



Five in One Risk Management and Control to Improve Enterprise Safety Management Level

Mingjing J*

Sinopec Zhenhai Refining & Chemical Company, China

***Corresponding author:** Jiang Mingjing, Sinopec Zhenhai Refining & Chemical Company, China, Email: jiangmj.zhlh@sinopec.com

Review Article

Volume 5 Issue 4

Received Date: July 14, 2021

Published Date: October 21, 2021

DOI: [10.23880/ppej-16000282](https://doi.org/10.23880/ppej-16000282)

Abstract

The operation risk management and control system is to discuss the daily operation of petrochemical plant by five professionals, including Process Engineer, Safety Engineer, Operator Electrical Instrument Engineer and Equipment maintenance personnel, to arrange weekly plan, identify risks and discuss preventive measures. In this way, the daily total amount of work can be controlled, the risk can be controlled, the efficiency is higher, and the safety in the petrochemical production process can be guaranteed.

Keywords: Risk management and control; Operation; Maintenance

Overview

The operation characteristics of petrochemical production determine that there are a variety of safety problems in the production process. If effective measures cannot be taken to effectively control these safety problems, it will have an impact on the healthy development of petrochemical industry [1]. Chemical production enterprises implement the “five in one” risk control system to ensure the safety control during the operation of production units, The “five in one” risk control system is jointly participated by five professionals including Process Engineer, Safety Engineer, Operator, Electrical Instrument Engineer and Equipment maintenance personnel, the team will focus on the risk assessment of the upcoming daily operation plan and weekly operation plan, formulate preventive measures, and controls the total amount of maintenance work.

Many accidents in petroleum and petrochemical industry occur in the process of unplanned operation, without sufficient risk assessment. A typical oil pipeline leakage and

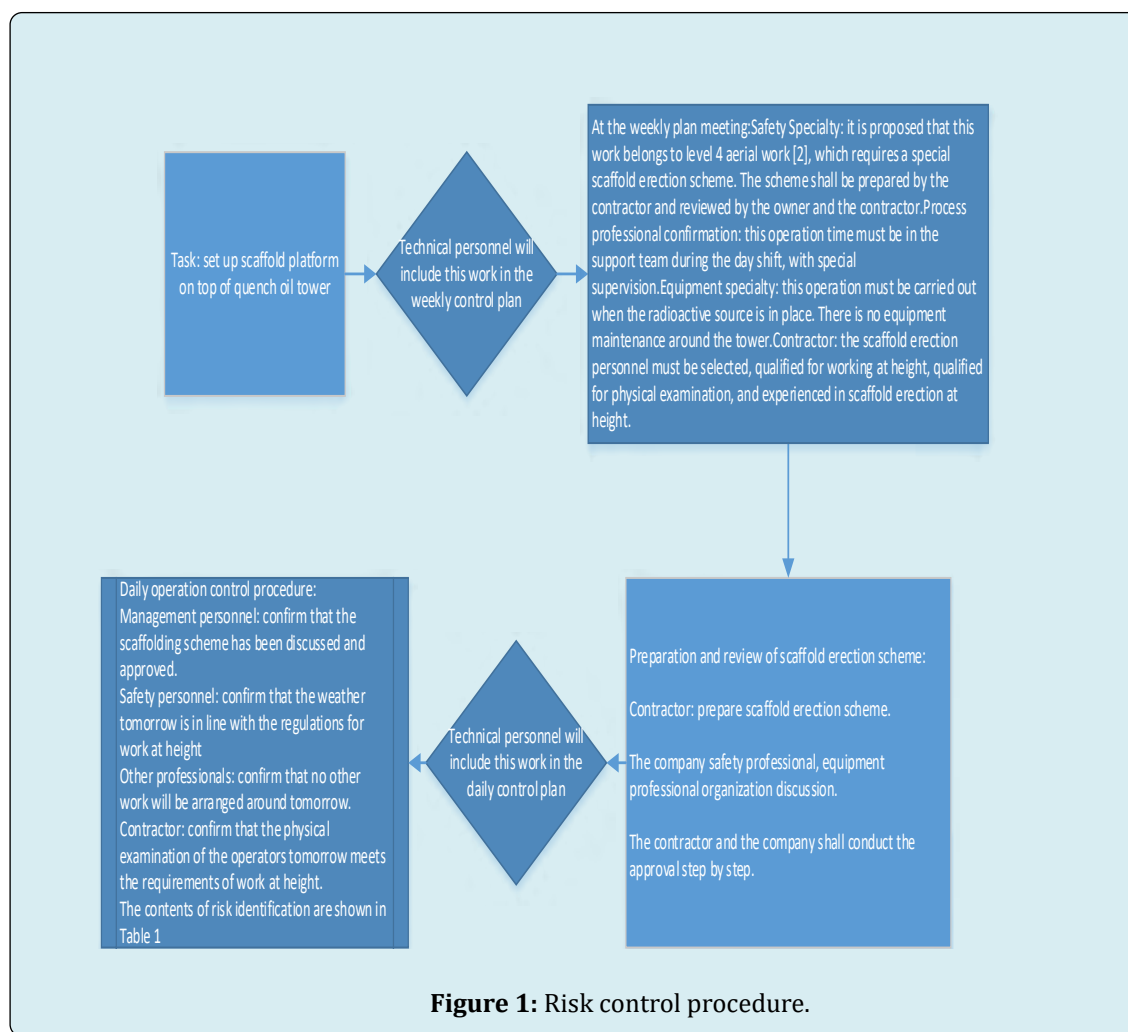
explosion accident of a company in 2013 resulted in injuries, with a direct economic loss of 750 million yuan [2]. Before the accident, the oil pipeline leakage was found, and the crude oil leaked out of the ground. The time was in a hurry, and the on-site operation personnel did not have multi-disciplinary safety risk assessment, so they directly used the crusher to excavate the ground; The explosive gas mixture in the closed space is ignited by the spark caused by the crusher. In 2018, a safety accident occurred in a petrochemical enterprise. Before the start-up of the unit, the container manhole was not sealed. The Contractor’s personnel found that a “no entry” sign fell into the container and entered the container rashly. The oxygen in the container caused the personnel to fall to the ground. The patrol operators found it and rescued it blindly, resulting in two deaths; In 2021, an accident occurred in an enterprise, in which the indication of the liquid level gauge of the rubber plant tower was inaccurate, and the team members took the risk to open the flange of the liquid level gauge when they could not completely close the root valve of the gauge, resulting in a large amount of C4 material leakage, fire and explosion; The “five in one”

risk management and control can effectively control the operation risk in the production process, greatly reduce the occurrence of accidents such as unplanned shutdown, personnel injury, safety and environmental protection incidents, and effectively help enterprises to realize safe, environmental protection and efficient operation.

“Five in One” Risk Control Method

In the process of petrochemical production, there will be a lot of daily operations, which can be divided into maintenance, production adjustment, Equipment upgrading. The common operations in maintenance operations include scaffold erection, core extraction of heat exchanger, anti-corrosion and thermal insulation, fire retardant coating repair, pump removal of filter screen, safety valve removal and pressure setting, etc. Taking an actual scaffold as an example, this paper analyzes the process of risk control.

The differential pressure of quench oil tower in ethylene plant rises and there is slight blockage. It is necessary to conduct gamma ray scanning of the whole tower to judge which layers of trays are coking, so as to determine the measures that can be taken in the next step. The scanning operation needs to set up a temporary platform for the operation activities of the detection personnel, on the top of the quench oil tower which is nearly 70 meters high, The work at heights is divided into four levels. When the height is 2 ~ 5m, it is class I work at heights, and when the height is 5 ~ 15m, it is class II work at heights. When the working height is 15 ~ 30m, it is class III high-altitude operation, and when the working height is more than 30m, it is special high-altitude operation [3]. The control steps of scaffold erection are shown in Figure 1, and the risk identification contents and countermeasures are shown in Table 1. On the day of operation, we should implement risk control measures one by one according to the division of labor, and implement one by one to ensure no missing items.



Tasks	Risk Level	Risk Assessment and Measures		
		Owner's JSA Risk Analysis and Control Measures	JSA Risk Analysis and Control Measures of Construction Party	Supplementary Risk Assessment
Erection of top shelf of quench oil tower	Larger E4	Complete the on-site disclosure and confirm the safety of the working environment. Isolate the operation area and hang warning signs. Assign special person (leader of operation Department, safety officer of construction contractor, operation team member) to supervise.	<p>Check the working machines and tools to ensure safety and reliability. All kinds of facilities in operation are shall not be approached.</p> <p>Understand the operation content, hazard factors and safety measures.</p> <p>In case of any abnormality or discomfort, evacuate immediately. Fasten the safety belt at height. Work hazard analysis or special construction scheme.</p> <p>Assign special person to supervise.</p> <p>Implement video monitoring. (1) permit for work at height (70 meters, three days)</p> <p>Fasten the safety rope.</p>	<p>When erecting and dismantling scaffold, fence or warning sign shall be set on the ground.</p> <p>Do not touch pipelines, instruments, cables, valves, etc.</p> <p>Take necessary protective measures for pipelines and instruments that may be involved.</p> <p>It is forbidden to throw objects in the process of assembly and disassembly.</p> <p>Preventive measures for falling of construction materials and tools.</p>

Table 1: Risk identification and measures.

In addition to the weekly work plan, there will always be temporary work, which can be arranged one day in advance to the daily plan as far as possible, so as to minimize the temporary work of the day. If there is no effective management for temporary operation, it is the operation with the highest safety risk. The main reasons are as follows: first, the risk assessment is insufficient. There are few personnel and insufficient time for the risk assessment of temporary operation. Often, the managers think of what they want to do today and direct the team members to complete it. Sometimes, the team members are inexperienced or can't fully think about the risk of operation, Temporary work often leads to hidden dangers such as cross operation, incomplete equipment emptying, wrong operation procedure, etc. With the weekly plan and daily control, the temporary operation can be greatly reduced.

If the temporary tasks must be carried out in the production process, the approval level can be improved. For example, the tasks that should be reviewed by the technician can be improved to the supervisor's review, and reported to the company's dispatcher for record. In addition, the company carries out classified statistical assessment on the amount of work temporarily arranged for each device, rewards the device management units with high planning, and encourages everyone to improve the planning of work.

Characteristics of Risk Management and Control

The Total Amount of Operation is Controlled

Multi professionals participate in risk management and control. Through weekly plan and daily arrangement, five professionals gather for one hour every Thursday afternoon to discuss the work to be carried out in the next week, focusing on the control of the total amount of work every day, balancing the amount of work, the allocation of monitoring personnel, and the arrangement of contractor's operation personnel, such as the fire work project, The company focuses on the fire work three days a week, and arranges the team monitoring force. The other four days are non-fire time, so the fire work is not arranged as far as possible. In addition, at the risk management and control meeting, we initially discussed how to distinguish the operation risk level. For high-risk operations, the construction scheme shall be prepared and gradually reviewed [4].

Every afternoon, five majors concentrate 40 minutes to carry out risk assessment and formulate risk prevention measures for the next day's operation. The total amount of daily equipment switching, equipment maintenance, instrument maintenance, technical measures and other

projects is controlled every day to prevent the total amount of work in a day from exceeding the control ability. The owner's supervisor and the Contractor's construction force make arrangements in advance to ensure that each operation on the day is managed by a special person and each preventive measure is implemented.

It Can Improve the Maintenance Efficiency

The efficiency of equipment maintenance can be improved by discussing the operation plan with multiple specialties. For example, when a cracking furnace is shut down for maintenance, the instrument personnel can arrange the instrument maintenance according to the shutdown time, the electrical personnel can take the opportunity to repair the induced draft fan of the cracking furnace, and the analysis professionals can arrange the meteorological chromatographic maintenance during the shutdown time of the cracking furnace, which can improve the efficiency.

It can Make the Safety Risk Identification More Comprehensive

The safety risk in the process of operation can be identified more comprehensively by multi-specialty discussion. For example, in the cracking furnace tube replacement operation, the equipment professional, safety professional and contractor representatives identify the risks that should be paid attention to in the process of confined space operation, high-altitude operation and fire operation. We remind each other that the identified risks are more comprehensive and the measures are more in place.

It can Improve the Effect of Staff Training

The multi-disciplinary operation risk management and control meeting held regularly every day is also a good platform for training. Trainee technicians and some team

backbones can be arranged to participate in the management and control meeting, so that they can participate in risk assessment more and improve their ability to analyze risks and propose prevention and control measures. The old employees can give full play to their own experience to check the safety of the young employees, that is, they can control the safety and train new people.

Summary

By carrying out "five in one" risk management and control, weekly and daily management and control, the total amount of unplanned operations in chemical production plants is greatly reduced, the risks in the operation process are fully evaluated, and the risk prevention measures are implemented one by one before operation, which greatly reduces unplanned downtime, abnormal fluctuations, safety and environmental protection accidents

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