CHAPTER II

LITERATURE REVIEW

The definition of oil refinery has been described in Occupational Safety & Health Administration. Technical manual section IV: chapter 2 on petroleum refinery process explains that:

2.1 Basic Refinery Process: Description and history.

Petroleum refining has evolved continuously in response to changing consumer demand for better and different products. The original requirement was to produce kerosene as a cheaper and better source of light than whale oil. The development of the internal combustion engine led to the production of gasoline and diesel fuels. The evolution of the airplane created a need first for high-octane aviation gasoline and then for jet fuel, a sophisticated form of the original product, kerosene. Present-day refineries produce a variety of products including many required as feedstock for the petrochemical industry.

- **Distillation Processes**. The first refinery, opened in 1861, produced kerosene by simple atmospheric distillation. Its by-products included tar and naphtha. It was soon discovered that distilling petroleum under vacuum could produce high-quality lubricating oils. However, for the next 30 years kerosene was the product consumers wanted. Two significant events changed this situation:

    1. Invention of the electric light decreased the demand for kerosene

    2. Invention of the internal combustion engine created a demand for diesel fuel and gasoline (naphtha).

- **Thermal Cracking Processes**. With the advent of mass production and World War I, the number of gasoline-powered vehicles increased dramatically and the demand for gasoline grew accordingly. However, distillation processes produced only a certain amount of gasoline from crude oil. In 1913, the thermal cracking process was developed, which subjected heavy fuels to both pressure and intense heat, physically breaking the large molecules into smaller ones to produce additional gasoline and distillate fuels. Visbreaking, another form of thermal cracking, was developed in the late 1930's to produce more desirable and valuable products.

- **Catalytic Processes**. Higher-compression gasoline engines required higher-octane gasoline with better antiknock characteristics. The introduction of catalytic cracking and polymerization processes in the mid- to late 1930's met the demand by providing improved gasoline yields and higher octane numbers.

Alkylation's, another catalytic process developed in the early 1940's, produced more high-octane aviation gasoline and petrochemical feedstock for explosives and synthetic rubber. Subsequently, catalytic isomerization was developed to convert hydrocarbons to produce increased quantities of alkylation's feedstock. Improved catalysts and process methods such as hydro cracking and reforming were developed throughout the 1960's to increase gasoline yields and improve antiknock characteristics. These catalytic processes also produced hydrocarbon molecules with a double bond (alkenes) and formed the basis of the modern petrochemical industry.

- **Treatment Processes**. Throughout the history of refining, various treatment methods have been used to remove no hydrocarbons, impurities, and other constituents that adversely affect the properties of finished products or reduce the efficiency of the conversion processes. Treating can involve chemical reaction and/or physical separation. Typical examples of treating are chemical sweetening, acid treating, clay contacting, caustic washing, hydro treating, drying, solvent extraction, and solvent dew axing. Sweetening compounds and acids desulfurize crude oil before processing and treat products during and after processing.

2.2 Effective shift handover

There have been a number of researches concerning the improvement and effectiveness of shift handover in Oil Refineries. The examples of the researchers are; Shirley Fletcher (1997), Competence-based Assignment Techniques; Laing M. Patricia, Piepho D. Carlton, Waszak Frank (1993), National Safety Council: Supervisors' safety Manual; Shell International Petroleum Maatschappij Manufacturing Oil and Gas, Safety Newsletters; Ronny Lardner, Chartered Occupational Psychologist, Effective Shift handover, Health and Safety Executive.

The Accident report from Piper Alpha (1988) has been shown that what caused the accident by the shift handover and also the insufficient communication in shift handover. The study used of Human Factor number 10 from Institute of petroleum (IP)

Suggestion on the problem in the refinery is about communication. Furthermore its guide regarding what the Management role should act on this problem. The studies of Fundamentals of Process of safety, which give the idea of what the operators should do and should not do in the process area, (Marshall Vic and Ruhemann Steve)

Techniques for handling in improving shift handover are described in Andrea Shaw (2003). Analysis on Fatigue management and the implement plan on fatigue that causes in shift handover. Guideline on communication to team leaders, who communicate it to the team what they should do, describing the fundamental of leader communication to deal with their subordinate, also on Part IV in Human Resources and Personal Management gives the detail on compensation and protection.

Competence assessment for the hazardous industries by Michael Wright, David Turner and Caroline Horbury have develop and review of past major incidents indicates that the lack of certain skills or knowledge has led to errors that contributed to the incident.

In each case, it had been assumed that an individual with a certain level of experience or training would be competent and/ or that the dissemination of a procedure would be sufficient. In addition, the concern about competence is further increased by the move towards multi-skilling, delayering and downsizing. Staffs are increasingly expected to take on a wider range of responsibilities with less supervision. This increases the need to check competence.

2.3 Occupational Safety & Health Administration regulations

Regard to Occupational Safety & Health Administration regulation (OSHA): 1910.132

On Personal Protective Equipment state that, application Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

Employee-owned equipment, where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required this section, the employer shall retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

- Changes in the workplace render previous training obsolete; or
- Changes in the types of PPE to be used render previous training obsolete; or
- Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.
- The employer shall verify that each affected employee has received and understood the required training through a written certification that contains the name of each employee trained, the date(s) of training, and that identifies the subject of the certification.

Moreover, the standard to control the energy or physically from the equipments which have the standard of OSHA number 1910.147 states that:

The servicing and maintenance of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy. It could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

This standard would not cover the following:

- Construction
- Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering.
- Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S of this part
- When other standards in this part require the use of lockout or tag out, they shall be used and supplemented by the procedural and training requirements of this section.

2.3.1 Definitions applicable to explain in the detail:

- **Energy isolating device.** A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit could be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.
- **Energy source.** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
- **Lockout.** The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.
- **Lockout device.** A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. The included are blank flanges and bolted slip blinds are included.
- **Servicing and/or maintenance.** Workplace activities are such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities embrace lubrication, cleaning or jamming of machines or equipment and making adjustments or tool changes,

where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

- **Tag out.** The placement of a tag out device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tag out device is removed.

- **Standardized.** Lockout and tag out devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tag out devices, print and format shall be standardized.

- **Lockout devices.** Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

- **Tag out devices.** Tag out devices, including their means of attachment, shall be substantial enough to avert inadvertent or accidental removal. Tag out device attachment means shall be a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

2.4 Training and communication

The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall contain the followings:

- Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy availability in the workplace, and the methods and means necessary for energy isolation and control.

- Each affected employee shall be instructed for the purpose and use of the energy control procedure.

- All other employees whose work operations are or might be in an area where energy control procedures may be utilized, shall be instructed about the procedure and the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

- When tag out systems are used, employees shall also be trained in the following limitations of tags

- Tags are essential warning devices affixed to energy isolating devices, and must not provide the physical restraint on those devices that is provided by a lock.

- When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person who is responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

- Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

- Tags and their means of attachment must be made of materials that will withstand the environmental conditions encountered in the workplace.

- Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

- Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

2.5 Notification of employees:

Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tag out devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

2.6 Machine or equipment isolation:

All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy sources.

2.7 Survey Research Methods

Regarding to Adams, G.R. Schvaneveldt, J.D. (1991), Mention on the characteristic of survey can be gathered form a sample or specific population, normally by researching methods as a form of questionnaire and interview at specific point at the same time. Not like experiment research design, the researchers do not have a control over independent variables.

Method

There are two methods of survey strategy that have been put into practice;

i. Interview, which can carried out by the researcher

ii. Self-completion questionnaire it can be carried out by mail or hand distributed

Regarding from literature review from Chanajit W, (2004) state that the face to face interview survey method could be times consuming, but the fact is that the interviewer would be able to gather the right answers in the correct manners when received the answer right back. The interviewer would also be able to verify the question to the participant if they are in doubt.

Another point of view from, Denscombe, M (2000) mentioned the classic social surveys and observations are some of the available option to be selected. The objective of the researcher is to look overview at the existing sources that related to the topic of research.

Therefore in this case, the researcher would have made decision not only interview but also observation in the present situation as well.

There are points to be considered such as advantages and disadvantages of the survey approaches.

Advantages

1. Limitation of data: Content of the data must focus on the fact, not just following the theory.
2. It could be coverage: Ease of the access
3. Produce the quantitative data: It can be carried out by the statistic data to be evaluated.
4. Gather lot of data at the same time at low cost: It can be carried out easily by given the data to fill in to those participants and quickly received back.

Disadvantages

1. Detail of the data: normally it would bring out a large scale of data and could not receive much details or the depth of the data.

2. The accuracy of the data: It would not tell that the participant could give the right answer or not depending on how they feel toward to the questions.

Therefore, the questionnaire must be designed to ensure that all the disadvantages point mentioned above shall not bring problem on validity.

Reliability

Regarding to Litwin, M (1995) mention on the reliability if the survey instrumentation, shall be able to assessed in the following term of;

1. **Test-retest**: by doing the measure of the stability of the response over the time required, in the same population.
2. **Consistence**: by doing the measure of how effective from several items in a scale vary together in sample.
3. **Alternative form**: by using difference of wording that associates to the existing or same meaning of the question to get to the specific point.

Validity

In the term of validity would be complied with the regarding of Litwin, M (1995) and Black T.R. (1999) mentions that the research shall be valid since the measurement was intend to be measured. To ensure that the validity is valid using method to find out the data and able to see the results carry out the measurement.

Ethical Issues

In the term of ethical issue shall be in term of some question in the questionnaire which gives the data of given the confidential data such as confidential data from company that would complied with company's policy. Therefore the answer would be obvious. Also participant shall not happy to cooperate the questionnaire due to their personal reason such as being busy or their emotion toward the researcher approaches.