2012 International Symposium on Safety Science and Technology

Study on the HSE management at construction site of oil and gas processing area

WANG Yu\textsuperscript{a,}\textsuperscript{*}, TIAN Mingbang\textsuperscript{b}, WANG Dongbo\textsuperscript{c}, ZHAO Qiang\textsuperscript{d}, SHAN Shihui\textsuperscript{d}, LIN Shuhuang\textsuperscript{d}

\textsuperscript{a}College of Mining Engineering of Hebei United University, Tangshan 063009, Hebei, China
\textsuperscript{b}Land Oil Extraction Area of Jidong Oilfield, Tangshan 063009, Hebei, China
\textsuperscript{c}Nanpu Oil Extraction Area of Jidong Oilfield, Tangshan 063009, Hebei, China
\textsuperscript{d}Oil-gas Gathering and Transportation Company of Jidong Oilfield, Tangshan 063009, Hebei, China

Abstract

With the constant development and oil production increment of Jidong Oilfield, higher requests for oil and gas processing technology and equipment are put forward. Large-scale technical renovations have been implemented in oil and gas processing areas every year, in order to offer better services to the production process. But in the process of transformation a multitude of problems are exposed, which are the important causes of the accidents. In this paper the above problems were analyzed and researched, the basic reasons were identified, the improvement measures were put forward, the level of HSE management was improved and all kinds of potential safety hazards were eliminated. It is shown that through more than two years HSE management at oil and gas processing plant site, the rate of safety hazards elimination has been enhanced while the rate of accident at construction site has been reduced obviously.

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Keywords: oil and gas processing area; construction; improvement measures; HSE management

1. Introduction

In oil field production system, the oil and gas processing stations are important hazard areas. In the transformation progresses a multitude of safety problems occur frequently each year, which cause personal injury accidents and lead to psychology shadow to each employee [1]. That also exposes existing problems in oil and gas construction areas over the years. In order to better improve the HSE management level and reduce accidents as well as personnel damages, the HSE management level must be constantly improved in construction site.

2. Analyses of the problems in construction site

According to the construction experiences in the oil and gas processing area and references to the accident lessons of other oil fields, the possible causes of accidents are analyzed and the springhead of the problems are found out, which provides us with important learning opportunities to the HSE field management [2].
2.1. Weak safety management of construction party

In construction project of oil and gas processing area, a part of the projects are sub-contracted to other companies and turn out to be out of control in management. Construction units which win the bidding successfully are qualified with construction qualification and safety qualification. As they subcontract projects to others who do not have the qualification, the HSE management of the construction work is in a mess, as follows:

(1) The construction units just coordinate construction works, collect fees and sort data while the construction is organized by the subcontractors. In order to shorten the work period and cost, security of the construction process can’t be provided by the subcontractors.

(2) The technical safety measures of the construction plan are formulated, but not used in directing the construction which is only deals with the inspection of management department. Even some part of the schemes have been revised, the technical safety measures are original.

(3) The construction party lack designated security supervision and management officers. Workers do not enforce safety rules and they construct just by experiences. As a result, the safety management is very weak.

(4) Some construction workers do not have the appropriate skills who are casual labourers without safety consciousness. Sometimes they are not subjected to management, which increases the construction management difficulty.

(5) As the construction teams are made up temporarily, their work experiences are insufficient and the works are not comprehensively done, leaving behind a lot of safe hidden troubles and posing a great threat to the follow-up production safety.

(6) Under the pressure of work time limit, the construction teams often cross operations, which caused a lot of accidents frequently.

(7) The corrosion and obsolete equipments are used by the Construction parties, which increase the construction difficulties and the security hidden troubles. A lot of difficulties to HSE management work are caused by the construction parties because of the weak safety management, and it also brings a lot of hidden dangers.

2.2. Inefficient executions of the on-site supervision personnel

It is clearly defined in CNPC’s HSE management system that the strict managements of confirm confined space, hot work, height operations and other aspects to construction workers must be enacted by the managers of oil and gas processing areas. But certain of its officers do not pay enough attention [3]. They just issue the relevant procedures, fill out the required forms which are to be checked and do not do substantive work. As a result, the execution is not in place and security risks cannot be nipped in the bud. On the regulatory side, the safety standards are not precisely mastered by supervision officers; so many security risks cannot be timely discovered or eliminated. Secondly, the construction safety supervision duties of the supervision units employed by the Party A are not divided clearly, and the concepts are not transformed, and the security responsibilities cannot be seriously performed. Thirdly, owing to large workload of overhaul construction and time limit, supervision staffs are insufficient and the safety supervision cannot be implemented. Many pressures have been brought by all above problems to on-site safety management, which are also important causes to accidents [4-5].

2.3. Inadequate understanding of the risk assessment and contingency plans

Risk analysis and emergency plans are important contents of the HSE management. But the risk analysis is not paid sufficient attention to, data of the technological transformation are lost for many years, and the work conditions of the construction site are not acquainted by the new employees. Dangers may easy occur in the construction process. The emergency plans are the solutions of the accident or in other words, remedy for the accident. Without the emergency plans, when the accident occurs, the best rescue opportunity may be delayed and bigger accidents may be caused.

3. Improving measures of the HSE management on construction site

In order to solute the problems of oil and gas processing area, the managements of construction party and on-site supervision units must be continually regulated, the risk analysis and contingency plans must be prepared. So that the accidents rate can be reduced and the safety of our lives and properties can be ensured.
3.1. Strengthening the management of the construction teams

For the subcontracting teams chosen by construction side, they must have the appropriate construction and safety qualification. Therefore, we are required to do a good job on the review of the construction side and the construction subcontractors without appropriate qualifications are resolutely prohibited to enter the construction site and begin the projects. The construction equipment and tools by the construction side must be inspected strictly as well as temporary power and explosion-proof tools in constructions, etc. For using non-compliant equipment and tools, the construction projects must be resolutely stopped. As for construction programs of the construction side, we not only have to step up inspection but also have to see whether constructions are in accordance with the construction programs. Those who want to save the work-period, modify the program of constructions and act in violation of the provisions, should be sternly punished in order to avoid similar incidents from recurring. It is requested that there must be equipped with the appropriate construction safety management personnel for the construction units. The behaviour that construction team casually looks for individuals posing as supervisory staff in order to meet the inspection must be avoided. The management of construction workers must be strengthened, especially for special operations personnel. Those who do not have operating permits and whose are due, must be resolutely stopped their work. Those who do not obey the management must be expelled. It was showed that many accidents occurred due to an illegal operation. Safety is everyone's responsibility. The rule-breaking operations must be forbidden. Cross-operations once discovered must be resolutely restrained immediately [6]. Construction operations are high security risks and cross-operations may increases the probability of accidents and potential risks, so cross-operations must be eradicated resolutely.

3.2. Improving the level of site safety inspectors

The construction safety responsibility contracts need to be signed with oil and gas processing units and construction units. The main contents of contracts must be formulated such as the responsible person, the on-site construction safety management, the liability for breach of the contract and the compensation for damage. The emphasis of safety management can be improved following the contract for the construction units, at the same time the practical and effective monitoring could be implemented by safety inspectors in the oil and gas processing field area. The safety inspectors need to be strengthened safety education and skills training. The training should not just be taken when new employees come into the plant but sustained ongoing safety training in their entire career regardless of age and level. HSE skills and professional intensive training need to be offered regular training on in accordance with contents and levels and conduct assessment irregularly. Through competition activities, the HSE management level of on-site supervision personnel can be improved, and the strength of supervision and management can be enhanced. Safety inspectors employed need to be termly assessed. The safety inspectors who are lacking in responsibility must be refused. Others having strong supervision responsibility would be employed. Qualified safety inspectors of on-site supervision should be trained as many as possible to meet the shortage of safety inspectors. The problems that several construction sites are supervised by one person and major accidents occur because of delayed supervision can be avoided.

3.3. Risk analysis and contingency plans

Risk analysis is an important means to avoid the accident. The more comprehensive understanding of the risk, the less probability occurs. There are no hidden dangers that can not be eliminated and there are no unavoidable accidents. Per year after constructions, the data should be collected well and used on training new employees on a regular basis. The logos of the oil and gas field area must be comprehensible understudied. The fully prepared for the pre-construction risk analysis must be made. Contingency plans are to deal with accidents timely, which must be paid high attention, with no palsy and relax. Each accident is almost always due to the negligence of the works, so emergency plans must be consummated to any possible incidents.

4. Statistical data of HSE management of oil and gas processing plants in Jidong Oilfield

The HSE management systems of the construction units have been established and perfected for three years with helps of Jidong oil and gas processing plants. Because of operational mechanical equipment insecurity states, personal unsafe behaviours and multiple work types, a lot of personal injuries occurred. The data of equipment insecurity states, personal unsafe behaviours, management failure and near-misses of five oil and gas processing plants in Jidong Oilfield during construction processes have been collected as shown in Table 1.

Through the analysis, statistical data indicate that human’s unsafe behaviour account for 76.41% in all direct causes of
serious accidents. Therefore, controlling unsafe behaviours is very important to safety management of oil and gas processing plants. Through HSE management at the construction site for three years, the HSE management level has been enhanced while the accident rate of site operation has been reduced.

Table 1. Statistical HSE management data of construction processes

| Data              | 2009 | 2010 | 2011 |
|-------------------|------|------|------|
| engineering quantity | 120  | 105  | 112  |
| human’s unsafe behaviour | 62   | 33   | 15   |
| equipment insecurity states | 15   | 9    | 5    |
| management failure | 3    | 1    | 0    |
| near-misses        | 6    | 4    | 1    |

5. Conclusions

Though the operations and practice of the HSE management system in the construction site, it is suggested that HSE management needs to be monitored by the management department. More to the point, the concepts of HSE management must be transformed and the awareness of HSE management must be strengthened for all the people involved in site operation construction. The responsibilities of the HSE management are not only assumed by safety inspectors but every one of construction workers and all participants. Due to the mutual cooperation, the HSE management of the construction site would be done well, the accidents would be reduced and the workers involved should be truly protected. At the same time the risk analysis and contingency plans must be consummated to minimize the hazards in the event of an accident.

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