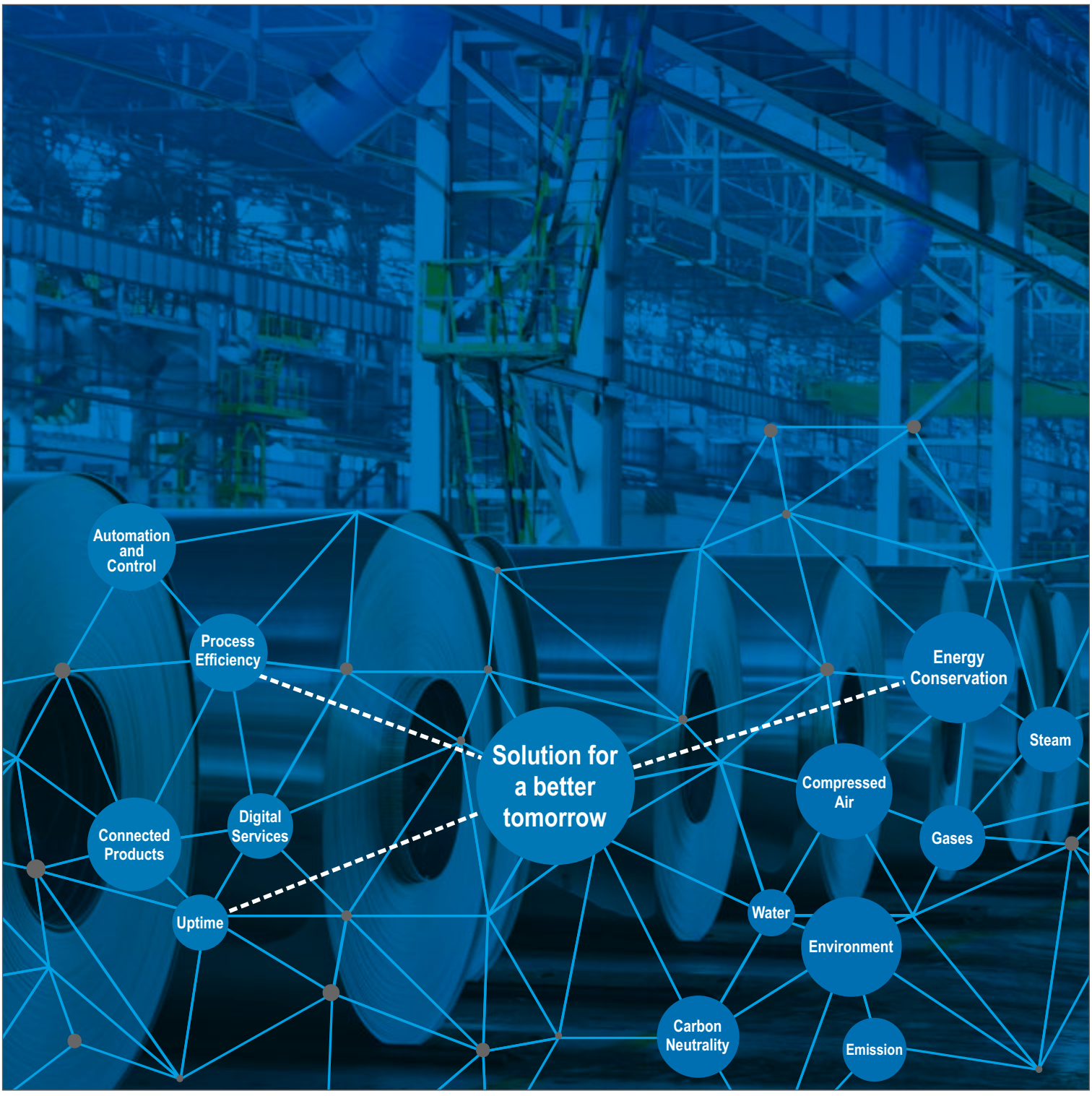
FORBES MARSHALL

Strengthen Your Steel

Solutions for the Integrated Steel Industry



FORBES MARSHALL

Solutions for the Steel Industry

Globally, steel manufacturing is on an upward trend due to heavy demand in infrastructure, manufacturing and the automotive industry, among others. Steel manufacturing is highly energy and water intensive. High production costs and sustainability goals are key areas of concern for the industry. The steel industry is continuously striving to modernise and upgrade older plants to achieve higher energy efficiency levels.

For over 75 years, Forbes Marshall has provided innovative products and services to help industries improve their process and energy efficiency and be more environmentally responsible. We have partnered with small metal producers or finishing mills to large integrated steel plants to reduce energy consumption, optimise the use of water. Our fully engineered solutions for the steel plant, covering the boiler and turbine house, all processes from the raw material to the finished product, and water treatment and effluent treatment help address bottlenecks and conserve energy, offering a typical return of investment of less than a year.

Icon Key

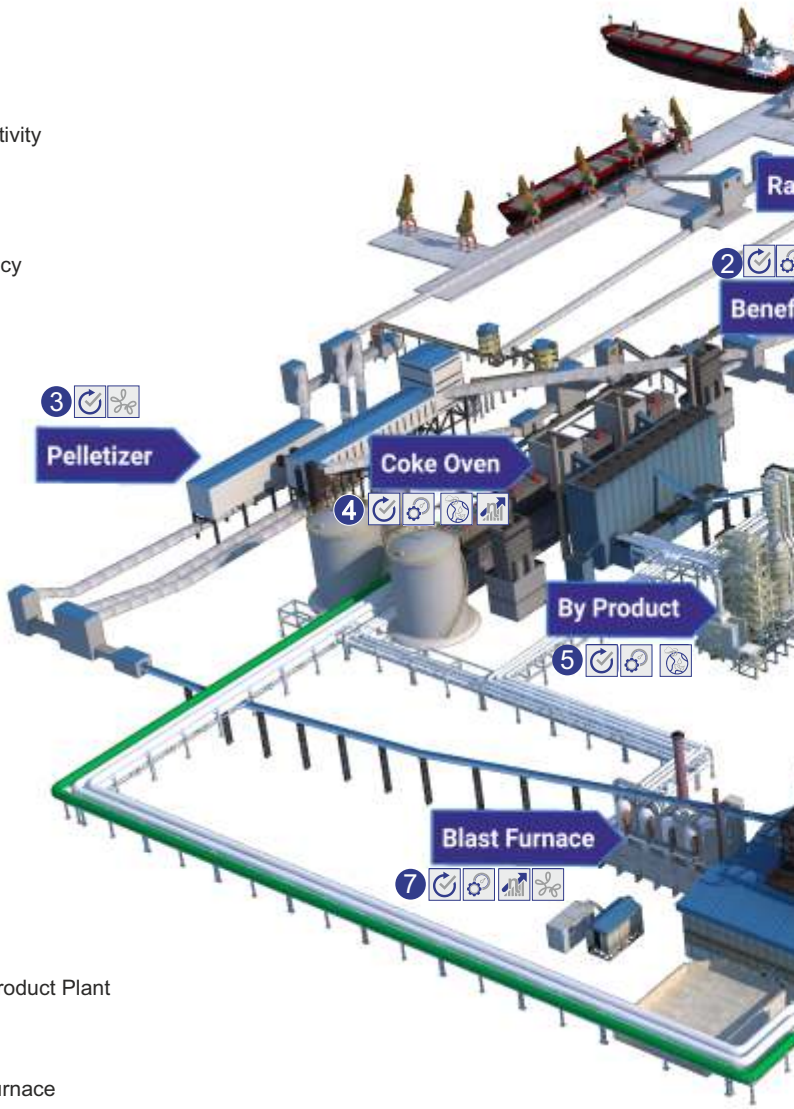
Reliability

Productivity

Ease of Operation

Energy Efficiency

Environment



1. Raw Material
2. Benefication
3. Pelletizer
4. Coke Oven
5. Coke Oven By-product Plant
6. Sinter
7. Blast Furnace
8. Basic Oxygen Furnace
9. Caster
10. HRM
11. CRM Plant
12. Oxygen Plant
13. WTP
14. DM Plant
15. RO Plant
16. Power and Blowing

Process Efficiency

With our diverse industry experience and process knowledge, we help to improve quality, consistency and accuracy of processes. In order to identify areas where control needs to be optimised, it is essential to measure and monitor relevant factors in your process. We offer a wide range of solutions for key parameters like pressure, temperature, flow, level, vibration, gas concentration and process water quality.

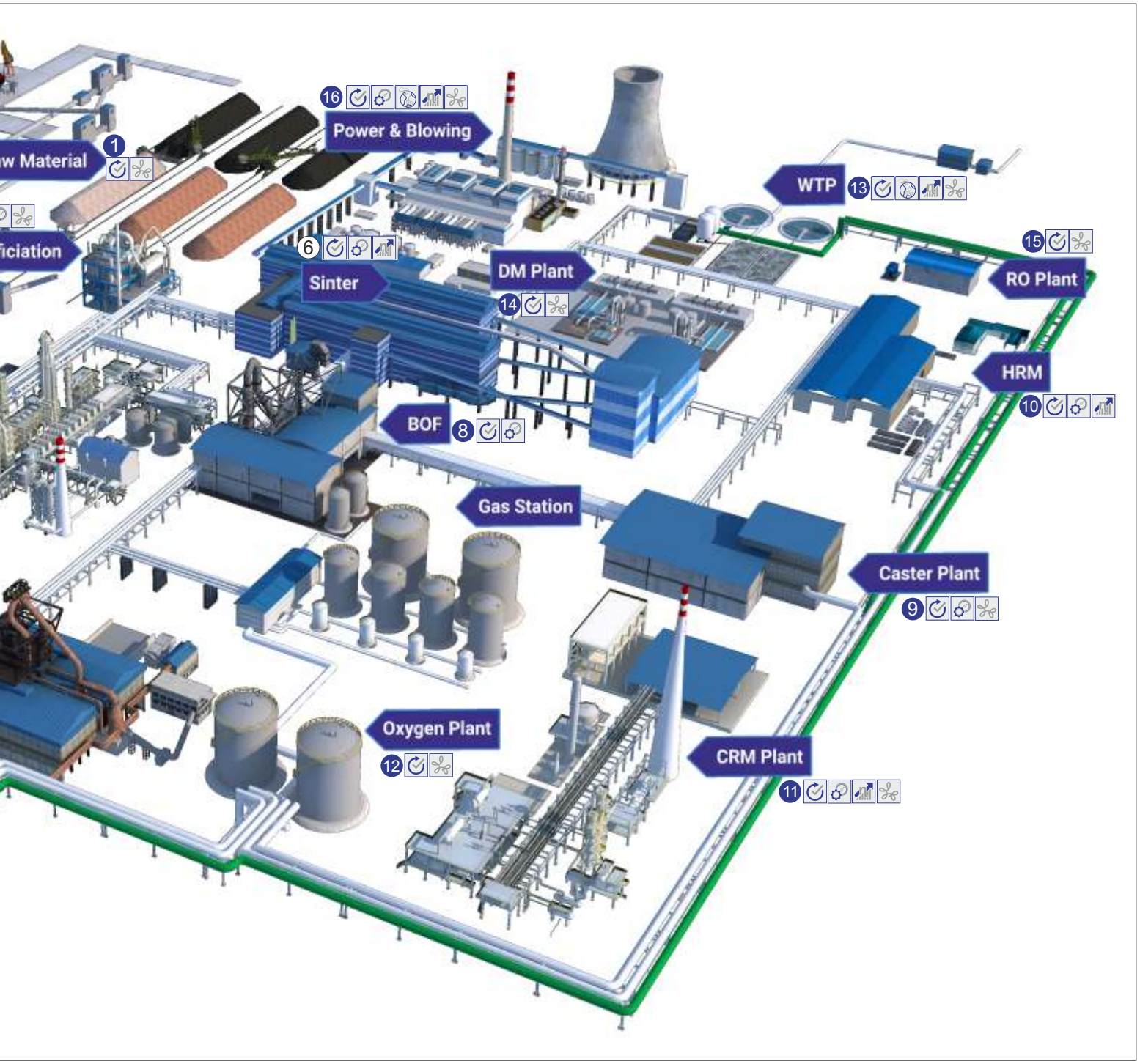
We provide complete turnkey solutions right from design, detailed engineering, drawing, documentation, supply and supervision of installation and commissioning services of the simplest to most complex industrial processes. Our offerings help optimise operations to deliver the desired system performance and product quality.

Energy Efficiency

Through our range of solutions we enable plants to operate at benchmark efficiency and bring down energy consumption. For steel processing, we work towards reducing specific utility consumption per ton of crude steel.

Our monitoring and control solutions for the boiler house help optimise its operating efficiency. Our range of steam accessories enables distribution of steam at the right quality, quantity with the lowest losses while our recovery solutions maximise condensate and flash steam recovery.

A comprehensive bundle of air efficiency solutions help optimise compressed air networks. Customised solutions for process areas, like oxygen enrichment in the blast furnace, help to reduce process energy demand.



Environment

Our pollution monitoring equipment helps plants comply with regulations and reduce their environmental impact. High quality instrumentation for analysing combustion processes and emissions help measure and monitor greenhouse gas and dust emissions. Our range of water quality analysers for effluent treatment plants help monitor parameters like pH, BOD, COD, TSS etc.

We also offer a wide range of products and services to monitor water quality.

We provide digital solutions and services to sustain the uptime of emission and effluent monitoring systems and reduce the water footprint of the plant. By enabling energy efficient operations we are able to reduce plant fuel consumption thus reducing CO_2 emissions.

Uptime

Unplanned plant shutdown due to machine problems can result in huge losses. Proactive health monitoring of utility and process assets and predictive analytical solutions from Forbes Marshall provide an understanding of equipment, systems and machine health and help you plan shutdowns in advance, thereby increasing plant uptime up to 95%.

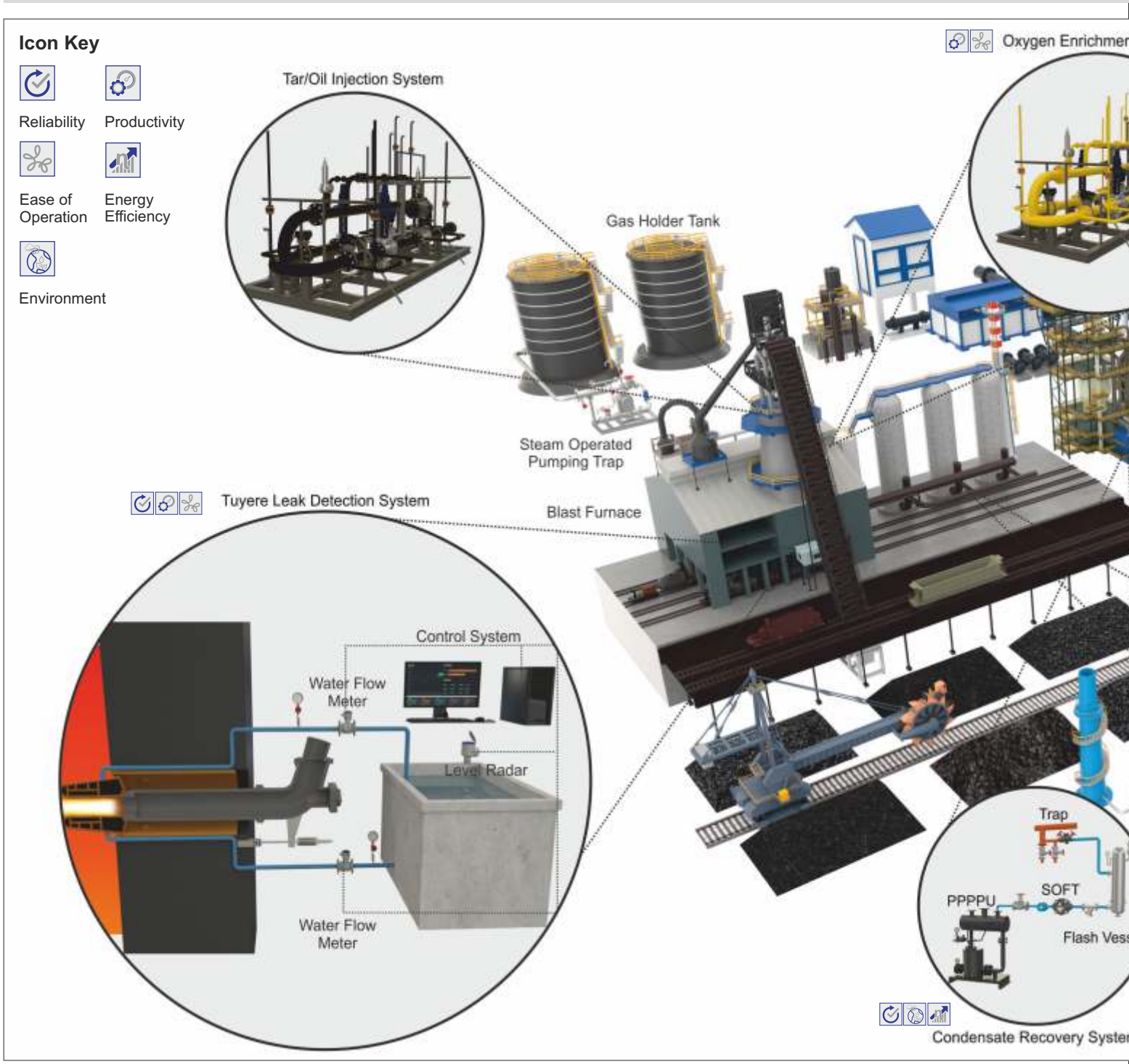
Remote monitoring solutions for rotating machines help users monitor and analyse vibration conditions to plan maintenance schedules better, increasing equipment availability. Steam and water analysis systems help to keep erosion and corrosion in check, minimising maintenance downtime.

Safety

Sustaining zero accident safe operations is possible through robust diagnostics and optimal operating practices. Customised leak detection systems for the blast furnace help prevent fires. Oxygen blowing skids engineered for accurate pressure and flow control help to avert blasts.

Condition monitoring solutions provide an indication of machine health and help to take proactive measures to improve operational safety.

Iron Making



Oxygen Enrichment System

Drawbacks of Conventional Systems

Excess heat required since nitrogen does not take part in the combustion

High fuel consumption, low burner zone control, high CO_2 emission

Benefits of the Forbes Marshall System

Higher flame temperature, hence better reduction of raw materials, higher volume availability, low CO_2 emission

Each percent increase in oxygen content in the blast increases the furnace output by 4.0-4.5 % and reduces coke consumption by 0.9-1.5%

Blast Humidification System

Drawbacks of Conventional Systems

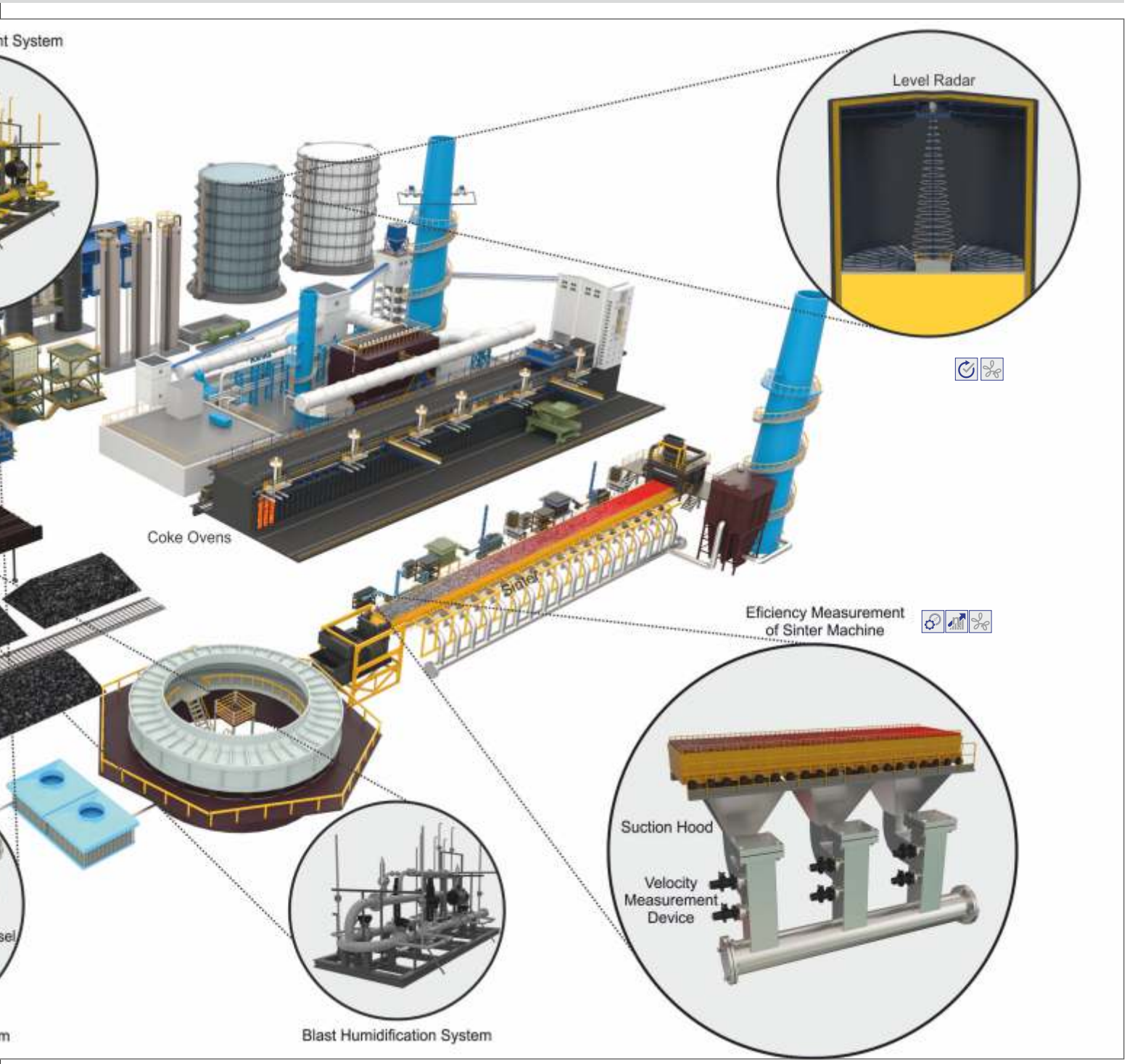
Uncontrolled / excessive moisture in the cold blast; can result in serious damage to the furnace

Less heat available for reduction of iron ore

Benefits of the Forbes Marshall System

Customised solution for optimised RAFT control; reduction in coke rate and increase in combustible gases, leading to better calorific value

Availability of hydrogen which is better reducing agent than carbon dioxide



Tuyere Leak Detection System

Drawbacks of Conventional Systems

Small leakages go unnoticed

Higher operational cost due to undetected water leaks

Benefits of the Forbes Marshall System

Detects leakages by real time measurement thereby increasing safety of the blast furnace

Optimum management of shutdowns due to accurate prediction of tuyere leak

Coal Tar Injection System

Drawbacks of Conventional Systems

Higher coke leading to higher coal requirement

Benefits of the Forbes Marshall System

Reduces process cost by reducing coke rate; coal tar replaces coke directly in a ratio of 1:1.2

Increase in RAFT thereby better reduction of iron ore and increased efficiency of the furnace

Steel Making

Icon Key

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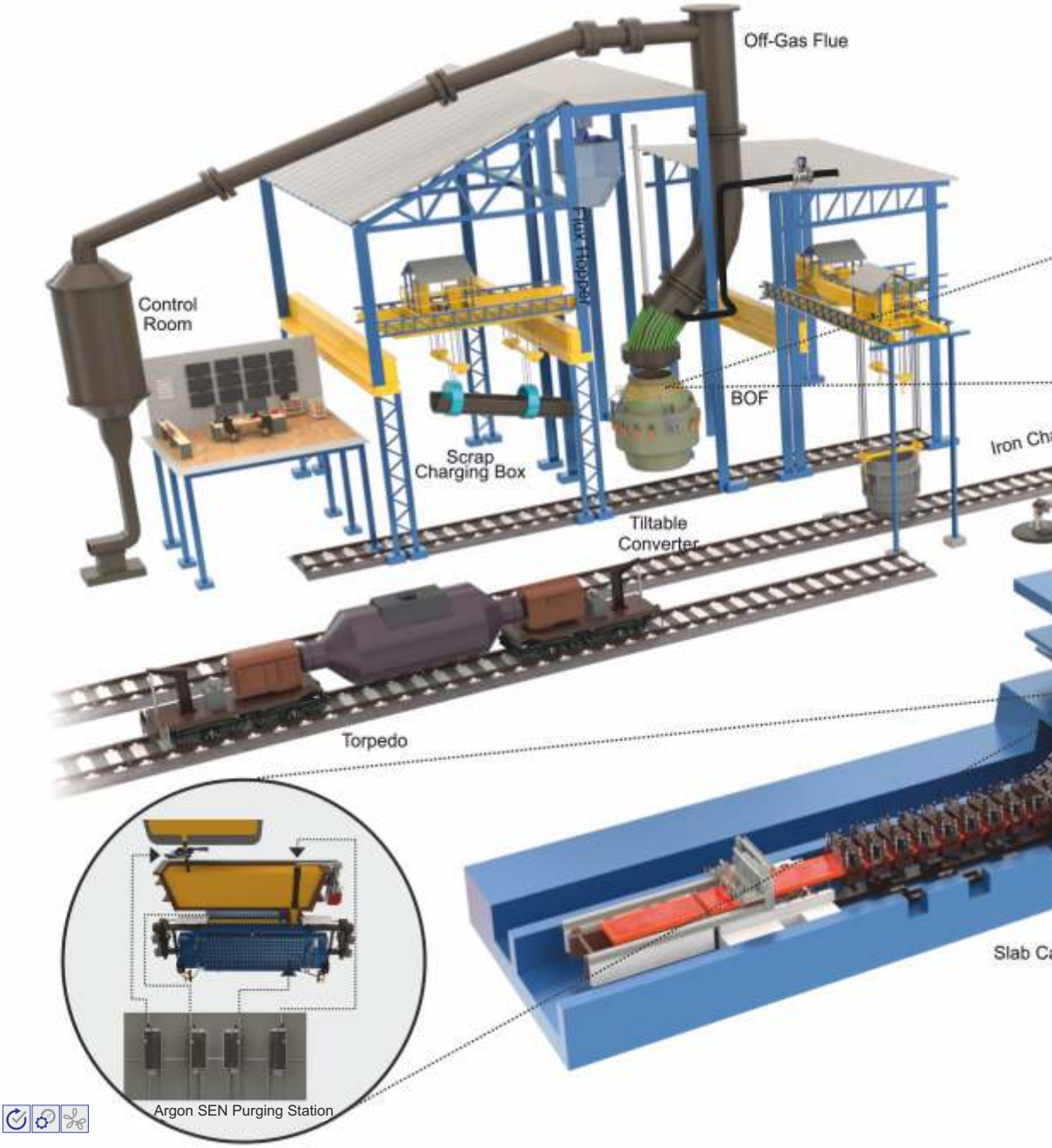


Oxygen Blowing Skid

Drawbacks of Conventional Systems

Improper design of system and control element may lead to unsafe operations

Benefits of the Forbes Marshall System

Customised engineered piping skid for pressure and flow control with safe materials manufactured in clean room atmosphere

Facility to integrate slag splashing in the O_2 blowing piping skid

Slag Splashing System

Drawbacks of Conventional Systems

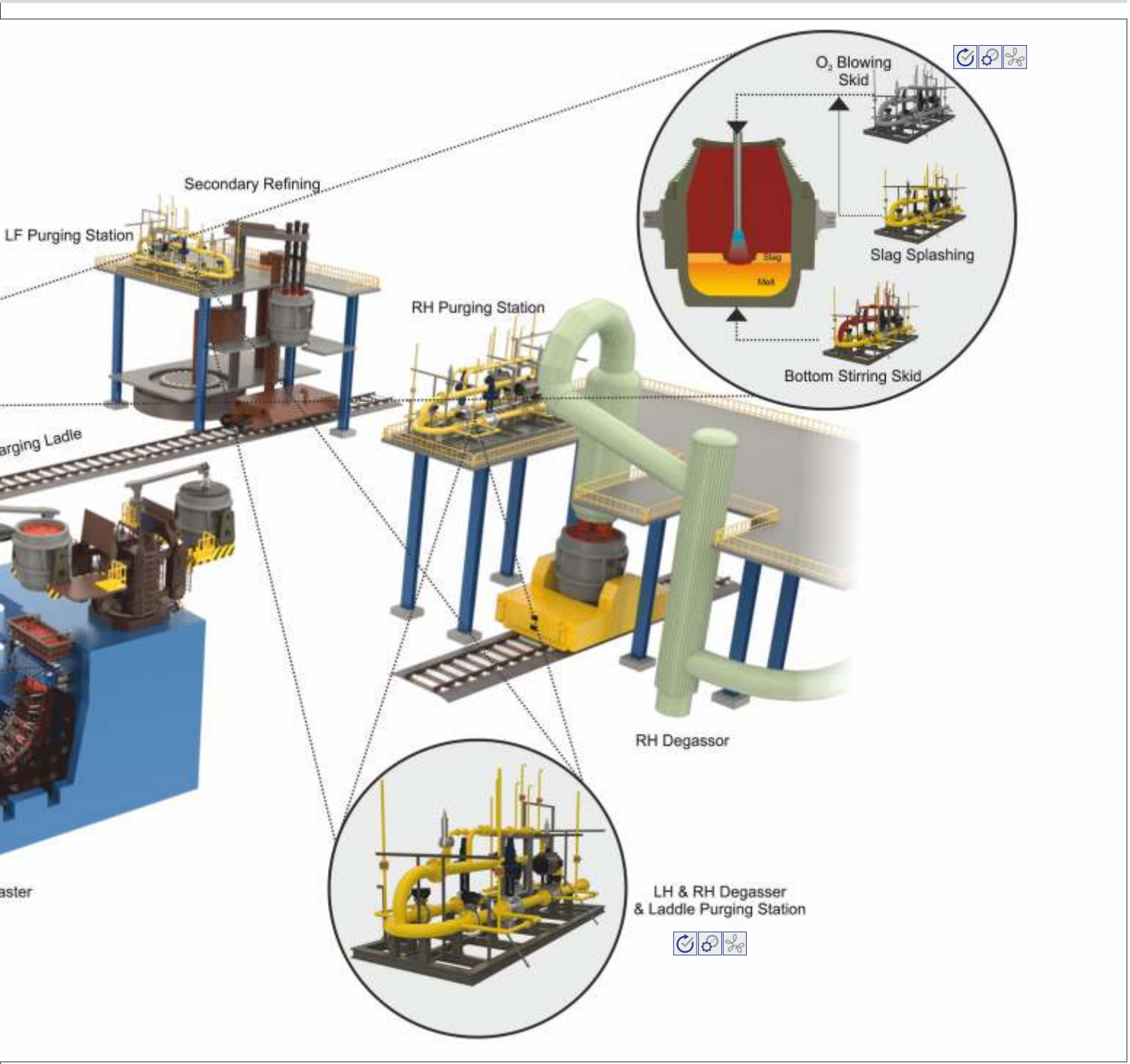
Limited life cycle

Frequent breakdowns due to refractory damage

Benefits of the Forbes Marshall System

Life of converter increased by up to 20,000 heats; reduction in gunning rates down to 500 grams per ton of steel

Quicker payback through significant increase in furnace utilisation



Bottom Stirring Skid

Drawbacks of Conventional Systems

Blowing inert gas at required pressure and flow is a challenge; improper valve design leads to fluctuating flow

Difficulty in obtaining homogeneous temperature, inclusion of floatation in steel bath

Benefits of the Forbes Marshall System

Flow parameters can be monitored and controlled with greater accuracy which increases safety of manual locking at minimum flow

Piping skid consisting of instrumental control package provides better stirring results

Argon SEN Purging Station

Drawbacks of Conventional System

Nozzle gets clogged

Steady control of argon not achieved, leading to frequent air ingress

Benefits of the Forbes Marshall System

No disruption in flow, so less surface defects

Improved operational performance and quality of steel as inert atmosphere is maintained

Steel Mills

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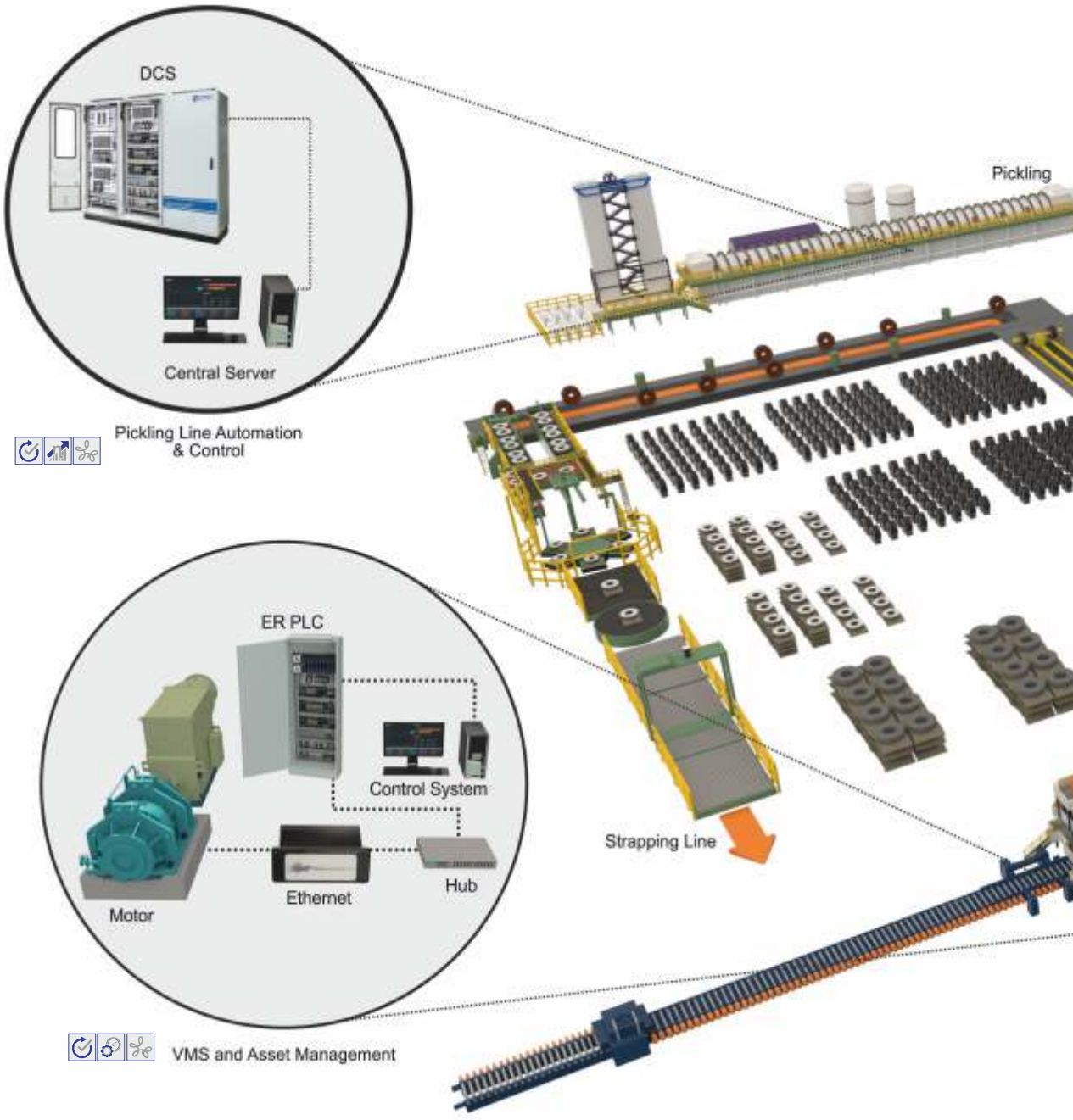


Pickling Line Bath Temperature Control

Drawbacks of Conventional Systems

Improper condensate evacuation causing stall in traps

Frequent opening of bypass valve to drain condensate, leading to steam loss

Benefits of the Forbes Marshall System

Equipped with steam operated pump trap for complete condensate evacuation and effective use of latent heat thereby increasing efficiency of the system

No opening of trap bypass valve during stall, resulting in steam and condensate savings

Jet Wiper System

Drawbacks of Conventional Systems

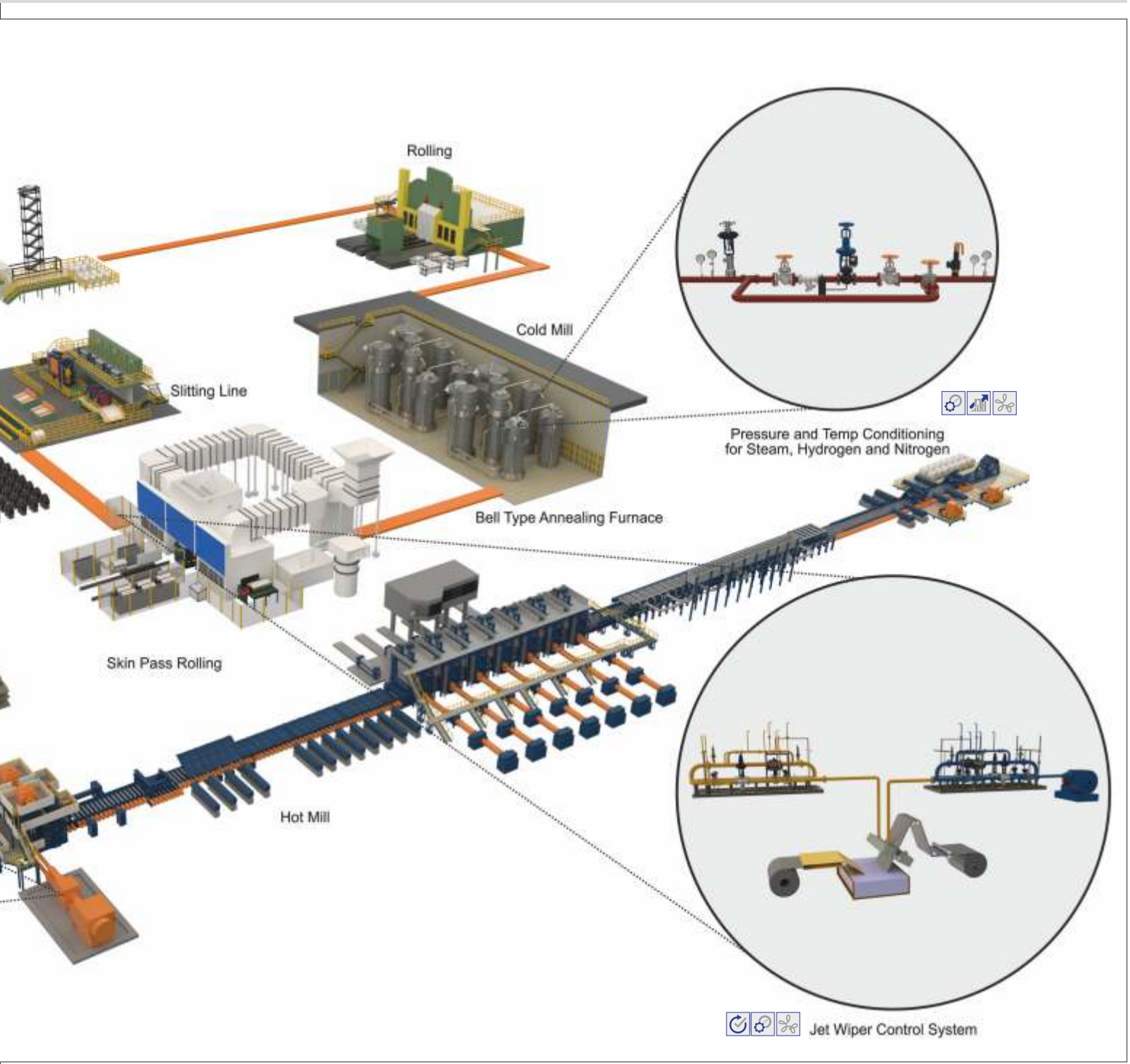
Uncontrolled jet pressure leading to uneven coating

Thickness of coating not as per specification leading to loss of material

Benefits of the Forbes Marshall System

Quality of sheet improves as thickness of coating gets controlled, added advantage with use of nitrogen

Reduced wastage due to even coating



Vibration Monitoring System

Drawbacks of Conventional Systems

Manual monitoring leading to unplanned shutdown

Analysis is done after problems surface

Unpredictable breakdowns

Benefits of the Forbes Marshall System

Plant wide analysis and diagnosis to reduce downtime and unplanned shutdowns; ensures plant safety

Central management system provides vital cross functional information ensuring better coordination between different units of plant

Pressure and Temperature Conditioning for Steam, Hydrogen and Nitrogen

Drawbacks of Conventional System

Variation in pressure and temperature; issues of redundancy, safety, load variations not addressed

Cumbersome installation and high commissioning time

Benefits of the Forbes Marshall System

System based station/skid design ensures controlled parameters addressing operational safety, redundancy and ease of operation

Ease of installation, lower commissioning time

Power and Blowing Station

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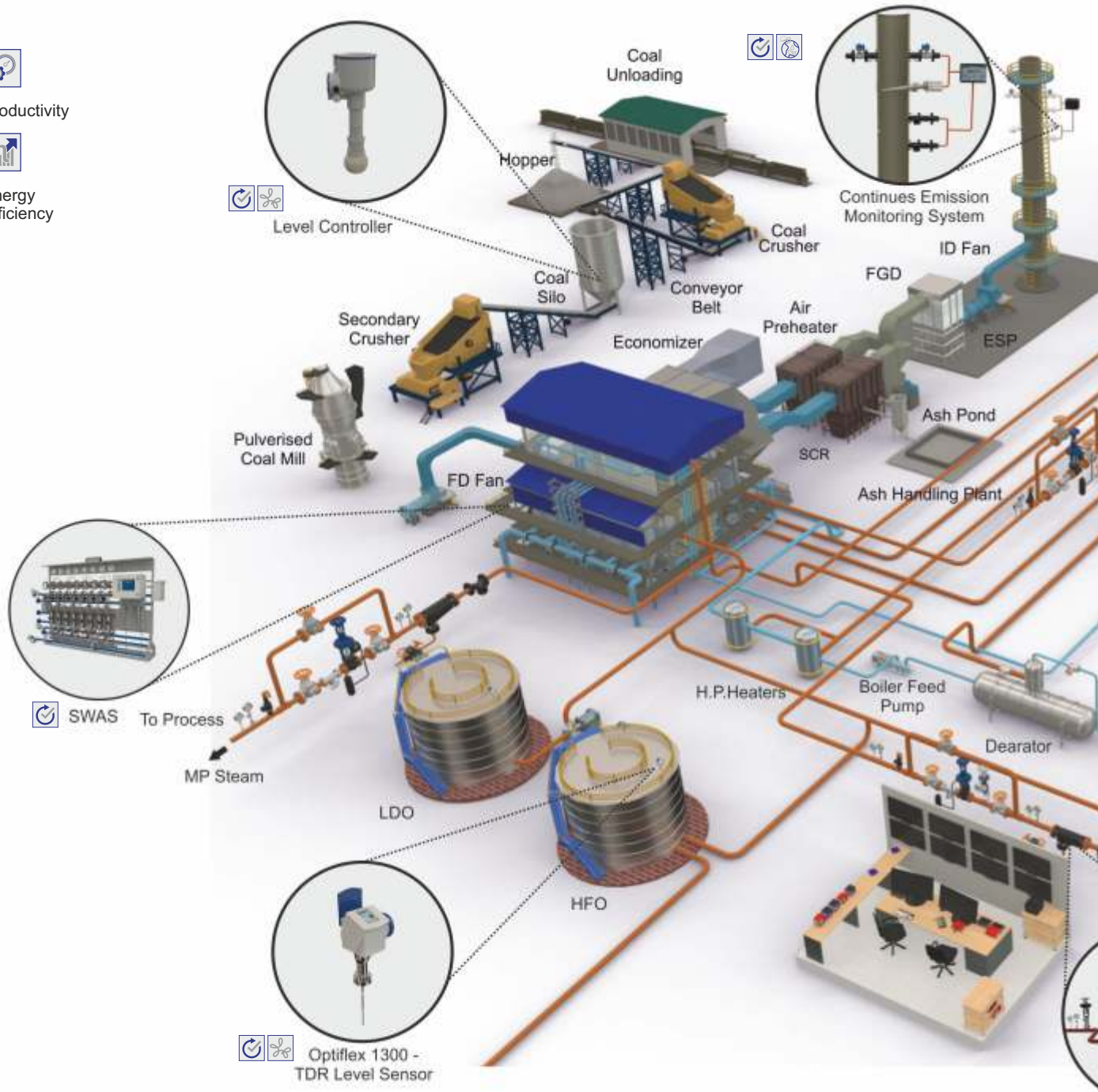


Boiler Automation and Monitoring System

Drawbacks of Conventional Systems

Efficiency parameters not defined

Variations in blowdown leading to loss of heat or increase in TDS level

Benefits of the Forbes Marshall System

Online boiler efficiency measurement with break up of losses (as per BS845)

Parameters can be measured, calculated and controlled

Web based remote performance monitoring

Steam and Water Analysis System (SWAS)

Drawbacks of Conventional Systems

Efficiency of process reduces due to factors like deposition on turbine blades, corrosion on steam pipe work and so on

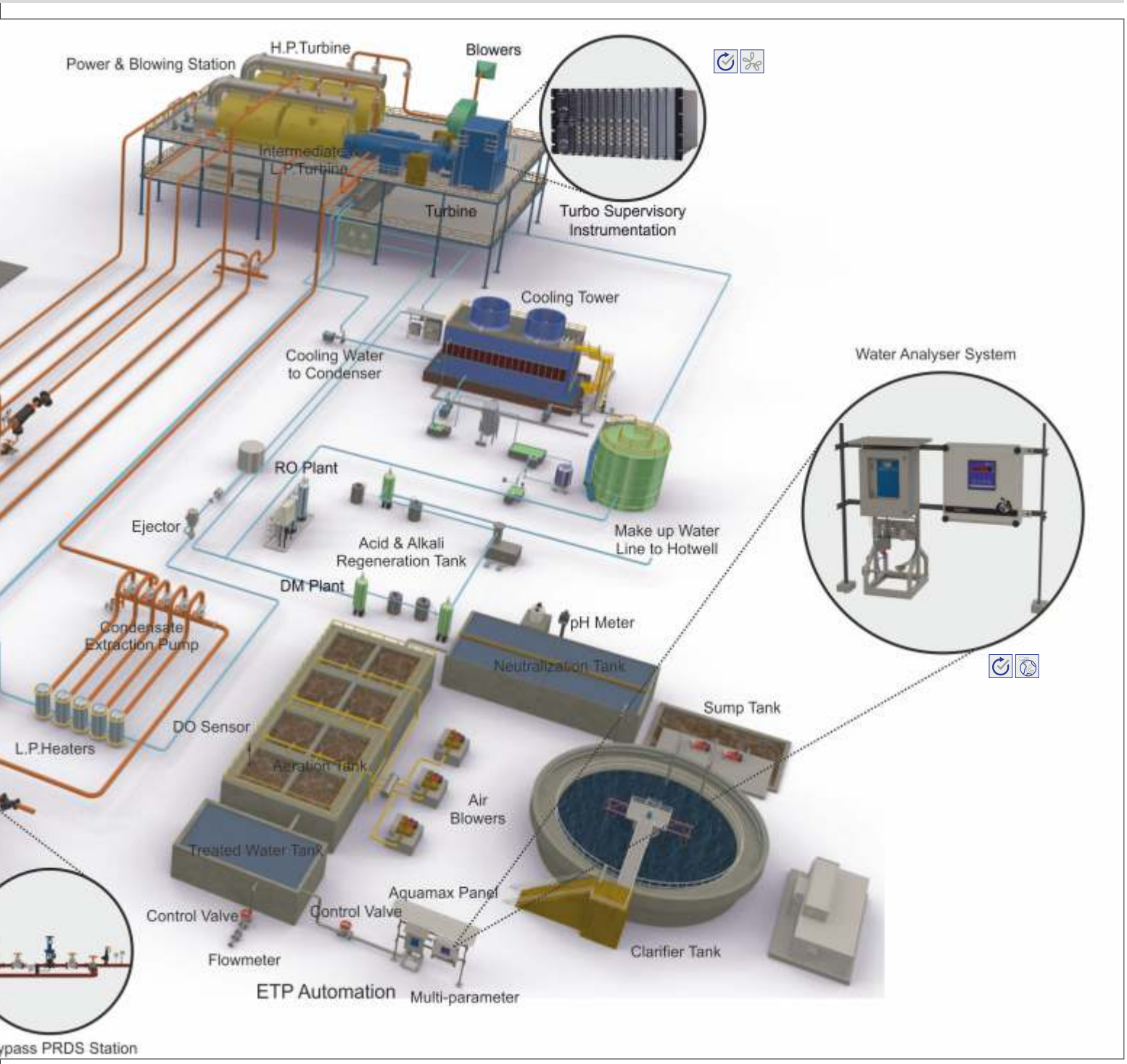
Equipments life gets affected due to bad quality steam and water

Benefits of the Forbes Marshall System

Precise measurements on critical parameters

Erosion and corrosion of equipment kept in check

Maintenance downtime minimised



Turbine Supervisory instrumentation and VMS

Drawbacks of Conventional Systems

Vibration not being monitored, and therefore not controlled, reducing the operating efficiency

Manual data collection for auxiliary by portable leads to delayed analysis

Benefits of the Forbes Marshall System

Forbes Marshall turbine supervisory instrumentation system monitors, analyses and diagnoses the behavior of turbines by measuring critical parameters

Forbes Marshall Vibtrans™ and Vibassist™ gives flexibility to monitor locally as well as remotely along with analysis and diagnostic of rotating equipments and assets

Pressure Reducing and Desuperheating Station (PRDS)

Drawbacks of Conventional Systems

Pressure reducing valve placed before the fixed nozzle desuperheater; challenges in delivering steam at the right pressure for the process

Benefits of the Forbes Marshall System

Pressure reduction and desuperheating in a single valve along with redundant variable nozzle desuperheater

Fully integrated engineered solutions with direct acting, pilot operated and PID controlled pressure reducing valves to deliver the right steam pressure

Hassle free installation and increased efficiency

Shared Services

Icon Key

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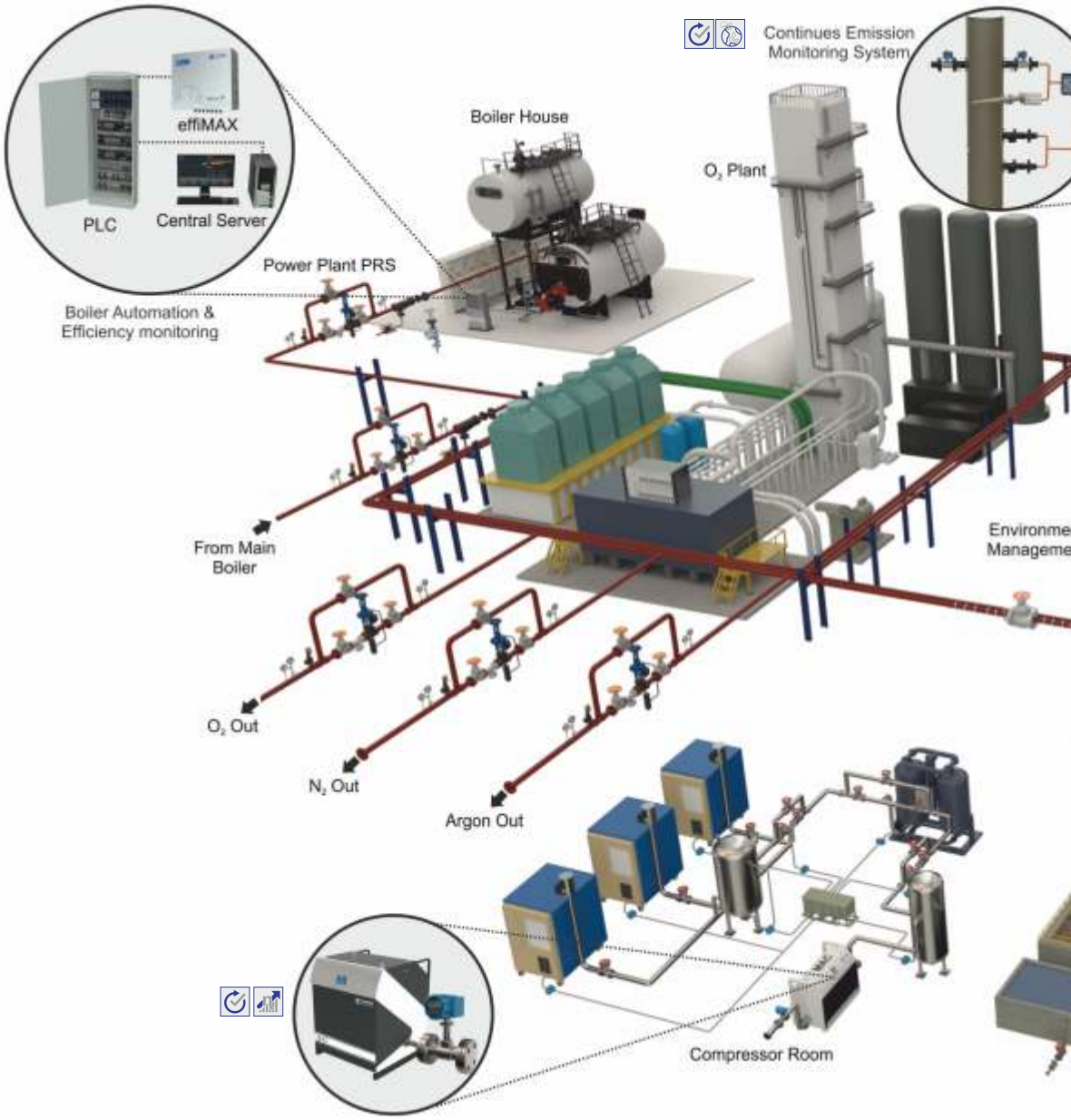


Steam Systems

Drawbacks of Conventional Systems

Loss of heat/energy due to steam over usage/ leakages

Maintenance of steam products is a concern

Benefits of the Forbes Marshall System

Optimum steam consumption and condensate recovery with zero leakage

Better lifecycle with minimal maintenance

Water Management Systems

Drawbacks of Conventional Systems

Manual monitoring

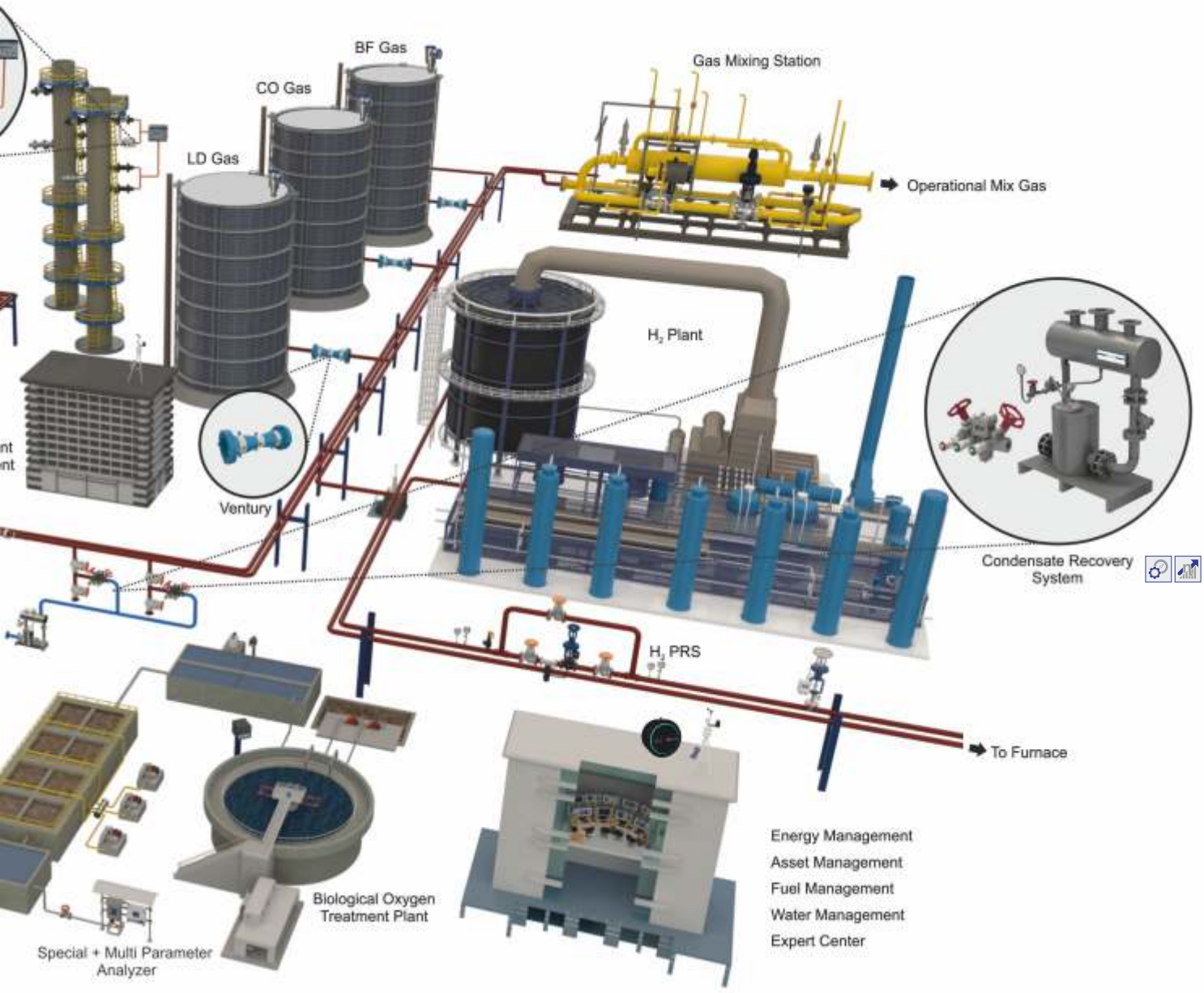
Water / effluents discharged not within industry norms

Increase in operating cost and plant efficiency

Benefits of the Forbes Marshall System

IoT enabled solutions for measurement and control of parameters in water, drinking water, waste water and effluent within norms

Optimised operational costs with remote monitoring and reporting facility



Environment Management System

Drawbacks of Conventional Systems

Manual monitoring, old technology extractive system

Do not address changing requirement of regulating bodies

Frequent maintenance required

Benefits of the Forbes Marshall System

Well engineered insitu systems

Robust, reliable and capable of continuous operation over long periods of time with minimal maintenance

Efficient online emission data transmission to SPCB and CPCB central servers

Smart Services

Drawbacks of Conventional Systems

Non availability of skilled personnel for maintenance; system health affected

High maintenance and calibration costs

Benefits of the Forbes Marshall System

Integration of the existing system with IIot analytical devices by subject matter experts and service team

Increased system availability

Smart remote maintenance

Mining and Beneficiation

Icon Key

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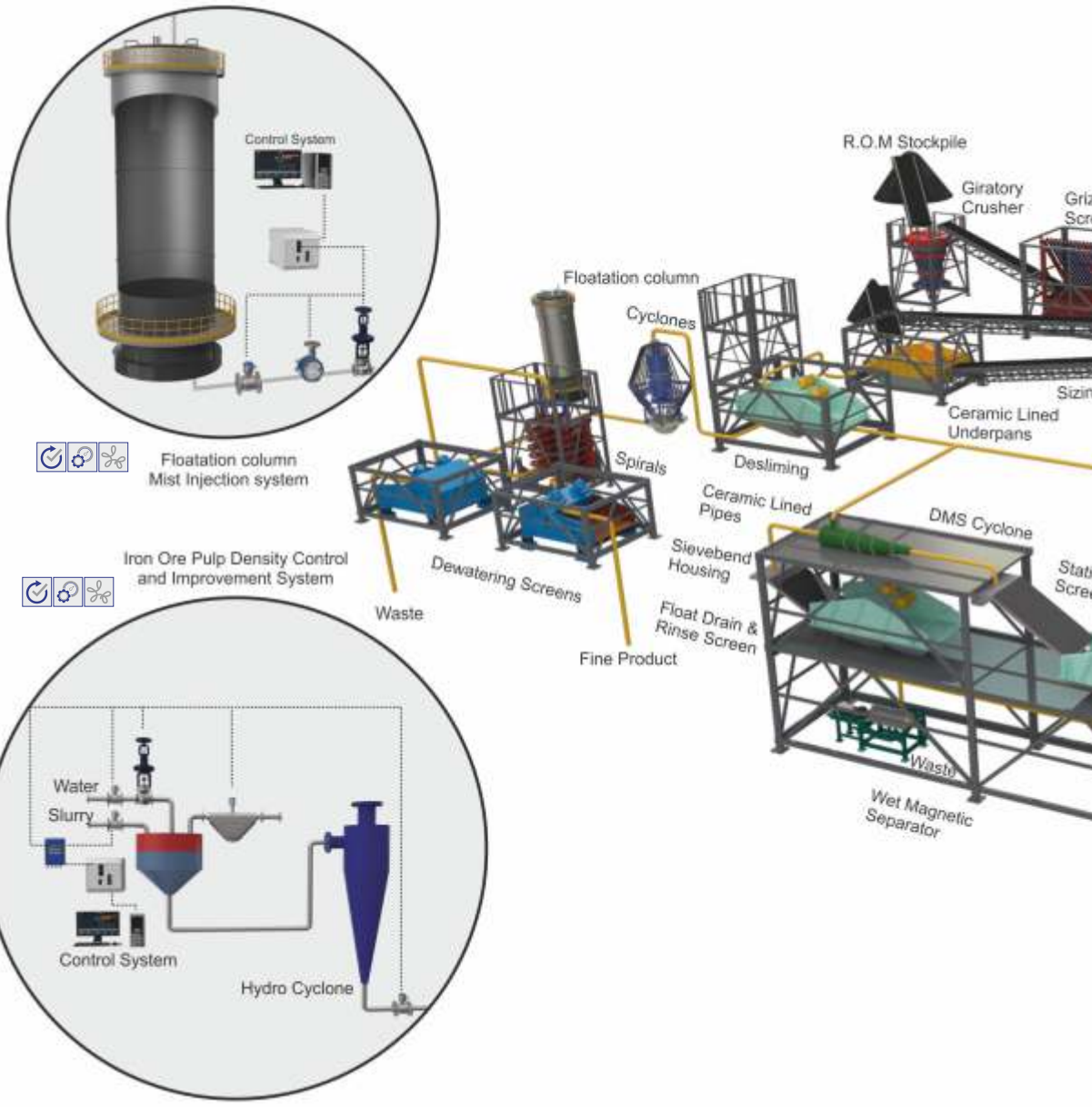
Ease of Operation

Energy Efficiency

Environment



Flocculant and HRT Automation for Coal Washery

Drawbacks of Conventional Systems

Poor process and production efficiency due to uncontrolled/ assumption based dosing

Time consuming, breakdown prone, not user friendly

Benefits of the Forbes Marshall System

Better control of density at HRT outlet yields better process efficiency

Accurate dosing of polymer/chemical leads to saving

User friendly SCADA based system for easier process management

Iron Ore Pulp Density Control and Improvement System

Drawbacks of Conventional Systems

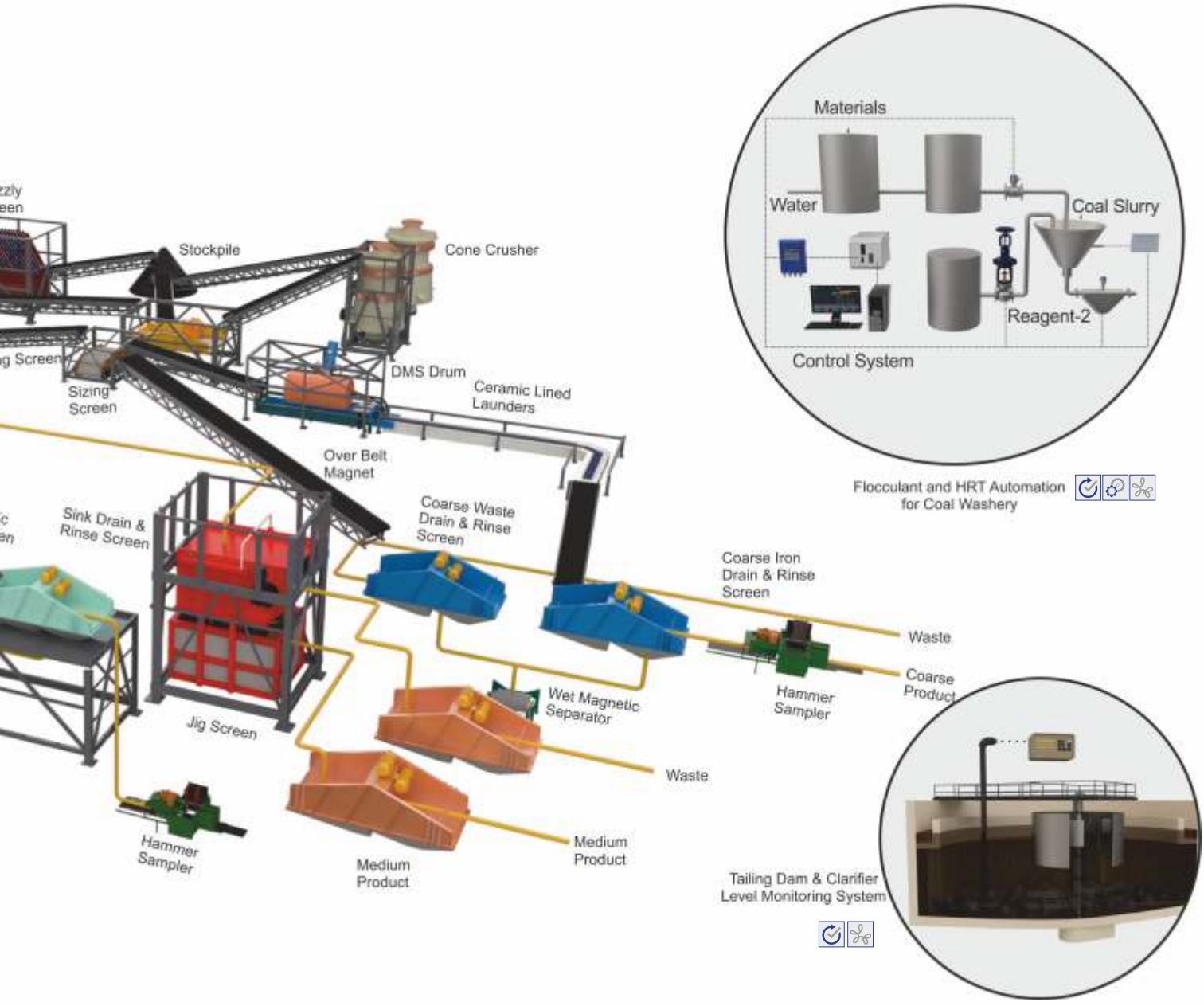
Poor process and production efficiency, breakdown prone, not user friendly

Labour intensive

Benefits of the Forbes Marshall System

Better pulp density control before hydro cyclone yields better productivity; accurate control of water addition; avoids water loss and jamming

User friendly SCADA based system for easier process management; no manual intervention required



Flocculant and HRT Automation for Coal Washery

Tailing Dam & Clarifier Level Monitoring System

Floatation Column Mist Injection System

Drawbacks of Conventional Systems

Low efficiency

Loss of recovery of materials due to uncontrolled process

Benefits of the Forbes Marshall System

Water addition in air for mist formation and improved efficiency

Controlled processes with accurate control of air and water for maximum recovery and minimal loss of iron ore

Tailing Dam Level Monitoring System

Drawbacks of Conventional Systems

Surface level monitoring; no information of solid level

Manual checking of solids leading to inaccurate profiling of solid content over the depth of tailing dam

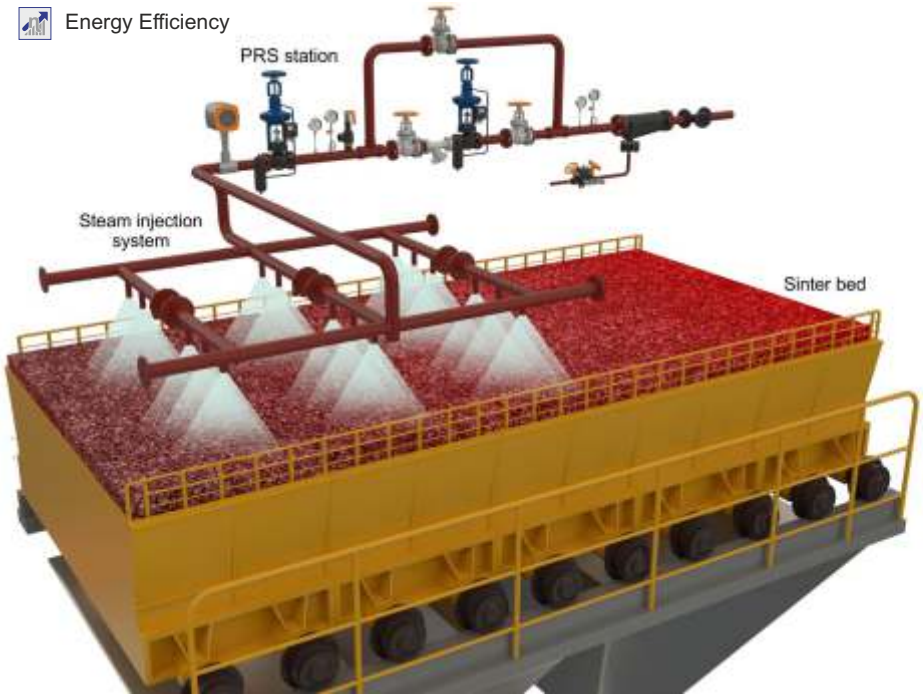
Benefits of the Forbes Marshall System

Accurate measurement based on profiling technique gives a clear idea of solid content apart from level measurement

Wireless transmission of signal and alerts

Sinter Bed Steam Injection System

- Reliability
- Productivity
- Energy Efficiency



Drawbacks of Conventional Systems

Limitation on speed

Higher coke consumption

Benefits of the Forbes Marshall System

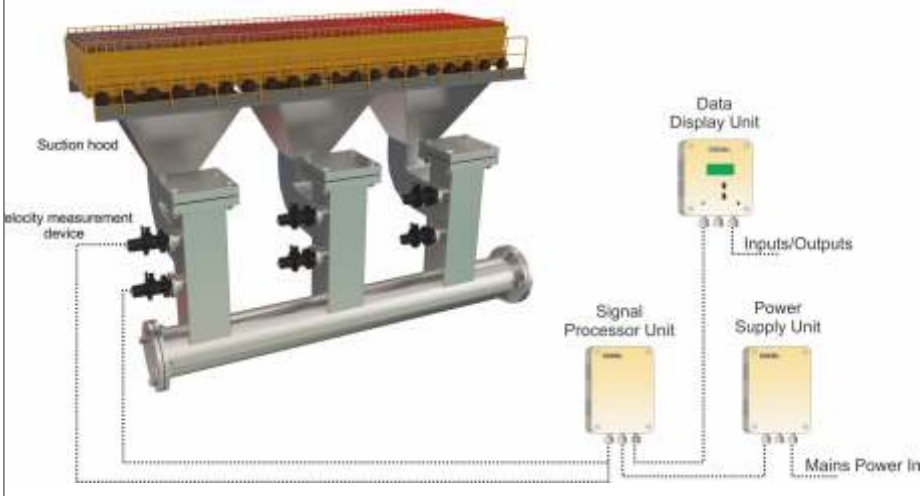
Increase of heat generation in the bed [$CO+OH=CO_2+H$]

Increase in sintering machine speed

Lower coke consumption, lower exhaust gas temperature

Sinter Plant Efficiency Monitoring

- Reliability
- Energy Efficiency



Drawbacks of Conventional Systems

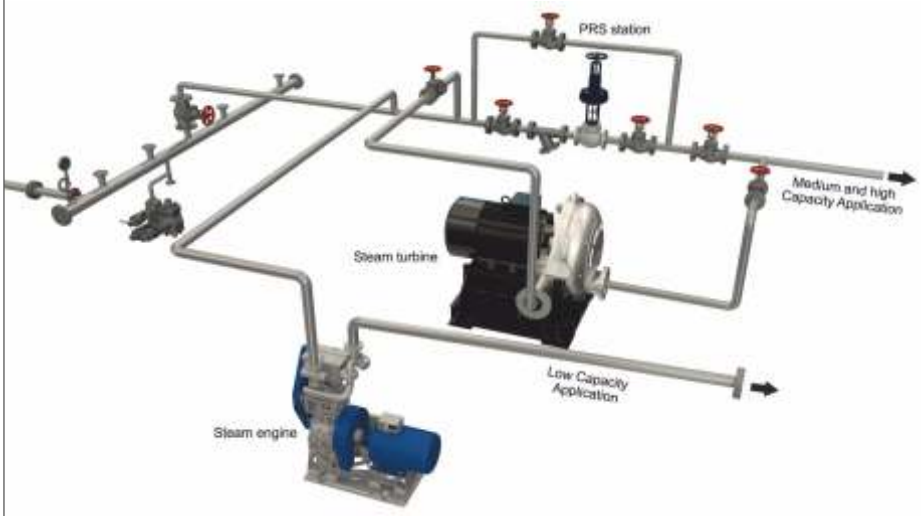
Inaccurate efficiency calculation based on negative pressure measurement and temperature

Benefits of the Forbes Marshall System

Accurate efficiency measurement based on flow, temperature and pressure

Optimised control on sinter mix to get the required porousness

Steam Expanders



Drawbacks of Conventional Systems

Stand alone PRS/PRDS design, leading to higher specific energy consumption.

Benefits of Forbes Marshall System

Equipped with saturated steam turbine to operate parallel to the PRS and convert the potential of the energy lost in pressure reduction to electricity.

Thermocompressors

Environment

Energy Efficiency

Drawbacks of Conventional Systems

Wastage of steam due to no utilisation at very low pressures

Increased production cost

Benefits of the Forbes Marshall System

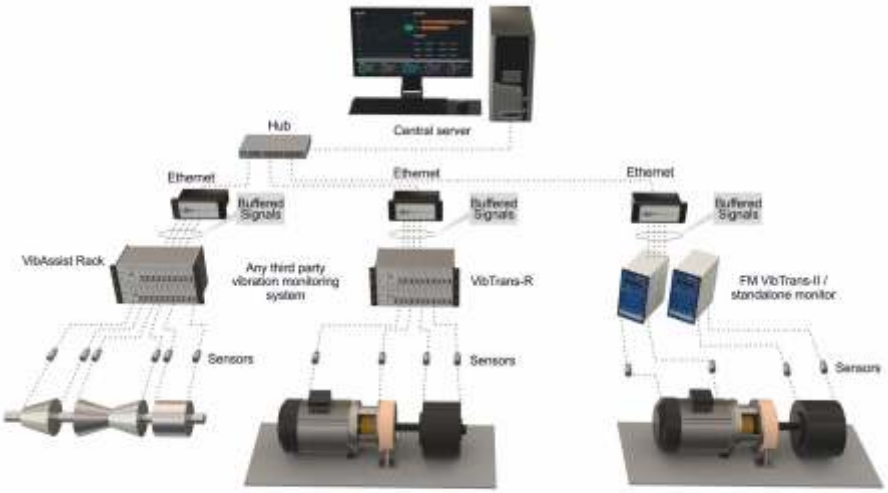
Solution for intermediate pressure requirement; pressure reducing station not required

Reduction in specific energy consumption

Digitalisation

Asset Management System

- Productivity
- Ease of Operation



Drawbacks of Conventional Systems

Unmonitored / manually monitored system leading to unpredictable breakdowns

Difficult to keep both processes and expenses in check, plant-wide

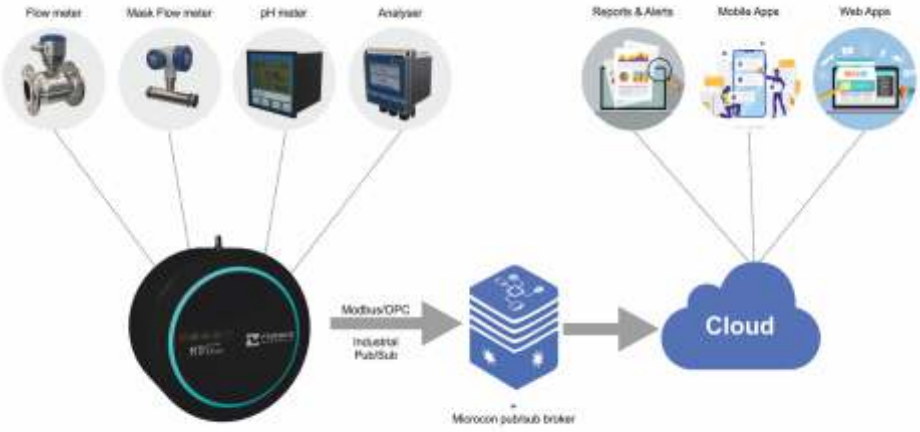
Benefits of the Forbes Marshall Systems

Monitoring, analysing and diagnosing asset performance for better predictive control

Expert process guidance software for proper energy and asset management

Remote Transmission System

- Reliability
- Ease of Operation



Drawbacks of Conventional Systems

Non availability of spares

High maintenance costs

Diffiicult to expand and upgrade

Benefits of the Forbes Marshall System

Existing system gets converted to smart system

Analysis of instruments on uptime and actions towards maintenance

Long cables and their maintenance is avoided

Cause and effect matrix along with pattern analysis for process improvement

Smart Skids

- Reliability
- Ease of Operation

Drawbacks of Conventional Systems

Preventive maintenance schedule is based on fix time interval, not on actual maintenance requirement

No health and diagnostic data available leading to poor management of spares

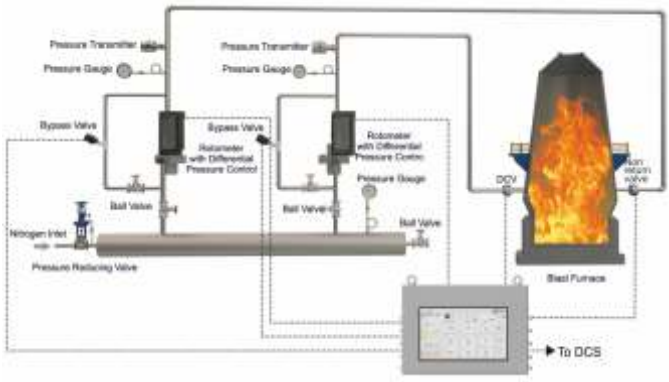
Benefits of the Forbes Marshall System

Collates raw parameters from the process and derives key performance indicators (KPIs)

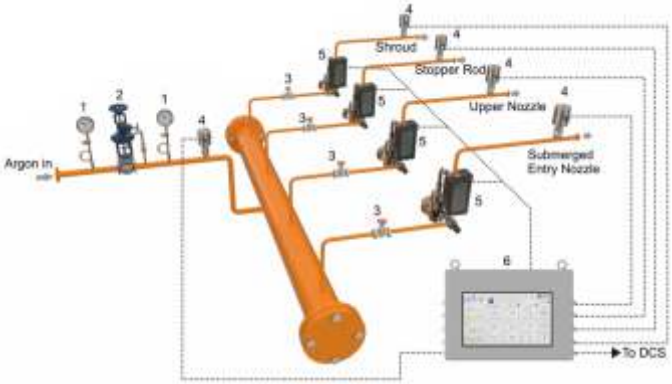
Alerts provided via SMS enabling proactive decision making on-the-go

Better control on timelines for maintenance

Oxygen Enrichment



Blast Furnace



S-Purge Purging System

Delivering Products That Perform

Flowmeters	Control Valves	Gauges
16000+	18,000+	90,000+

Gas Control Systems	Vibration Sensors	Gas and Dust Analysers	Steam Traps	Process Analysers
300+	10,000+	450+	5000+	1000+







FORBES MARSHALL

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Krohne Marshall
Forbes Marshall Arca
Codel International
Forbes Vyncke
Forbes Marshall Steam Systems

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