

COAL GRINDING AND FIRING SYSTEMS - HAZOP ANALYSIS

A Process Hazard Analysis (PHA) is a key element of a Process Safety Management (PSM) program. It analyzes potential risks to personnel operating in an industrial environment. .

A PHA is a thorough detailed systematic approach to finding potential hazards in an industrial plant. It includes an analysis of the equipment, instrumentation, utilities, human actions, and external factors which could be potential hazards.

One of the techniques of a PHA used to identify hazards and operability problems is the HAZOP (Hazard and Operability) study which can be performed on both a new or operating coal grinding and firing system.

This article describes activities and elements involved in a HAZOP study of a coal grinding and firing system.

Introduction:

The handling, preparation, storage, conveying and firing of ground solid fuel have inherent operating risks. Various qualities of coal are used as fuel. Due to the combustible properties of coal in general, safe handling is important during the entire process.

Accidents are mainly caused by the unintended release of energy caused by fire and explosion. A HAZOP study identifies situations where such release of energy may occur. It also identifies and estimates the potential severity of damage and recommends mitigation measures.

A HAZOP study of a typical operating Coal Grinding and Firing System encompasses the following areas:

- a) Fuel handling and storage – Raw coal receiving, storage and handling.
- b) Fuel preparation – Raw coal grinding.
- c) Fuel conveying – Fine coal storage and conveying for an indirect firing system.
- d) Fuel conveying – Fine coal conveying for a direct firing system.

Methodology:

A HAZOP study is generally performed using a comprehensive and widely used methodology in the industry, known as “What –If”. The technique is usually performed by a team of 3 or 4 experts. By using relevant documents, process knowledge and experience, the team develops “What-If” questions around all possible deviations, upset process conditions, equipment failures and potential human errors. Potential hazards, operational problems and design faults are thus identified. The team evaluates the consequences of each deviation and, depending on what safeguards are available in the present system, decides upon recommendations or actions for preventing such occurrences.

The HAZOP Study of the Coal Grinding and Firing Systems addresses the following aspects:

- a) The hazards of the coal grinding and firing process,
- b) Engineering and administrative controls applicable to the hazards and their interrelationships,
- c) Detection methods (Hydrocarbon detectors & gas analyzers) and continuous process monitoring,
- d) Consequences of failure of engineering and administrative controls,
- e) Human factors affecting the operation,
- f) A qualitative evaluation of safety and health effects of failure of controls on employees,
- g) The identification of any previous incident which had a potential for catastrophic consequences.

Documentation:

The following documents will be required for a HAZOP study:

- Layout and G A drawings
- Equipment lists
- Process flow sheets and Process and Instrument Diagrams
- List of Process control loops and Process and Safety Interlocks
- List of Instrumentation and Alarms and Process variables with all limits
- Operating procedures and work instructions for various modes of operation
- Maintenance procedures and work instructions
- Documentation on all auxiliary systems and Fire hydrant system
- Raw Coal and Fine Coal analysis
- Method to control bypassing the Interlocks and Alarms
- Hazardous Area Classification

Staffing:

A HAZOP study is performed by a team whose members are process and maintenance engineers with specific knowledge in the operation and maintenance of coal grinding and firing processes. At least one member of the team must be knowledgeable in the specific process hazard analysis. Operation and maintenance engineers as well as coal mill operators participate in structured brainstorming to look for deviations from the design performance.

Results:

A HAZOP study identifies potential deviations which had not been experienced in the coal grinding and firing system.

The ultimate aim of a HAZOP study is to achieve the following:

- ensure that the coal grinding and firing system can be started, operated and shut down safely,
- recommend appropriate changes to the process design or its operation that increase safety or enhance operability,
- consider existing safety interfaces with operation software including installations such as the Coal mill baghouse, fine coal storage and dosing system, fuel firing systems, inertization systems, etc.,
- derive the recommendations and actions to eliminate potential occurrences identified as risks.

A HAZOP analysis is required whenever there have been modifications/changes to the equipment, operation and maintenance procedures, operating parameters, environmental conditions; and in the case of incidents or near misses. Therefore, a HAZOP analysis also provides an opportunity to develop a system to manage Changes effectively.

Report:

The HAZOP Study Report provides comprehensive results compiled in specific formats and clearly lists the actions to be taken by the plant management. Table 1 is a typical analysis format used to record the findings.

Biography:

This article was presented by Mr. Jagrut Upadhyay, Senior Process Consultant at PEC Consulting.


PROCESS HAZARD ANALYSIS - HAZOP													
		Company		Drawing Numbers:									
		Facility		Unit / Process:		Coal grinding and Firing System							
		Study	HAZOP	Equipment:		Coal grinding mill							
		Date		Documents referred:									
Sr. No.	Deviation/ What if	Cause	Consequence	Risk matrix before Mitigation measures				Safeguard	Risk matrix after Mitigation measures				Recommendation
				Likely hood of the consequence (Probability)	Severity	Detection of Hazard	Risk= PxSxD		Likely hood of the consequence (Probability)	Severity	Detection of Hazard	Risk= PxSxD	

TABLE - 1