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## ACHIEVING EXCELLENCE THROUGH ASSET MANAGEMENT AND RISK ANALYSIS

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### Abstract:

The physical assets are a key or a critical factor in achieving its business goals. Manufacturing, mining, petroleum, and power generation are some of the most asset-intensive industries in the world. These Organizations develop business Objectives to meet their strategic plans while simultaneously managing massive physical portfolios of assets efficiently. To a large extent, success hinges on whether or not asset-related risks to the value stream are adequately identified and managed in such a way that minimizes the total cost of ownership throughout an asset's lifetime. By aligning both corporate culture with an integrated systems approach to managing assets from Concept to Decommissioning, organizations will not only uncover practical processes for getting the most out of capital investments but will realize immediate benefits after applying an asset management standard.

At least 85% of a typical organization's total annual expenditures are associated with two areas - its operations and maintenance personnel and its capital budget.

Three fundamental questions drive most of the expenditure decisions:

- What work should my operations and maintenance crews be doing, where, and why?
- Which capital projects to undertake, when, and why?
- When to repair, when to refurbish, and when to replace?

Hence managing the assets and taking right decisions is vital in Business point of view. This has been taken care by an Effective Asset

Management system. The simple way of understanding the Asset Management is managing the assets to achieve desired performance and sustainability of an Organisation. It involves the coordinated and optimized planning, asset selection, acquisition/development, utilization, care (maintenance) and ultimate disposal or renewal of the appropriate assets and asset systems.

An AM System (Fig-1) is primarily designed to support the execution of an organizational strategic plan (Business Plan), which in turn is aimed at meeting the expectation of the stake holders. The business goal is starting point of the development of the primary elements like Policy, objectives, strategy and plans.



Fig-1 AM System

The business objectives must be reasonable, achievable and concrete. This means that each objective must be quantitative, use time constraints, and be understood throughout the organization. These, in turn, direct the optimal combination of life cycle activities to be applied across the portfolio of asset systems and assets (based on their criticality, condition and performance). This connective thread is a key feature of an AM System, providing clear “line of sight” from the organizational direction and goals down to the individual, day-to-day activities. Similarly, looking upwards, the monitoring of asset problems, risks and opportunities should provide the factual basis for adjusting and refining AM strategies and plans, through a process of continuous improvement and should inform stakeholders by way of adjustments to the Business Plan.

### Key Attributes of Asset Management System

- Whole asset life - cycle: planning & optimization
- Activities are better aligned with business objectives
- Multi-disciplined teams with aligned KPIs
- Shared & used asset information
- Effective work management systems
- Active and quantified risk management
- Continuous improvement focus
- Real empowerment (within clear boundaries) – operators /technicians ‘own’ the process
- Managers as vision-sharers and enablers, *not* just controllers /instructors

### I. NOMENCLATURE

AM: Asset Management  
EFOR: Equivalent forced outage rate  
EAF: Equivalent Availability Factor  
KPI: Key performance Indicators  
MOC: Management of change  
RCA: Root cause Analysis

CAPEX: Capital expenditure  
OPEX: Operational expenditure

### II. INTRODUCTION

M/s. Odisha Power Generation Corporation Ltd (OPGCL) is having 2\*210MW coal fired thermal power plant at Jharsaguda, India. These Units have become operational from 1994 to 1996.

The entire power output of the plant is contracted with GRIDCO, Odisha a 30-year PPA (capacity and energy based with a fuel pass-through) expiring in 2026.

Considering the above business context, the main performance driver for our business is our ability to meet our KPIs, customer and the related PPA requirements while operating to the highest standards of Health, Safety & Environment (HSE).

But there are some external and internal challenges, which are adversely impacting current performance:

1. Since the genesis of the plant coal quality has been inconsistent. The generation loss due to coal quality has been around 6~7% due to higher Ash content. Since the equipment are not designed for handling high ash content Coal on a continuous basis, there has been accelerated erosion of the components leading to premature reduction in Life of the equipment over a period of 20years.
2. Low Equipment reliability due to
  - i) Ageing of equipment
  - ii) Obsolete of system
  - iii) quality of preventive maintenance that has been carried out needs improvement
  - iv) Operating practices such as strict adherence of equipment changeover schedule, parameters excursion study and checking of standby equipment etc. needs improvement.
3. Grid disturbances

Inadequate protection system at Local Grid leading to Unit tripping.

In order to overcome internal challenge cited in point 2, OPGC management decides to adopt Asset Management System which covers the key processes that are crucial for achieving performance and financial excellence.

### III. DEVELOPMENT

Asset Management Team has been formed consisting the members from cross-functional team to implement Asset Management system in IB TPS.

As ISO 55001:2014 standard specifies the requirements for the establishment, implementation, maintenance and improvement of an asset management system, Organisation has set a goal for certification of ISO 55001:2014 in the year 2016-17.

The Stages of AM and the key elements which are covered in AM System are as follows:

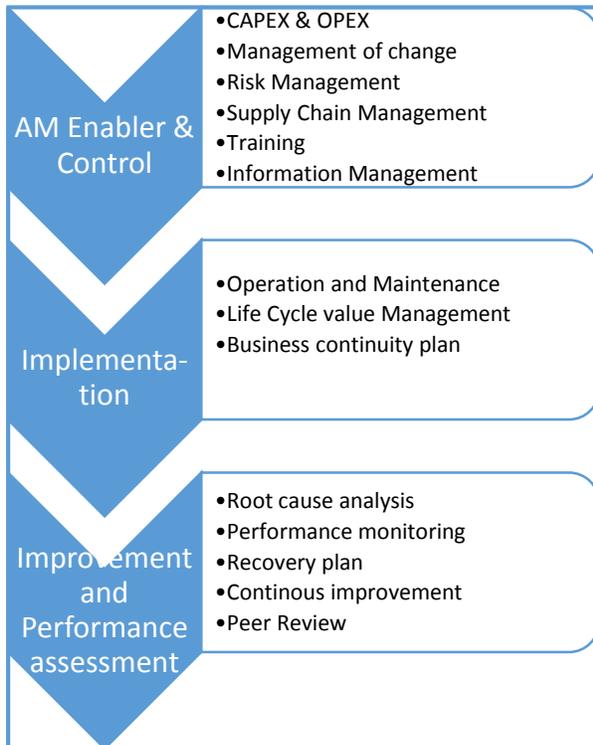


Fig-1 AM Key elements

AM Enablers and controls influence and apply to all other elements of AM system.

CAPEX and OPEX element uses as guiding principles to identify, prioritize, plan, budget, execute, control and close out capital expenditure projects and major operational expenditure.

MOC element used to handle the type modifications related to equipment, procedures, raw materials and processing conditions.

The element “Risk Management” is a central and important component of proactive asset management, which is described in detail in the later part of this paper.

The element “SCM” is to provide the best total cost of ownership to businesses through the supply of high quality equipment, materials, parts, or services. This objective is only achievable with a close collaboration with the asset management efforts to assure that all the materials and services acquired are functionally consistent with the asset’s operation requirements and asset best practices, and fulfill the required delivery times, safety rules and regulatory requirements.

The “Training” element maintain training and development arrangements to ensure that people are competent in their roles, particularly roles related to asset management and deliver on their asset management responsibilities.

The “Information Management” element depicts organized collection, storage and use of information, including asset information, for the benefit of a business. It is essential to help the business effectively, efficiently and sustainably monitor and control asset performance over the asset life cycle.

AM Implementation stage contains the elements which are implemented throughout the life cycle of an asset.

The “Asset management operating and maintenance” element ensure proper plans of O&M practices that are intended to achieve AM objective like higher plant Availability, higher Maintenance effectiveness which reduce or limit levels of risk to the Asset.

The “Life cycle value management” element deals with starting from acquisition of new assets and ends with the asset decommissioning.

The “Business continuity plan” is designed in order to enhance and address the state of readiness for a disruption to business operations.

The “AM Improvement and Performance assessment” stage assures business growth in a consistent manner.

“RCA” element of AM helps to identify and address the underlying causes of the failure of any equipment/safety incident, so that the most effective solution can be found out and implemented which prevents the reoccurrence of the same issue.

“Performance monitoring” element of AM suggests to monitor the lagging and leading KPI related to Asset to facilitate subsequent analysis of failure to assist in determining corrective/preventive actions and/or to facilitate continual improvement.

“Recovery plan” element is a group of activities designed to address and correct, or mitigate, a current or anticipated unfavorable variance in operational or financial performance.

“Continuous Improvement” element suggests the use of a structured problem solving process and associated techniques to address asset related problems and performance gaps, by finding the root cause, selecting appropriate solutions, monitoring them and, if successful, rolling them out to other similar areas.

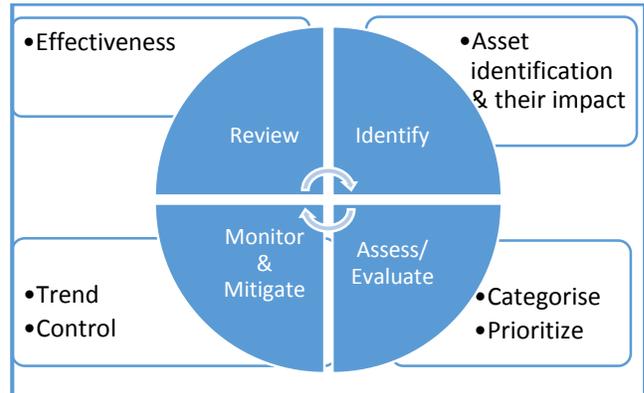
“Peer Review” element is the self-auditing process.

**Risk Analysis**

From the above key elements, Risk Management is one of the vital element which drives the entire life cycle of an asset which in turn directly impacts the business performance.

The purpose of risk management is to understand the cause, effect and likelihood of opportunities and adverse events occurring and devise risk controls where these are found to be

necessary or desirable. The main requirements for the effective management of risk include identifying, assessing, monitoring, mitigating and reviewing of risks which describes in the fig-3:



*Fig-3 Risk Management process*

Risk assessment, which is a component of risk management, can be further broken down into the analysis of the nature of the risk.

Risk assessment consists of following process:

- (1) Risk identification
- (2) Risk Analysis and evaluation

Each step is important because it contributes to the understanding of the risks and allows for timely decisions regarding those risks, leading to a proactive actions which results in more predictable business results.

**(1) Risk Identification**

When assessing risk, the first step is to identify risks. For the purpose of Asset Management, risk management is focused on those risks related to the physical assets only. The goal of this process is to identify as many risks as practical that may enhance or obstruct the ability of the organization to achieve success.

Types of risk:

- i. Operational Risk - Operational risk addresses those parameters which arise from

people, processes, and procedures in the operation of the business. Examples are the procedure for responding to abnormal conditions, the process of capturing events and operational experiences and the routine communications process between shifts.

ii. Maintenance Risk - Maintenance risk addresses those parameters which arise from the maintenance practices that are implemented at a business. These risks are influenced by the age of the business and its equipment, maintenance staffing and budget and availability of external resources.

iii. Condition Risk - Condition risk addresses those parameters which arise from the current physical condition of the business. Factors influencing this risk include the age of the plant and its equipment, previous execution of maintenance, and the historical budgeting for maintenance.

## **(2) Risk Analysis and evaluation:-**

The Risk analysis process consists of collection of asset list from each department, failure history, impact of the failure through conducting brainstorming session in the plant, and finally, process the data in order to assess and quantify this risk, and generate preventive maintenance plans, action plans corrective task forces.

In OPGC, Risk register has been developed in order to document the equipment wise risk, the risk owner, risk assessment, and risk evaluation. Those equipment which pose the greatest threat to the business after the process of risk quantification, falls in the higher risk category asset. Accordingly risk mitigation plan is developed for those asset and monitored. The Asset Risk Register is continuously updated as needed, and a formal review is done annually prior to the budget cycle. Risks that are determined to be high-impact/ high-probability may be monitored more frequently.

To accomplish a risk assessment and evaluation, 8 points are being considered that need to be evaluated in order to categorize (tolerable,

moderate and intolerable) and quantify risks (0 to 100 scale), which are:

- 1) Probability of occurrence,
- 2) Repair cost
- 3) Impact on safety,
- 4) Impact on environment,
- 5) Impact on company image,
- 6) Impact on EFOR,
- 7) Impact on EAF,
- 8) Oil consumption

The risk value can be calculated as:

$$\text{Risk Value} = \text{Probability} \times \text{Dimensions}$$

Where:

$$\text{Dimensions} = \text{Non-Financial Losses} \times \text{Financial Losses}$$

$$\text{Non-Financial Losses} = \text{Safety} + \text{Environment} + \text{Company Image}$$

$$\text{Financial Losses} = \text{EFOR} + \text{EAF} + \text{Oil consumption} + \text{Repair Cost}$$

Where EFOR: Equivalent forced outage rate

EAF: Equivalent Availability Factor

The points used to calculate the Non-Financial and Financial Losses vary from 1 to 5 according to certain condition.

- I. Intolerable risk - Intolerable levels of risk- Adverse risks are intolerable whatever the benefits, and risk mitigation measures are essential at any cost if activity is to continue.
- II. Moderate risk - As Low as Reasonably Practicable, a level of risk that is tolerable and cannot be reduced further without expenditure of costs disproportionate to the benefit gained or where the solution is impractical to implement.
- III. Tolerable risk - Risks are negligible or so small that they can be managed by routine, procedures and no additional risk treatment measures are needed.

Some other techniques that have proven to be effective aids for risk assessment include:

- i. Failure Modes and Effects Analysis (FMEA);
- ii. Failure Modes and Effects Criticality Analysis (FMECA);
- iii. Threat analysis;
- iv. Root Cause Analysis (RCA); and
- v. Fault Tree Analysis (FTA).

### **Managing Risk**

#### **(1) Risk monitoring and mitigation**

After determining the significance of the risks, all the Intolerable risks are scrutinized and action plans are created to eliminate them or reduce them. Risks identified as Moderate are analyzed to verify that the existing quantity can become a significant concern. So this is also monitored to ensure treatment and that existing controls are satisfactory.

The actions plans are consisting of preventive maintenance, corrective action plans and task forces (in case of problems common to all or many of OPGC critical equipment) actions as well as investment-type reforms and modernization, technology upgrades, monitoring systems, etc.

Coordination of Planning and Coordination of Maintenance are responsible for performing the action plan.

#### **(1) Risk review**

If all activities of the action plan have been carried out, the Performance Division evaluates the risk again. If the actions executed are insufficient to eliminate the risks and remain the same with values intolerable, the planning area requests support from the Maintenance and Engineering to set up a new plan. Accordingly new mitigation plan are created.

The implementation of initiatives involves the budget cycle (budget approval, scheduling charts, resource reservation, etc.), from planning to final delivery of initiative.

## **IV. RESULT**

Following are the result of implementation of AM System:

- **Better Managed risk** - Ongoing review of processes, procedures and asset performance enables informed management decisions that balance cost, risk, opportunity and performance which improve organisational efficiency and effectiveness
- **Supports business growth and improvement** - The asset management system (AMS) aids improvement with formalized, prioritized and coordinated implementation plans to which the entire organisation can understand and commit.
- **Improved financial performance** – CAPEX and OPEX budgeting process strengthen the internal controls for preparation, selection & monitoring the CAPEX and OPEX budget that can facilitate improved return on investment and cost reduction through effective risk analysis without sacrificing short or long-term organisational performance.
- **Improved Organisational sustainability** – AM system helps in performance enhancement through continuous improvement and Performance Excellence program.
- **Increased Maintenance Effectiveness** – Reduced Breakdown Maintenance
- **Increased Availability** – Reduce planned and unplanned outages

In current financial year 2016-17, planned and unplanned outages are reduced by almost 50% compare to last year.

## V. CONCLUSIONS

The successful implementation of AM requires commitment of top management, ownership of the down below managers and floor people. Asset Management helps in taking right decision at right time as it balance the costs, risk, opportunity and performance.

## VII. REFERENCES

1. "ISO 55001:2014 standard"
2. "AES asset Management Standard"

## VIII. AUTHORS, BIOS AND PHOTOS

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