An Integrated Operational Risk Management Framework for Power Generation

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Introduction

Excellent risk management is one of the keys being able to successfully manage the operation and consistently meet the responsibility.

An integrated operational risk management framework was developed and applied in power generation environment.
Key elements in operational risk management

A successful operational risk management framework needs to have the following elements:

- Engineering Risk Management
- Incident Management
- Change Management

Lacking any one of element may lead to severe plant failure or incident.
Risks should be considered on a business-wide basis including strategic, financial, operational and other hazard.

Not all risks are material – it depends on their potential impacts on the value of the business.

Uncertainties where actual outcomes may differ from expected outcomes.

The approach should be a regular process, not a one-time event.

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**Definition on Operational Risk Management**

Operational Risk Management – the process of systematically and comprehensively identifying critical risks, quantifying their impacts, and implementing integrated risk management strategies to maximize enterprise value.

The enterprise should develop and execute strategies to avoid, mitigate and finance risks.

Optimize the balance between risk and return.

Individual risks are prioritized using the common language of 4x5 risk matrix.
The “Goal” of Operational Risk Management

We recognised that ‘zero risks’ are not possible in real life, operations environment is dynamic. With a structure and systematic risk management approach, we can migrate risks before they became critical to our business. We can focus sufficient resources and efforts to achieve

- Zero accidents
- Zero non-compliance
- Zero wasted energy
Plan – Do – Check – Act principle applies for continuous improvement
Risk Management in Plant Life

- Risk Management in Power Plant is a journey. It needs to start early.

Planning
- High level project risk assessment
- Engineering review

Design and Construction
- Design HAZOP
- Environmental Impact Assessment
- HMI check list
- Contractor Management (JSA)
- Pre-startup review

O&M
- Scenario based assessments
- Re-HAZOP of hazardous plant systems
- Change Management
- Incident Report and Investigation
- Review of lessons learnt

De-commissioning
- SHE Plan

On-going risk-related activities are essential
Risk Assessment

STRATEGIC RISKS

MANAGEMENT SYSTEMS

CULTURE

Identification

Risks

Identification of Problems
Potential threats to business objectives

Analysis

Risk Significance
Evaluating and prioritizing risks

Options
Identifying and evaluating potential alternatives:

Decision Making

Prioritization & Budget Decisions
Decide what to do

Evaluate and identifying the most cost-effective resource allocations:

"Which things should I do, and in what order?"
Qualitative Risk Assessment Steps

1. Identify a hazard or problem
2. Determine probability
3. Determine consequences
4. Place on matrix
5. Define Preventative Measures
6. Define Mitigation Measures

<table>
<thead>
<tr>
<th>CONSEQUENCE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<td>I</td>
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Risk Reduction Options

• NOTHING IS ABSOLUTELY SAFE
• Some risk can be tolerated
  - Matrix placement defines the view of acceptability of risk
  - Need to define if “As Low As Reasonably Practicable” (ALARP)
  - Regulatory requirement to achieve ALARP
  - Have a duty to implement inexpensive risk reduction measures to achieve ALARP even if risk is otherwise tolerable
• Unacceptably high risk can be reduced to a tolerable level by:
  - Improving prevention (reducing probability)
  - Improving mitigation (reducing consequence)
Change Management
Change Management

- A change can have the following adverse impact on:
  - SHE Risk
  - Regulatory Compliance Related
  - Plant Integrity and Reliability

- The objectives of Change Management are:
  - Changes are identified and documented
  - SHE impacts, regulatory compliance and plant integrity impact are assessed and managed
  - Changes are communicated to affected parties
Three Types of Changes

- **Emergency Change** – Emergency basis and need to carry out as soon as possible.

- **Temporary Change** – Temporary basis such as trial run for a period.

- **Permanent Change** – Permanent on plant system and proper documentations are required.
Applicable to all changes that can have:-

- Adverse Impact on Safety, Health & Environmental.
- Impact on Plant Integrity & Reliability.
- Regulatory Compliance aspects of the business activities.
Incident Management
Key objective of incident management is to share the lessons learnt from incidents and hence prevent reoccurrence of incident. It relies on:

- Consistent and systematic investigation methodologies
- Neutral and independent investigation team
- Quality of investigation and the implementation progress of remedial actions
- Total Involvements from relevant departments
The following incidents were classified:

- Plant related incident
- Safety, Health and Environment related incident
- Security and miscellaneous incident
- Near miss cases

All the incidents must be reported within a defined timeframe and a computerized reporting system is used to manage the process.
Incident Management

“From Cradle to Grave”

1. Report Incident (via web based IT system).
2. Verification by respective incident administrators.
3. Investigation Team Formation according to incident severity (0,1,2 &3).
5. Incident Review Committee meets every month to review all incidents.
## Formation of incident investigation team

<table>
<thead>
<tr>
<th>Level</th>
<th>Chairman of Investigation Team</th>
<th>Investigation Team Member</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>Team Leader of line department</td>
<td>Team Leader of relevant department</td>
</tr>
<tr>
<td>1</td>
<td>Branch Head of Line Department</td>
<td>Team leader of relevant department</td>
</tr>
<tr>
<td>2</td>
<td>Independent Department Head</td>
<td>Branch head of relevant department</td>
</tr>
<tr>
<td>3</td>
<td>Enquiry board appointed by senior management</td>
<td>Enquiry board appointed by senior management</td>
</tr>
</tbody>
</table>

Investigators must receive proper investigation training
Incident Review Committee and Meeting

- Purposes:
  - All incidents are properly investigated according to the Investigation team formation guideline
  - Root cause of major incidents are identified
  - Appropriate action is taken to avoid recurrence of similar incidents.
  - Implementation of the actions is taken in a timely manner
  - Learning from the incidents is disseminated.

Meeting is arranged every month to discuss the incident
Incident Management
Process Diagram

- One-stop web base IT platform
- Automation for incident reporting, notification and monitoring of follow-up actions
Relationship between Each Element

• In order to prevent the occurrence of incident, proper risk management are required on different plant system.

• When changes are required on the plant system, risk assessment and appropriate approval is required for the changes.

• Most of the potential risk can be reduced after the risk identification and appropriate mitigation measures.

• In case of incident, lessons learnt and sharing is the key to prevent re-occurrence of incident. Further risk assessment will be carried out if required.
Conclusion

• The operational risk in the power generation can be proactively managed by integrated operational risk management framework.

• The key elements including engineering risk management, incident management and change management.

• Strong belief of risk culture is required for implementation of the framework into day-to-day business.
Thank You !!