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Manufacturing

Chhindwara Plant Journey Towards Energy Efficient Plant

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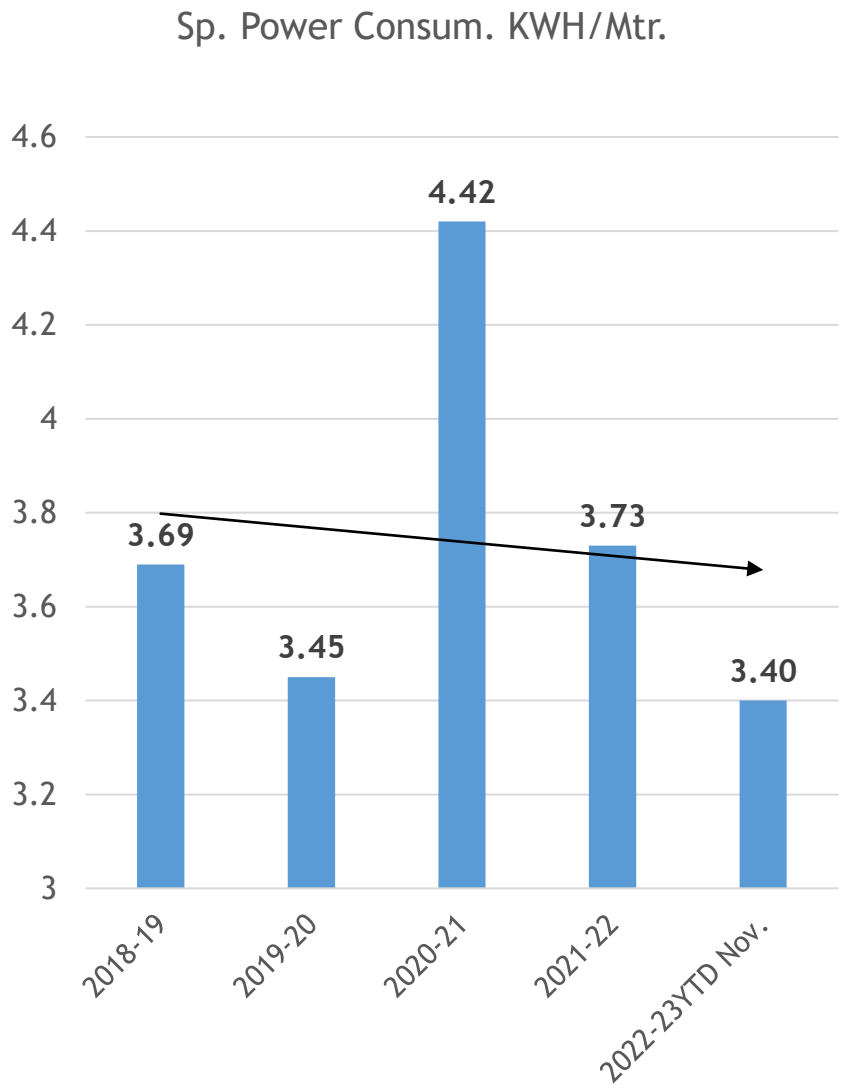
Agenda of Presentation

1. **Plant Performance**
   - *Last Four Years Energy Use , Power, Steam & Coal .*
2. **EC Projects Summary**
   - *Compiled summery of projects last four years.*
3. **Major EC Practices Adopted**
   - *Waste heat Recovery, Compressed air system, IoT.*
4. **Cost Saving & CO2 Reduction**
   - *Summery Sheet*
5. **IoT An Effective Tool**
   - *Our steps with IoT*
6. **Roadmap For Continual Improvement**
   - *Roadmap For Continual Improvement*

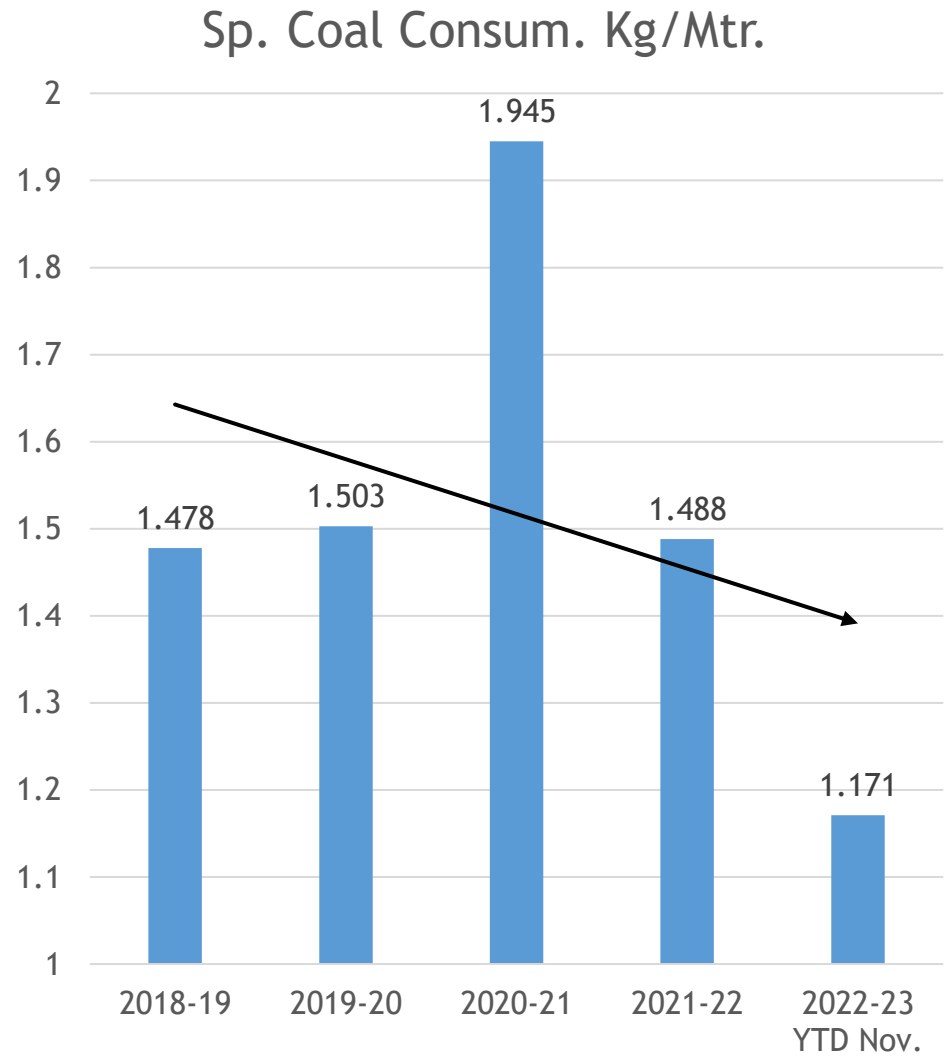
Plant Performance - Electricity

FY	Power Consumption in Lac KWH	Production in Lac Mtr	Sp. Power Consum. KWH/Mtr.
2018-19	533.415	144.529	3.691
2019-20	515.672	149.385	3.452
2020-21	259.033	58.631	4.418
2021-22	449.978	120.548	3.733
2022-23 YTD Nov.	336.705	98.950	3.402



Plant Performance - Coal

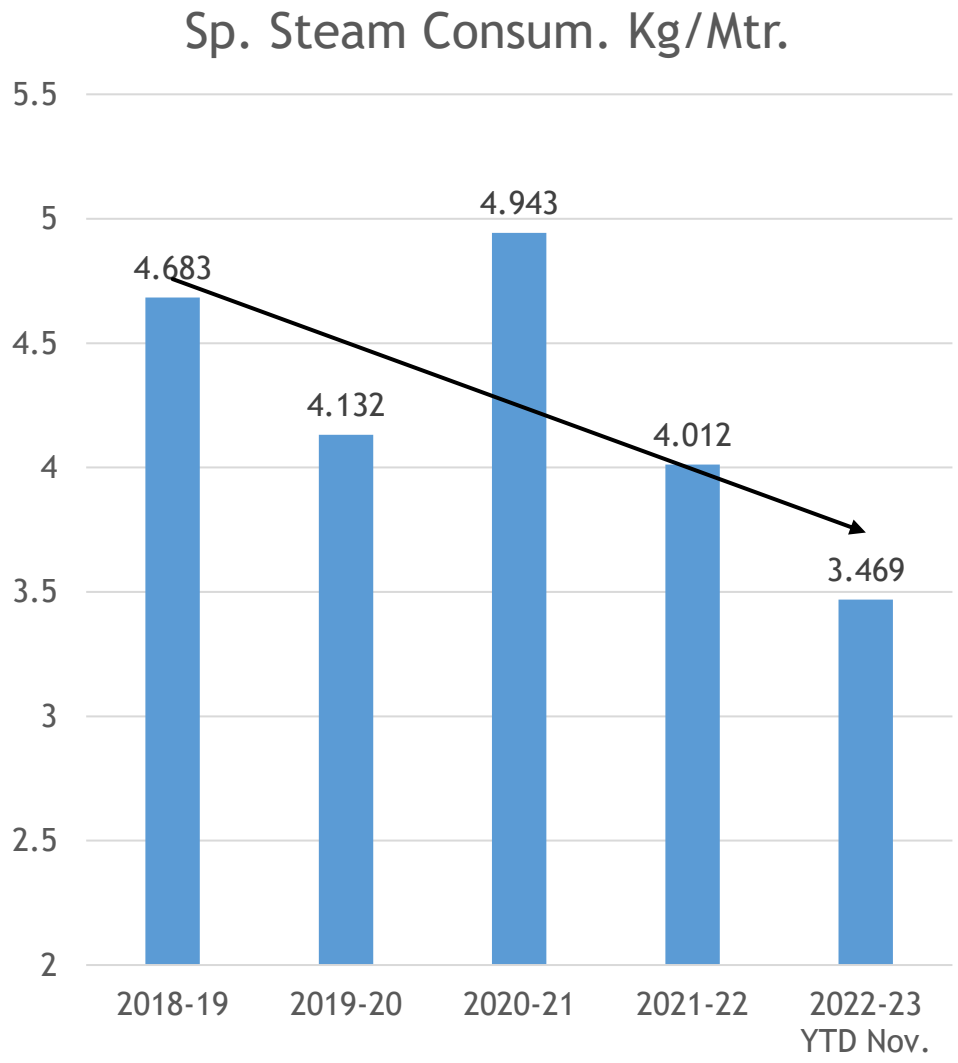
FY	Coal Consumption in MT	Production in Lac Mtr	Sp. Coal Consum. Kg/Mtr.
2018-19	21360.610	144.529	1.478
2019-20	22454.300	149.385	1.503
2020-21	114025.73	58.631	1.945
2021-22	17936.260	120.548	1.488
2022-23 YTD Nov.*	11587.57	98.950	1.171



* Coal + Rice Husk (**8518+3068**) MT

Plant Performance - Steam

FY	Steam Consumption in MT	Production in Lac Mtr	Sp. Steam Consum. Kg/Mtr.
2018-19	67684.890	144.529	4.683
2019-20	61732.791	149.385	4.132
2020-21	28979.960	58.631	4.943
2021-22	48362.620	120.548	4.012
2022-23 YTD Nov.	34327.76	98.950	3.469



Major Energy Conservation Steps

Waste Heat Recovery

Compressed Air System

IoT & Digitalisation

Boiler & Thermopac

Electrical

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Waste Heat Recovery

- **Reduction In C02 Emissions (MT/Year)**
  - 693 MT
- Investment)
  - Rs. 70 lakh
- **Saving Qty Annual**
  - 350 MT Coal & 0.72 Lac Kwh

- **Project Description**

Dyg – From Hot Drained Effluent.

Stenter – From waste exhaust gas.

Compressor – From hot Oil

- **Expected cost saving**
  - Rs. 75 lakh / annum
- **Status**
  - Work in process for Low grade waste heat from Process Machines

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Waste Heat Recovery

Machine	Location	WH Media	Hot Water Recovered In KL/day	Heat Recovered In Kcal	Annual Fuel Saving In MT	Cost Saving In Lakh Rs	CO2 Reduction In MT
Dyg WHR	Top Dyg	Dyg Effluent	76.50	2295000	695	25.43	1551
Stenter	Finishing	Waste Flue Gas	80.00	2000000	606	27.00	1418
Compressor	Compressor Room	Hot oil	81.60	2448000	742	27.13	1654

DYG WHR

Stenter WHR

Compressor WHR

Compressed Air System

- **Reduction In C02 Emissions (MT/Year)**
  - 1069 MT
- Investment)
  - Rs. 105 lacs
- **Saving Qty Annual**
  - 12.6 Lac Kwh

- **Project Description**

Three Bands- Low ,Medium & High

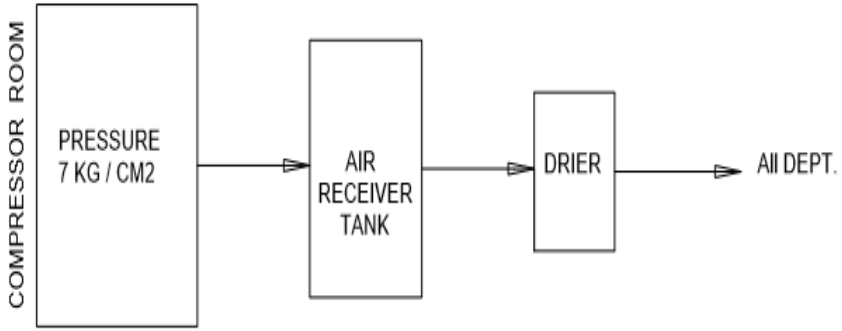
Efficient Compressor- Replaced old with efficient Compressors.

- **Electrical cost saving**
  - Rs. 75 lac / annum
- **Ongoing work**
  - Old Compressor replacement is in process.

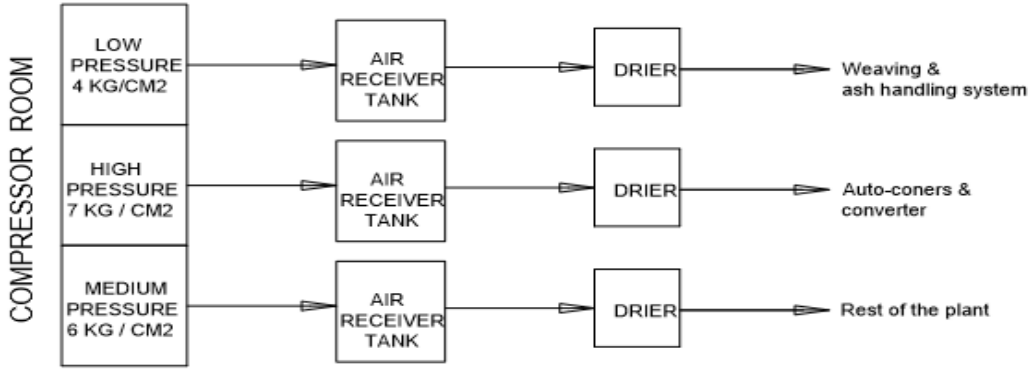
Compressed Air System

Compressed Air Pressure Band Separation

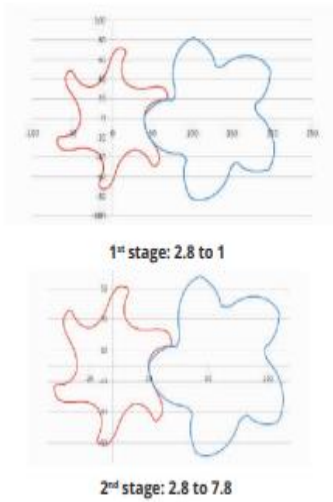
Before Pressure Band Separation



After Pressure Band Separation



Energy Efficient Two Stage Compressor



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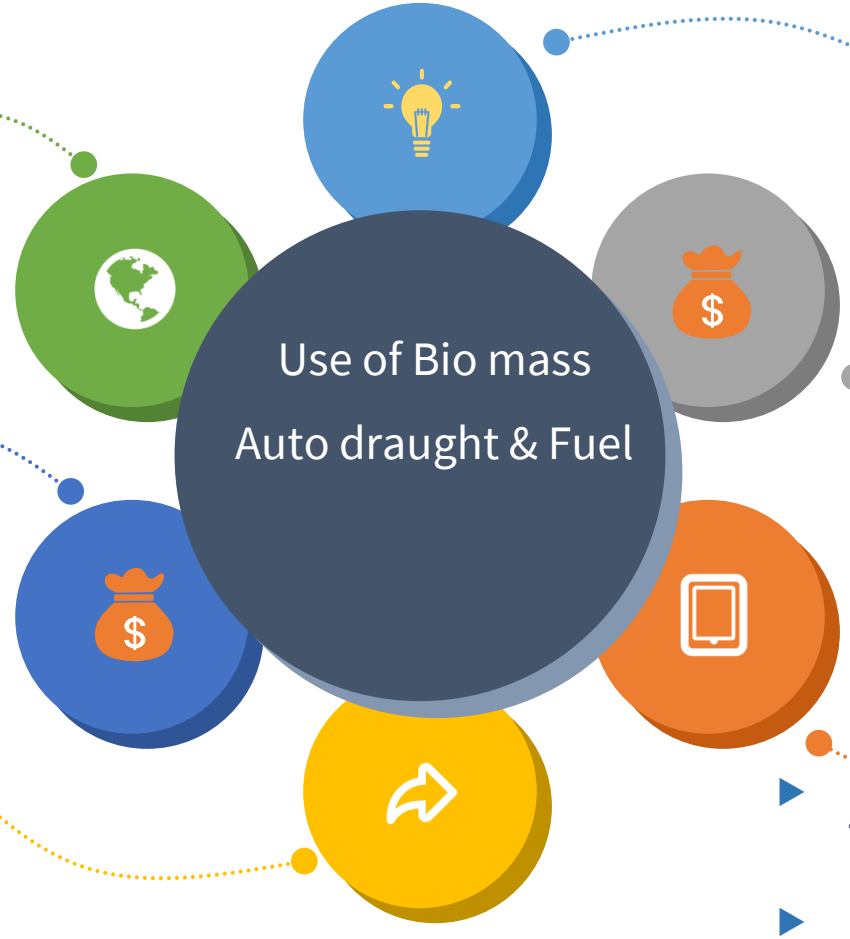
Boiler & Thermopac

- **Reduction In C02 Emissions (MT/Year)**
  - 3404 MT
- Investment)
  - 44 lacs
- **Saving Fuel Qty Annual**
  - 1785 MT



- **Project Description**

1)Use Of Rice Husk in Boiler & Thermopacs

2) Upgradation of Old TFH with Auto fuel Draught System

- **Expected cost saving**
  - Rs. 150 lac/ annum
- **Other Practices**
  - Using Treated Effluent Through RO
  - Pre heating of Feed water by waste heat
  - Automatic Blow Down

Electrical (F.Y. 2018-2023)

- **Reduction In C02 Emissions (MT of CO2)**
  - 2276.80
- **Investment)**
  - 507.55 Lakhs
- **Savingl**
  - 28.10 Lakh kWh

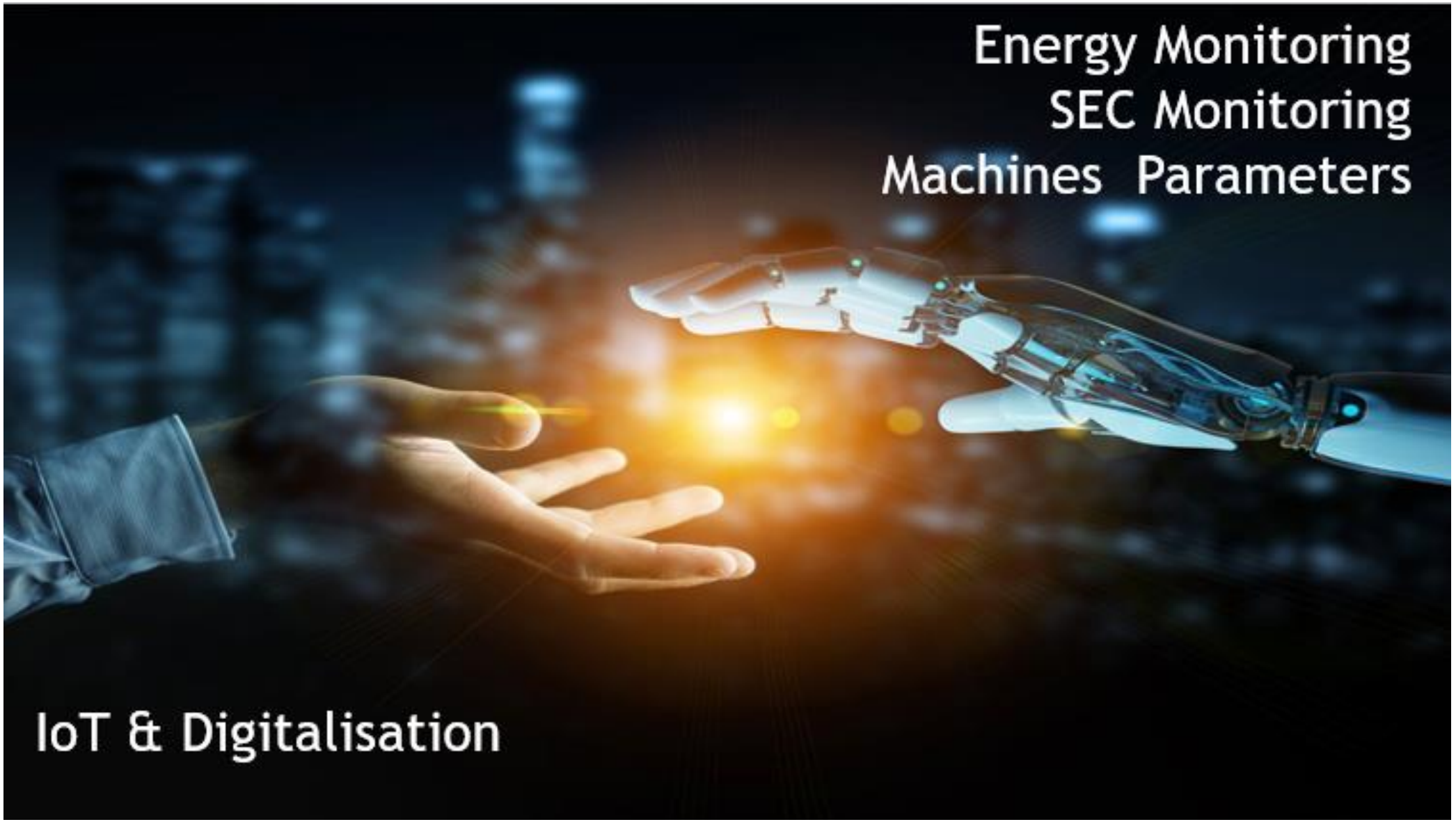
- **Project Description**
  1. Energy Efficient Motors
  2. Efficient Fans In AWTs
  3. Installation of AHF
- **Actual cost saving**
  - 519.09 Lakhs
- **General Practice**
  - Efficient Lighting
  - Harmonics Control & PF Correction
  - Upgradation of Old Machines

Electrical

Efficient Aerodynamic Fans

Power Quality Improvement

Efficient Motors



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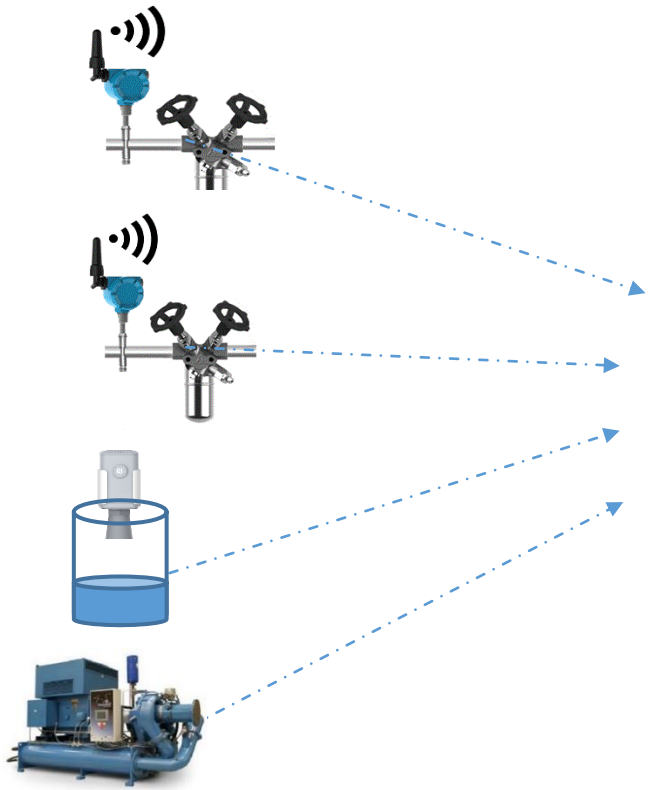
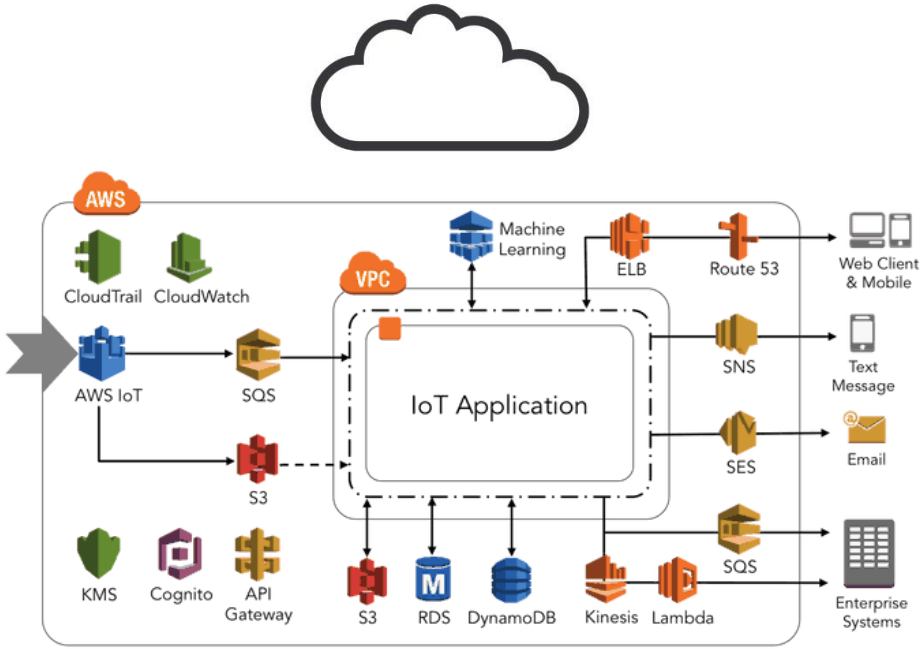
Architecture for IoT set up in Chhindwara plant



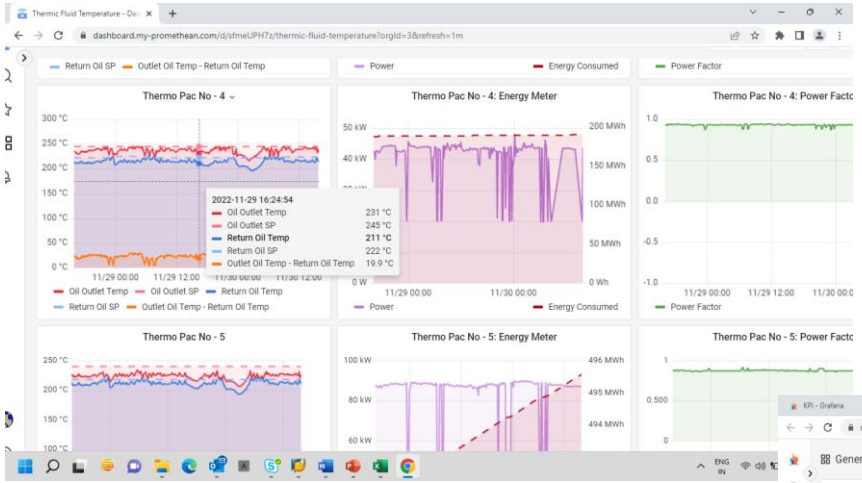
500+ sensors can connect to one gateway

1 gateways can cover a 200 acre factory



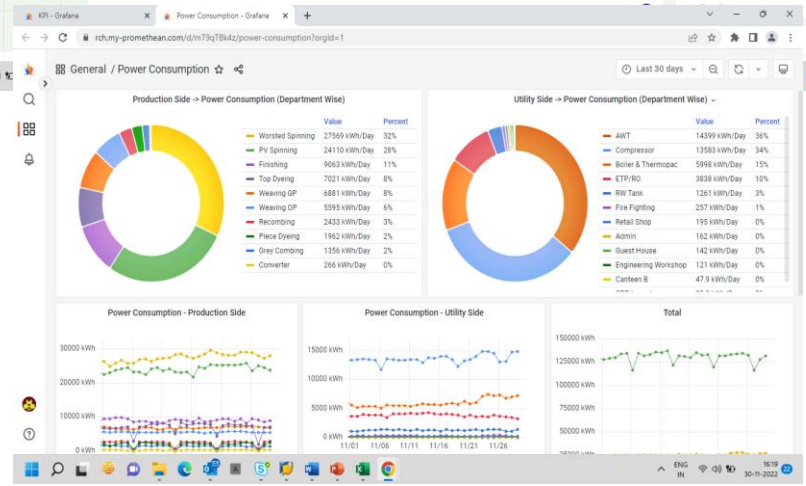
Algorithms to detect failures and issues – continuously learning, and accuracy improves with more installations and more data

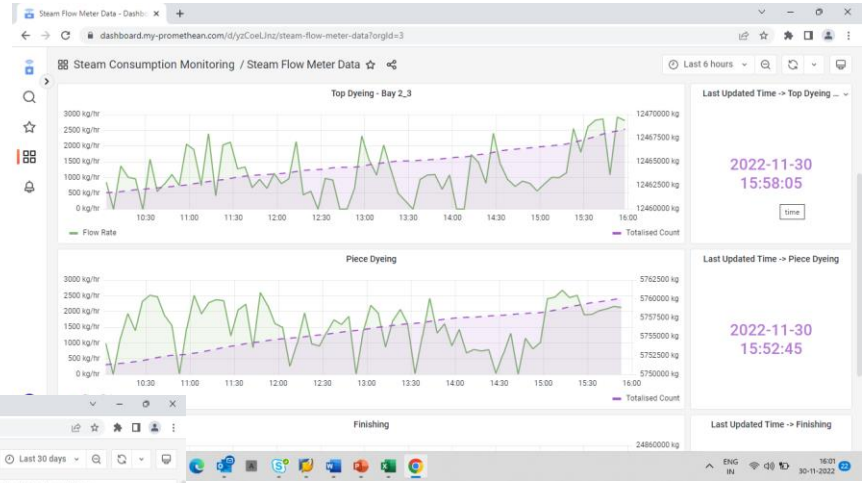
Utility Monitoring



Thermic Fluid Heater

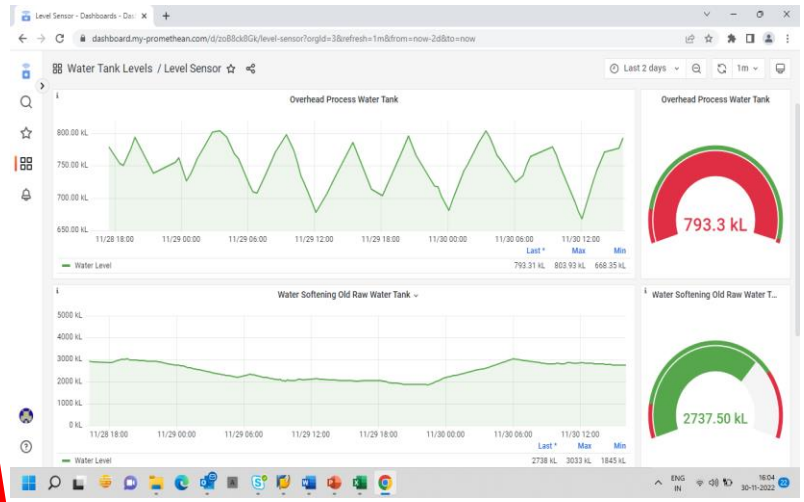
Power



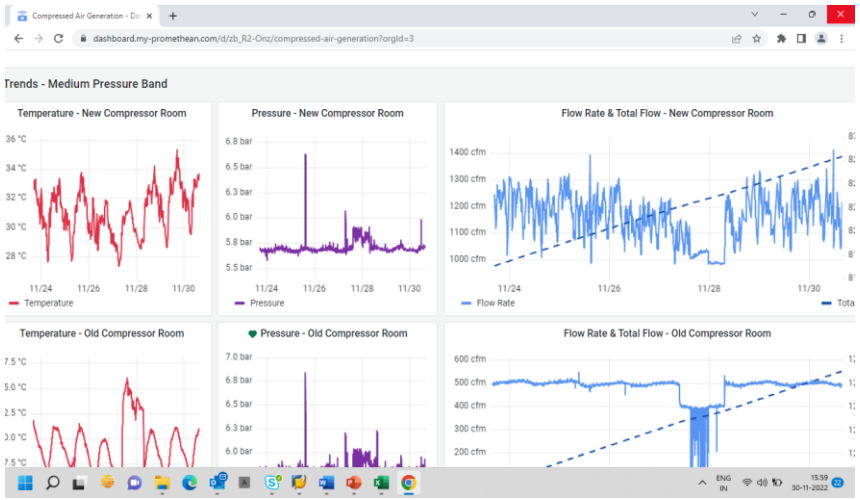


Steam Consumption

Water Level & Consumption



Compressed air system



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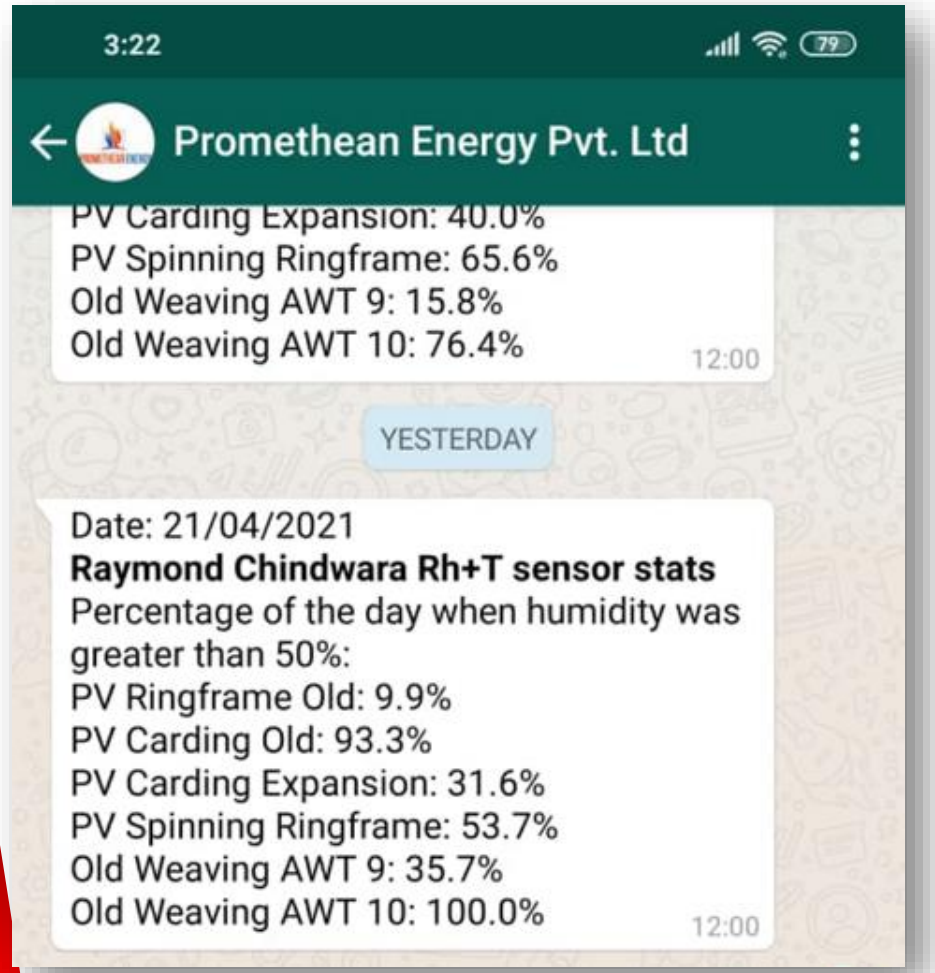
Internet Of Things

- Energy monitoring and Analytics
- Specific Energy Monitor and Alert System
- Easy monitoring and analysis at significant Energy User Machine level.
- Auto WhatsApp Reports to all concerned for Deviation Monitoring & Critical Parameters

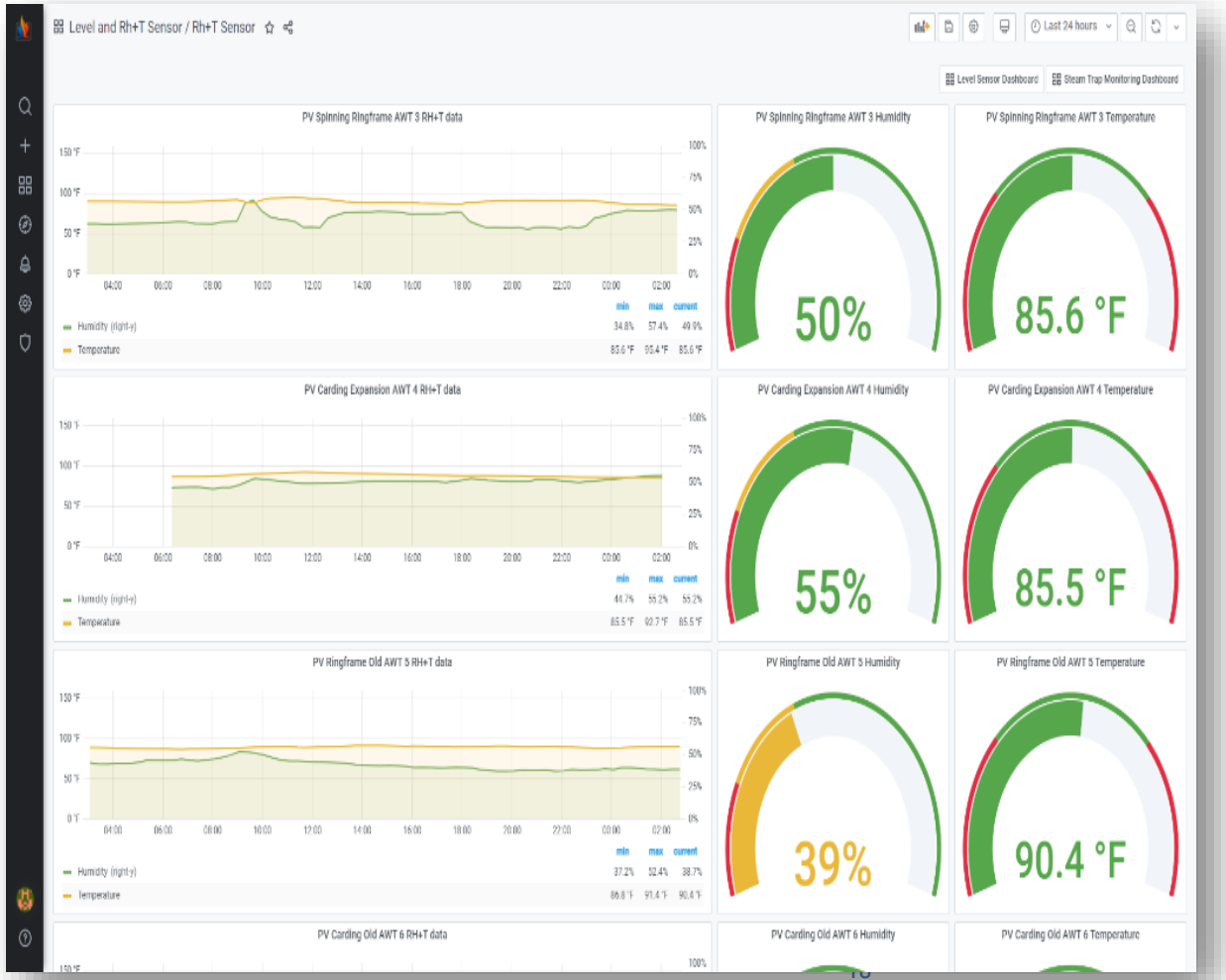
- Utility Monitor.mp4
- SEC.mp4
- Machine KPI.mp4
- WhatsApp.mp4

IoT Based Humidification Monitor

Reports on WhatsApp



Easy Monitoring



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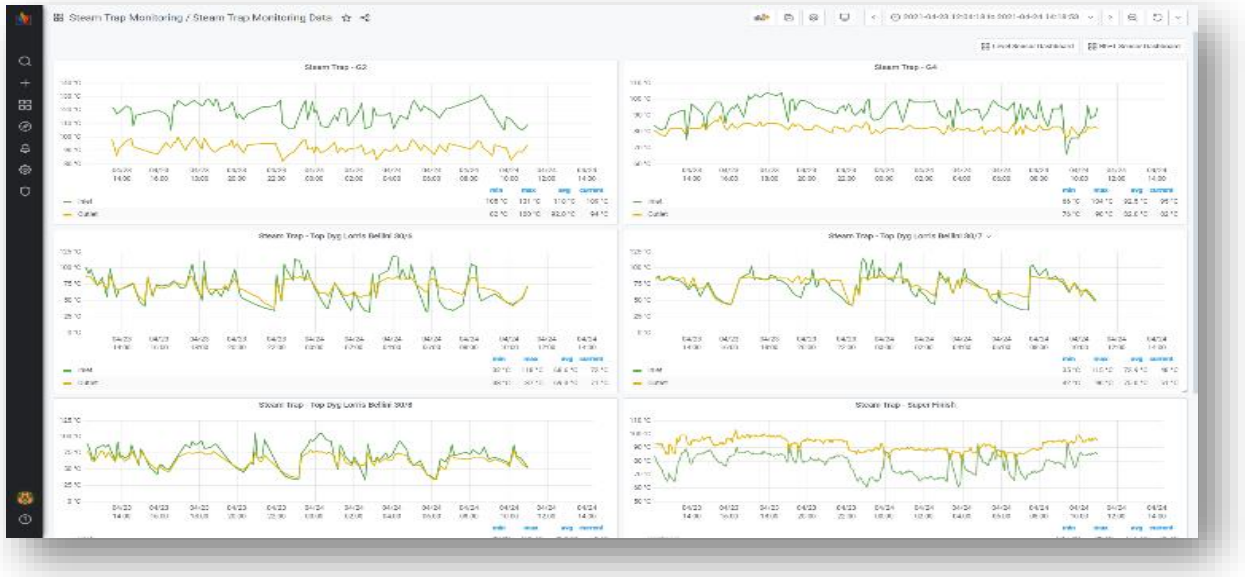
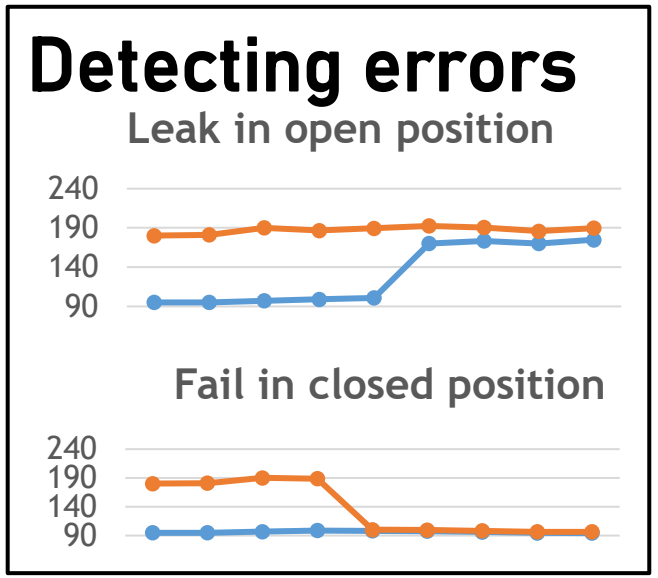
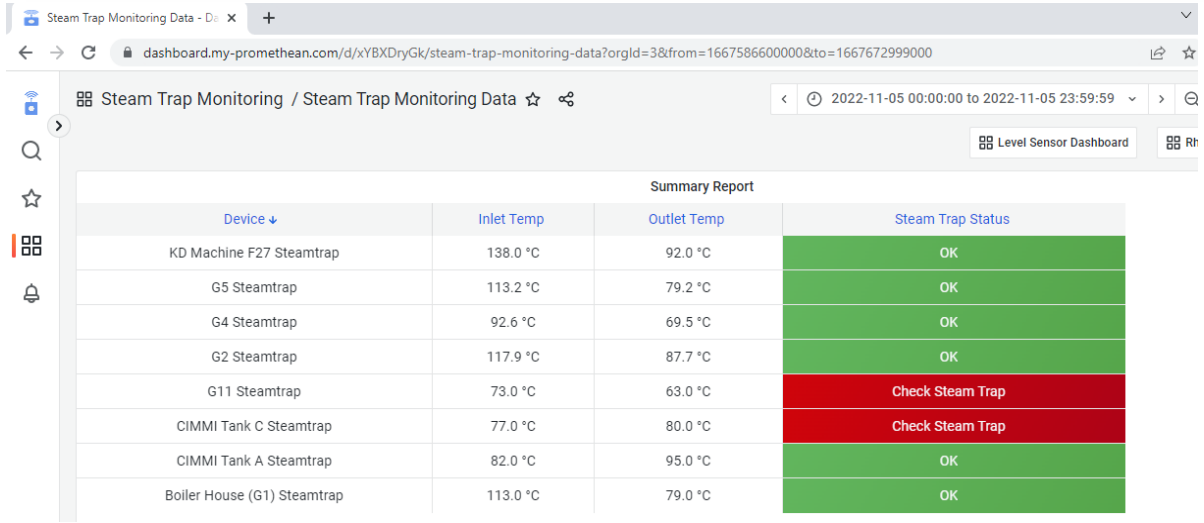
IoT Based Steam Trap Monitor







Summary Report

Device	Inlet Temp	Outlet Temp	Steam Trap Status
KD Machine F27 Steamtrap	138.0 °C	92.0 °C	OK
G5 Steamtrap	113.2 °C	79.2 °C	OK
G4 Steamtrap	92.6 °C	69.5 °C	OK
G2 Steamtrap	117.9 °C	87.7 °C	OK
G11 Steamtrap	73.0 °C	63.0 °C	Check Steam Trap
CIMMI Tank C Steamtrap	77.0 °C	80.0 °C	Check Steam Trap
CIMMI Tank A Steamtrap	82.0 °C	95.0 °C	OK
Boiler House (G1) Steamtrap	113.0 °C	79.0 °C	OK

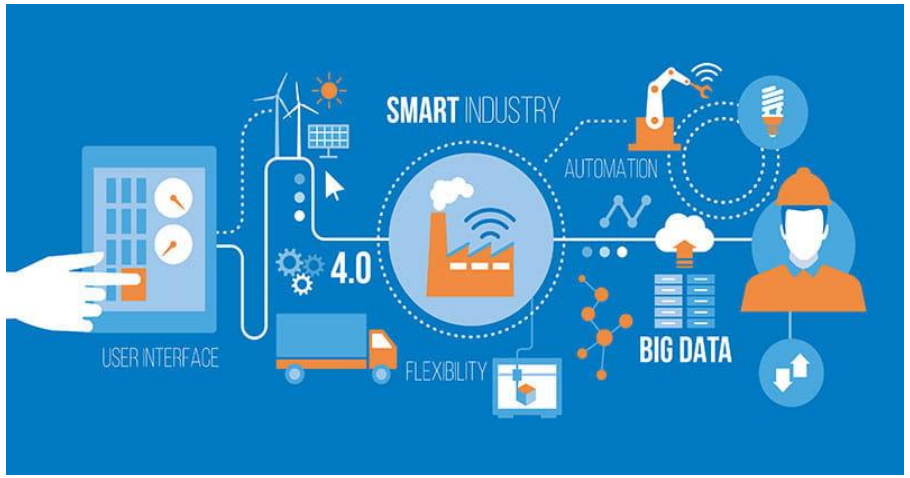
Cost Saving and Carbon Reduction

FY	Power Saving in KWH	Coal Saving in MT	Cost Saving in Lakhs INR	CO2 Reduction In MT
2018-19	368970	1285.34	70.832	3424
2019-20	1452044	264.31	92.058	1874
2020-21	642628	650.31	57.783	2120
2021-22	317397	673.00	60.577	1898
2022-23 YTD OCT	29833	2842.32	105.261	5740

Microsoft Excel Worksheet

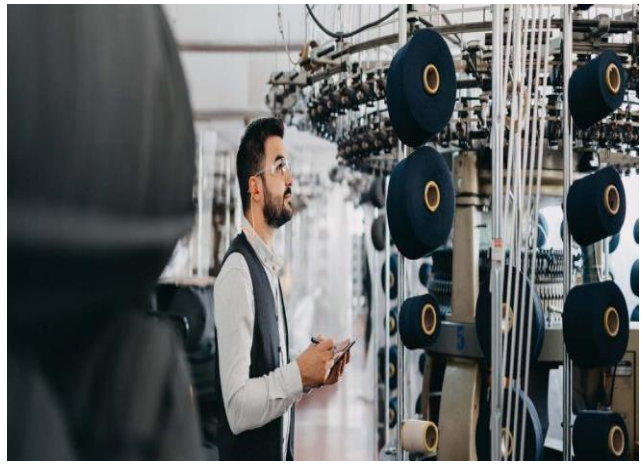
Road Map

Renewable Energy – Solar Power & Thermal energy



Scaling Up of IoT to remaining areas

Scaling Up of Waste Heat Recovery Systems.



Upgradation – Utility & Production Machines

More Biomass use

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Thank You