Digitalising of O & M of Thermal Power Plant

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Outline

- Prevailing Challenges & expectation for Power sector
- Digitisation & digitalising.
- Extract of Mc Kinsey & Company “The digital power plant of the future.-Next S Curve of performance.”
- Most Promising digital technology Available / deployed by GENCo globally.
- Adoption of this technology
- Case Study
- Digitalization implemented at GIPCL.

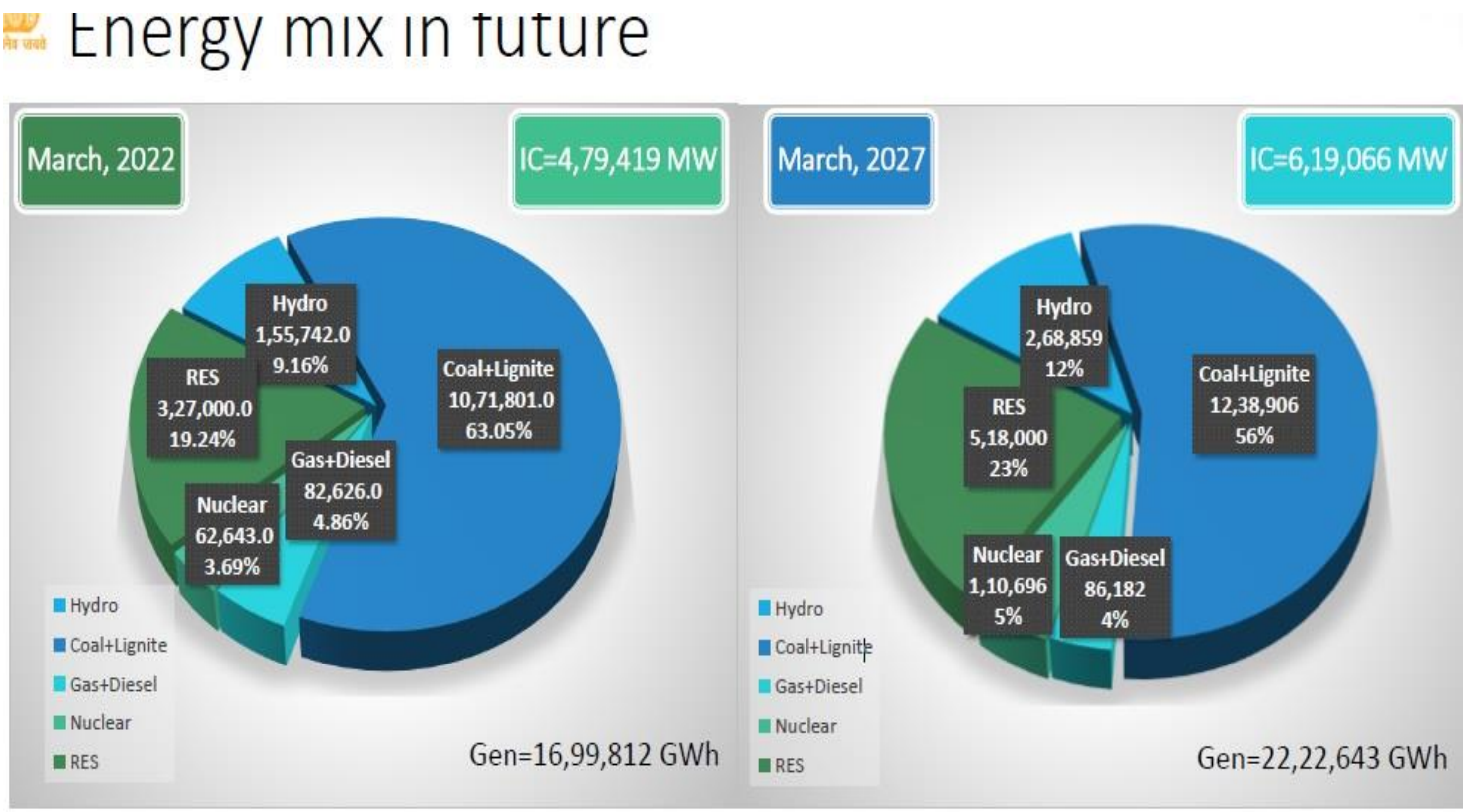
Load Forecast courtesy 19th EPS, CEA

	2021-22	2026-27	2031-32	2036-37
Electrical Energy Requirement (in BU)	1566	2047	2531	3049
Peak Electricity Demand (in GW)	226	299	370	448

LONG TERM RESULTS- LIKELY INSTALLED CAPACITY BY 2030

FUEL TYPE	INSTALLED CAPACITY (MW) IN 2029-30	%
Hydro*	60,997	7.46%
PSP	10,151	1.24%
Small Hydro	5,000	0.61%
Coal + Lignite	2,66,911	32.66%
Gas	25,080	3.07%
Nuclear	18,980	2.32%
Solar	2,80,155	34.28%
Wind	1,40,000	17.13%
Biomass	10,000	1.22%
TOTAL	8,17,254	
Battery#	27,000MW/108,000MWh	

Energy mix in Future



Expectation from Coal fired plants

- In accordance with the expected massive RE introduction.
- Share of non-fossil fuel installed capacity to increase to 47% by 2022 which contribute around 20% of total energy requirement:
  - Higher loading / unloading & Fast load ramp-up/down
  - Faster start up
  - Lower stable minimum load / Low Load operation
  - Load Cycling : Frequent & increased trend
  - Two shift operation
  - Frequent & increases number of unit start up & shutdown cycle
  - Reduced effect on life of equipment
  - Minimal impact on environment
- Other development:

A. Imported coal blending (10 % for FY)
B. Biomass blending (5 %)
C. Revised Environmental Norms.

Digital transformation solution In energy field

1. Coal management
2. Optimized load distribution
3. Maintenance planning
4. Fuel optimization
5. Abnormality detection
6. Equipment diagnosis
7. Plant modernization
8. Emission control management

Digitising

- To digitise is to convert analogue data into digital form.
- Digital age / Digital form.
- Faster and easier communication, new channels for information.
- Application of new technologies to existing business models to make them operate better.
- Digital technologies such as email and electronic databases, we are now entering a world of machine learning, robots, and data analytics.
- Digitisation is doing what you have always done, but using technology to make it more efficient.
- The business model does not change, but operational efficiency is improved.

Comparison

	Digitization	Digitalization
Definition	Transforming analog data to digital	Utilizing technology to enhance corporate processes is known as digitalization
Related to	Information	Business Processes
Examples	1- Scanning a paper document 2- Convert music to mp3 3- Convert wet signature to electronic 4- Converting a paper map into digital	1- Video conference call instead of physical meet up 2- Automating work certificate processes in businesses 3- Ability to use ATM to deposit cheques 4- Audio conferencing, chat, messaging
Benefits	1- Faster access to information 2- Reduced storage cost 3- Improved digital preservation & archiving 4- Ability for integration	1- Efficiency & productivity improvements 2- Improved transparency 3- Faster & better decision making 4- Improved customer satisfaction

	Digitization	Digitalization
Definition	Converting analogue information into a digital form	Incorporating digital technologies into business processes and interactions
Deals With	Information	Processes & Interactions
Examples	• Scanning a document into a PDF • Scanning a photograph into a digital image file e.g jpg, png • Converting a paper form into a digital version • Turning a VHS recording into a digital file e.g. mp4 • Capturing printed or handwritten notes via OCR • Converting typed or handwritten reports into usable data	• Sending messages via email instead of by post • Chatting to someone in real-time via instant messaging instead of by phone • Meeting up with someone via video conferencing instead of face-to-face • Monitoring equipment using digital sensors instead of visual inspection • Assembling products with a robot instead of by hand
Benefits	• Faster access to information • More permanent storage of information • Access to historical data	• Efficiency & productivity gains • Greater accuracy of information • Enhanced visibility • Better decision making
Possible Tools	• Scanner • Digital Camera • Online Forms & Software • Storage & Retrieval Systems • OCR Software	• ERP Software • Messaging & Conferencing Software • Predictive Maintenance Systems • Robotics & Controller Systems • Computers, Servers & Networks

Background

- Advanced Process Control (APC) for improved efficiency & energy conservation.
- Power plant uses a conventional DCS (Distributed Control System)
- DCS: Operator operate based on the experience and available allowances. Set point data variability is quite broad and is required to consider some unexpected contingencies. some allowances in the operating limitations are taken, which results in performance deterioration.
- APC can improve the controllability and ability to optimize the allowance. Improves the plant efficiency through stricter control band & can predict possible future behavior accordingly change the control variable based on the manipulated and disturbance conditions.

McKinsey & company's White paper "The digital power plant of the future" 1/3

- Power generation company becoming increasingly digitized
- No global end-to-end cases of digitization in power generation.
- most technologically advanced players >> isolated digitization use cases, which are not directly tied to business value.
- PGC not nearly advance as they could be>>O&M Cost are higher than it could be.
- Cost Pressure continues rise & large scale RE deployment further complicate
- four areas >> important themes to create value are : O ; M; energy efficiency; and HSSE.
- Thermal energy Contribution 62% globally by 2021 (1,60,00,000 GWH) ,48% by 2030
- Research shows that end-to-end digitization can realize earnings potential of 20 to 30 %
- Six common pitfalls:

1. Lack of defined vision and new roles. (Fail to Articulate>> Threat)

Successful DX make smart use of date and efficient way of working to focus on PI >> update roles rather than reduce head count

i. Control Room Operator
ii. Outage & Maintenance Planner
iii. Power Plant Manager

2. Use-case selection and prioritization not based on value. : DESIGNED>>BUILT >>PILOTED>>ROLLEDOUT :

Individual Interest Vs Business Value

3. Focus on solutions instead of ways of working.

Heat Rate Optimization Model / SOP

Co-Creation : Credibility

4. Data availability and structure. : Data Quality + Frequency + Detail Broadness / Non standardization across asset within Company

Not accessible TWO Speed data & IT architecture

Continue 2/3

5. Reliance on Small Siloed IT Teams :

Lack of talent + IT Team exclude O Engg + M Engg

Digital capacity Building by Reskilling + Upskilling

Serves motivation & Confidence booster >> sustainable change

6. Lack of Focus to build a model power plant early:

Company that neglect to model transformation may implement isolated digital solution for different asset >> limiting each asset`s role in transformation >> above strategy may work in other industry but power plant requires comprehensive & selective approach >> LIGHT HOUSE APPROCH

	From a traditional power plant . . .	. . . to a digital power plant
1. Operations	Focus on safe and reliable operation with major effort on manual work for reporting, issue resolution, and control walks	Real-time performance optimization during safe and stable operation—supported by automated reporting, guided issue resolution, and digitized control walks
2. Maintenance	World-class reliability based on engineering experience, OEM maintenance intervals, and diligent execution	World-class reliability and reduced planned-outage time and maintenance cost—using data analytics and digital process support
3. Energy efficiency	Heat-rate losses regularly analyzed by performance engineers based on manually created performance reports	Heat-rate losses and root causes visualized in real time, triggering immediate actions to resolve issues as quickly as possible
4. Health, safety, security, and environment (HSSE)	Analysis of incidents still recorded on paper; not all available data used to analyze root cause and prevention measures	End-to-end digitized HSSE process with automated monitoring and documentation to aid root-cause analysis and creation of preventative measures

Continue 3/3

- *Operation : Automated Reporting | Guided Issue Resolution | Digitized Control walks*
  - *Process efficiency : Standardized Operator Round | RFID*
  - *Flexibility :*
- Maintenance : High Reliability / Lower Outage time & Maintenance driven by Data Analytics | Digital Process Support
  - *Maintenance strategy: Advance Analytics to reduce TBM (APH map.) Vs PrdM.*

→ *Digital Twin >>insight of plant condition/ Spare Management based on WO / Equipment Condition*

  - *Outage and project execution : Digital control towers | Monitor + Real time track >> Automated calculate potential delay >> determine counter measure*

→ *Drones Vs Scaffolding for Boiler Tube & Cooling Tower*

→ *Systematic scaffolding easy to programme*

  - *Reliability : Bad Actor | gaps | Collect data from DCS + Digital Twin >. Calculate impact >> Root Cause Assessment using advance analytics + Trend analysis & anad anomaly detection can help identify best solution*
- Energy efficiency : Heat rate loss & efficiency >> not only regular analysed but also visualized in real time >> trigger quick resolve
  - *Fuel efficiency : Comprehensive thermodynamic model >> automatic real time analysis >> compare with optimum condition >> to generate recommendation | digital key board + Virtual bunker >> optimal fueld mix according to plant condition & market price*
  - *Chemical-consumption reduction & Auxiliary power efficiency*
- Health, safety, security, and environment

Most Promising digital technology Available / deployed by GENCo.

- TOMANI (BY MITSHUBISHI)
- HITACHI DX
- YOKOGAWA
- PROMECON
- TOSHIBA (DIGITAL TRANSFORMATION)

TOMANI (Architecture)

- Intelligent solutions that accelerates economical & environment sustainability with power plant design, O&M and system knowledge.
- TOMONI leverages advanced controls, artificial intelligence and machine learning with multi-layered cybersecurity to make energy systems smarter, more profitable and ultimately more autonomous.
- Every power plant is different & their unique challenges. They collaborates with power generators to help them choose the intelligent, digital solutions that support their specific business needs.
- TOMONI brings together industry-leading Mitsubishi Power engineers with best-in-class technologies from leading software, platform and cybersecurity partners, such as Microsoft's Azure Cloud, AVEVA/OSIsoft's PI System and others.
- Combining the latest AI technology with their extensive technology, design and manufacturing knowledge of power generation equipment has enabled them to achieve optimal operations that meet the needs of our customers.
- TOMONI systems can be customized to work with user's existing platform to provide benefits of O&M Optimization, Performance Improvement and Flexible Operation

Architecture-TOMANI

Data Foundation & Enablers : TOMONI intelligent solutions provide a customized range of platforms and upgrades to provide exactly the right data management and control system capabilities needed to achieve your digitalization objectives.

From cyber security and digitalization assistance to control system upgrades, enabling platforms and remote monitoring and diagnostics, TOMONI provides the foundation and enablers needed to make your plant smarter.

O&M Optimization : TOMONI intelligent solutions leverage decades of O&M experience to provide asset-management solutions that directly improve power plant's operation and maintenance, increasing plant effectiveness and productivity.

O&M Optimization and Performance Improvement

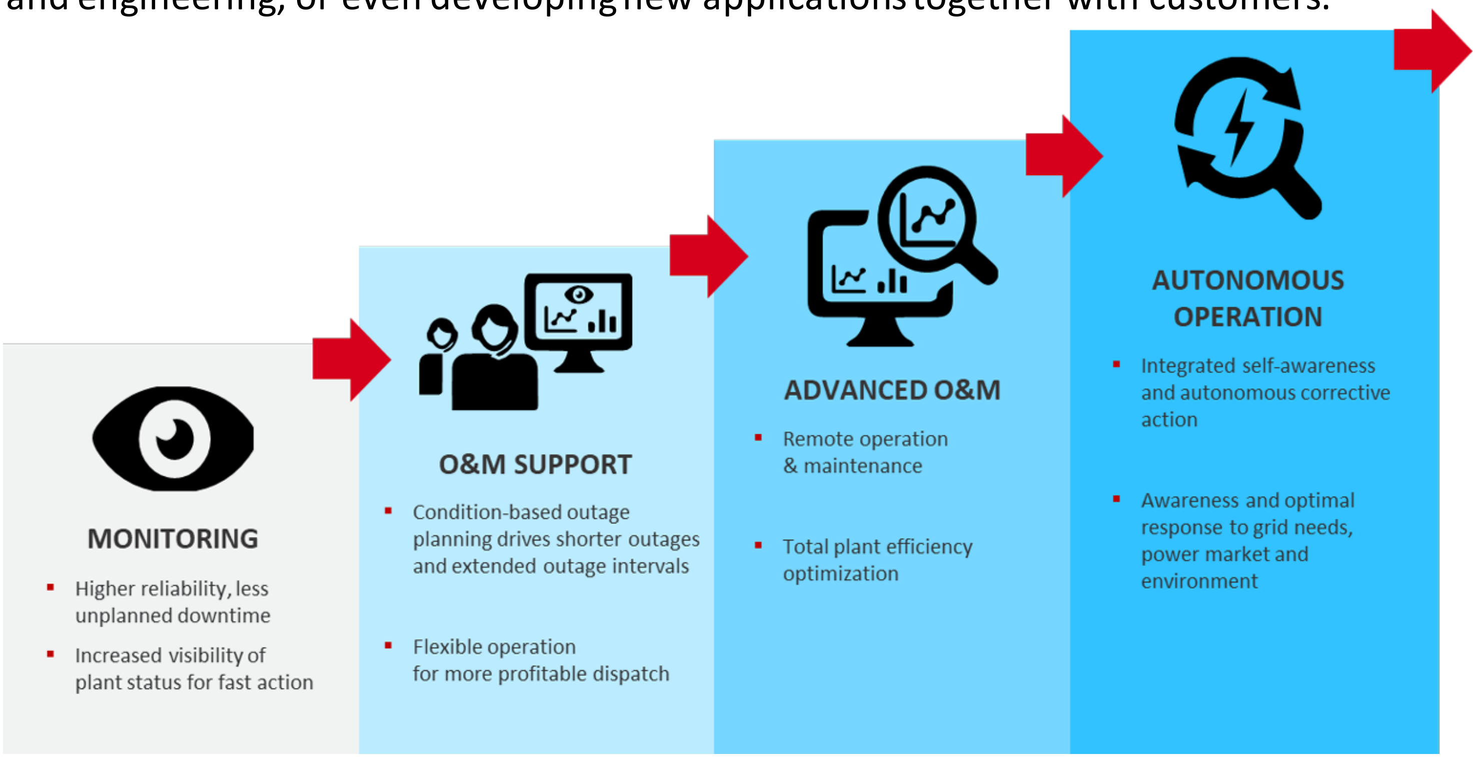
- Remote Monitoring Centers around the world provide expert recommendations, which can help you make smarter, more informed decisions. The result is more effective maintenance planning and improved total plant reliability and uptime.
- TOMONI intelligent solutions organizes complex data for practical use to improve the performance of power plants.
- As the energy industry transitions to increasingly competitive wholesale power markets, improved dispatch ability is pivotal to plant performance.
- These total plant solutions help increase your plant's output and efficiency, which benefits your business and boosts your profits.

Flexible Operation

- TOMONI intelligent solutions uses AI simulation technology that responds quickly to changes in the environment, ensuring the reliability of baseload operation of power generation facilities while enabling flexible operation. Their Flexible Operation solutions equip you to nimbly meet the changing demands of the market such as new support requirements, less predictable fuel characteristics and renewable energy penetration and also lead to new revenue streams in ancillary service markets.

Roadmap Towards the Autonomous Power Plant

Intelligent solutions are provided through various technology layers, from remote monitoring to autonomous operation.
TOMONI provides solutions by providing applications, packaging digital applications and engineering, or even developing new applications together with customers.



TOMANI (Architecture)

- With TOMANI can analyze massive amounts of data from power plants and use them to provide predictive maintenance, solve complex problems, increase plant performance and improve economic efficiency. By combining their technology offerings with state of the art digital solutions, customers will have the tools to manage their assets in today’s challenging environment and into the future.
- intelligent solutions leverages advanced analytics, adaptive control technology, artificial intelligence and machine learning to make power plants smarter, lowering emissions, increasing flexibility and supporting decarbonization.

Case Study

- Mitsubishi Power's TOMONI™ Intelligent Digital Solutions Adopted for Unit 1 (572 MW) of the Joetsu (GTCC) Thermal Power Station ,Japan.
- **Real-time operation monitoring system using cutting-edge data analysis applications.**
- **More advanced and efficient O&M enhances asset value and also contributes to the reduction of emissions including decarbonization.**
- TOMONI intelligent digital solutions applied to this project allow the various services to be used via cloud computing accessible from the customer's remote computer.
- Like data analysis applications to support O&M, optimizing plant efficiency and equipment inspections, which will help to reduce CO_2 emissions, thus reducing plant maintenance and operation costs.
- Intermountain Power Service Corporation in Delta, Utah, United States

  Based on green hydrogen technology – 840 MW
- The long-term reliability of TOMONI has been confirmed at T-Point 2, which is a grid-connected, GTCC power plant operated remotely from the TOMONI HUB(Note) at the Takasago Works in Hyogo Prefecture.- 435 MW
- Linkou Thermal Power Plant, Taiwan - 800 MW USCC TOMONI boiler combustion tuning system

TOSHIBA

- **Delivering IoT technology for a cleaner and efficient operation of a Coal Fired Power Plant.**

Survey result report

- Investigation of possibility of improving thermal efficiency and environmental performance at Durgapur Steel Thermal Power Station (DSTPS) (Implementation of real-time unit performance management using IoT)
- This project has been executed with the aim of refining the thermal efficiency management of existing coal-fired plants in India, by considering the feasibility of introducing a real-time unit performance-management system using IoT to target plants with target 500 MW subcritical units.
- The background of this project is the need to improve deterioration in thermal efficiency due to RE injection

Survey result report

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Survey result report

- The following were found desirable: 1. To determine performance deterioration in real time by recognizing tendencies and age deterioration status on a daily, weekly, monthly and yearly basis, 2. To use highly accurate performance test data and 3. To apply a method which manages deviation from performance reference values using the heat balance model. Using the big data the power plants when applying these management methods allows us to provide a performance-management system service utilizing IoT from Japan as a new business, which is the stand-out feature.
- Summary of the walkthrough result ・ The condenser has about a 20% margin against the design performance and shows no performance degradation at present. ・ Conversely, only one unit of circulating water pumps was stopped during the high vacuum operation in the winter season, which indicates room for improvement. ・ The condenser is cleaned with a ball, brush and acid and actions to maintain efficiency are conducted. ・ The boiler has been subject to three tube leaks on the economizer and superheater this year. ・ It was explained that while the boiler is cleaned by operating the soot blower manual, relatively little molten ash had accumulated within the boiler at the time of overhaul. ・ With regard to the turbine, a temperature difference emerges between the upper and lower casing at low-load (60%) operation and any further increase in this temperature difference is controlled by opening the casing drain valve (connected to the condenser), which is supposed to be open only when the unit starts up, to release the stagnating steam. According to the maker, this might be due to incorrectly positioned heat insulators. ・ The purchased coals all had properties with calorific values varying from 2000 to 4000kcal/kg and ash content from 30 to 70%. Domestic coals are supplied from four coal mines and the mine which produces the coal on which the design is based is the most distant and has the lowest purchase quantity, despite being of high quality. This coal seems to be a low-sulfur variety, with a high ash melting point. ・ All the coals are transported by train. The capacity of the coal storage area is 280,000 m³ and the daily coal consumption is 14,000 t.

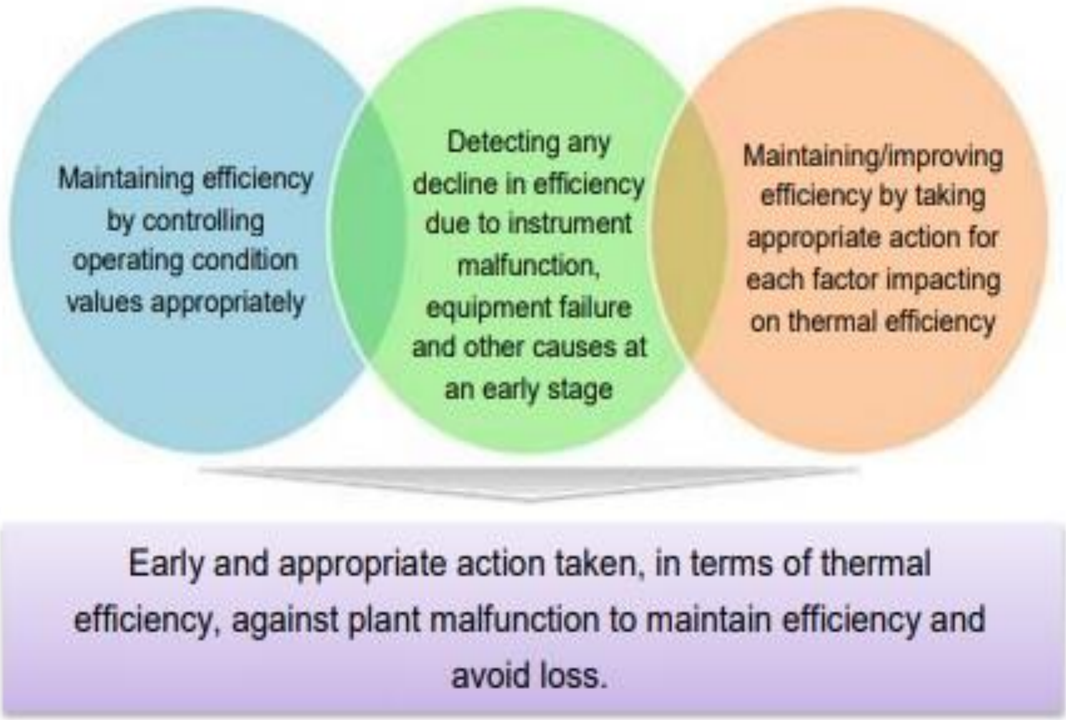


Figure 2-1 Approach to maintain/improve thermal efficiency of the plant alone

Table 3-1 Impact in terms of improved thermal efficiency and reduced fuel costs of the unit if remedial actions are taken

Equipment	Recommendation	Expected value of restored performance	Change in thermal efficiency of the unit (%pt)	Reduction in CO_2 emission (t-CO2/year)	Reduction in fuel consumption (t/year)	Fuel cost reduction (103 INR/year)
Intermediate pressure turbine	Efficiency recovery by first stage nozzle replacement, etc.	Recovery of intermediate pressure turbine inner efficiency by 1.0%	0.17	▲13,499	▲10,032	▲30,096
High pressure heater	Heat exchange performance recovery by jet cleaning of tubes	Recovery of TD and DC values up to the values at Performance guarantee test	0.05	▲3,983	▲2,890	▲8,670
Air Preheater	Reduction in air leakage ratio by installing SDS	15% annual average leakage → 10% (design value) will be maintained.	0.03	▲2,391	▲1,960	▲5,881
Condenser	Optimal vacuum maintenance by installing vacuum regulating valve	0.02% pt. efficiency decrease due to excessive vacuum in winter season will be avoided.	0.02	▲1,595	▲90	▲270
Total			0.27	▲21,468	▲14,972	▲44,917

Note 1. The annual utilization ratio of the unit is estimated as 70%.

Note 2. The gross calorific value (GCV) of the design coal, 3300 kcal/kg, was used as the calorific value for the coal fuel.

Note 3. 3000 INR/t (result of hearing) was used as the coal fuel unit price.

Table 3-2 Impact in terms of ROI of the unit if remedial actions are taken

Facility	① Fuel Cost Merit (10^3 INR/year)	② Effective duration (year)	③=①/(②/2) Fuel Cost Merit (per effective duration) (10^3 INR)	④ Repair expenses and investment expense (10^3 INR)	Construction period (days)	Working artificial number (Number)	⑤=(③+④)/② **Total Cost Merit (10^3 INR/year)**
IP Turbine	▲ 30,096	5	▲75,240	60,000	80		**▲3,048**
HP Heater (4 Unit)	▲ 8,670	5	▲21,675	2,000	5	16 (4 × 4units)	**▲3,935**
Air Preheater	▲ 5,881	20	▲117,620	100,000	50		**▲881**
Condenser	▲ 270	20	▲5,400	5,000	50		**▲21**
Total	**▲ 44,917**		**▲220,117**	**167,000**			**▲7,885**

Note 1. Repair expenses : Convert actual price in Japanese yen to INR (1INR=2yen)

Note 2. Effective duration : It means a period during which the unit performance drops to the performance before recovery

Note 3. For the merit evaluation, we do not consider losses of power sale equipment due to suspension of work

Note 4. HP Heater for 4 units = 5A,5B,6A,6B Heater

Success Story

- Comprehensive Solution for safe & efficient Operation of supercritical Coal fired Power Plant
- Jaypee Nigrie SC coal Fired PP [2 x 660 MW]

Customer Challenge	Solution
Improving power plant efficiency	Yokogawa helps power plants operate more efficiently by improving the control of fuel, steam, and feed water.
Safely and efficiently starting up boilers, a complicated process that requires considerable skill	Yokogawa systems make startups safer and more efficient by automating processes such as heating with fuel oil and switching over to biomass fuel. Graphic displays give operators a real-time window into the status of each process.
Improving combustion efficiency and reducing/eliminating harmful stack emissions	Yokogawa oxygen analyzers measure the oxygen (O2) concentration in flue gas. With this information, the air-fuel ratio can be adjusted to optimize combustion. Likewise, our stack gas analyzers can be used to reduce harmful emissions by measuring the concentrations of nitrogen oxide (NOX) and sulfur oxide (SOX) in stack gas.
Reducing the emission of CO, NOX, dioxins, and other substances into the atmosphere by burning off residual gas components in the stack gas	Yokogawa gas analyzers measure the oxygen concentration in the stack gas so that adjustments can be made in the O2 supply that will improve combustion efficiency and burn off more residual gas components.
Prevent fire accident in coal yard, transmission, and any other facilities.	Distributed Temperature Sensor (DTS) provided by Yokogawa contributes to fire detection, leak/plugging detection, hot (cold) spot monitoring, and facilities preventive maintenance.

Risk base maintenance

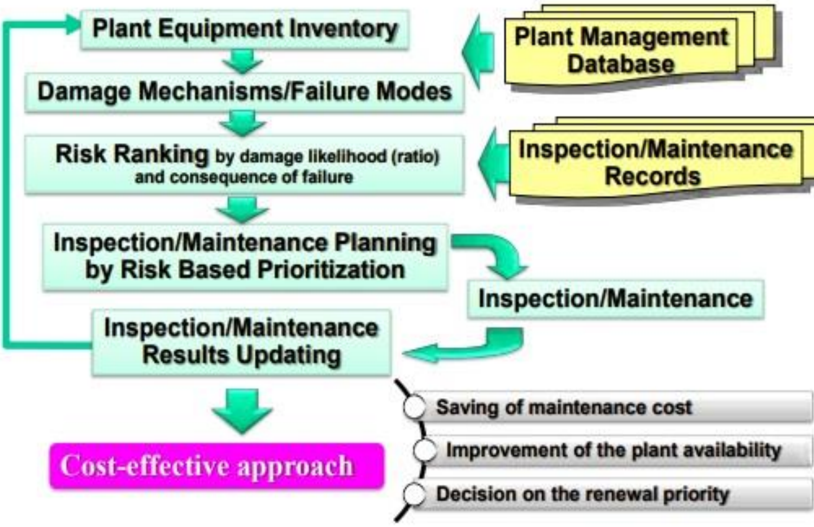


Figure 59. RBM Procedure[42]

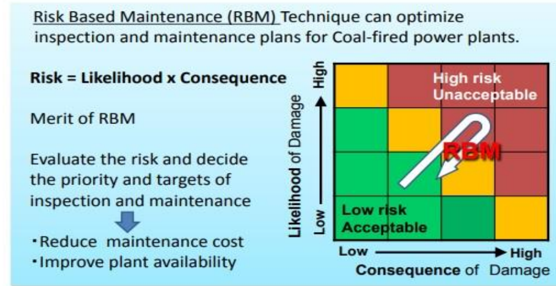
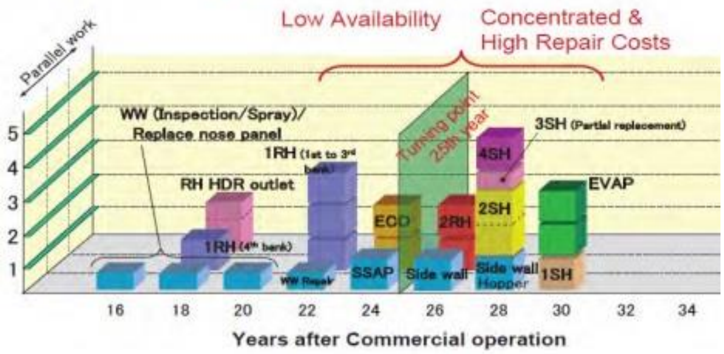


Figure 58. Risk Based Maintenance (RBM)[41]

(3) Typical Boiler major RBM categories and Asset Services



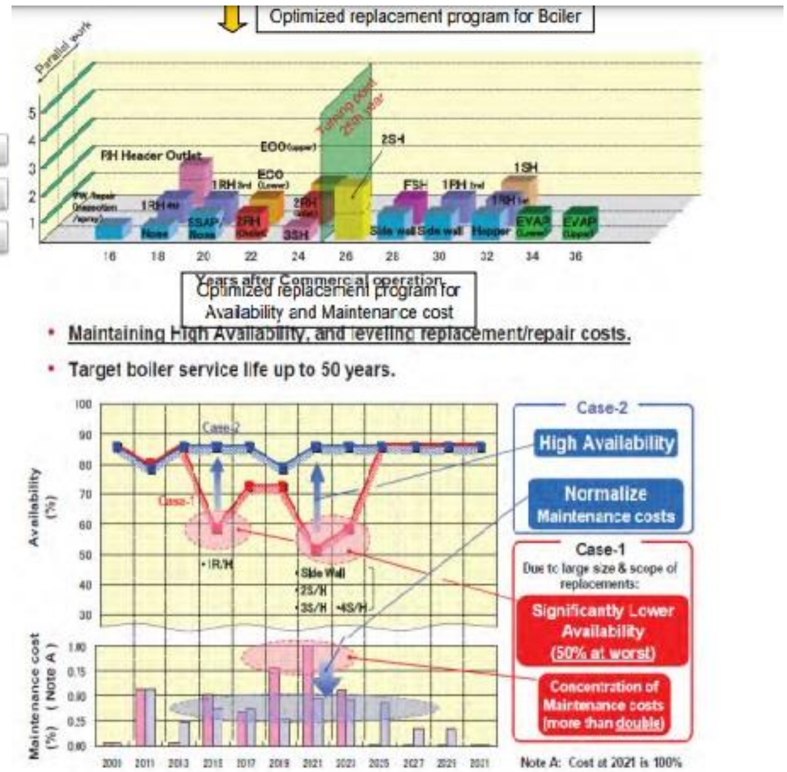


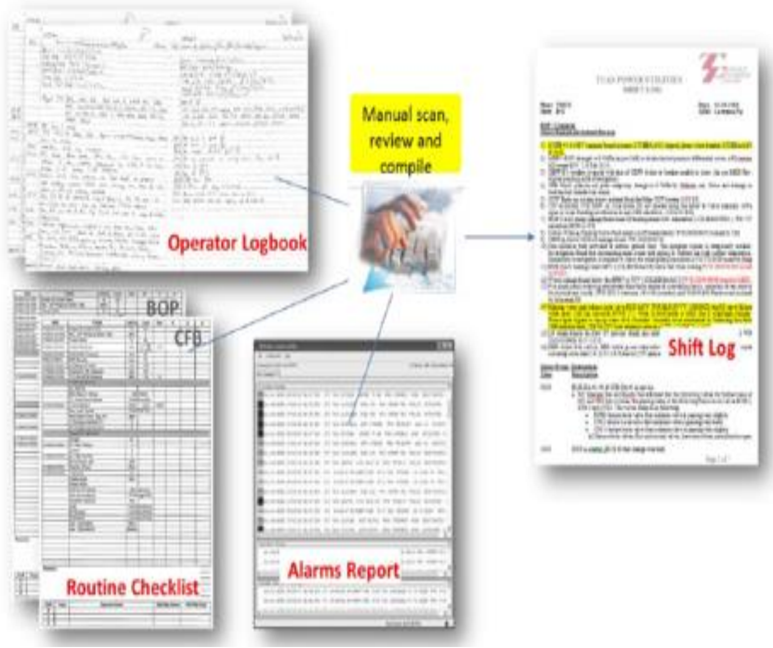
Figure 60. RBM Procedure[43]

YOKOGAWA TOTAL SOLUTION- Case Study

- TP Utilities Pte. Ltd. Tembus District, Jurong Island, Singapore :
- One of the top three players in the Singapore power sector. Tuas Power, operates a utility complex on Jurong Island in Singapore that provides steam, power, and other utility services to customers in the Tembusu industrial area, and also supplies electricity to the national grid.
- Yokogawa Engineering Asia worked with TP Utilities to provide solutions under its Co-innovation program that improved reliability and availability.
- program offers a totally integrated and enhanced set of Operations Management, Alarm Management, Decision Support, and Asset Management solutions for field instruments and rotating equipment
- Before implementing Yokogawa's Operations Management solutions, the customer was facing the following challenges:
- Paper-based logbooks
- Manual shift handovers
- Manual progress tracking and monitoring
- Miscommunication of work instructions
- Manual data collection and reporting
- The need to source data from multiple systems

YOKOGAWA TOTAL SOLUTION- Case Study

- Retrieving information from handwritten operation logbooks was tedious and time-consuming, and shift personnel had to access multiple systems to collect information such as critical DCS parameters in order to prepare the shift reports required for handover. The entire process was manual, took a lot of time to complete, and was prone to human error. The paper-based work instructions were also not always up to date, so operators would have to make assumptions when deciding what to do. In addition, the reliance on paper documentation made it difficult to share and pass on knowledge about plant operations.



YOKOGAWA TOTAL SOLUTION- Case Study

- Yokogawa's Operations Management solution has helped to ensure safe, reliable, and efficient operations as well as regulatory compliance at the Tembusu Multi-Utilities Complex by enabling all information on key operations management practices to be handled in digital form. This has improved productivity by helping to standardize work practices, streamline processes, and improve communication and coordination across departments.
- Yokogawa's Operations Management solution has helped to ensure safe, reliable, and efficient operations as well as regulatory compliance at the Tembusu Multi-Utilities Complex by enabling all information on key operations management practices to be handled in digital form. This has improved productivity by helping to standardize work practices, streamline processes, and improve communication and coordination across departments.

YOKOGAWA TOTAL SOLUTION- Case Study

- ***Digitized operation records***
- To address the limitations of the existing system, Yokogawa first identified which information needed to be collected from different systems for shift hand-over:
- Operation log books
- Routine task checklists, information on ad hoc tasks
- Maintenance work orders and permit tracking information
- Information on critical processes and overrides
- Information required for efficient shift hand over reporting
- Alarm handling information
- Information on standard operating procedures
- With the Yokogawa Operations Management solution, field operators, panel operators, and shift managers throughout the Tembusu complex are able to access digital operation logs on a centralized system and update status information on their activities. This enhances visibility by giving everyone access to the same information, and also makes it easier to search for and retrieve information.
- ***Benefits of the Operations Management solution***
- With the Yokogawa Operations Management solution, digital operation records are created that have the following benefits:
- 30 minute reduction in shift handover report preparation time
- Single-window view of plant-wide operation log entries
- Accurate and reliable shift handover reports
- Integration with SAP & Eclipse systems and improved productivity by avoiding double entry
- Efficient tracking and status reporting
- Retention of valuable knowledge on plant operations

YOKOGAWA TOTAL SOLUTION- Case Study

- **Co-Innovation program**
- In addition to Operations Management, Yokogawa also deployed the Alarm Management, Decision Support, and Asset Management components of its Co-Innovation program. These innovative and practical solutions improved operation decision support and the monitoring of critical auxiliary equipment at this power plant.
- ***Program 1: Expert operation decision support system (EODSS)***
- The EODSS enables intelligent self-learning and procedural automation based on good manufacturing practices and the actions of experienced operators. The EODSS adds intelligence to the existing decision support system to keep it current and provide pre-alerts before the occurrence of critical events. Thus, this new solution helps in building a knowledge historian and provides guidance to less experienced personnel on how to optimize power plant operations and improve reliability.
- ***Program 2: Enhanced predictive condition monitoring system (EPCMS)***
- The EPCMS enhances the monitoring of critical auxiliary rotating equipment and other production assets, and has an advanced diagnostics module that makes automatic estimates of asset health for predictive maintenance. The key element in this was the development of a data fusion method that combines vibration and oil analysis with process data, thus accurately and consistently integrating multi-time and multi-scale data from multiple sources that are collected during the same sampling interval.

Benefits of Co-Innovation program

Upon the completion of this project in fiscal year 2017, a follow-up re-evaluation of equipment reliability, human reliability, and plant availability was conducted at this plant. The data showed that the value created through the Co-Innovation Program exceeded the targets set at the outset of the project (fiscal year 2014).

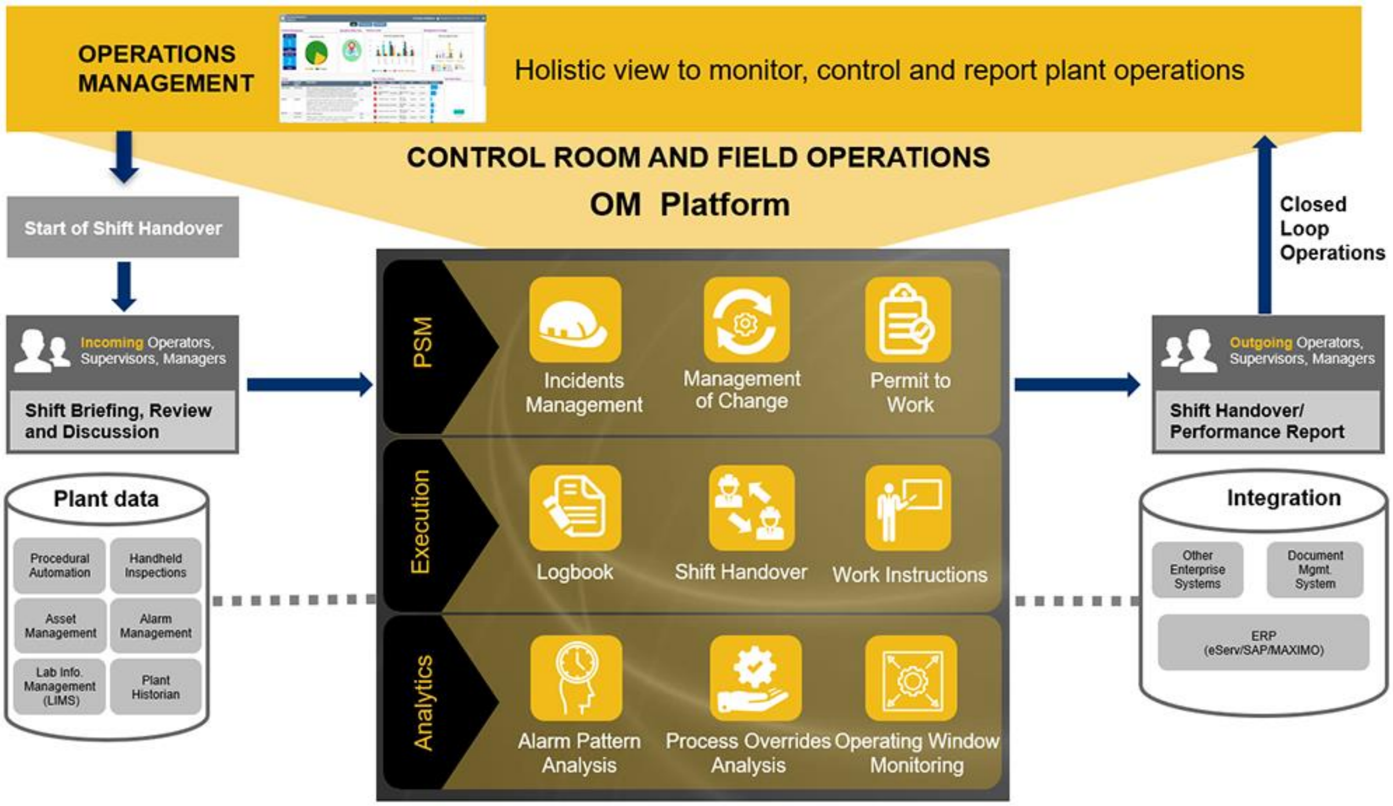
2014

- Equipment reliability: Majority Time based maintenance approach, No online monitoring of critical auxiliary equipment.
- Human reliability : Expert dependent, Manual Operation, No mechanism to share best practices, Less competency leading to human error.
- Plant Availability :Lack of synergy and missed opportunity rises due to human error and lack of decision system

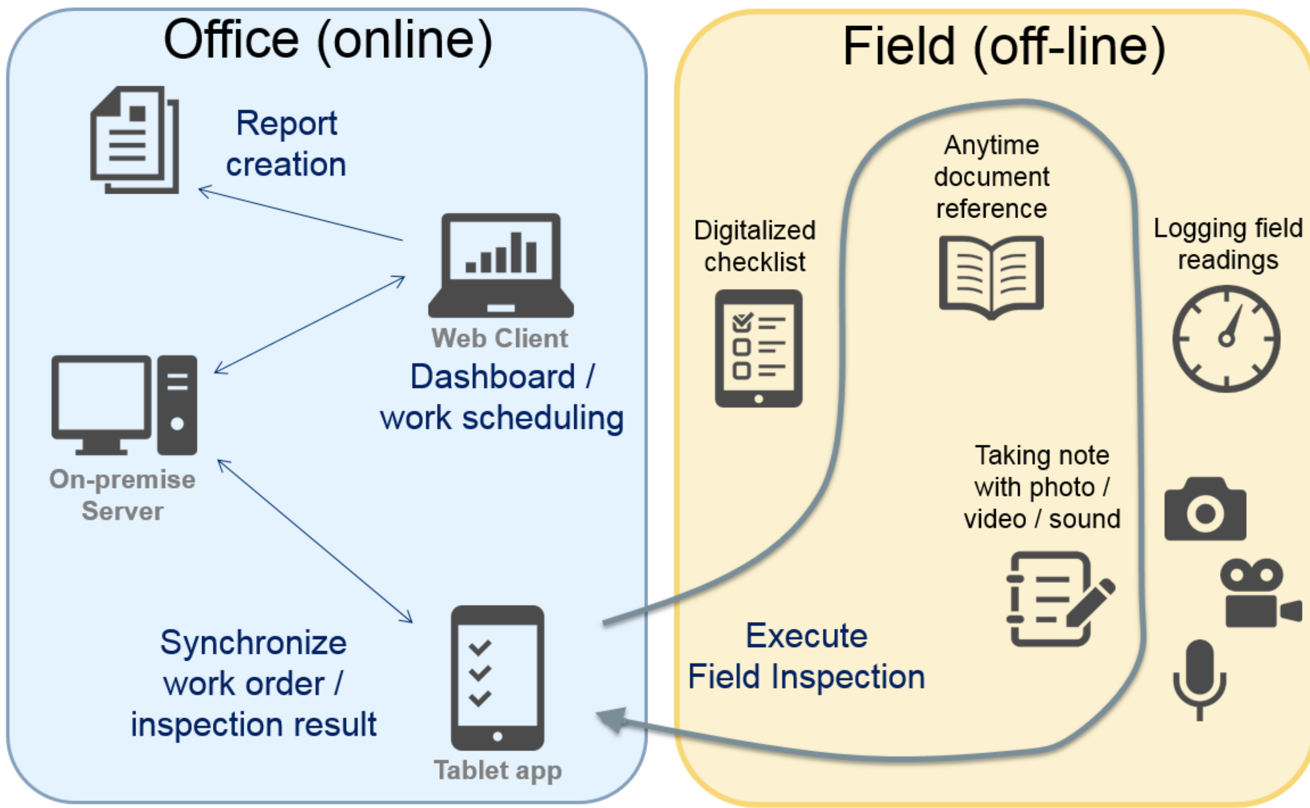
2017

- Equipment reliability: Proactive (predictive) maintenance has been achieved through the online monitoring of critical auxiliary equipment.
- Human reliability: Fully automated systems have enabled the learning and sharing of best practices, which helps to eliminate human error by improving competency and skills.
- Plant availability: A fully integrated system with intelligent decision support systems has been achieved.

YOKOGAWA TOTAL SOLUTION- Model



YOKOGAWA TOTAL SOLUTION- Model

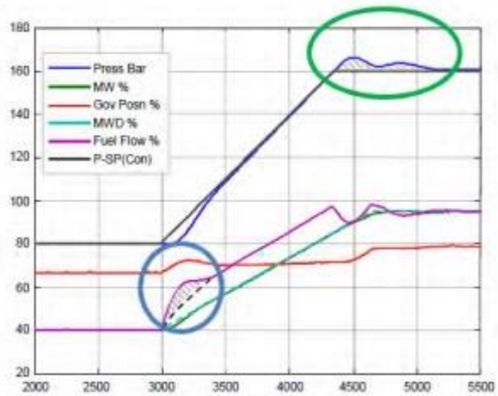


Advance Process Control of Boiler , Turbine & BoP. (Extract of ASEAN Report)

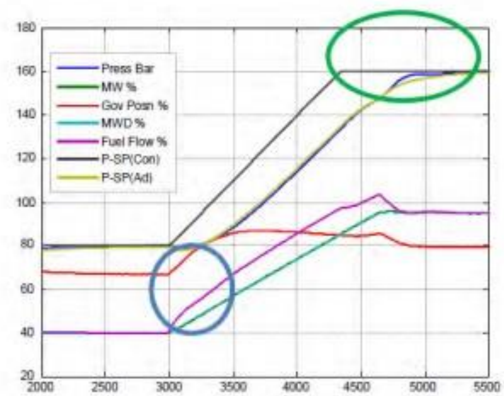
- The coal fired power generation plant has been strongly recommended for improved efficiency through Advanced Process Control (APC) for contributing to energy conservation.
- The power plant uses a conventional DCS (Distributed Control System), the control parameters are changed by the operator manually in accordance with the situation based on the experience and available allowances. However, in general, the set point data variability in manual setting is quite broad and is required to consider some unexpected contingencies.
- Co Sequently, some allowances in the operating limitations are taken, which results in performance deterioration
- APC can improve the controllability of the process and it ensures the ability to optimize the allowance of a variation in set-points within operating limitations. APC also improves the plant efficiency through stricter control band. The APC can provide not only high controllability, but also an operating optimization in the total power generation plant system. APC can predict possible future behaviour of the power plant and change the control variable based on the manipulated and disturbance conditions and achieve both high controllability and an optimization facility in the control algorithm.

Advance Process Control of Boiler , Turbine & BoP. (Extract of ASEAN Report)

- Introduction of new steam pressure controls Steam Pressure controls in power plants are difficult to optimize, due to the characteristics of the fuel/combustion/steam generation processes, and also constraints imposed by material stresses, fuel delivery systems, and boiler firing limitations.
- The optimization by the advanced control strategy provides minimised over firing through a dynamic pressure set point formation and a continually adjustable reserve margin for frequency response.



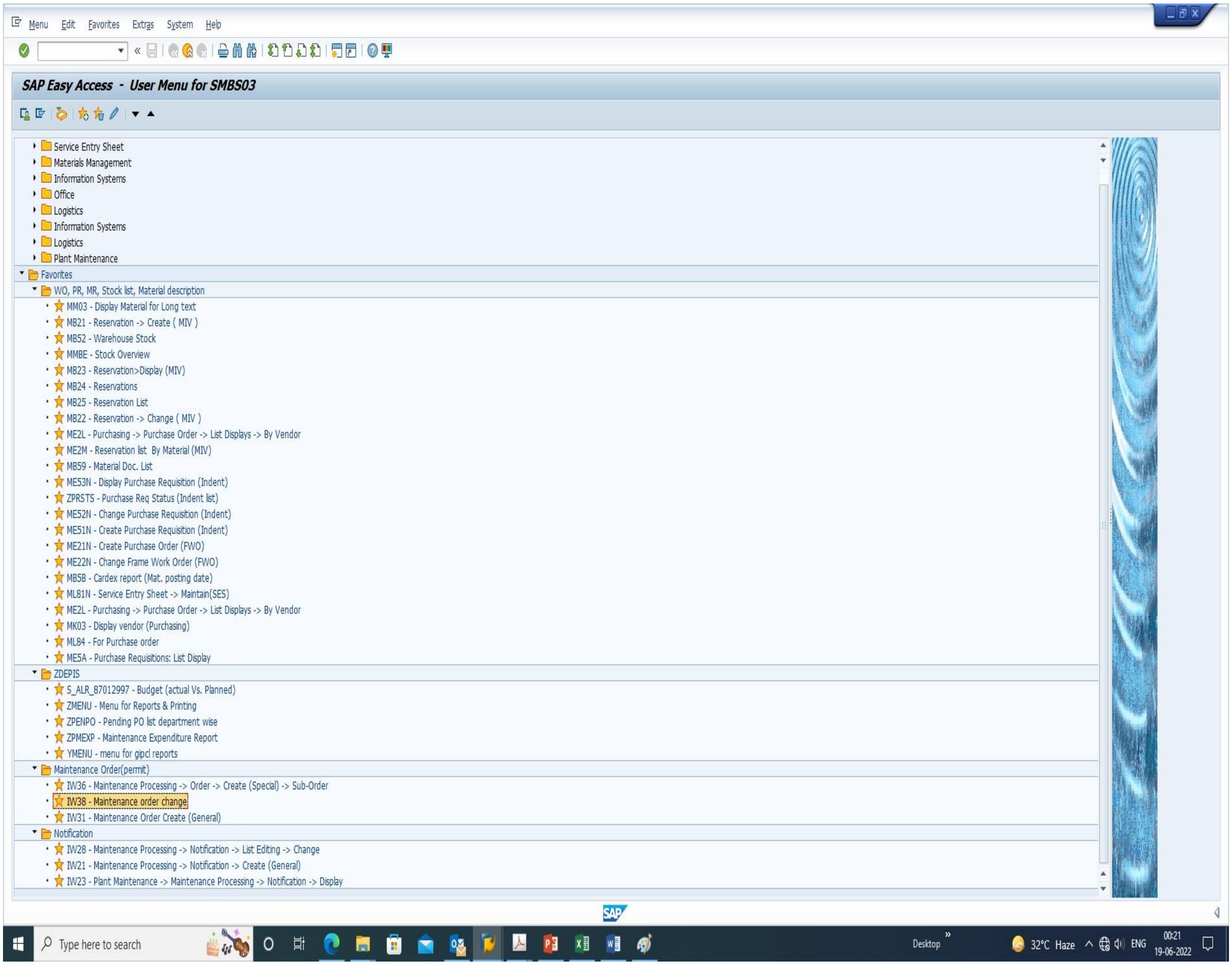
Simulation Result of
Conventional Control Structure



Simulation Result of
Advanced Control Structure

Digitalization Implemented at GIPCL

- Separate List
- ESP Operation
- Soot Blowing Operation


Menu Edit Favorites Extras System Help
SAP Easy Access - User Menu for SMBS03
Service Entry Sheet
Materials Management
Information Systems
Office
Logistics
Information Systems
Logistics
Plant Maintenance
Favorites
WO, PR, MR, Stock list, Material description
MM03 - Display Material for Long text
MB21 - Reservation -> Create (MIV)
MB52 - Warehouse Stock
MMBE - Stock Overview
MB23 - Reservation>Display (MIV)
MB24 - Reservations
MB25 - Reservation List
MB22 - Reservation -> Change (MIV)
ME2L - Purchasing -> Purchase Order -> List Displays -> By Vendor
ME2M - Reservation list By Material (MIV)
MB59 - Material Doc. List
ME53N - Display Purchase Requisition (Indent)
ZPRSTS - Purchase Req Status (Indent list)
ME52N - Change Purchase Requisition (Indent)
ME51N - Create Purchase Requisition (Indent)
ME21N - Create Purchase Order (FWO)
ME22N - Change Frame Work Order (FWO)
MB5B - Cardex report (Mat. posting date)
ML81N - Service Entry Sheet -> Maintain(SES)
ME2L - Purchasing -> Purchase Order -> List Displays -> By Vendor
MK03 - Display vendor (Purchasing)
ML84 - For Purchase order
ME5A - Purchase Requisitions: List Display
ZDEPIS
S_ALR_87012997 - Budget (actual Vs. Planned)
ZMENU - Menu for Reports & Printing
ZPENPO - Pending PO list department wise
ZPMEXP - Maintenance Expenditure Report
YMENU - menu for gipcl reports
Maintenance Order(permit)
IW36 - Maintenance Processing -> Order -> Create (Special) -> Sub-Order
IW38 - Maintenance order change
IW31 - Maintenance Order Create (General)
Notification
IW28 - Maintenance Processing -> Notification -> List Editing -> Change
IW21 - Maintenance Processing -> Notification -> Create (General)
IW23 - Plant Maintenance -> Maintenance Processing -> Notification -> Display
SAP
Type here to search
Desktop
32°C Haze
ENG
00:21
19-06-2022

Thanks