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AN OVERVIEW OF HAZOP ON HANDLING AND STORAGE OF LPG & RUST PREVENTIVE OIL IN HEAVY MANUFACTURING INDUSTRY

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ABSTRACT

HAZOP is based on a theory that assumes risk events are caused by deviations from design or operating intentions. Identification of such deviationsis facilitated by using sets of "guide words" as a systematic list of deviation perspectives. HAZOP study examines the safety in the system during inspection, maintenance operation especially in Hydrocarbons, through work permit system can be formed to prevent accident. When in a workplace a hazard has been identified and risk to health assessed, an appropriate prevention or control strategy is required. Many times people get injured in confined spaces because ofmisunderstandings like entering without permission to do job or without proper housekeeping or knowledge. Hazards associated with Handling and storage of Liquefied Petroleum gas (LPG) & Rust preventive oil are analyzed and evaluatedby using Hazard and Operability Study (HAZOP) in this work. The LPG storage and supply pipeline network and is utility system have various risk and hazards and the collecting electrode bundle of Electrostatic precipitator is dipped in the rust preventive oil tank. HAZOP study details the possible deviations that could occur in a system, so that the mitigation measures shall be carried out to reduce the risk or prevent any accidents

Keyword: Hazop, Hazard Analysis (Pha) & Material Safety Data Sheets (Msds)

1. INTRODUCTION

1.1 Hazard & Operability Analysis (HAZOP)

Hazard and Operability Analysis (HAZOP) is a structured and systematic technique for system examination and risk management. In particular, HAZOP is often used as a technique for identifying potential hazards in a system and identifying operability problems likely to lead to nonconforming products. HAZOP is based on a theory that assumes risk events are caused by deviations from design or operating intentions. Identification of such deviations is facilitated by using sets of "guide words" as a systematic list of deviation perspectives. This approach is a unique feature of the HAZOP methodology that helps stimulate the imagination of team members when exploring potential deviations.

1.2. PROCESS HAZARD ANALYSIS TECHNIQUES

Risk management involves process hazard analysis (PHA) as the first step to commence the process of hazard identification. Many methods exist for conducting PHA, such as:

What-if checklist

Fault tree analysis (FTA)

Failure mode and effect analysis (FMEA)

Cause–consequence analysis

Event tree analysis (ETA)

Hazard and operability analysis (HAZOP).

Of the above, a HAZOP study is a powerful technique for the identificationof hazards. It requires that a systematic and comprehensive procedure be followedthroughout the study, and it utilizes team efforts of experienced persons in the areas of design, operations, maintenance and safety.REQUIREMENT OF UPDATED DOCUMENTS

Documents for a new or existing facility must be available long before a HAZOP study. The availability of these documents saves time during these sessions:

Process flow diagrams, along with heat and material balances

Piping and instrumentation diagrams (P&IDs)

Equipment layout drawings

Material safety data sheets (MSDS) for hazardous chemicals

Project control philosophy and cause-and-effect diagrams

Provisional operating instructions, and startup and emergency shutdownprocedures
Utility specifications (as applicable).

1.3 OBJECTIVE

To identify how the system or plant deviate from the design intend andcreate risk for personnel and equipment operability problems.

To access the hazard potential of malfunction of equipment and theconsequent effects of the facility.

To identify and assess major potential hazards in the storage andhandling of flammable products.
To suggest action measures.

2. LITERATURE REVIEW

L. kotak, M. Tabas (2014) reported that the quantitative HAZOP analysis technique uses a systematic approach to identify possible deviations from normal operations and ensure appropriate safeguards are in place to help prevent accidents with keywords for generating deviations from safe condition. Quantitative HAZOP is based on the development of scenarios and finding the causes deviations , to identify safety functions and estimate the final effects, but it more complements the assessment of probability and severity scenario and it allows the most important preventive recommendation for implements.

Egidijus babilas (2016) reported that in this research, Decommissioning of nuclear facilities involves different types of activities tools, equipment and systems andthere is potential for a wide range of radiological and industrial accidents during various stages of decommissioning project creating risk for workers and environment and the paper focus on the application of HAZOP technique for identification of hazards raised due to dismantling and decontamination activities at the nuclear power plant.

Feng wang (2014) reported that this paper represents the design method for process safety data management program for petrochemical plants based on HAZOP analysis and demonstrates the steps of application involved in building a process safetydata for ethylene glycol production plant.

Faisal khan and S.A. Abbasi (2016) reported that in this paper, HAZOP studies constitute an essential step in risk analysis of any chemical process industry andinvolve systematic identification of every conceivable abnormal process deviation, it causes abnormal consequences. The TOPHAZOP knowledge base consists of two main branches specific and general. The TOPHAZOP framework allows these two branches to interact during analysis to address the process specific aspects of HAZOP analysis

3. METHODOLOGY

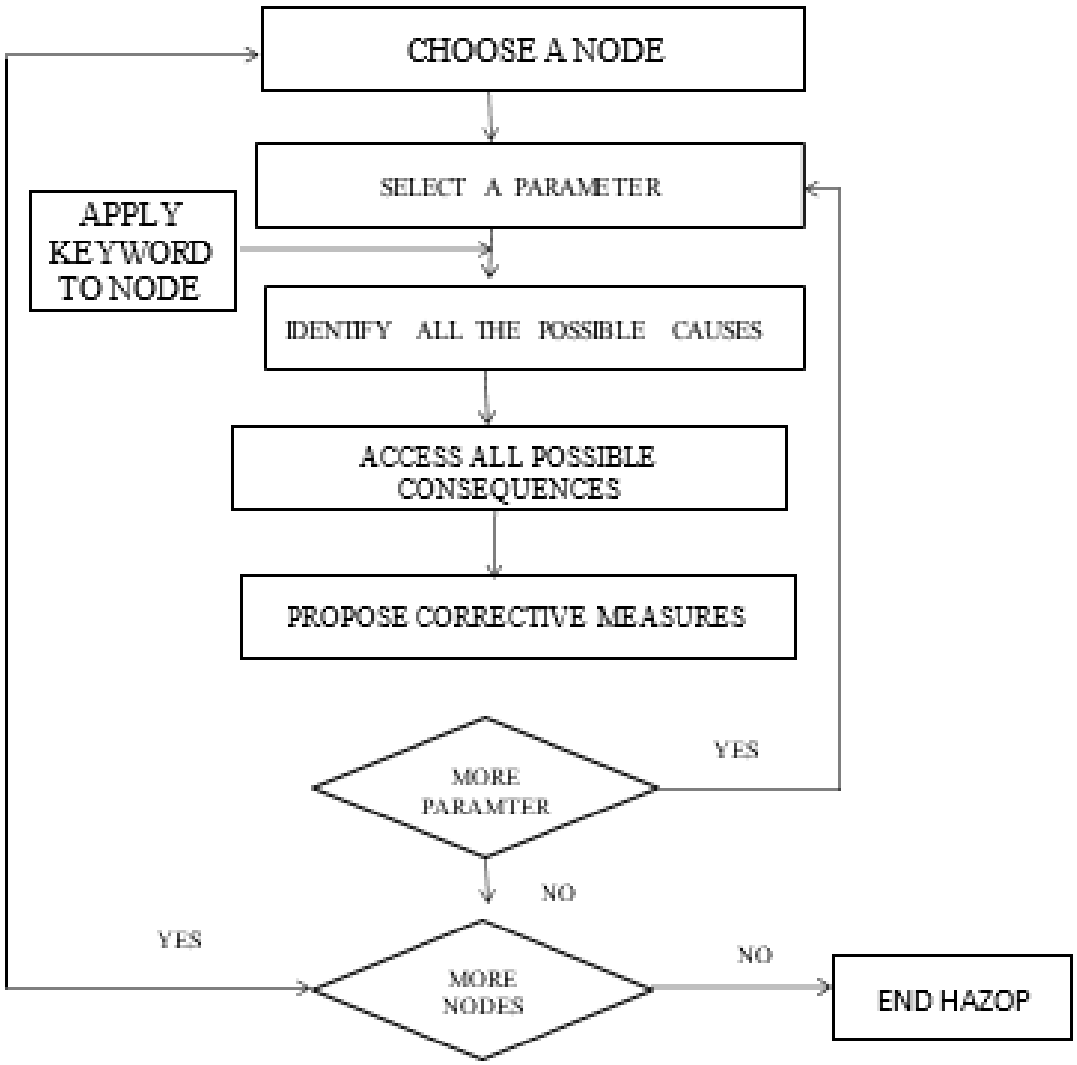
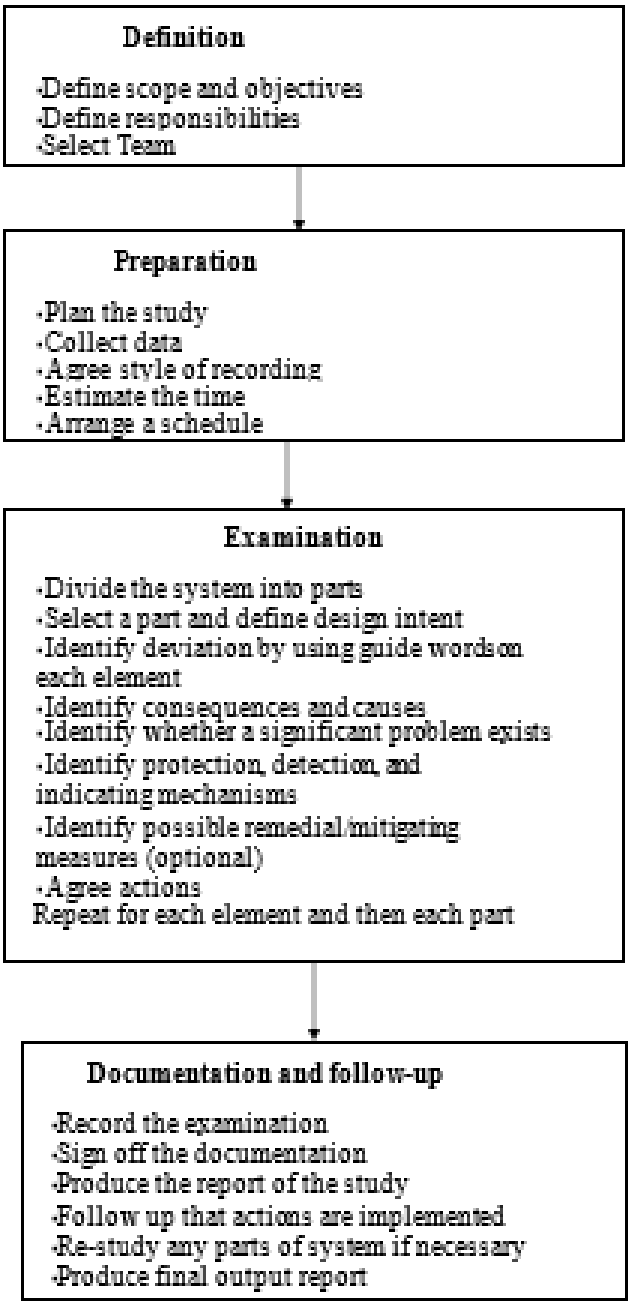


FIG.1 HAZOP METHODOLOGY

4. HAZOP Methodology

The HAZOP analysis process is executed in four phases as illustrated below:



5. DEFINITION PHASE

The Definition Phase typically begins with preliminary identification of risk assessment team members. HAZOP is intended to be a cross-functional team effort, and relies on specialists (SMEs) from various disciplines with appropriate skills and experience who display intuition and good judgment. SMEs should be carefully chosen to include those with a broad and current knowledge of system deviations. During the Definition Phase, the risk assessment team must identify the assessment scope carefully in order to focus effort. This includes defining study boundaries and key interfaces as well as key assumptions that the assessment will be performed under.

5.1 PREPARATION PHASE

The Preparation Phase typically includes the following activities

Identifying and locating supporting data and information

Project management preparations

Consensus on template format for recording study

Outputs Consensus on HAZOP guide words to be used during the study

Risk assessment teams are responsible for identifying the guide words that will best suit the scope and problem statement for their analysis. Some common HAZOP guide words include:

5.2 EXAMINATION PHASE

The Examination Phase begins with identification of all elements (parts orsteps) of the system or process to be examined. For example:

Physical systems may be broken down into smaller parts as necessary

Processes may be broken down into discrete steps or phases

Similar parts or steps may be grouped together to facilitate assessment

The HAZOP guide words are then applied to each of the elements. In this fashion a thorough search for deviations is carried out in a systematic manner. It must be noted that not all combinations of guide words and elements are expectedto yield sensible or credible deviation possibilities. As a general rule, all reasonable use and misuse conditions which are expected by the user should be identified and subsequently challenged to determine if they are “credible” and whether they should be assessed any further. There is no need to explicitly document the instances when combinations of elements and guide words do not yield any credible deviations.

a. DOCUMENTATION & FOLLOW-UP PHASE

Risk assessment teams may modify the template as necessary based onfactors such as:

Regulatory requirements

Need for more explicit risk rating or prioritization (ex:rating deviation probabilities, severities, and/or detection)

Company documentation policies

Needs for traceability or audit readiness

Other factors

The following figure graphically illustrates the HAZOP Examination Phase processflow.

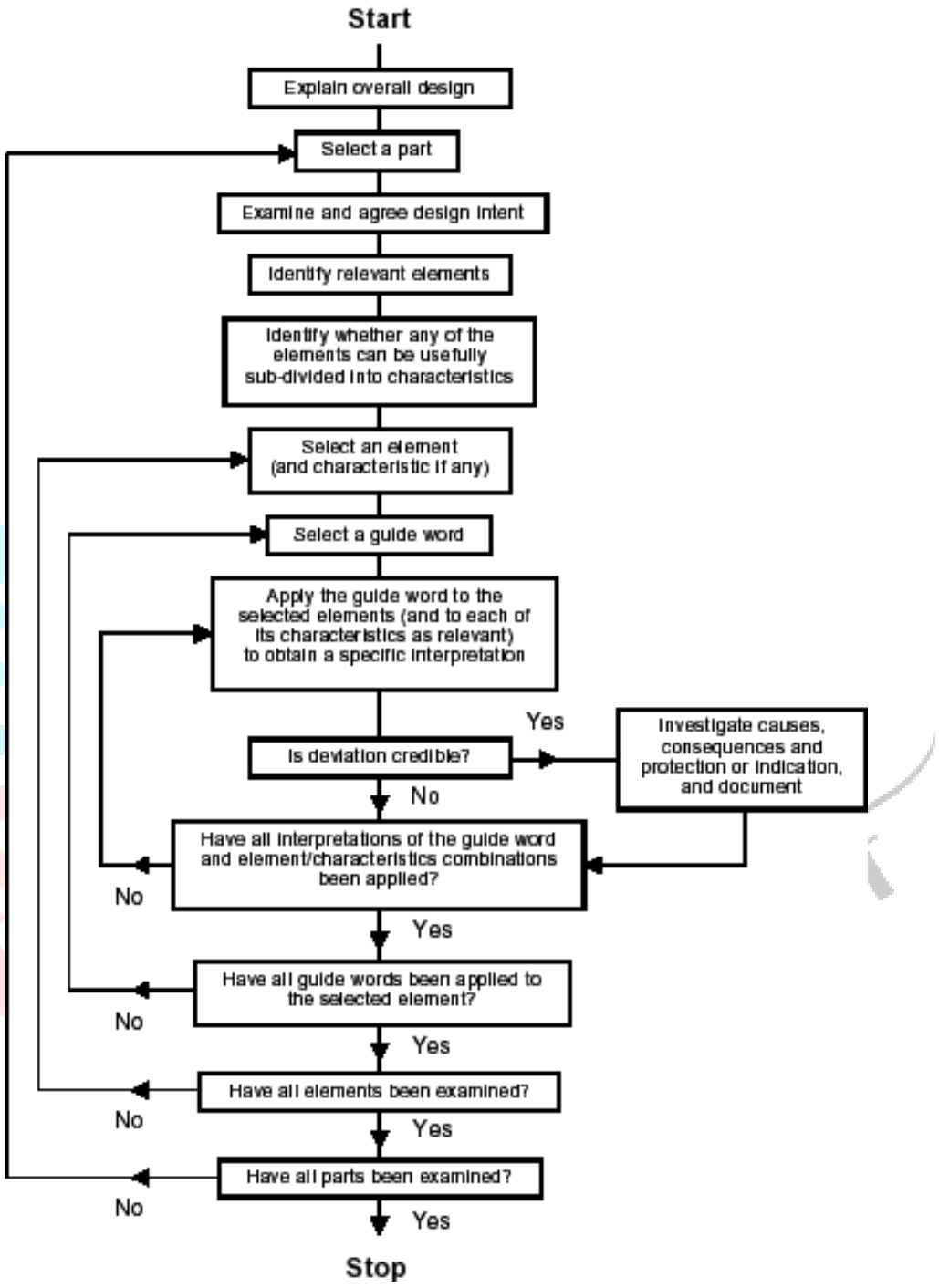


Fig.2. HAZOP Examination Process

6. RESULTS AND DISCUSSION

Hazop Analysis is conducted in the handling & storage of LPG and Rustpreventive oil is done.

The process of LPG node is carried out in
Liquid LPG from Road Tanker to LPG Bullet
LPG Vapor from LPG Bullet to Suction of LPG Vapor Compressor
LPG Vapor from LPG Vapor Compressor discharge to LPG Road Tanker
Mounded LPG Bullets
Distribution of LPG through pipelines to various points of service
Tapping of LPG at usage

The process of Rust preventive oil is carried out in
Mixing of RP oil and Thinner
Dipping of Collecting Electrode
Soaking of Collecting Electrode
Draining of Collecting Electrode
Drying of Collecting Electrode

7. CONCLUSION

The process involved in each operation of Handling and storage of LPG and Rust preventive oil were studied and various hazards identified by using HAZOP study. For conducting risk assessment of LPG and Rust preventive oil, system is divided into nodes by using process flow diagram and P&I diagram. Deviations in nodes of LPG and Rust preventive oil are identified. Flow, temperature and pressure are the important design parameters in LPG pipelines and Rust preventive oil. Causes and consequences of the deviations of the deviations are identified and recommendations / safeguard for those deviationsis provided. HAZOP has been taken to identify the possible potential hazards and risks involving in BHARATH HEAVY ELECTRICALS LIMITED – BOILER AUXILLARIES PLANT Ranipet, in this project findings and recommendationsare done to reduce the accidents.

8. REFERENCES

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