

## The Safety Auditing in Yousu Petrochemical Complex

En Sup Yoon<sup>1</sup>, Yong Ha Kim<sup>1</sup>, Sung Joon Ahn<sup>1</sup>, Tae Hwan Kim<sup>2</sup>, and  
Chang Jun Lee<sup>1</sup>

<sup>1</sup>*School of Chemical Engineering, Seoul National University, Seoul, Korea*

<sup>2</sup>*Security Service Department, Yong-In University, Yong-In, Korea*

### Abstract

Petrochemical/Chemical industries are composed of complicated processes with many recycle streams of energy and materials, regulated by environmental and safety considerations. Last autumn there was three big accidents which come from carelessness in Korea. After these accidents, Korea Petrochemical Association made the Safety Auditing Team to check the present condition of 16 Petrochemical/Chemical companies in Yousu Petrochemical Complex. This project has been progressed by ICP (Institute of Chemical Process) of Seoul Nat'l University. Each team had made the investigation about 16 companies objectively. And the results are made as Radar Chart.

### 1. The purpose of safety auditing

Including a fire accident of SK(Co., Ltd.) Ulsan factory, last October, 20th night, and an explosion accident of Honam Petrochemical Corp., Yeosu factory, last October, 3th, industrial accidents concerned with petrochemical/chemical company happened in 5 places, Hyundai Oil Bank, Kumho Petrochemical Corp. and Youngsin Chemistry.

In addition, from Jan. to July, the number of casualties by industrial accidents increased 27.87% to 55,575 from 45,978 the

same period of last year. The number of deaths by industrial disasters is 1,725, increased rapidly 16.48% compared with that of the same period of last year.

By the comment referred to Korea occupational safety & health agency (KOSHA), an estimation of a financial loss by industrial accidents comes up to \$ 920 million annually and it is analysed that this is 10% of a budget of nation, \$98 billion. In the field of insurance businesses, it is estimated that the insurance amount increased by 50%, including \$16 million of the fire of Harim factory in Iksan, Chonbuk [The Korea Economic Daily, 2003.10.22].

Consequently, the economic loss of industrial accidents such as safety problem,

---

Corresponding Author- Tel.: +82-2-874-1581;

Fax: +82-2-872-1581

E-mail address: esyoon@pslab.snu.ac.kr

insurance and manufacturing is very large. Now the recognition is required that the decrease of rates and damages of accidents is directly related with productivity and elevation of enterprise impression.

The purpose of this safety auditing in Yeosu Petrochemical/Chemical Combinat is as follows;

- a) Analyzing statistical data about serious accidents for past 10 or 20 years and finding the pattern of those
- b) Building up legal or self system for the chemical accident prevention and the safety management.
- c) Strengthening public relations between industrial companies and local community for the safety.
- d) Increasing the investment status and resources (manpower) for the safety.

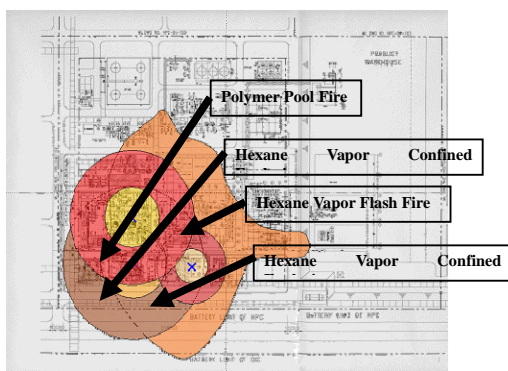


Fig 1. An explosion accident simulation of Honam Petrochemical Corp.

## 2. The Contents and scope of Safety Auditing

### 2.1 The Contents

The 16 companies in Yeosu Petrochemical/Chemical Combinat take part in this safety auditing. The safety management system and the safety facility system of each company will be inspected. For this work, the check for fields of each factory, data examination and analyzing will

be performed and the results of this auditing will be examined of credibility and objectivity by conferences at all time. Safety check lists are based on all sorts of guideline for safety of international organizations.

This safety auditing in Yeosu Petrochemical/Chemical Combinat supervised by Institute of Chemical Process in Seoul National University and many related organizations and universities participate in this auditing.

### 2.2 The Scope

This auditing is for conformation and examination of safety management system, safe operation of facilities, efficiency of resources and system, etc. against combinat's safety.

The scope of this safety auditing is as follows;

- ⊙ The Safety Management System
  - The Safety Management Organization (management & safety management organization consist, include safety audit)
  - The information management organization (establishment, equipment, safety, include technique data management)
  - The repair & amendment management (include cooperation establishments)
    - The education & training
    - The assessment of hazards & safety auditing system
    - The accident consequence analysis
    - The emergency planning
- ⊙ The Safety Facility System
  - The high-pressure facility
  - The management of harmful & poisonous material
  - The process & system management
  - The fire equipments

- The electric installation and utility management
- The mechanical installation & pipe arrangement
- The automatic & safety facilities
- The storage tank

For this, we made each 16 check lists and each that includes 50 contents of inquiry for investigating safety management system.

Consequently, we are purposed to help considering counterplans and build up the safety management system of each plants so that they can improve public relations between industrial companies and local community and ensure the safety of petrochemical/chemical combinat. To do this, the company will be graded as Table 2.

Table 1. The example of Check list table

The removal of static electricity of facility caused frame - The facilities caused frame is located at equipment which can remove static electricity
An electric shock prevention of static electricity - First of all, you grasp the static electricity generation area, you must do efficient action for the removal of static electricity
Safety equipment inspection - All safety equipment is inspected regularly for a boiler
Sprinkler facility - Auto sprinklers is equipped in facilities that treated fuel which can cause a fire.
Safety equipment inspection - The safety equipment connected facilities must regularly inspect

Table 2. The Grade of Safety Auditing

-Excellent (A) Class: The integrated safety management & operating system of factory is excellent
-Good (B) Class: Need to recommend detailed inspection about

target processes equipment and strength the integrated safety management & operating system.
--

-Fair(C) Class: Because of insufficiency of safety management & operating system, need to recommend detailed inspection about whole processes and to set up the integrated safety management from beginning.
--

### 3. Organization of safety auditing team

This safety auditing in Yeosu Petrochemical/Chemical Combinat supervised by Institute of Chemical Process in Seoul National University which is going to carry out safety inspection which divides safety management system and safety equipment system generally as centrifugal part of safety inspection team.

It is consulted by overseas human agency and ex-engineers who have technical career over 20 years to compare with advanced country's safety standard and set up the Korea Petrochemical Industry Association as a standing advisory organization for technical problem.

### 4. Detailed schedule of safety auditing

Safety inspection is preferentially examined safety inspection details and decided through discussion of organized inspection team.

The team is reorganized two groups, groups visit plants and carry out each field research for about 10 weeks and they will submit the reports in this April.

Safety auditing team attains final auditing reports through discussion and devise measures which reinforcement the safety management system for Yeosu Petrochemical/Chemical Combinat.

## 5. The result

We will draw out each auditing result as radar chart form about the systems of safety management system and safety facility system. Based on the results, we suggest improvements in order to compensate indicated deficient parts. By precisely and objectively evaluating safety standards, it is possible for us to compare our safety standards with that of foremost corporations of developed countries. Through this auditing, not only can we recommend the problems for each plant, but the results promote to strength safety management and operating system in combinat.

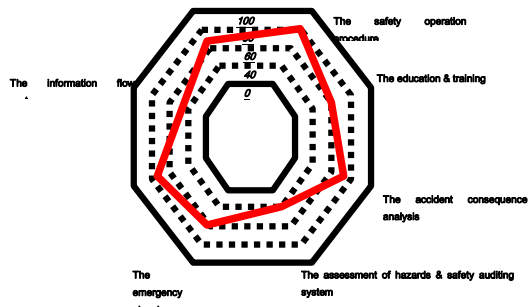


Fig. 2 The example of radar chart

## References

1. Factory Mutual(FM)
2. Occupational Health and Safety Management System(OHSAS) 18001 & BS8800
3. Occupational Safety and Health Administration(OSHA)
4. International Organization for Standardization(ISO) 9000, 14001
5. International Labour Organization(ILO)
6. International Safety Rating System(ISRS)
7. Organization for Economic Co-operation and Development(OECD)
8. American Gas Association(AGA)
9. The high pressure gas administration law
10. The energy use rationalization law

11. The electric safety management law
12. The industrial safety and health law
13. The fire protection law