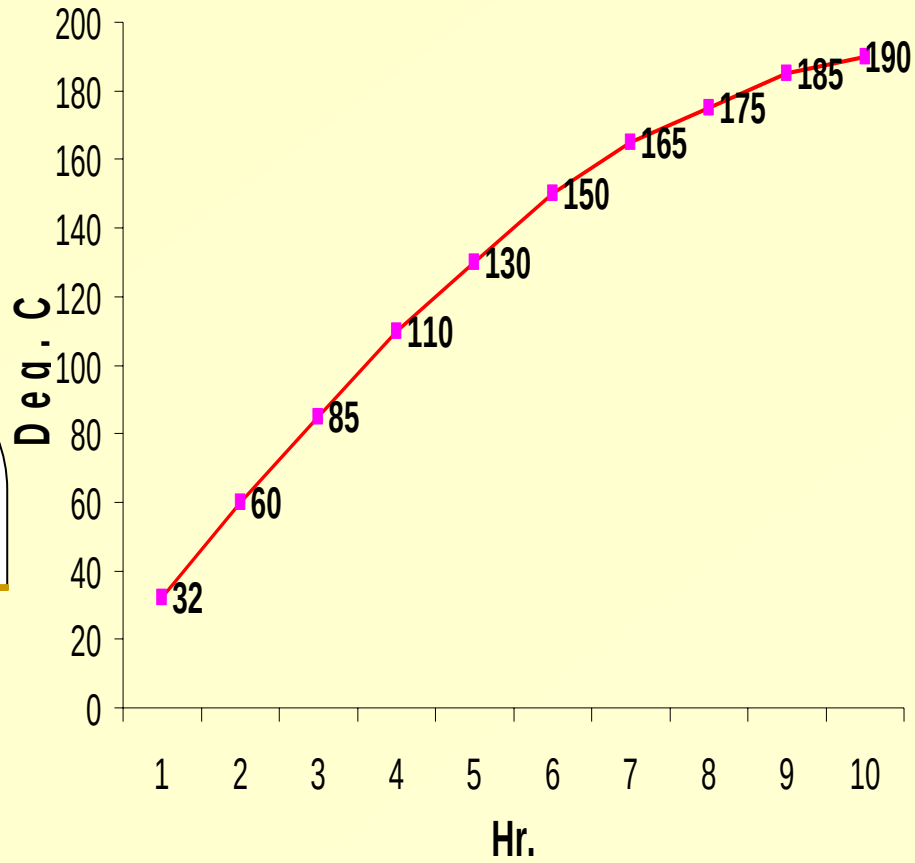
No. of runs : 3 runs I.e. 120 deg. Phase apart over the pipe cross section



Heat tracer type selection & configuration



Temperature profile



Experiment with Prototype Arrangement

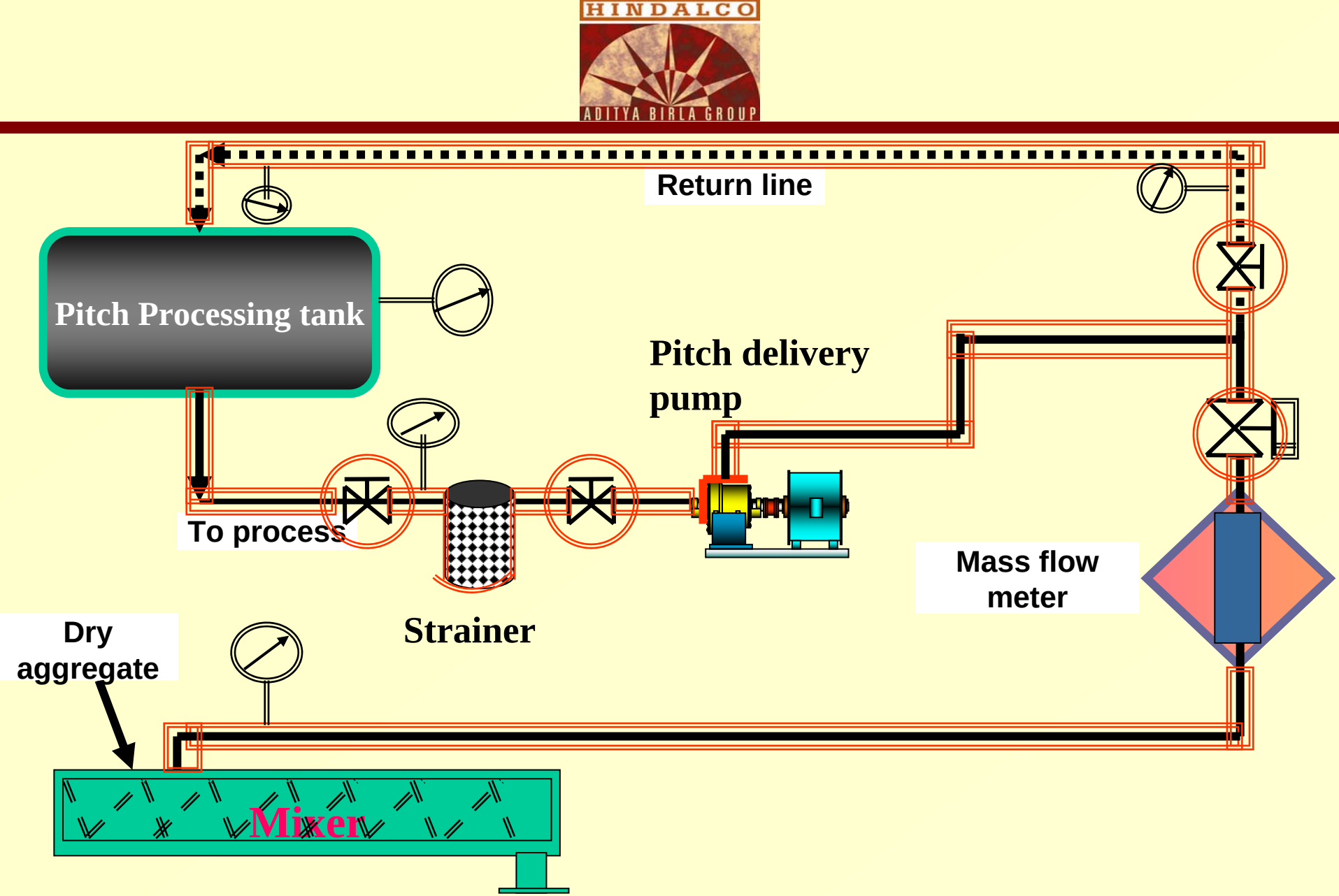
Supplier’s recommendation to avoid encapsulation by thermal insulation

☞ **Pitch delivery Pump, Valve & Strainer**

Jacketed body was filled up with thermal conducting cement.

☞ **Mass flow meter**

Left unchanged as the existing in-built electrical heating could take care of.



Heat traced pitch flow line

Problem faced:

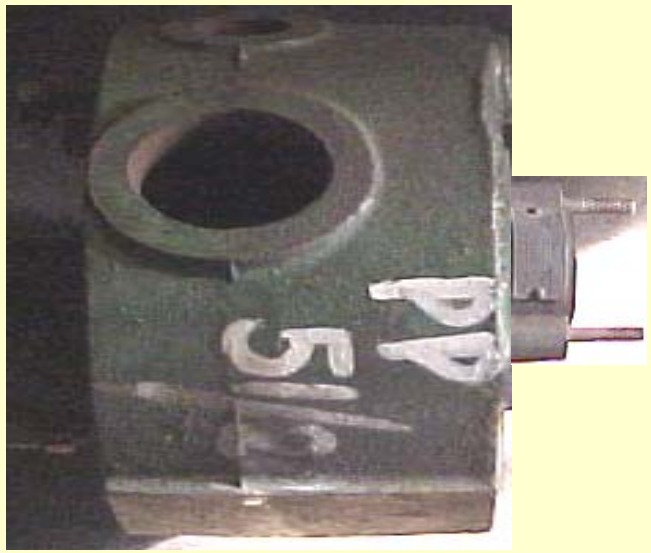
Frequent tripping of Pitch delivery pump.

Analysis:

Pitch inside the pump not getting melted due to inadequate temperature.

Remedial action:

Thermally conducting cement was replaced with thermic fluid heating system.



Modification of Pitch pump

Problem faced:

Semisolid formation inside strainer box.

Analysis:

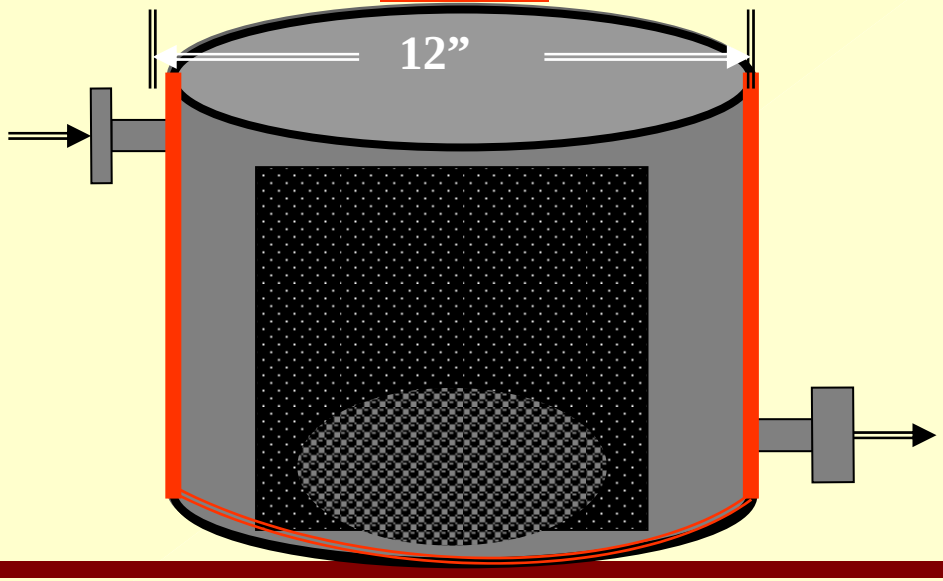
- **High volume**
- **Low temperature**

Remedial action:

1. Jacketed body was replaced with non-jacketed type.

2. 12” dia strainer box was reduced to 8” dia.

Before



After

Modification of strainer

Problem faced:

- Flow restriction offered by mass flow meter.

☞ Stage: 1

Remedial action:

Suggested to the supplier to provide thermic fluid jacketed sensor tube.

Conversion of electrical heating to fluid heating

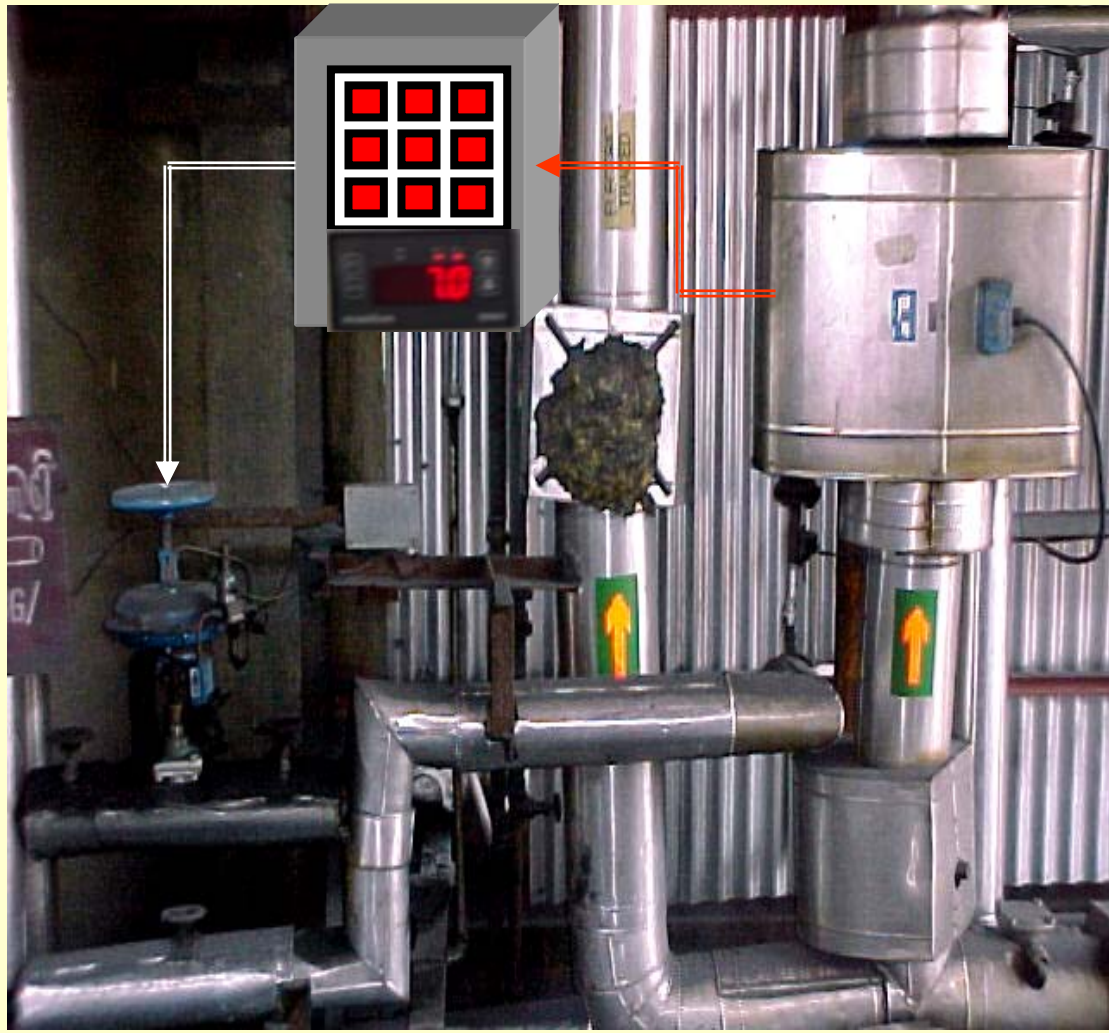
☞ Stage: 2

Problem faced

Error observed in the mass flow meter corresponding to “over temperature”.

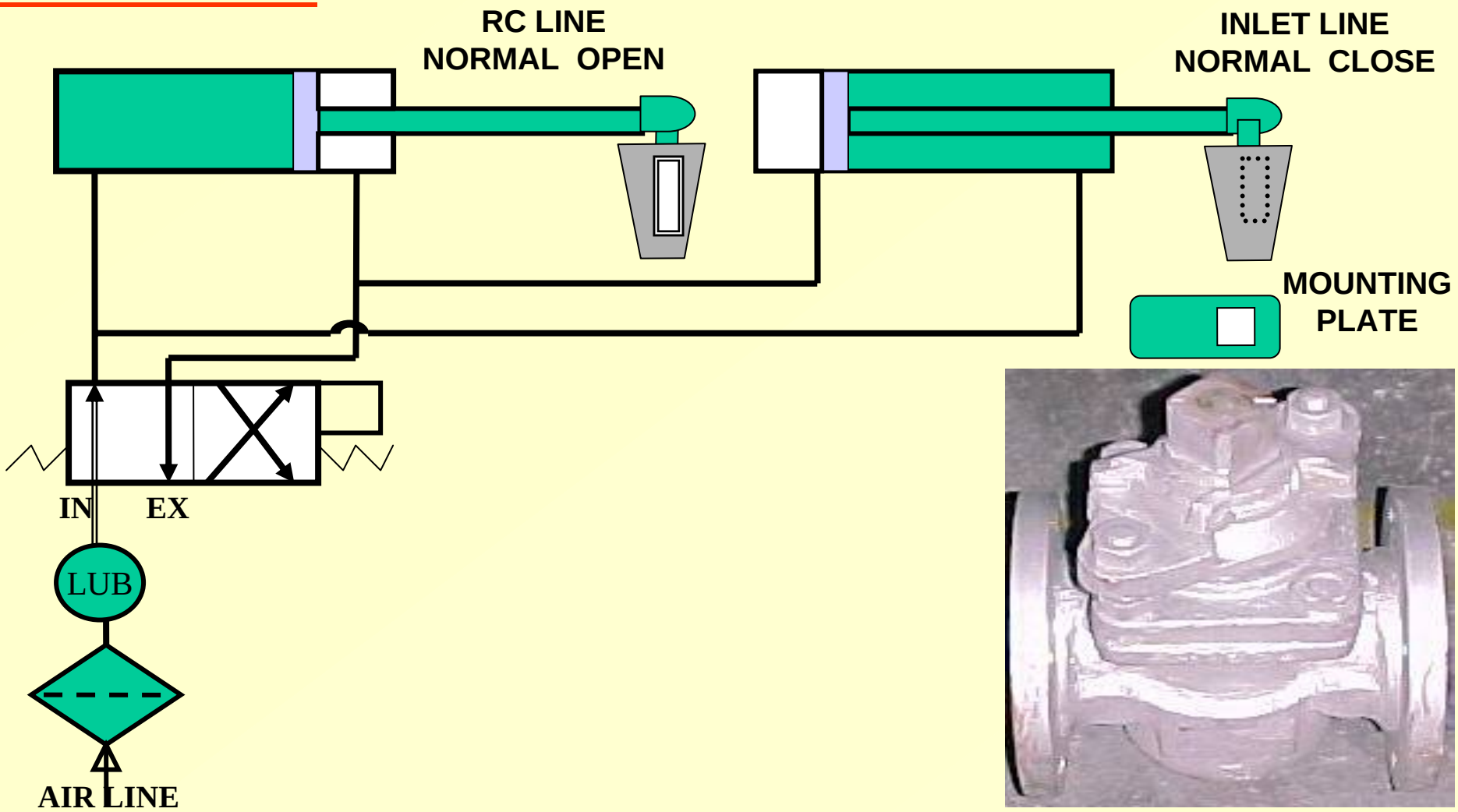
Remedial action:

- **Developed temperature control mechanism.**



Auto temperature controller

Remedial action:



Automation of Pitch valve

Problem faced:

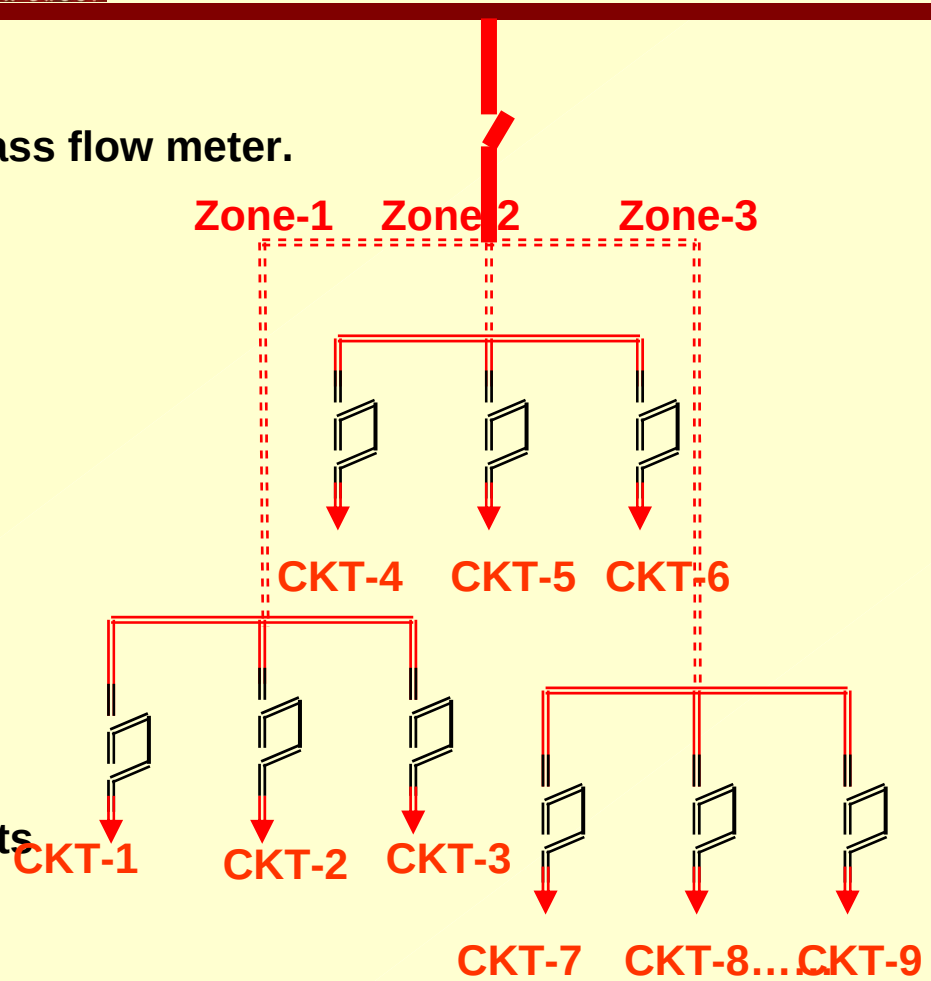
1. Less flow rate of Pitch as indicated by the mass flow meter.
2. Pump motor draws high amperage.

☞ Approach:

- Observed Zone #3' drawing less current.
- Not reflected in temperature indicator.

Remedial action:

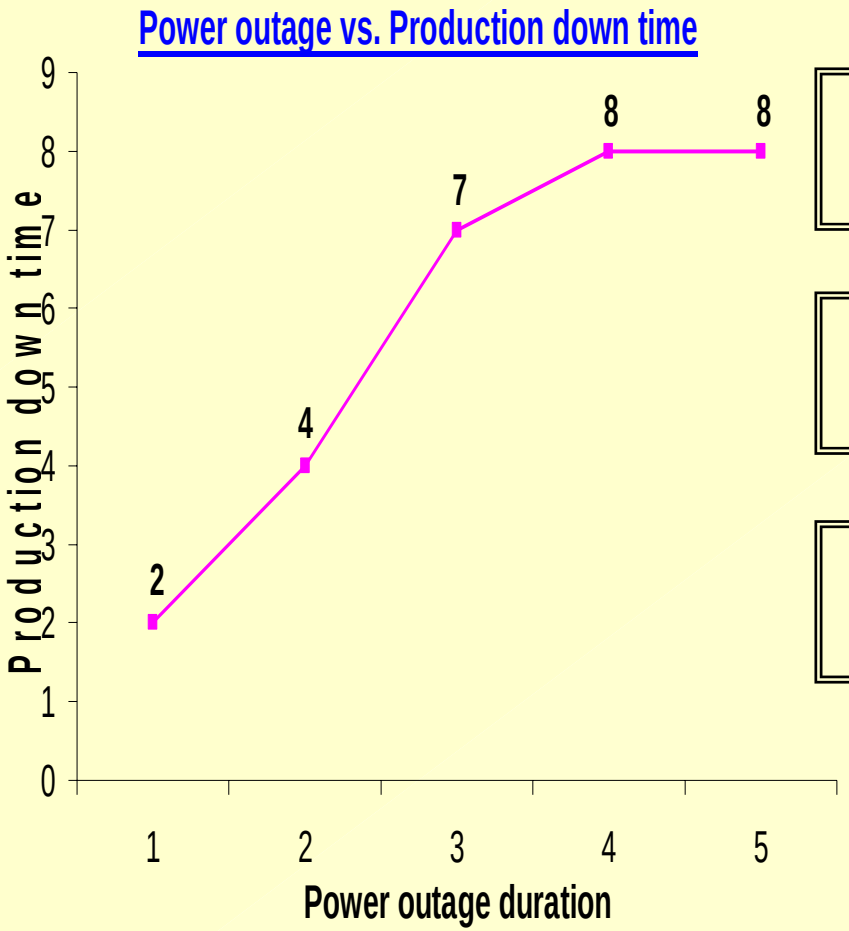
1. Subdivision of Zones into circuits
2. No. of ammeters & temperature sensing points were increased to 9 nos from 3 nos.



Circuit modification

Impact of Power failure: -

- Simulation study



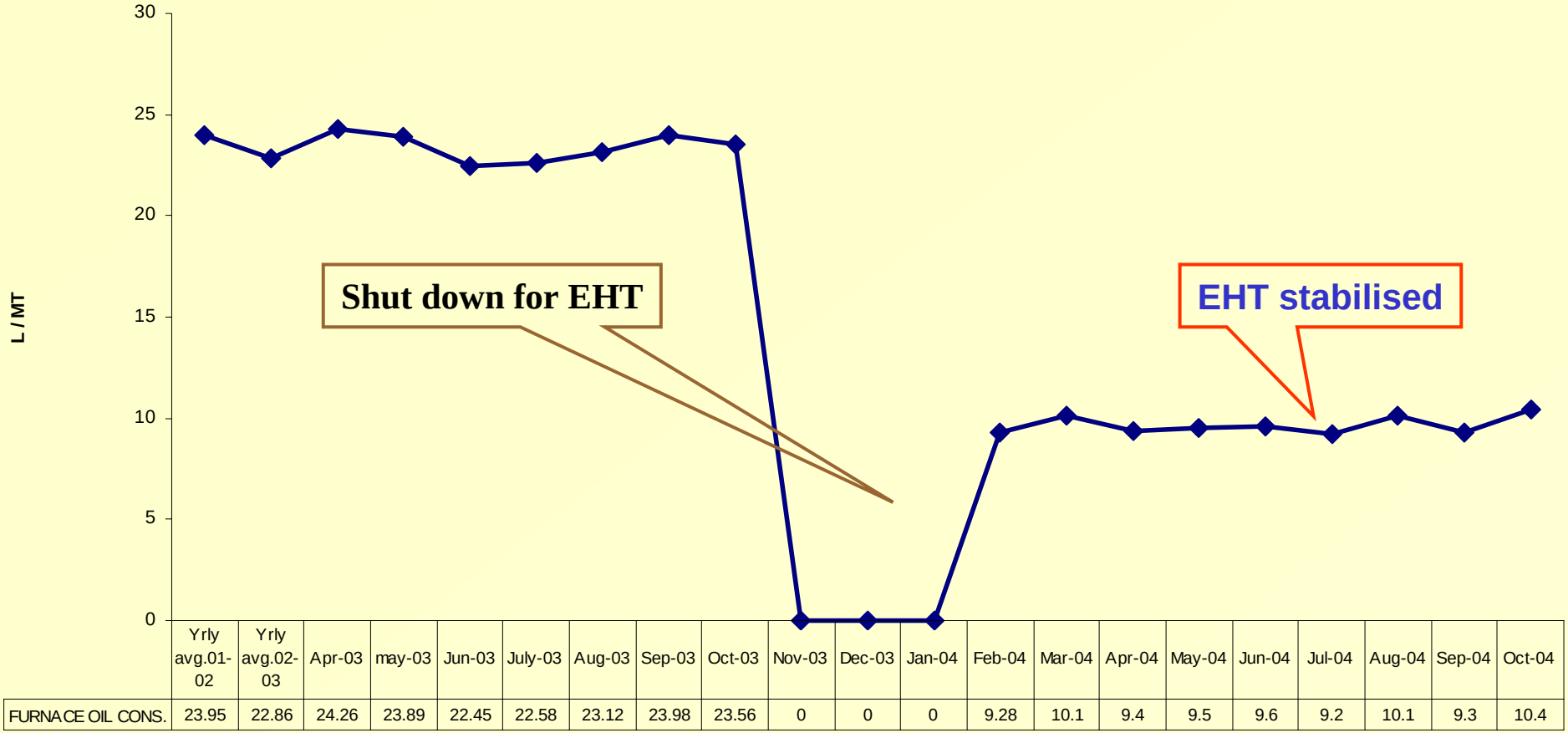
Diesel generator of CPP

Plant aux. Feeder #1

Plant aux. Feeder #2

Failure prevention against power supply interruption

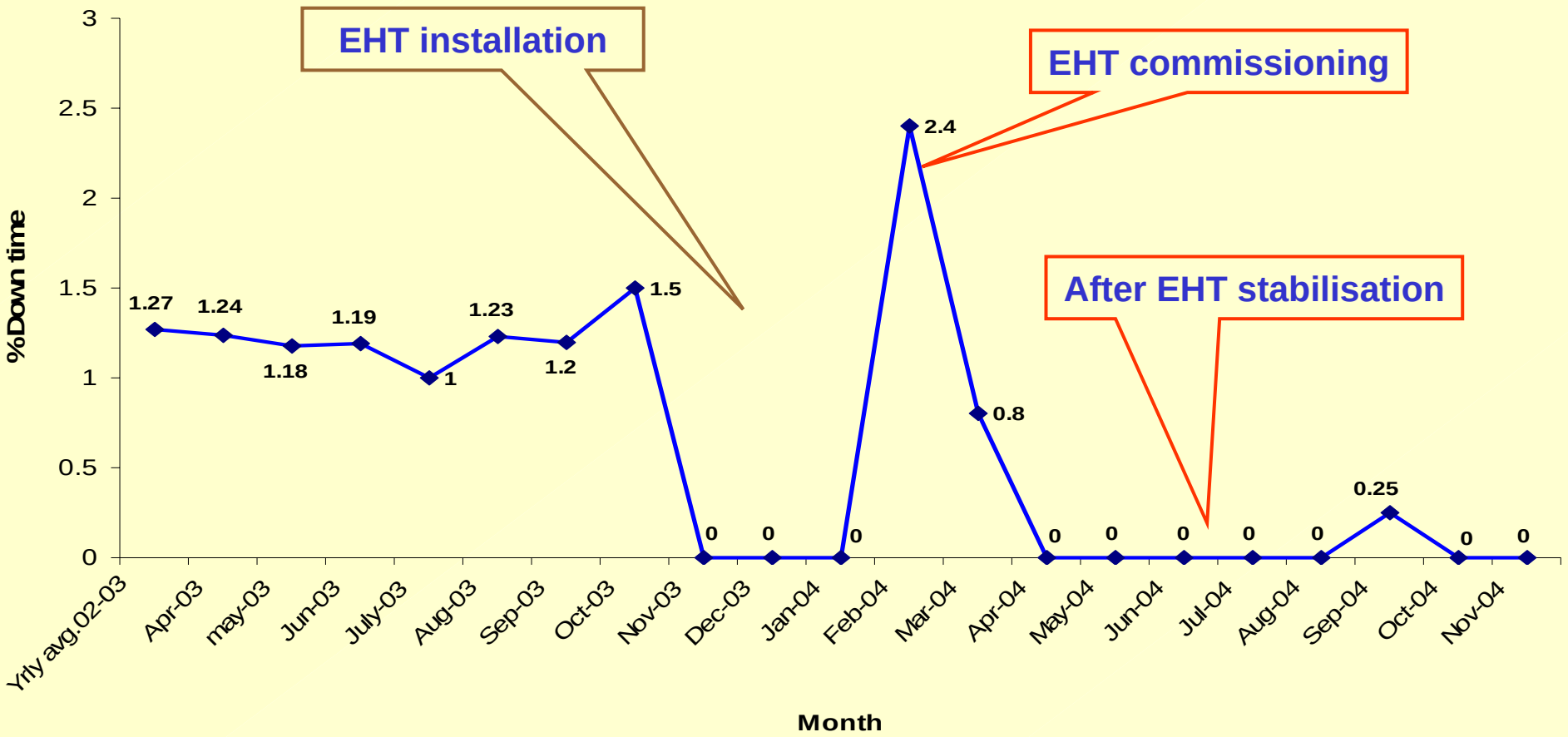
FURNACE OIL CONSUMPTION TREND



	Yrly avg.01-02	Yrly avg.02-03	Apr-03	may-03	Jun-03	July-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04
FURNACE OIL CONS.	23.95	22.86	24.26	23.89	22.45	22.58	23.12	23.98	23.56	0	0	0	9.28	10.1	9.4	9.5	9.6	9.2	10.1	9.3	10.4

Result

Production down time



Result

Investment:

1. Replacement of old pitch line	: Rs. 5,00,000/-
2. Installation of Heat tracer system	: Rs. 11,00,000/-
Total	Rs. 16,00,000/-

Major Recurring Savings:

1. R & M cost	: Rs. 5,24,750/-
2. Man-power (Mtce. +Opern.)	: Rs. 7,16,075/-
3. Electrical energy	: Rs. 1,26,000/-
4. Furnace oil	: Rs. 75,50,000/-
5. Cosumable chemicals & spares	: Rs. 1,44,800/-
6. Production loss due to break down & scheduled stoppage for inspection	: Rs. 1,25,000/-
7. Cost of quality	: Rs. 75,000/-

Total : Rs. 92,61,625

Recurring Gain

- Resource conservation.
- Maintenance free operation.
- Reduced complexity.
- Free from statutory requirement.
- Environment friendly operation.
- Very low inventory.

Intangible Gain

- EHT performance parameters viz. Temperature & Circuit-wise current display along with annunciation against abnormality were provided at the operator desk.

- Operational check chart was developed and established for daily monitoring of condition monitoring parameters by the operator.

- Visual management boards were displayed near the system.

- Training imparted to both operation & maintenance crew.

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Pitch line with heat tracer