RISK ANALYSIS IN INDUSTRIAL BUILDING: CASE STUDY

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ABSTRACT - Risk analysis is a technique used to identify and assess the risk involved in a process. This topic discuss the use of risk analysis to support decision making on maintenance activities. In recent years there has been a growing interest in the use of risk analysis and risk based approaches for guiding decisions on maintenance. And also this topic has been given much attention in various industries. The purpose of risk management is to ensure that adequate measures are taken to protect people, the environment and assets from harmful consequences. Risk management includes both measures to avoid the hazards and reduce their effect.

1. INTRODUCTION

Risk management constitutes one of the key elements towards effective project implementation and success. The risk management process can be viewed in different ways. From the project management perspective it is common to consider planning, identification, classification, analysis, response, monitoring and control as the main steps. All these steps are interconnected and are part of a system, which means each should be properly addressed so as to enable an effective operation of the whole.

There are instances where qualitative techniques are more effective than quantitative, although the latter may appear to be the most robust and meaningful for many practitioners. Again, the right analysis technique is the one capable of adequately capturing and handling uncertainty. The purpose of this paper is to review and discuss risk analysis techniques that would be most suitable to construction management. We have chosen Kerala Minerals And Metals Limited. It is a well-reputed company fully owned by the State Government of Kerala. The Company has indulged in the manufacturing of world class Titanium Dioxide. I t has been ranked among the top ten competitions in the world producing its own product.

2. CONCEPT OF RISK ANALYSIS AND MANAGEMENT

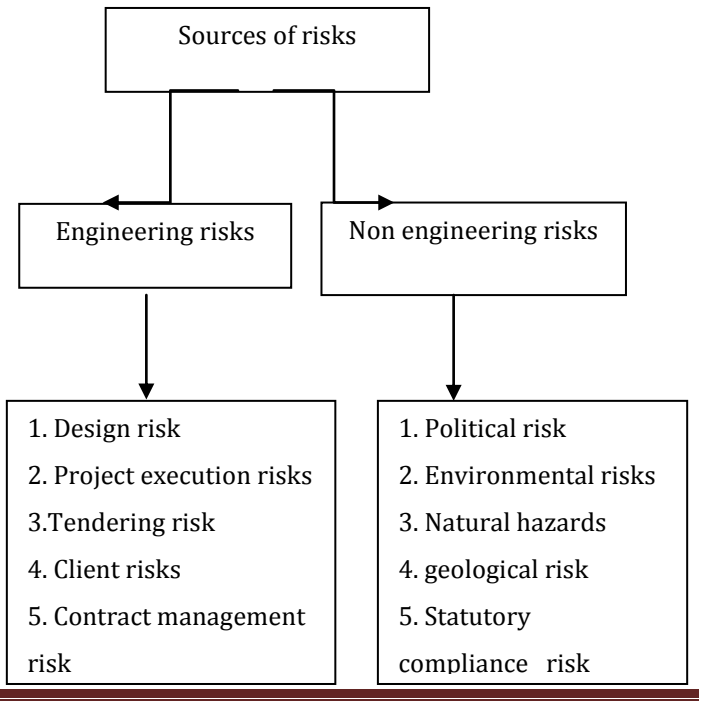
Purpose of risk analysis is to identifying, documenting and quantifying potential risk to product due to any activity, process, testing or change and to determine appropriate measures, with the objective of eliminating or reducing the risk to patient.

Risk management is a process which identifies the project risks, analyze them, and determine the actions to avert the threats on any project. All steps in the risk management process should be included to deal with risks, in order to implement the process of the project. Due to the nature of construction projects, risk management is a very important process.

2.1 RISK ASSESMENT & RISK ANALYSIS

Risk assessment is the process of estimating and communicating workplace safety risk, and deciding whether this risk is acceptable. Conducting a risk assessment involves making a value judgment based on this information and any available evidence within the workplace and industry.

Purpose of risk analysis is to identifying, documenting and quantifying potential risk to product due to any activity, process, testing or change and to determine appropriate measures, with the objective of eliminating or reducing the risk to patient. From the risk identification process the major risk sources and their impact are identified. The knowledge map representing the risk sources affecting the project success is shown in figure 2. This flow chart consists of various risk factors, in which Engineering risks are predictable and those non engineering risks are non predictable. The predictable factors should be forecasted during the earlier stage of the project whereas the non predictable factors involve uncertainties; this should also be estimated for the successful completion of the project because these risks will affect the cost, time, quality of the project.



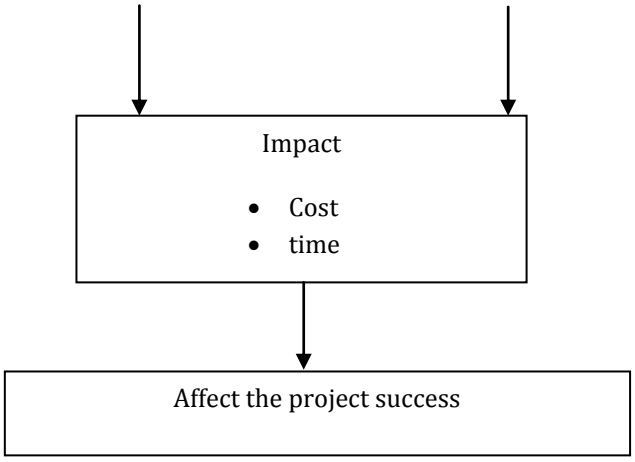


Figure 1: A Risk Table

Risk analysis is a systematic use of information to identify specific sources of harm (hazards) and to estimate risks. Risk analysis is the estimation of the risk associated with the identified hazards.it is the qualitative or quantitative process of linking the likelihood of occurrence and severity of harms.in some risk management tools, the ability to detect the harm also factors in the estimation of risk. For analysing the risks in the industrial building, we were select the method Failure Mode and Effect Analysis(FMEA)

Failure Mode And Effects Analysis (FMEA)

Failure Mode and Effects Analysis (FMEA) is a proactive process aimed to evaluate a system, design, process and service for possible ways in which failures can occur. The FMEA procedure assigns a numerical value to each risk associated with causing a failure using severity, occurrence and detection indexes and Risk Priority Number (RPN) is obtained by multiplying these numerical values. The FMEA is a formalized but subjective analysis for the systematic identification of possible root causes and failure modes and the estimation of their relative risks. The main goal is to identify and then limit or avoid risk within a design. Hence, the FMEA drives towards higher reliability, higher quality and enhance safety. FMEA concentrates in identifying the severity and criticality of failures. FMEA is a fully bottom-up approach.

RPN (Risk Priority Number)

Risk Management identifies hazards and tracks them through a sequence of events that creates a hazardous situation. This hazardous situation could result in harm to people, property, or the environment. The resulting harm has a severity and a probability of occurrence. The combination of severity and probability establishes the risk. Figure 1 illustrates the approach.

		SEVERITY				
		NEGLIGIBLE	MINOR	SERIOUS	CRITICAL	CATASTROPHIC
PROBABILITY	FREQUENT	R3	R3	R3	R3	R3
	PROBABLE	R3	R3	R3	R3	R3
	OCCASIONAL	R2	R2	R3	R3	R3
	REMOTE	R1	R2	R2	R3	R3
	IMPROBABLE	R1	R1	R2	R2	R2

Key:
R3 – Unacceptable risk
R2 – Further risk reduction investigation needed
R1 – Insignificant risk

The table in Figure 1 maps five levels of severity and five levels of probability to three levels of risk acceptability. This is a 5 × 5 → 3 map. Notice that the 5 × 5 table has 25 cells, but we use only 3 values of risk acceptability; some values must be in more than one cell.

The map doesn't have to be 5 × 5. For example, a device manufacturer could have seven severity and five probability levels mapping to two risk acceptability levels: unacceptable or acceptable. This is a 7 × 5 → 2 map.

FMECA One tool often employed in Risk Management is Failure Modes, Effects, and Criticality Analysis (FMECA). This tool is common in reliability and addresses the issues when a product fails. Typically these are single point failures, but the tool is applicable in multiple failures as well.

There is, however, an important distinction to make. FMECA deals with failures and their failure modes. Medical device risk management deals with hazards; they can be present in normal and in failure condition.

One common approach in FMECA calculates a Risk Priority Number (RPN). Each failure (mode) has an assigned severity, probability, and detectability values. This common approach uses the following qualitative scale for ranking.

• The severity score (S) is an integer between 1 and 10, where the most severe is a 10
• The probability score (P) is an integer between 1 and 10, where the highest probability is a 10
• The detectability score (D) is an integer between 1 and 10 where most difficult to detect is a 10.
The RPN is not a measure of risk, but of risk priority.

Severity Index

The severity shall be estimated based on the effects it may cause on the product/prosess

Index value	severity	interpretation
3	Critical	Serious effect
2	Major	May cause adverse effect directly or indirectly
1	minor	No potential effect

Frequency Index

The Frequency Index is based on the frequency of occurrence of each identified cause.

Index value	severity	interpretation
3	High	Will occur
2	Moderate	Likely to occur
1	Low	Unlikely to occur

Detect ability Index

Based on the ability to detect the event

Index value	**Estimated detectability**	**interpretation**
3	Not detectable	There are no control to detect the defects
2	Moderately detectable	Current method may identify the failure
1	Highly detectable	Failure are detected with high degree of probability

RPN OF KMML

KMML consist of Integrated Titanium dioxide plant. Here there are mainly three plants are working MSP, TSP & TDP respectively. For our project we choose the TPP(Titanium Dioxide Pigment Production Plant). The manufacture of titanium dioxide pigment in KMML is based on chloride Technology. There are three subplants for this process. They are Ilmenite Benification Plant(IBP), Acid Regeneration Plant(ARP) & Pigment Production Plant(PPP). Here the works are of very complex in nature. Because of the use of chemicals for treatments high rised buildings with steel structures are provided. Due to this many types of risks are involved. So proper analysis must be carried out. So in our projects we use Failure Mode and Effect Analysis. The FMEA procedure assigns a numerical value to each risk associated with causing a failure using severity, occurrence and detection indexes and Risk Priority Number (RPN) is obtained by multiplying these numerical values.

RPN= Severity Index X Frequency Index X Detectebility Index

Severity Index

Based on the effect of hazard on the process the severity index taken as 2(May cause adverse effect directly or indirectly).

Frequency Index

On the basis of frequency of occurrence of hazard the frequency index taken as 1(no record of previos occurrence and is not expected to occur)

Detectability Index

On the basis of ability to detect the failure during its occurrence the detectability index is taken as 1(Failure are detected with high degree of probanility)

RPN= Severity Index X Frequency Index X Detectebility Index

= 2 X 1 X 1

= 2

RISK CATEGORY	**RISK FACTOR (RPN)**	**INTERPRETATION**
Unacceptable	**>21**	Risk is too severe
ALARP region of acceptable risk	**6-21**	Tolerable risk
Negligible risk	**1-6**	Negligible Risk

From this analysis we can understand that the risks of KMML is Negligible.

3. CONCLUSIONS

Development plays a very important role in the progress and uplift of a society and country as a whole. Hence it holds very crucial to analyze and to rectify every aspect throughout the entire course of the project. Based on all the information and performance data that has been gathered, the risk management is the core of industrial building & project management. The success of an industry depends on how efficiently and effectively the uncertainties are handled. KMML consists of integrated titanium dioxide plant. Here the works are of very complex in nature, because of the use of various chemicals for treatment. The high rise building, improper scaffolding etc. are the main reasons for the risk. From our study we concluded that the risks of KMML is minimal with suitable remedial measures adopted as and when a risk occurs.

Maintenance management is responsible for the smooth and efficient working of the industrial plant and helps in improving the productivity. If there is no proper maintenance management it will create more risks and accidents. So risk management is essential for the successful working of any industry.

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