CHAPTER-10
ENVIRONMENT and SAFETY

10-1 Introduction

The topic is the health and safety in the drilling and the engineering sciences. It is designed to give idea about practical measures taken to protect health and prevent accidents in the drilling industry. Its major is to provide better understanding of the complexities in the field of labor protection, present day social and industrial life.

The drilling accident is an undesired event that result in a certain length of disability of stoppage of the work time loss due to the effect of a productions-related dangerous factor or a combination of such factors. Accidents may cause death, injury and loss of material. In addition to that, the injury is an external damage to the human body resulted from an accident.

Labor protection, that is prevention of disabilities and reduction in the frequency of accident, has always been in a matter of major concern of drilling industry and the workers.

Management and the government should take in the lead in promoting and maintaining high safety standards through practical measures intended to reduce frequency of industrial and the drilling accidents. This can be achieved by:

-Reducing hand labor and heavy job

-Providing working clothes, protective shoes and other personnel protective equipment

-Carrying and the comprehensive programs to improve working condition, safety and drilling hygiene

-Using the achievements of the science and technology for the working condition and the protection of labor and environment

-Extending research programs in the field of safety and hygiene

The industrial changes have greatly improved the working conditions in the drilling industry and thus make them safer. Furthermore, huge capital investment on labor protection

and promotion of safety and hygiene has reduced the frequency of accidents and the occupational disease in the drilling sections of the developed countries.

10.2 Ergonomics Approach to Health and Safety

Ergonomics is defined as the scientific study o f the relationship between man, machine and environment. It covers ambient environment but also tools, materials, methods of work, organization of the work. All these are related to nature of the man himself; to his abilities, capabilities and limitations.

10.2.1 General Purpose of the Ergonomics:

-Doing the task more efficiently

-Having safety and healthy working environment,

-Providing suitable work to workers according to their physical capabilities, strength and characteristics,

-Designing tools, equipment, machine or systems in a ways that they could be used easily and comfortably by the workers,

-Creating suitable psycho-social environment

The expected results by the application of ergonomics will be:

-Achieving high level of drilling safety and health,

-Minimizing drilling accidents and professional illnesses,

-Minimizing workday losses,

-Minimizing work stress,

-Increasing efficiency.

Furthermore, there is other factors affect the drilling ergonomics. Effectiveness of a machine depends on its design, reliability and the ability of the operator. When one of these conditions is missing, the efficiency problem arises. It can be obviously seen the ability is greatly influenced by the design of the machine. For instance, the control system (electric cut

off, starter, remote control) used in the drilling operations should be easily reached so that the operator can maintain suitable and comfortable working conditions.

In the drilling ergonomics is also concerned with general working conditions such as vibration, radiation, and temperature, lightening during night drilling operations. Moreover, the importance of maintaining safety standards to ensure the health and safety of workers are realized. It is a known fact that healthy and safe working environment increases the overall efficiency and minimizes drilling accident, professional illnesses and workday losses.

Any type of the machine or equipment used in the drilling operation should be designed to make the operator's task easily reducing the physical and mental strain to let him free to devote his attention to his work.

10.3 Factors of the Accidents in Drilling Operations

In the accident investigations to find out the causes, ergonomics is applied to human, machine, environment combination. The effect of this combination on accidents in the drilling operations should be investigated in detail.

10.3.1 Human Factors

In the investigation of the human factor the followings should be considered:

-Physical and mental tiredness of the workers,

-Type of the work, heavy, homogenous, brings high responsibility,

-Physical fitness of the work, have enough energy to the work, be nourished well,

-The capability and the level of the education,

-Workers like their jobs,

-Existence of the individual problems or inconvenience,

-Any physical faults and health defects,

-Hearing sense and others are all right or not,

-Any problem with the character of the worker,

10.3.2. Machine Equipment Factor

The followings should be investigated in this section:

-Machine protectors are enough and reliable or not,

-All measuring equipment, pointers are all right or not,

-Any control system, working or not periodical maintenance is all right,

-Machines and equipment are overloaded or not.

10.3.3 Environmental Factors

-Vapor, dust exist or not

-Any poisonous material exist or not

-Noise, vibration, radiation exist or not and any ionization,

-Heat, high temperature and the moisture exist or not.

10.4 Environmental Protection

All industrial process and plants generate contaminants that range from common municipal trash to hazardous waste. The treatment and disposal of these wastes result in the release of some of these contaminates into environment in gas, liquid, or solid form. Gas releases usually result from stack gas or fugitive process emission. These may include combustion product like water and carbon dioxide, products of incomplete carbon monoxide and complex organic, and vaporized hydrocarbons. Liquid release may come from wastewater, wastewater treatment discharges, or from non-point sources, like runoff. Solid releases might include bulk trash, drummed wastes, suspended solids in wastewater, and airborne dust and particulate. The solid releases are either hauled away or released in combination with gases or liquids.

10.4.1 Air Pollution

Point sources of air emissions are emitted from well-defined locations, such as exhaust stacks and vents. Fugitive emissions may come from surface impoundment, storage tanks,

process lumps and roadways. Often these air pollution releases involve both gases and solid phases of contaminants.

The petroleum industry produces enormous quantities of crude oil and natural gas, which are vital to the economy. During the exploration and production of these hydrocarbons, volatile organic compounds are emitted, including benzene, toluene, xylenes and butadiene.

Much of the oil and gas is stored in various types of storage tanks prior to and after further processing into products for the marketplace. Emissions from these volatile organic compounds and petroleum-product sources are significant contribution to air quality. Gasoline is the largest petroleum product that must be transferred from petroleum refineries to the consumer. During the transfer and storage of gasoline, volatile organic compounds escape into the atmosphere. Gasoline is a complex mixture of hydrocarbons. It includes paraffins, naphthenes, olefins, and aromatics, among them benzene, xylenes, toluene, hexane, ethyl benzene, cumune, methyltertiary-butyl ether, and naphthalene. When these volatile compounds are emitted to the air, they contribute to air pollution.

10.4.2 Water Pollution

Like that all the other sciences, the drilling engineering destroys some parts of the nature such as air pollution, water pollution, and also land pollution. First of all, the reasons of them are explained and then the precautions are performed to prevent these kinds of problems.

From the beginning of the time pollutants have been degrading water quality. For many centuries these pollutants were not great enough to adversely affect the use of the surface water. As population and the industrial growth increased, these same pollutants reach a level to make some waters no longer suitable for waste disposal.

Water pollutants include dissolved oxygen, nitrogen, phosphorus, solid particles, and heavy metals and thermal energy.

10.4.3.Land Pollution

Releases of contaminates to the soil may occur from many sources. Transportation of the material and the hazardous are fairly common occurrences that pollute the land. All these items take place during preparation of the drilling operations. The transportation and storage of the hazardous materials and wastes is a major source of potential pollutants to the land, as well as to the air and the water during the drilling operations. In addition to this, the remaining inorganic, organic contaminants, toxic materials may be harmful to human health and the environment when they are discharged to the land.

10.4 Pollution Prevention

Ideally, pollution should be prevented at the source throughout:

-Product reformulation, -

Product substitution,

-Process modification,

-Equipment redesign

-Improved housekeeping,

-Segregation of incompatible toxic wastes

Wastes can be also recycled and reclaimed either at the source or off side at another facility. Industrial pollution prevention efforts should concentrate on those solutions that are obvious, simple, and low cost such as housekeeping improvements and direct recycling of process materials. Equipment redesign and process modifications are generally more complex and expensive and are generally implemented later in the pollution prevention program. The reformulation or substitution of products to prevent pollution must overcome many marketing and operational obstacles before becoming successful. Process and plant designers need to work closely with research and development, operations, and marketing personnel in order to achieve an optimal process and plant that addresses these environmental options.

10.5 Causes of Accident

An accident is any unplanned event that results in personnel injury and/or in property damage. The personnel injury may be considered minor when it requires no treatment or only first aid. The personnel injury is considered serious if it results in a fatality or permanent.

10.5.1 Energy Sources

-Mechanical: machinery tools, compressed gases and explosions

-Electrical: uninstalled conductors and high voltage sources

-Chemical: acids, fuels, bases, reactive materials

-Thermal: flammable and nonflammable

-Radiation: noise, x-rays, lasers, microwave and radioactive materials.

10.5.2 Hazardous Material

-Compressed or liquefied gas: flames and hot surfaces

-Corrosive materials, oxidizing material

-Flammable material: solid, liquid, gas

-Poison radioactive material, dust.

10.5.3 Indirect Causes of the Accidents

-Failing to use personnel protective equipment,

-Failing to warn co-workers,

-Engaging in horseplay, lifting improperly

-Loading or placing equipment or supplies improperly

-Making safety decides inoperable

-Operating machine without authority or not used to them desired conditions,

-Serving equipment in motion or taking an improper working position,

-Using drugs and alcoholic drinks,

-Using defective equipment or using equipment improperly.

10.5.4 Unsafe Conditions

-Defective tools, equipment and supplies,

-Fire and explosion hazard,

-Excessive noise and radiation exposure

-Hazardous atmospheric conditions: gases, fumes

-Inadequate warning systems, poor illumination.