PROMETHEAN ENERGY

Opportunities in textile units
Thermal Energy Optimization

Opportunities for thermal energy savings for textile units

About us

Opportunities for thermal energy savings
1. Dye effluent heat recovery system
2. Heat recovery from air compressors
3. Stenter heat recovery system
4. Heat Pumps

Discussed in this document

Opportunities for digitization in textile plants
1. Steam trap and steam monitoring
2. Digital water metering and water balance
3. Compressed air monitoring
4. Equipment OEE
5. Digital Logbooks for engineering and maintenance
6. Vibration monitoring

Team of thermal, energy and IOT engineers

Team of IIT engineers

- Headquartered in Mumbai
- Strong advisory team of industry stalwarts
- Top ranked BEE Certified Energy Auditors






75,000 GJ energy recovered

80,000 tons CO_2 emission reduced

Most awarded Energy Efficiency Start-up in India

"Most Innovative Product" – CII, Energy Efficiency Summit

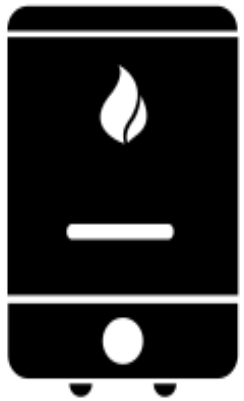
"5 energy firms invited by PM to Silicon Valley"

"Top 10 innovative companies in the country" conducted by, Department of Science and Technology, FICCI, and Stanford University

"Global Winner of Energy Efficiency Category across ~10 countries" – Global Cleantech Innovation conducted by UNIDO and GEF

1. Heat Recovery Opportunities – Dye effluent HRS

Current Scenario



Coal Boiler

Steam to generate hot water from 30˚C to 90/130˚C

Dyeing unit – water kept at 80-90 ˚C for 1-4 hours and then discharged

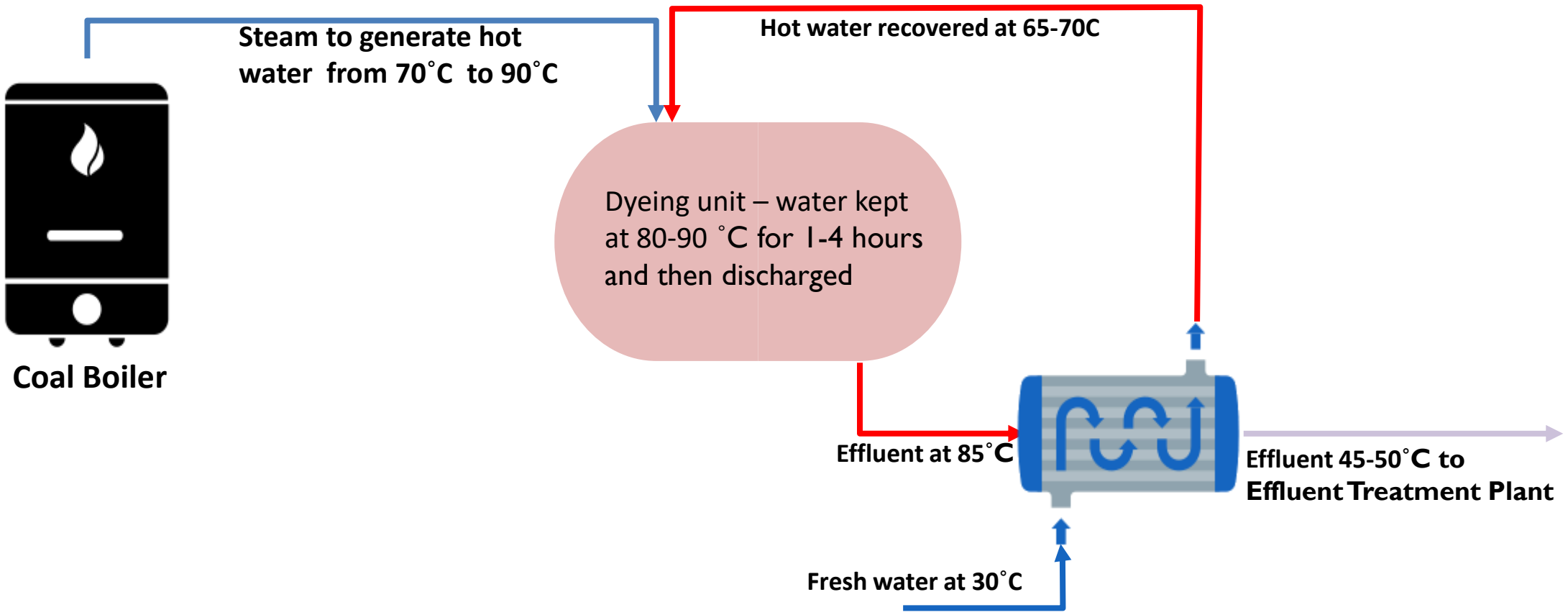
Effluent discharged at 85˚C to Effluent Treatment Plant

Problems in current system

1. Inefficient boiler operations, excess coal used – optimization of steam cycle to reduce coal consumption

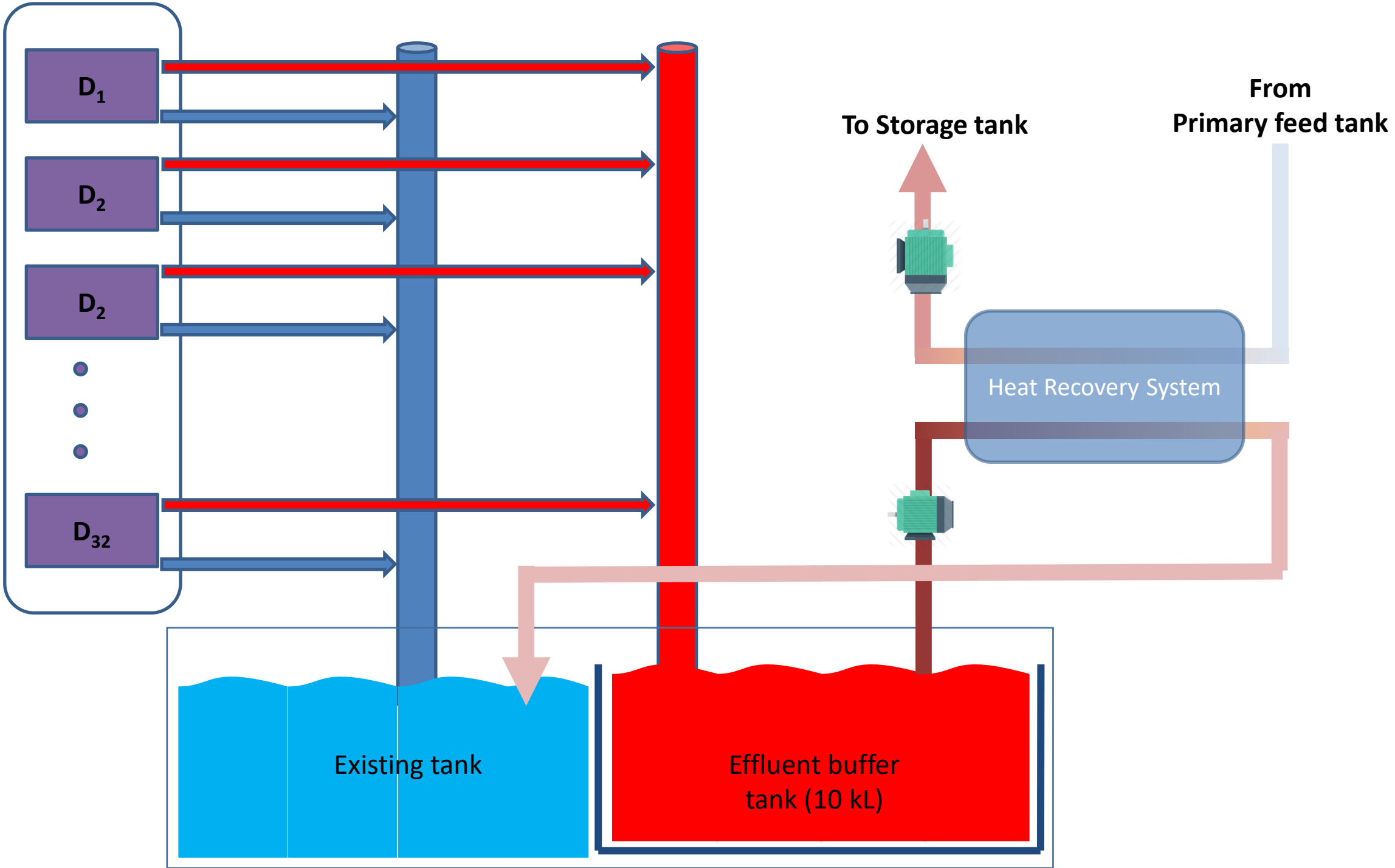
2. Lot of hot water is discharged each day,roughly 100,000 – 200,000 liters of hot water per day. This further adds to load on Effluent Treatment Plant, where microbes cant function at high temperatures

Proposed conceptual intervention

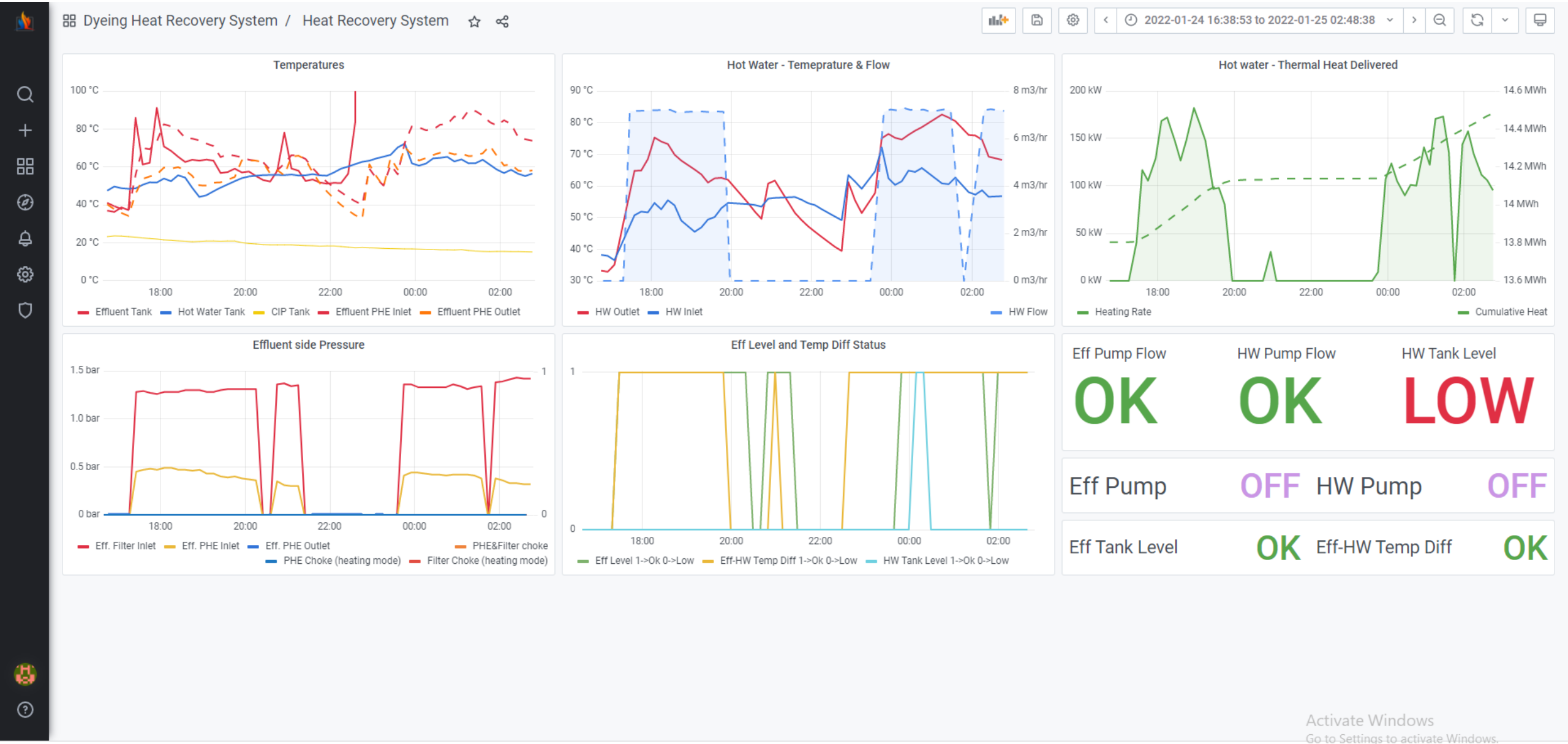


Intervention and expected outcome

Heat recovery from effluent to generate hot water upto 70C expected to **reduce coal consumption by 20-30%**. Further, temperature of effluent to be reduced, leading to higher efficiency of ETP plant


D_1
D_2
D_2
D_{32}
To Storage tank
From
Primary feed tank
Heat Recovery System
Existing tank
Effluent buffer
tank (10 kL)

Continuous monitoring



Features

a. Minimal choking of system – low maintenance
b. CIP built in to system
c. Backflushing arrangement inbuilt to system
d. PLC driven operations
e. Special low maintenance pump for suction
f. Easy to maintain
g. Complete online monitoring with alarms

Authorized engineering partner

Technology validated by

How much savings is possible?

Example

Key data point	Value
Hot water requirement	75 kL per day
Hot effluent quantity	75 kL per day
Cost of steam	3 INR/kg of steam

Savings and investment

Key data point	Value
Savings in fuel	5 ton steam per day
Daily fuel savings	1000 INR per day
Annual Fuel savings	35 Lakh INR per year
Cost of HRS	15 Lah INR
Additional cost (piping, tanks)	10 Lakh INR
ROI	<1-2 years

Savings in different scenarios for different plants

	Plant 1	Plant 2	Plant 3
Hot water requirement per day	75 kL per day	150 kL per day	300 kL per day
Annual savings	**INR 35 Lakh**	**INR 55 Lakh**	**INR 90 Lakh**
HRS cost	INR 15 Lakh	INR 19 Lakh	INR 26 Lakh
Additional costs	INR 15 Lakh	INR 20 Lakh	INR 25 Lakh
Total investment	**INR 30 Lakh**	**INR 39 Lakh**	**INR 51 Lakh**
ROI	<2 years	<1 year	<1 year

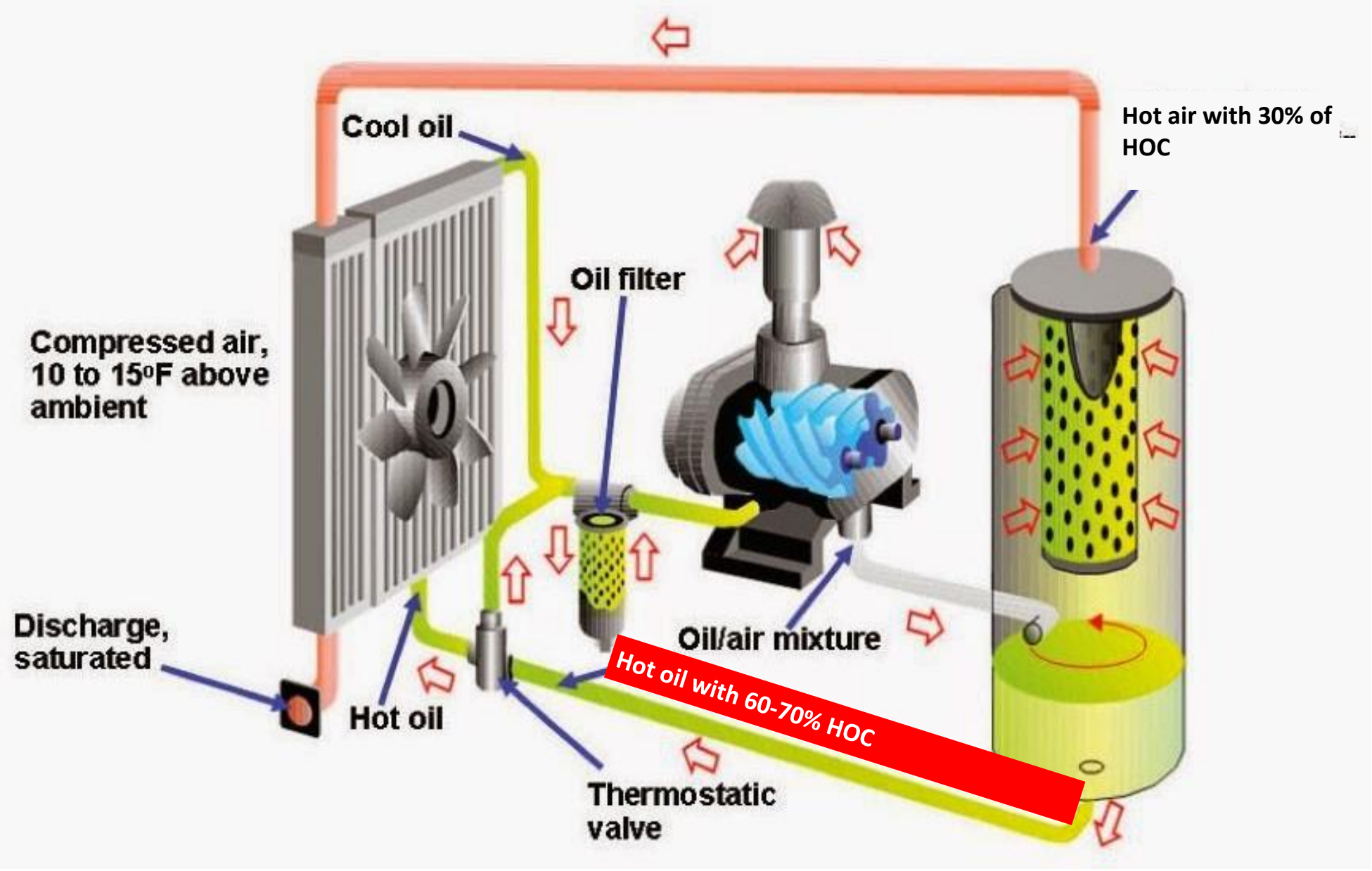
Additional costs include pumps, tanks, piping, non HRS automation, etc.

Benefits

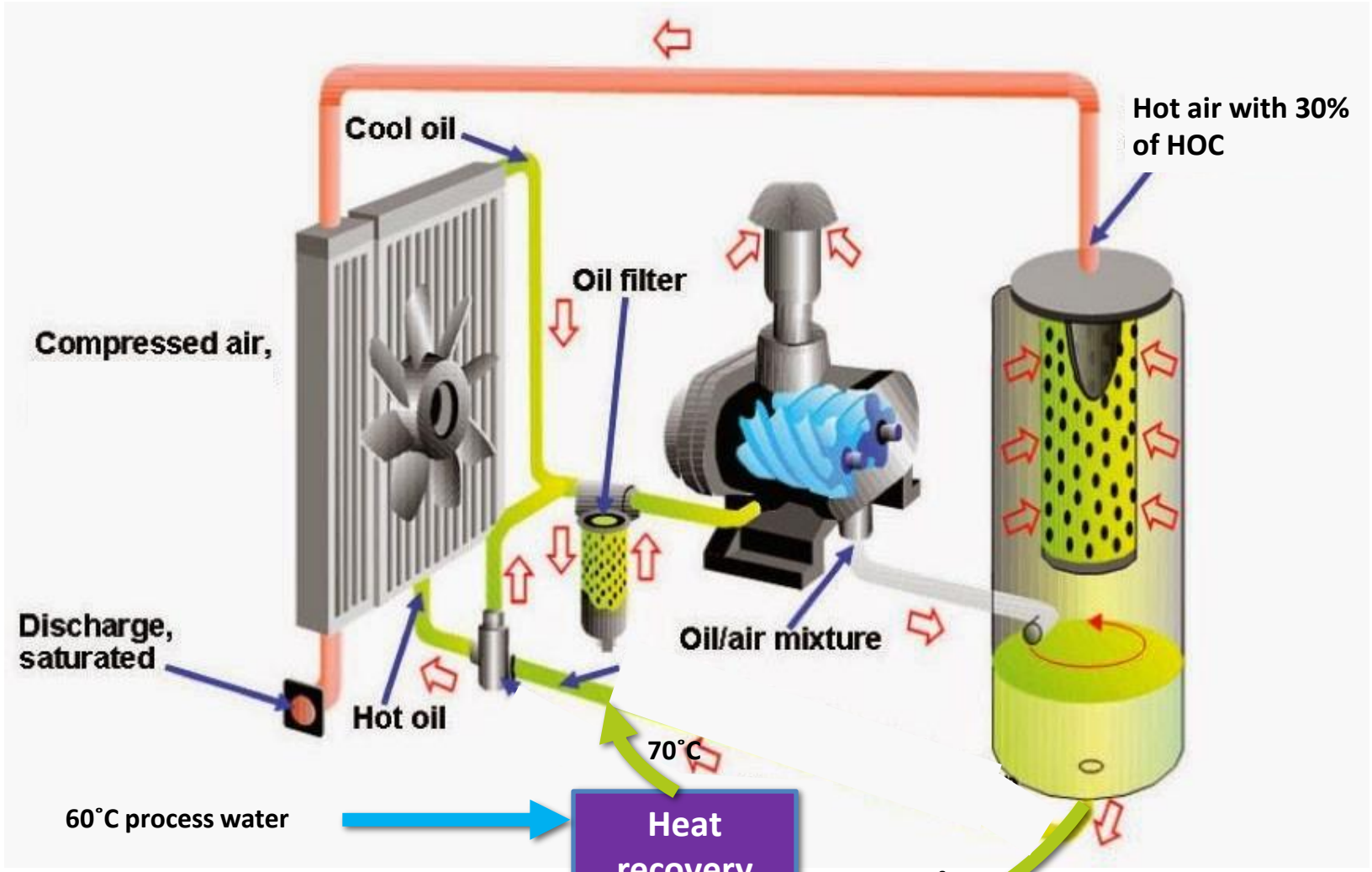
Savings in firewood, coal and other fuel
Lower carbon footprint
Lower ETP temperature
Faster production time – 5-10 minutes per batch saved – all auxillary costs related to that saved as well

2. Heat Recovery Opportunities – Air compressor HRS

Current flow of heat in an oil compressor



New flow of heat with heat recovery system



Benefits

60-70% of electrical input to compressor can be recovered for generating hot water

Heat rejection in radiators and cooling towers is significantly reduced leading to a cooler factory environment

The heat recovery system also acts as an oil pre-cooler, and helps in keeping oil temperature under control during summer months

Compressed air temperatures are lower even in hot summer months leading to better plant air quality

Installation photographs - Compressor

Heat recovery system at Air compressor side

1. Double walled heat exchanger to prevent intermixing of oil and water
2. Temperature protection to prevent steam buildup incase of overheating
3. Bypass system to existing oil cooler incase of maintenance reuirement
4. Live monitoring solution to see performance of system in realtime including BTU meter measuring kilocalories generated

How much energy can be saved

Example :
160 kW air compressor running 24 hours per day

Energy that can be recovered :
87000 kCal/hour of heat energy = 2200 liter per hour heated from 30 to 70C
Savings equivalent to 150 kg per hour of steam

Assuming steam cost at 2 INR/kg
Approximately INR 300/hour of savings

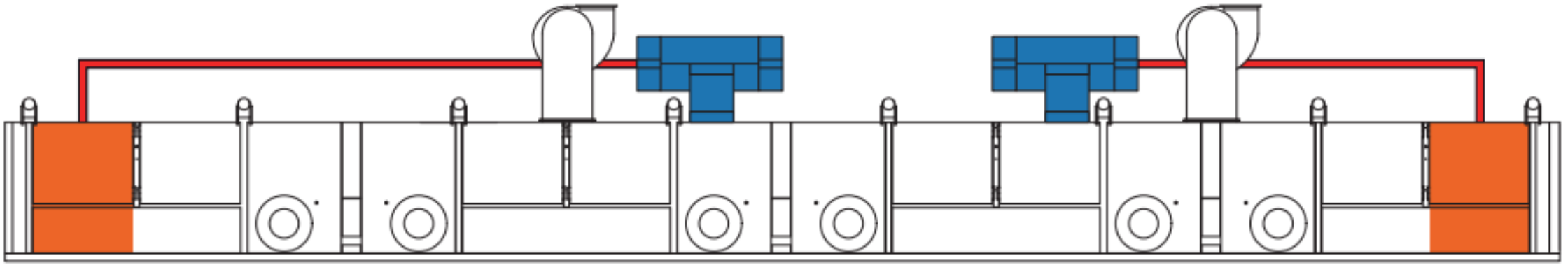
Approximately INR 10-20 Lakh/year of savings
ROI : < 1-1.5 years

Heat recovery models available for:

- Atlas Copco
- Kaeser
- CP
- Ingersoll Rand
- Sullair
- Elgi

3. Heat Recovery Opportunities – Stenter HRS

Stenter heat recovery system



Recover heat from exhaust of stenter and use it for preheating air into stenter
Upto 20-30% savings in stenter energy consumption
Heated air fed back into stenter

Affordable product being piloted – commercial scale ready in 6 months

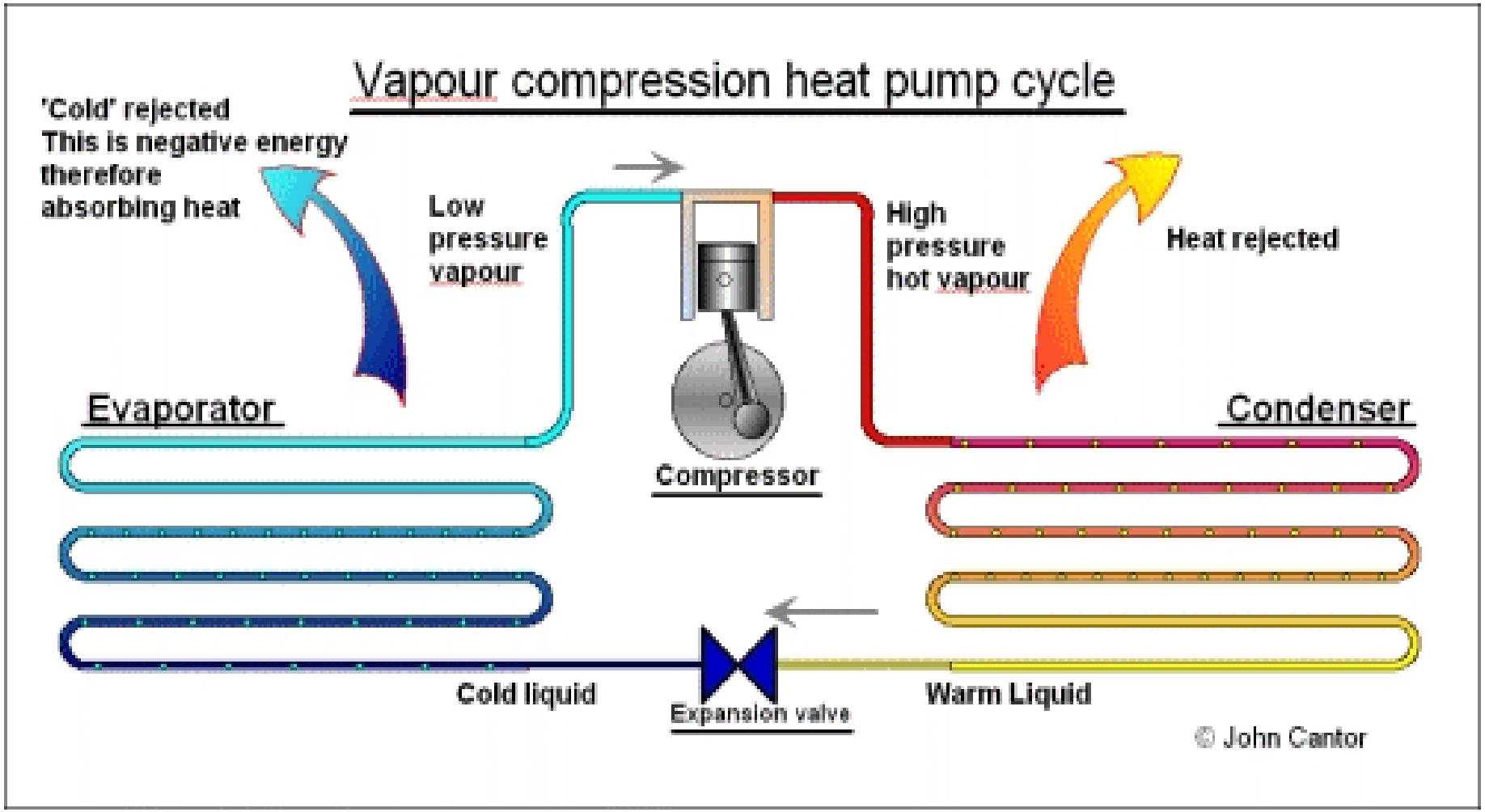
Stenter heat recovery

- 1000 – 3000 m3/hr requirement of exhaust air
- Resistant to dust and fabric particles
- Prevention of oil deposition
- Easy to clean and maintain
- ROI expected less than 1.5-2 years

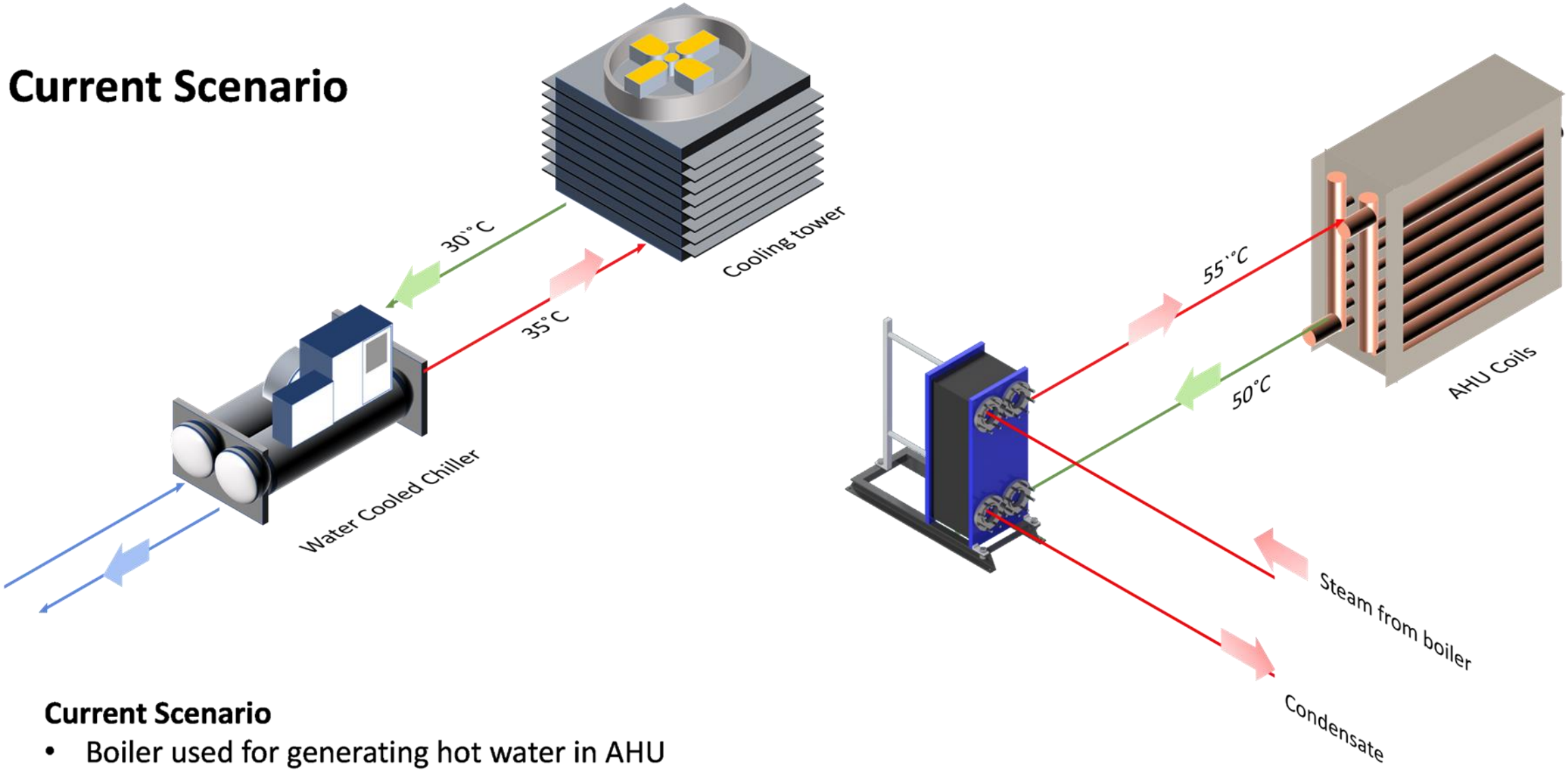
Affordable product being piloted – commercial scale ready in 6 months

4. Heat Recovery Opportunities - Heat Pumps for simultaneous cooling and heating

High temperature heat pumps – operating principle



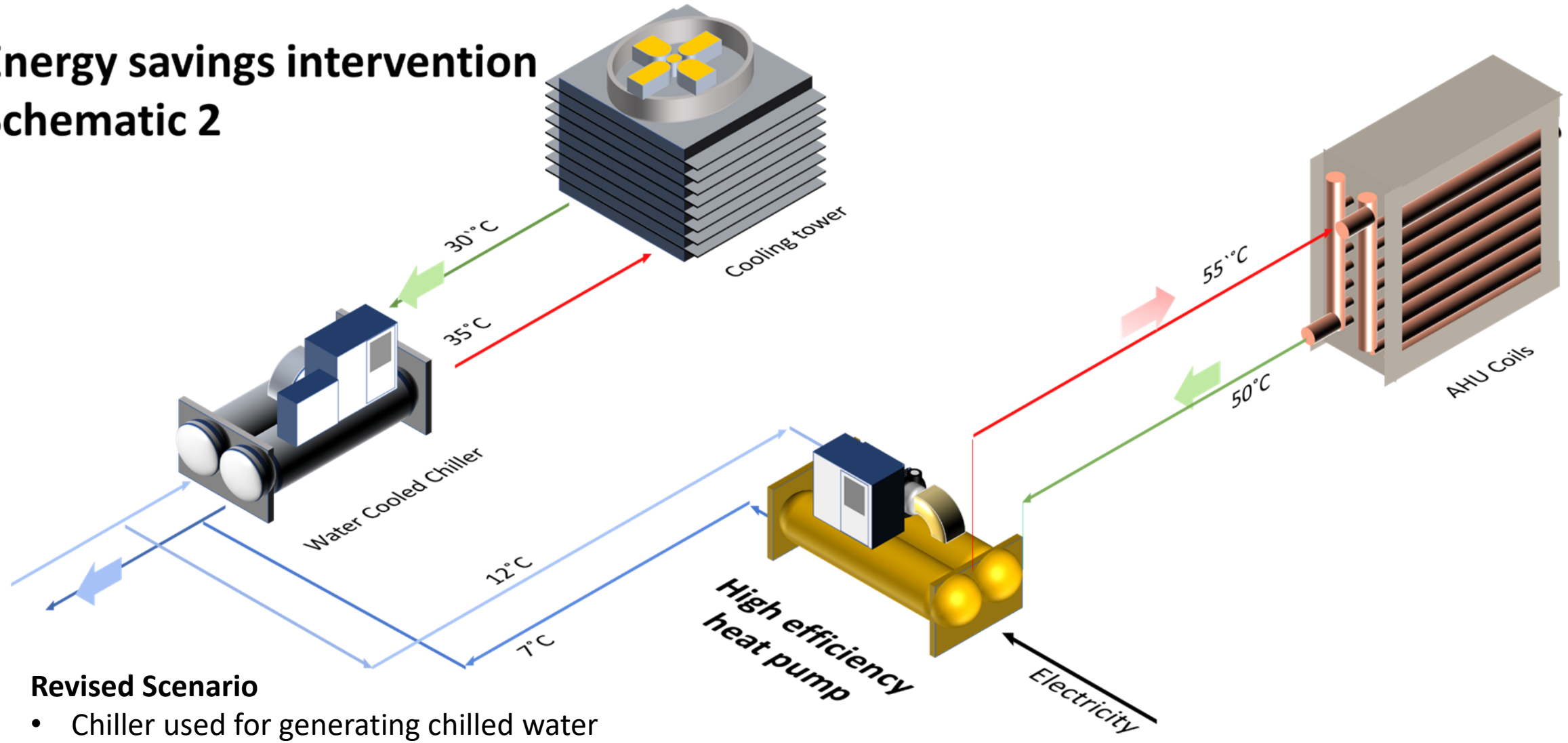
Current Scenario



Current Scenario

- Boiler used for generating hot water in AHU
- Chiller used for generating chilled water
- Heat of chiller rejected in cooling tower

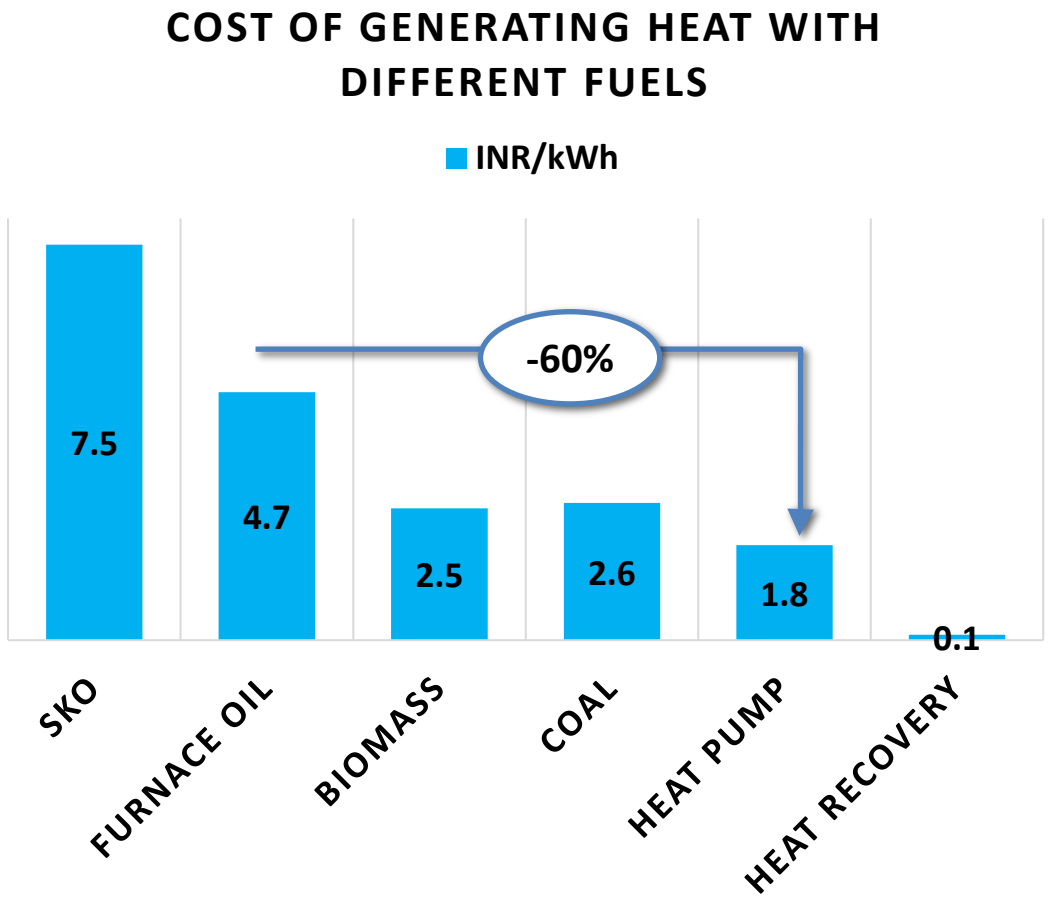
Energy savings intervention Schematic 2



Revised Scenario

- Chiller used for generating chilled water
- Part of chiller load used in heat pump to boost heat
- Low cost of heat + savings in chiller power + cooling tower water savings

Operating cost and maintenance



Maintenance

30% lower maintenance than existing chiller

Spares and RM similar to existing chillers

Much lower maintenance as compared to FO boilers

Summary

Multiple opportunities exist to recover energy from existing wet processing plants
Upto 25-30% of energy can be reduced by utilizing sources of heat properly
Product is 25%, proper engineering is 75% of the success in the project.

Reach out to us to know more,

PROMETHEAN ENERGY

Email : info@prometheanenergy.com