Oil Seed and Pulse processing Level II

Based on September 2019, Version 2 Occupational standards

Module Title: Operate Crude oil Storage Process
LG Code: IND OSP2 M15 LO (1- 3) LG (47-49)
TTLM Code: IND OSP2 TTLM 1020V1

October, 2020

United Nations
Educational, Scientific and
Cultural Organization

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LG #47	LO #1 Prepare the crude oil storage

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Preparing Crude Oil Storage equipment and work area
- Confirming Services for operation
- Setting-up storage process

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Prepare Crude Oil Storage equipment and work area
- Confirm Services for operation
- Set-up storage process

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet-1 Preparing Crude Oil Storage equipment and work area

1.1 Introduction

Crude oil which are untreated and unrefined are stored in tanks for shipment to other locations or processing into finished products. A crude oil storage tank is a container for storing crude oil usually can be found in refineries, oil fields, oil deposits, and other industries Crude oil storage tanks are large capacity specially designed vessel reservoirs, which can be constructed with various types of materials, for storing crude oil. Storage tank assembly includes its integral piping and its entire components, including dispensing systems, spill containment devices.

1.2 Crude oil storage equipment

Crude oil storage tank can be prepared from different materials. Steel and remain most popular choices tanks, glass-reinforced plastic, thermoplastic and polyethylene tanks are increasing in popularity. They offer lower build costs and greater chemical resistance, especially for storage of specialty chemicals. Some of the Components of crude oil storage tanks are:

- bulk storage
- flow meter
- filters
- pumps
- tankers

1.3 crude oil storage tanks

There are a few different types of crude oil storage tanks. Stainless steel is the most preferred metal for the construction of tanks. It is particularly recommended for the storage and transport of fully refined oils and fats. Tanks of mild steel should preferably be coated with an inert material on the inside. Generally storage tanks can be classified as pressurized storage tanks and atmospheric storage tanks. Pressurized storage tanks are usually used for storing liquids that evaporate. For this reason atmospheric storage tanks are the ones that are best suited for storing crude oil.

Atmospheric tanks are operated at or near the pressure found in the atmosphere. Atmospheric storage tanks can be further broken down into open top storage tanks, fixed roof tanks and floating roof storage tanks. Open top tanks are better suited for storing water. The remaining two are widely used to store crude oil, among other oil products. Fixed roof storage tanks are used when the quantities of crude oil are not that much. When the crude oil levels are low, then the position of the roof will be low as well. When there is more crude oil being stored in the tank, then the level of the roof rises to match the level of the oil.

Figure 1. storage tank of crude oil

The down side of floating roof storage tanks is that they are prone to be affected by the elements. Heavy snow can accumulate on the roof of the tank and cause the roof to be pushed down into the crude oil below. Rain water also has the same effect tank capacity.

Figure.2 storage tank of crude oil in industry

In general, crude oil storage tank has two kinds, fixed roof tank and floating roof tank. Fixed roof tank is usually used when the quantity of crude oil is not too much. While, floating roof tank is the optimum selection for storing larger quantities of crude oil.

Self-Check 1.	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s (5point each)

1. What does crude oil storage tank mean?
2. Write the components of crude oil storage tanks?

Note: **Satisfactory rating - 5 points** **Unsatisfactory – below 5 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-2 Confirming Services for operation

2.1 Introduction

An external floating roof tank is a storage tank commonly used to store large quantities of oil products such as crude oil or condensate. It consists of open- topped cylindrical steel equipped with a roof that floats on the surface of the stored liquid. The roof rises and falls with the liquid level in the tank. As opposed to a fixed roof tank there is no vapor space (ullage) in the floating roof tank (except for very low liquid level situations). In principle, this eliminates tank breathing loss and greatly reduces the evaporative loss of the stored liquid. There is a rim seal system between the tank shell and roof to reduce rim evaporation. The roof has support legs hanging down into the liquid. At low liquid levels the roof eventually lands and a vapor space forms between the liquid surface and the roof, similar to a fixed roof tank. The support legs are usually retractable to increase the working volume of the tank.

Different services are under taken at crude oil storage process. Some of them are:

- power
- air/ventilation
- nitrogen
- Water
- Compressor
- Instrumentation material

✓ **Electric power**

Electric power is the most important in any processing industry. Without electric power it is impossible to operate or produce any product using machine. It provides energy to operating equipment and machines which helps to process the feed raw materials in to new products. If power shortage happens during processing, it may cause many damages to raw materials, product and machine.

- ✓ **Steam**

Steam is water in the gas phase. It is commonly formed by boiling or evaporating water. Steam that is saturated or superheated is invisible; however, "steam" often refers to wet steam, the visible mist or aerosol of water droplets formed as water vapour condenses.

It is useful in:

- Cleaning ,heat, and cook process of oil seeds
- Cleaning of oil processing equipment
- Internal combustion engines and part
- Cleaning floors

- ✓ **compressed and instrumentation air**

Compressed air is air kept under a pressure that is greater than atmospheric pressure. Compressed air is an important medium for transfer of energy in industrial processes, and is used for power tools such as air hammers, mill and presser and to transfer pipes.

2.2 Operational Activities

Production scheduling defines what products should be produced and what products should be consumed at each point in time over a short period; hence, it defines which run-mode to use and when to perform change overs to meet the market needs and to satisfy the demand. For instance: the scheduling of the loading and unloading of crude oil in intermediate storage tanks. During crude oil storage, a product sample is typically analyzed to ensure quality control. Various additives may be employed to increase product performance and other characteristics.

The crude oil produced by a mill is the 'end product' in some operations. However, in most new investments, a refining process may also be considered. Its object is to produce an oil that is bland, light-coloured, and without odour or flavour. World trade occurs extensively in both crude and refined oils. The value added potential of new refinery investments may be adversely affected by surplus capacity in established refineries. It is important to reduce to a minimum any losses of oil during the refining process. Each process involving the removal of impurities inevitably causes a loss of oil. The other major source of oil loss is poor storage and handling during milling which increases the free fatty acid composition of the crude oil. Vegetable oil loses some of its natural anti-oxidants during refining, and care is needed especially during storage, packing and when processing in batches to prevent oxidation.

Refining Systems Crude oil contains free fatty acids (FFA) and may also be contaminated with water, resins, gums, or other decomposition products. The crude oil in this state is cloudy, dark-colored, strong-flavored, and deteriorates rapidly. The refining process consists of four basic steps, degumming, neutralization, bleaching, and deodourizing. In addition to purification processes to remove the contaminants, color and odor, refining includes other optional processes such as hydrogenation and winterization, which enhance the appeal of the refined oil for particular markets.

In general, refining processes can be either batch or continuous. Investment costs are lower for batch systems, but they tend to have high labor and operating costs. Continuous systems, although more efficient and less labour intensive, require a higher level of skills for their operation.

Self-Check 2	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s

1. Write different services under taken at crude oil storage tank.(5point)
2. What is the safety precautions needed during confirming different services of crude oil storage operations? (5point)

Note: **Satisfactory rating - 5 points** **Unsatisfactory – below 5 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-3 Setting-up storage process

3.1 Introduction

There are a number of different types of vertical and horizontal storage tanks which contain crude oil. Their size, shape, design, configuration, and operation depend on the amount and type of products stored and company or regulatory requirements. Vertical tanks may be provided with double bottoms to prevent leakage onto the ground and cathodic protection to minimize corrosion. Horizontal tanks may be constructed with double walls or placed in vaults to contain any leakage.

3.2 Safety Precaution

- While assembling the various units the power source must be shut out completely.
- The Aluminum components must be handled with minimal pressure being exerted on them as any form of deformation will create misalignment during assemblage.
- The float should not be allowed to puncture or crack while fixing.
- There should be no restriction, no matter how minimal, in the up and down movement.

3.3 Things to be considered during setting up of crude oil storage

The following are some of the parameters have to be taken into account when setting up storage process of crude oil:

a. General layout of the storage facility: is there an adequate buffer zone (safety distance) between the storage area and vulnerable populations and public facilities;

b. Identifying Secondary and tertiary Containment considerations,

c. **Emergency access and response support:** Access for Emergency Response teams (Fire Brigade, Police, and Ambulance Services);

d. Power supplies: The need for emergency equipment such as lighting, fire pumps, sprinkler system to operate when the main power source is impaired;

f. Safe Refuges: Are there safe refuges considered in case of fire and toxic releases;

g. **Occupied Buildings** (e.g. Control Rooms, meeting rooms and offices);

h. The consideration of location of occupied buildings: to minimize risk for the occupants in an emergency situation such as fire or explosion

3.4 Maintaining of crude oil storage tanks

Regular maintenance checks should be made, preferably as part of a properly planned maintenance programme. They should include

- Functioning of steam pressure regulation valves;
- All steam supply valves and steam traps for leakage;
- Thermometers, thermostats,
- Recording thermometers,
- Weighing equipment and
- Any gauge meters for function and accuracy;
- All pumps regulated by thermostat for leakage;
- Integrity of tank coatings;
- Hoses (internal and external) and
- Condition of tanks and ancillary equipment.

The construction of storage tanks for crude oil is a process that requires great care.

- There is no room for leaks in these tanks
- They must be rigorously tested before they are put to use
- All pipes, their fittings, control points should be installed appropriately

The specifications for these tanks differ from client to client. Many companies that manufacture crude oil storage tanks use carbon steel, which is a type of steel that contains percentages of carbon. Stainless steel is also used, which is a type of steel

that contains chromium, which is rust resistant. Carbon steel is cheaper than stainless steel, and so some companies may prefer it as the material that their tanks are made of. Much like every other aspect, crude oil storage tank dimensions really depend on the needs of the client.

In a world where everyone is concerned with keeping the environment clean for future generations to enjoy, it has never been more important to make sure that crude oil spills are minimized as much as possible. As a result, it is imperative that the tanks that store massive amounts of crude oil be made out of the best materials. The tanks need to be the right size for the amount of crude oil that they will hold. Crude oil must be handled safely and securely so that it proceeds to refinement, and we get the various oil products that we get out of it while keeping our working area safe.

All materials used in the construction of tanks and for ancillary equipment (including heating facilities) should be inert to oils and fats, and should be suitable for use in contact with food. Stainless steel is the most preferred metal for the construction of tanks. It is particularly recommended for the storage and transport of fully refined oils and fats. Tanks of mild steel should preferably be coated with an inert material on the inside, for example phenolic epoxy resins. Their suitability for contact with foodstuffs, particularly oils and fats, should be obtained from coating manufacturers. Zinc silicate coatings for mild steel tanks are also suitable, but it should be noted that deterioration of the oil can take place if used with crude oils and fats with high acid values.

Prior to application of the coating, the metal surface must be sand-blasted to bright metal or equivalent. It should be noted that there are temperature limitations on many coatings which must be carefully observed particularly during the cleaning of the tank (for example, the temperature limitation may preclude the use of live steam in the cleaning operation).

Self-Check 3.	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s (each has 4point)

1. Write the maintaining activities under taken during setting up of crude oil storage process.
2. Write the safety pre requisite while setting up of crude oil storage

Note: **Satisfactory rating – 4 points** **Unsatisfactory – below 4 points**

You can ask your teacher for the copy of the correct answers.

LG #48	LO #2 Operate and monitor the crude oil storage

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Starting up storage process
- Monitoring Control points
- specifying crude oil storage tanker
- Cleaning the storage facility and handling equipment
- Segregating crude oil
- Moving Crude Oil into and out of storage facility
- OHS Occupational Health and Safety
- Monitoring equipment Operation
- Identifying and reporting Out of specification process and equipment
- Identifying and reporting the performance of process and equipment

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Startup storage process
- Monitor Control points
- specify crude oil storage tanker
- Clean the storage facility and handling equipment
- Segregate crude oil
- Move Crude Oil into and out of storage facility
- OHS Occupational Health and Safety
- Monitor equipment Operation
- Identify and report Out of specification process and equipment

• Identify and report the performance of process and equipment
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 6. Do the “LAP test”

Information Sheet-1 Starting up storage process

1.1 Introduction

Storage tanks are located at the ends of feeder lines and gathering lines, along truck pipelines, at factory loading and unloading facilities and in refineries, terminals and bulk plants. Terminals are storage facilities which generally receive crude oil products by tank pipeline. Terminals store and redistribute crude oil to refineries, other terminals, bulk plants, service stations and consumers by pipelines.

Crude oil storage tanks are the main container to store crude oil all over the world. For some crude oil storage tanks with high wax content, the seal gland should be designed with a variety of foundations including rainproof, wax scraping, secondary seal, etc. The bottom of crude oil tank is always deposited with a certain thickness of impurity, when storing heavy, high sulfur content and acid value oil, anti-corrosion requirements higher. For large oil storage tank with huge reserves and severe corrosion, the importance of design and set anti-corrosion system is self-evident.

1.2 Prerequisite things during storing process

The basic things needed to the storage tank

- Fire protection
- Ventilation
- Emissions
- Accessories

Storage Tank Operations and Routine Maintenance

- Tank lot, roof drainage, and tank gauging
- Crude oil transportation and storage
- Crude oil tank handling
- Shipment, receipt, and transfer
- Water draw

Storage Tank Inspection and Maintenance

- Pipe and pipe fitting procedures
- Tank instrumentation maintenance
- Safety systems

Self-Check 1	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s

1. What are the prerequisite things needed for crude oil storage tank.(5points)
2. What are the things to be inspected and maintained at storage tank of crude oil?(5point)

Note: **Satisfactory rating – 5 points** **Unsatisfactory – below 5 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-2 Monitoring Control points

2.1 Introduction

In oil seed and pulse processing industry different factors may be found which are controlled by control points. Some factors which need monitoring system at control points are like temperature by thermometer, Humidity, Moisture content of crude oil, Material of construction.

2.2 Control points

Some of control points of different factors in oil industry may include:

- Steam pressure
- regulation valves;
- Thermometers,
- Thermostats,
- Recording thermometers,
- Weighing equipment and
- Gauge meters

2.3 Description of crude oil Quality Parameters

In oil industry different parameters are monitored at control points to get appropriate quality and quantity of edible oil from crude oil storage. Some of the common used edible oil industry quality parameters are:

- free fatty acids,
- color,
- Acid Value,
- Peroxide Value,
- Polar Compounds,
- Phospholipids and etc.

A. Free Fatty Acid Content

Free fatty acids (FFA) are formed by the hydrolysis of oils (triacylglycerides). They are not bound or esterified to a glycerol molecule. Crude oils and fats in natural form, not refined, contain small amounts of free fatty acids, which are usually removed during the refining process. Free fatty acids are not desirable in edible oils because when oils with high free fatty acids content are used in foods, they lower the oxidative stability of the product, increase acidity and lead to off-flavor formation. There are other analytical methods, which are faster and suitable for small sample sizes. Chemical analysis kits and various automated hand-held instruments also are available for analyzing FFA concentrations in oils.

Voluntary industry standard for free fatty acid content in refined edible oil is ≤0.05 percent (based on oil weight). In the food industry, frying oils with free fatty acid content exceeding 2 percent are either discarded or fresh oil is added to bring the free fatty acid content down**.**

B. Acid Value

Acid Value is an important indicator of oil quality. Acid value is expressed as the amount of potassium hydroxide (KOH, in milligrams) necessary to neutralize free fatty acids contained in one gram of oil.

C. Peroxide Value

Peroxide value is an index used to quantify the amount of hydroperoxides present in fats and oils. Hydro peroxides, which are shown to be toxic to humans, are the primary oil oxidation products formed during the initial stages of oxidation. Fourier transform infrared and near-infrared spectroscopy methods developed for peroxide value measurement have the advantages of analytical speed and automation; the instruments used for these tests are quite expensive and require extensive calibration. Evaluating oil quality based on only peroxide value can be misleading. Because low peroxide value does not necessarily indicate low level of oxidation, it could be due to the advanced level of oil oxidation during which primary oxidation products are converted to secondary oxidation product lowering peroxide value but increasing acid value of the oil.

Hence, both peroxide value and acid value should be used for oil quality evaluation. Refined oils usually have PV of <1 meq/kg. Oils are considered oxidized when PV > 3 meq/kg.

D. p-Anisidine Value

P-Anisidine value is a measure of the secondary oxidation products that are formed by breakdown of the primary oxidation products during extensive oxidation. The secondary oxidation products are mainly aldehydes such as 2, 4-dienals and 2-alkenals. P-Anisidine value is strongly correlated with overall oil odor intensity. Refined oils should have P-Anisidine value of <5.

E. Polar Compounds

Presence of polar compounds in crude oil is one of the best indicators of heated crude oil quality. Polar compounds consist of dimeric and higher polymeric triacylglycerides formed through thermal polymerization of triacylglycerides, monomeric oxidized products, mono- and triacylglycerides and free fatty acids formed through hydrolytic cleavage of triacylglycerides. The analysis of the polar compounds is conducted by high-performance size exclusion chromatography, which allows the separation and quantification of polymeric compounds, dimers, oxidized triacylglycerides, mono- and diacylglycerides and FFA. As the name implies, this method determines the total polar compounds in the crude oil, not the individual polar compounds. Regulations in some countries specify that oils should contain less than 25–27 percent TPC.

F. Phospholipids

Phospholipid is a common name for lipids containing phosphoric acid or other phosphorus-containing acids in ester form such as glycerophospholipids (e.g. acid, phosphatidylcholine, and phosphatidylethanolamine) or sphingophospholipids (e.g. sphingomyelin). Although these compounds (also called gum because of their gummy consistency in oil) have some health benefits and surfactant/emulsifier properties, they need to be separated from crude oil during the refining process, which is referred to as degumming. Otherwise, they impart a cloudy appearance and precipitate out of the oil

during storage creating an unpleasant solid residue at the bottom of the containers and adversely affect the functionality of refined oils, i.e. because foaming during frying. The phospholipid content of oils is commonly measured as phosphorous, which can be converted to phospholipids by using conversion factors calculated by using the phospholipid composition and the molecular weight of individual phospholipids present in the oil. Refined oils have about 30 mg/kg phosphorous, while super degummed oils contain less than 10 mg/kg phosphorous.

G. Color

The color of crude and refined vegetable oils is an important factor in the determination of their market value. Removal of color pigments, which are extracted along with the oil from the seeds during the extraction process, is achieved during the oil refining referred to as bleaching. The color compounds in the oil mainly consist of carotenoids, chlorophyll, gossypol and related compounds. Chlorophyll is a sensitizer of photo-oxidation and promotes oil oxidation in the presence of light and decreases the oxidative stability of oils. Chlorophyll also acts as a catalyst poison during oil hydrogenation process. The color of the edible oils also can be an issue for food formulations adversely affecting the color of the final product which incorporated. Lovibond is the most common method used to determine color of the commercial oils. In Lovibond method color is expressed as red and yellow components. In general, fully refined oil may be 0.8 R (red) and 8.0 Y (yellow). Frying oils often are discarded when their Lovibond red color increases from 1.5-3.5 to 20-30.

Self-Check 2.	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s

1. Write the parameters which are determine the quality of crude oil. (10point)

Note: **Satisfactory rating – 5 points** **Unsatisfactory – below 5 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-3 specifying crude oil storage tanker

3.1 Introduction

Crude oil storage tank are regulated and labeled under separate regulations from other storage tankers like from oil tank. Storage tanks containing hazardous waste are regulated under separate regulations which impose numerous and stringent engineering requirements. The most suitable shape is the vertical, circular cross-section tank with self-supporting fixed roof, preferably conical in shape. Where possible, tall, narrow tanks are preferred to minimize the surface areas of the contents and, therefore, to minimize contact of the oils or fats with air and the oxygen it contains. Tank bottoms should be conical or sloped (with a sump) to facilitate draining. All openings such as manholes, inlets, outlets, draining out points, etc., should be made such that they can be locked and/or effectively sealed. For each installation, the total storage capacity, size and number of tanks need to be related to the size and frequency of intakes, rates of turnover and the number of different products handled etc.

3.2 Distribution of Pipe, Valves, and Fittings.

- Piping, valves, fittings, and related components must be designed and fabricated from suitable materials that have adequate strength and durability to withstand operating pressure, structural stress, and exposure.
- Piping must be installed in accordance with acceptable practices to avoid damage during installation, testing or operation. Material must be compatible with the products stored, and must be installed according to the manufacturer's recommendation.
- Distribution piping must be provided with a secondary containment system independent of the storage tank. Secondary containment must be a double wall piping system installed per the manufacturer's recommendation. The secondary pipe system must have a monitoring system to detect leaks independent of tank monitoring.

- Provide spill prevention equipment that prevents release of the product if the transfer hose is detached from the fill pipe; provide containment manholes around fill pipes and large enough to contain a volume equal to delivery hose volume. Provide containment manhole with bypass valve to allow captured product to drain back to tank.
- Tank and piping systems shall be installed according to manufacturer's recommendations,
- Crude oil storage tanks are large capacity specially designed vessel reservoirs, which can be constructed with various types of materials, for storing crude oil.
- Storage tank assembly includes its integral piping and its entire components, including dispensing systems, spill containment devices, stage II vapor recovery devices, and overfill protection devices, secondary containment systems and any associated release detection equipment. Storage tanks are of different classifications, types, sizes and shapes. Components (fittings) incorporated, design criteria, material of construction, and protection and maintenance systems are based on their uses and type of fluid to be stored.

Self-Check 3.	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true or false

1. Storage tanks containing hazardous waste should be regulated under separate regulations. (3point)
2. Crude oil storage tank and piping systems should be installed according to manufacturer's recommendations. (3point)

Note: **Satisfactory rating – 3 points** **Unsatisfactory – below 3 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-4 Cleaning the storage facility and handling equipment

4.1 Introduction

During the long storage process of crude oil tank, mechanical impurities, sand, as well as other heavy oil component contained in the oil product, may be settle at the bottom or surface of tank. These components will accumulate in the bottom of crude oil tank, formed a thick and black gelatinous material layer, which is sediment of the storage tank. The sediment will increase with the continuous increasing time of crude oil storage. May influenced the storage and transportation of storage tank, so that it is important to clean the crude oil tank regularly, which is also required by production safety. Since most liquids can spill, evaporate, or seep through even the smallest opening, special consideration must be made for their safe and secure handling. This usually involves building a bunding, or containment dike, around the tank, so that any leakage may be safely contained. Some storage tanks need a floating roof and structure. This floating roof rises and falls with the liquid level inside the tank, thereby decreasing the vapor space above the liquid level. Floating roofs are considered a safety requirement as well as a pollution prevention measure for many industries including crude oil refining.

The most effective and common corrosion control techniques for steel in contact with soil are cathodic protection. Corrosion of oil storage tanks used to store crude oil and produced water in an operating oil field were identified as a potential safety issue when inspection results indicated significant wall loss due to internal corrosion. Soil-side corrosion of the bottom plates of crude oil storage tanks is a major corrosion challenge in the oil industry especially when these tanks are constructed on oiled-sand pads. Severe corrosion has been identified on tank. Methods of handling and storing crude vegetable oils are often overlooked in the production of good quality finished products at the lowest possible costs. While good methods are not difficult to understand and implement, they are extremely important.

4.2 Crude oil storage tank maintenance

A. Preventive measures

- Regular inspection and maintenance must be carried out of all components in the control system. Moreover, the filling ratio of the tank must be obeyed to avoid the overfilling incidents.
- Good policy regarding periodic maintenance for all equipment utilized in the storage farm.
- Pipe joints/flange should have copper bonding to maintain electrical continuity; flange guard is useful to divert the leakage of oil.
- Fixed roof tank must be provided with pressure relief valves and breather vents placed on the top of the tanks.
- Conventional lightning protection system for storage tanks involves installing the lightning masts around the tank and shield wires above the tank as well as ensuring the tank is well earthed or installed at appropriate place.

B. Mitigation measures:

The mitigation measures must be done to limit and minimize the magnitude of the incident. Safety supporting systems must ensure a continuous supply of basic requirements to the storage tank farm, these systems comprised of the following:

- Automatic detection systems such as fire detectors, alarm system, heat Sensing and flame Sensing.
- Foam supply and production system for the tank fire protection.
- Tank cooling system that mounted on every tank in order to prevent its exposure to an adjacent fire
- The using of personal protective equipment must be strictly worn by all workers in the storage farms.

- Development of a green belt around the installation area will help in preventing the spread of fire to other areas.

Self-Check 4.	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true or false

1. Automatic detection systems such as fire detectors, alarm system, heat Sensing and flame Sensing are important for safety of crude oil storage tanks. (3point)
2. Cleaning the crude oil tank regularly is important, which is required by production safety. (3point)

Note: **Satisfactory rating – 3 points** **Unsatisfactory – below 3 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-5 segregating crude oil

5.1 Introduction

Crude oil has to be cleaned, separated, and converted (refined) until the final products suitable for sale are made. These processes often involve complex distillation processes that require precision and reliability. The crude oil from the expeller is passed through screens and allowed to settle in tanks before it is filtered through a filter press. The seed residue from the settling tanks is known as 'fools'. Residues from the screens and the filter press, together with the 'fools', are re-processed in the expeller by mixing them with the fresh oilseed feedstock or oil-cake. Oil-cake is frequently passed through the expeller again to remove more oil.

Crude oil is refined in different steps. For instance: neutralization, bleaching and deodorizing, which remove fatty acids, colour, and off-flavours respectively. Each of these processes involves heating the oil to a certain extent. The refining processes may be carried out in stages using batch plant or by using equipment providing continuous operation. The fatty acids are neutralized by mixing the oil with a solution of caustic soda. The caustic soda solution reacts with the fatty acids to produce soap which can be washed from the oil with water.

Deodorization is carried out by passing high pressure steam through the oil under vacuum to remove the taints and odours present in the oil at the beginning of the refining process, and those produced by the neutralizing and bleaching stages. Bland-tasting oil is finally obtained.

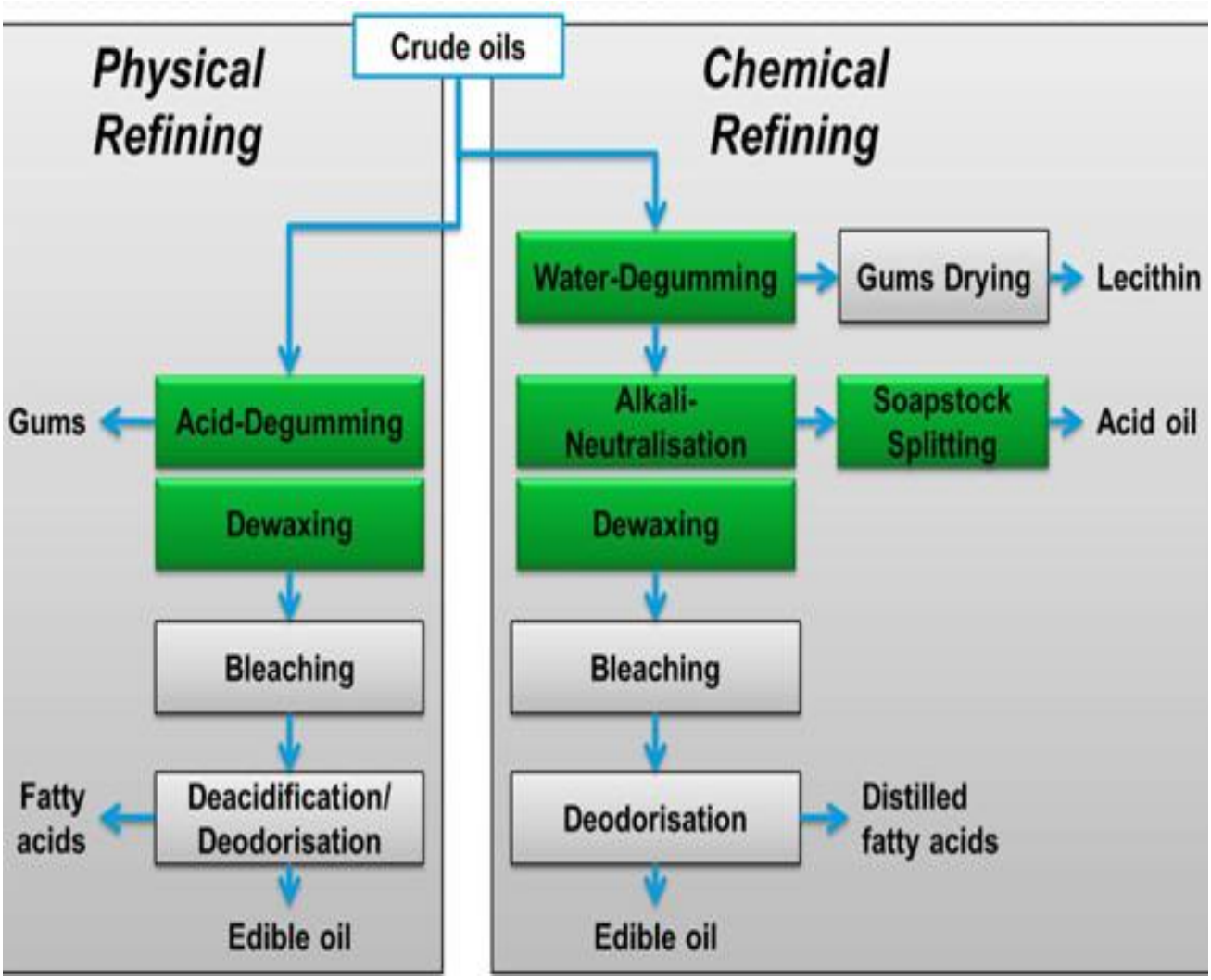

Figure 1 general process of crude oil

Crude vegetable oils are traditionally refined by physical or chemical processes. The objective of refining is to eliminate impurities with the least possible effect on desirable components present in the crude vegetable oils in order to obtain an odorless, bland and oxidatively stable refined vegetable oil that is acceptable to consumers. Acceptable quality characteristics of crude vegetable oils processed by refining methods are of crucial importance in order to obtain such refined vegetable oils. Most crude vegetable oils conventionally have been obtained from oilseeds by either mechanical pressing or solvent extraction methods. Solvent oil extraction is usually applied to seeds with low oil

content, such as soybeans. There are three major steps in solvent extraction i.e., oilseed preparation, oilseed extraction and desolventizing of the oil and meal.

The quality characteristics of crude vegetable oils obtained by solvent extraction methods are primarily dependent on

- Extraction solvents
- Extraction temperature
- Pretreatment of oilseeds, etc.

The solvent extraction most commonly used today is percolation extraction using hexane as a solvent. However, flammability, toxicological risks, health and environmental concerns have motivated interest in replacing hexane. In the mechanical pressing method, the preconditioned oilseed is passed through a screw press (expelling) where a combination of high temperature and shears is used to crush the oilseed to release the crude oil. This method is relatively less efficient as it recovers only 70-80% of the available oil depending on the oilseed and pressure employed.

Oil extraction by mechanical pressing is simpler, safer and contains fewer steps, compared with oil extraction by solvent. Many of the higher oil content oilseeds, such as sunflower seeds, are extracted by pre-pressing with a screw press followed by extensive extraction of the oilseeds with hexane as solvent. The solvent must then be eliminated from meal and crude oil. This method is most widely used for oilseed extraction in the vegetable oil industries to proceed efficiently and trouble-free. The pre-pressed and solvent extracted oils are generally blended before storage. Also, both are usually mixed before refining. Pressed oils are sometimes commercialized separately from solvent extracted oils. In the vegetable oil industries, some plants may employ only mechanical extraction while other mills not having expellers may employ direct solvent extraction. The oilseed extraction methods have a direct effect on quality and stability characteristics of crude vegetable oils obtained from the oilseeds. As a corollary, the critical point for the production of good quality crude vegetable oils is the selection of an

optimized oilseed extraction method. If optimum oilseed extraction conditions are not met, a drastic loss in quality will result. This loss in quality is noticeable by different analytical determinations which describe the quality and stability characteristics of the crude vegetable oils such as free fatty acids, peroxide value, trace metals, tocopherols, color value, etc. In addition to using various traditional analytical evaluations, trans fatty acid levels are a powerful tool for determining good oilseed extraction processes and also for assessment from a nutritional viewpoint because of their adverse effects on health.

5.2 Crude oil and refined oil

The relationships between crude and refined oils are examined by quantitation of minor glyceridic compounds, namely, oxidized triglyceride monomers, dimers and diglycerides, associated with oil quality. Particularly, two groups of compounds, i.e. oxidized triglyceride monomers and diglycerides, are of especial interest as they are indicative of oxidative and hydrolytic alterations, respectively. The main conclusion is that quantitation of minor glyceridic compounds in refined oils not only offers a new possibility for quality evaluation but also allows the crude oils to be characterized by the presence of markers of oxidative and hydrolytic alterations.

General guidance in case of crude oil and oil refining industry

- Normally the seed is delivered in the dried condition. Where required to avoid storage problems and quality losses, the moisture content of the seed is adjusted to the required level by drying. The seed is stored and transported in bulk. At the place of use it is unloaded by means of grabs, bucket elevators, aspiration equipment or chutes, freedom from dust and coarse foreign matter in screens, cyclone and magnetic separators before being fed to the storage silos by chain conveyors, for instance. In-plant transfer of the moist oil seed and meal is generally accomplished by means of mechanical conveying equipment (e.g. chain conveyors).
- The first step in the process is to remove extraneous matter (e.g., chaff, stones, metal) from the incoming seed utilizing sieves, magnets etc.

- Dependent upon the seed being processed, various types of grinding, and cracking, flaking and rolling equipment is used to rupture oil cells to allow egress of the oil. In the case of soybeans, the husks and hulls can also be removed by cracking and air classification, prior to flaking.
- In order to further improve oil recovery during the process; all seeds are heated, typically using indirect steam, to condition and/or dry the material to a required moisture level prior to expelling (or flaking in the case of soybean
- Some products complete their processing at this stage and are marketed as expelled cake and expelled oil.
- However, in the majority of cases, the residual oil in the expelled cake is extracted using hexane. Cake is washed with solvent, under a counter current flow, producing an oil/solvent mixture (termed a miscella) and a residual meal containing solvent.
- The miscella is subjected to evaporation and steam stripping to recover the hexane from the oil. The hexane is then separated from the water mixture by physical settlement and is recovered for re-use in the extraction operation.
- At this stage, a crude oil has been produced which either may be refined on site or sold to another operator for refining.
- The solvent-laden meal is processed by steam distillation in a desolventiser to recover most of the hexane content. The meal is then dried and cooled before storage in silos or loading, and may be sold as animal feed in this state or may be further processed by grinding prior to sale.
- Crude oils and fats, which are obtained by expelling, extraction, or rendering contain substances and trace components, which are undesirable for taste, stability, and appearance or further processing. These substances and trace components include seed particles, impurities, phosphatides, carbohydrates, proteins, traces of metals, pigments, waxes, oxidation products of fatty acids, and polycyclic aromatic hydrocarbons (heavy and light) and pesticide residues.

- The purpose of refining oils and fats for edible purposes is to remove these undesirable substances and components while maintaining the nutritional value and the stability of the end product.
- The first step of chemical refining is degumming. Its purpose is to remove seed particles, impurities, and (partly) phosphatides, carbohydrates, proteins and traces of metals.
- The crude oil is treated with food grade processing aids and/or water, which leads to hydration of the main part of the phosphatides, proteins, carbohydrates and traces of metals. The hydrated material precipitates from the oil and can be removed by centrifugation.
- Alkali neutralization reduces the following components: free fatty acids, oxidation products of free fatty acids, residual proteins, carbohydrates, traces of metals and a part of the pigments
- The treatment consists of the reaction with an alkali-solution. By this treatment a second phase is formed (soap stock), in which phase the undesired substances are dissolved. This phase is separated and removed, for example by centrifuging the mixture. The recovered soap stock may be sold or acid-split on site to produce byproducts for use in the animal feed or soap industry.
- The neutral oil is usually washed after initial separation to remove any residual soap and dried.
- The purpose of bleaching is to reduce the levels of pigments such as carotenoids and chlorophyll, heavy polycyclic aromatic hydrocarbons, but also residues of phospholipids, soaps, traces of metals and oxidation products. These substances are removed by adsorption with activated clay, silica and/or activated carbon. The bleaching clay containing all these substances is separated by filtration.
- The purpose of deodorization/stripping is to reduce/strip out free fatty acids and to remove odors, off-flavours and other volatile components such as pesticides and light polycyclic aromatic hydrocarbons.

- The physical characteristics (e.g. hardness, melting profile) of oils, fats and blends can be adjusted to meet customer requirements by means of Modification processes. The modification techniques used are hydrogenation, interesterification or fractionation.
- The basis of Hydrogenation is the addition of hydrogen to unsaturated fatty acids to create saturated fats with a higher melting point. Oils can be either partially or fully hydrogenated.
- Interesterification is a process where different oils are combined to produce a fat with different melting characteristics. This process involves the separation of triglycerides into fatty acids and glycerol followed by recombination
- In fractionation oil is cooled under controlled conditions. This separates the high melting point triglycerides in the oil from the low melting point triglycerides, leaving the fat in two parts or "fractions", one of which is more solid than the other at room temperature.
- Some oils like sunflower oil contain waxes, which crystallize at low temperatures and give to the oil a turbid appearance. To remove these waxes, different procedures are applied. They all have in common the low temperatures at which the waxes crystallize.

Self-Check 5.	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true for correct statements and false for incorrect statements

1. Crude oils obtained by pressing and/or extraction are sometimes used directly for food and feed purposes. (3points)
2. The purpose of refining oils and fats for edible purposes is to remove undesirable substances while maintaining the nutritional value and the stability of the end product. (3points)
3. During refining process neutralization, bleaching and deodorizing, which remove fatty acids, colour, and off-flavours respectively are under taken.(3points)
4. The refining processes may be carried out in stages using batch plant or by using equipment providing continuous operation. (3points)

Note: **Satisfactory rating – 6 points** **Unsatisfactory – below 6 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-6 Moving Crude Oil into and out of storage facility

6.1 Introduction

Crude oil untreated and unrefined are stored in tanks for shipment to other locations or processing into finished products. Crude oil may also transport to other places for biodiesel production, and other services. During transporting crude oil (unrefined oil) from one place (storage tank) to other places (storage tanks) proper care is needed.

6.2 Loading and Unloading

Transport tanks differ from land tanks and complete segregation of tanks is achieved by using individual pumps and line systems, each tank having its own dedicated pump and line system. Mild steel tanks should preferably be coated to prevent attack or corrosion of the mild steel by the cargo. The coating should be approved for contact with food. The trend towards the use of stainless steel for tank construction will remove the need for tank coatings. Damage to coatings can be caused by abrasion or by using unsuitable cleaning methods leading to local corrosion. The tanks should always be inspected before a cargo of oil or fat is loaded and, if necessary, repairs to the coatings should be carried out.

Terminal operations mainly consist of unloading and loading the product from supply pipe to storage tanks, and onward to distribution links, typically truck tankers. Crude oil product terminals generally employ lateral piping systems, consisting of pipelines, hoses /loading arms, valves, instrumentation connections, meters, and pump stations, to transfer the product between tanks and transport links (refining house). The design, construction, and operation of these systems are subject to international standards. Terminals involving tanker ships have distinct loading and unloading considerations and equipment.

6.3 Crude Oil Refining and Preparation for Biodiesel Production

Crude oil obtained by both solvent extraction and mechanical pressing contains desirable and undesirable compounds. Desirable compounds include triacylglycerides (neutral lipids) and health beneficial compounds such as tocopherols and phytosterols. Free fatty acids, phospholipids, also referred to as gums, and lipid oxidation products are the major impurities removed during oil refining. There are several unit operations in a crude oil refining operation. Degumming, deacidification/refining, bleaching, deodorization and winterization are commonly used for edible oil production. Vegetable oils to be used for biodiesel production must be deacidified.

In general, crude oil preparation for biodiesel production includes at least degumming, neutralization and drying. Oil to be converted to biodiesel should have the following specifications:

Phosphorous content: 2-10 ppm

Water content: 500-1000 ppm

Acid value: 0.05-0.25 percent free fatty acid, max

Self-Check 6.	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true or false

1. Crude oil which is untreated and unrefined are stored in tanks for shipment to other locations or processing into finished products. (2ponts)

2. During transporting crude oil from one place (storage tank) to other places (other storage tanks) proper care is needed. (2points)

Note: **Satisfactory rating – 2 points** **Unsatisfactory – below 2 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-7 Occupational Health and Safety (OHS)

7.1 Introduction

Hazardous Materials may involve in oil processing during the transport, storage, and use of bulk quantities of acids, alkalis, solvents, and hydrogen during extraction and refining. Their transport, storage, and handling provide opportunities for spills or other types of releases with potentially negative impacts on soil and water resources. Their flammability and other potentially hazardous characteristics also present a risk of fire and explosions. Occupational health and safety impacts during the construction and decommissioning of oil seed and pulse processing plants are common to those of most large industrial facilities. Occupational exposures may be most likely related to the dermal contact with crude oil and inhalation of crude oil vapors during crude oil loading and unloading. Exposure should be prevented through the implementation of occupational health and safety management programs and measures and chemical occupational health and safety hazards.

7.2 Occupational health and safety

Occupational health and safety issues during the operational phase include:

- Chemical hazards
- Physical hazards
- Confined space entry
- Electrical hazards
- Risk of fire and explosion
- Noise

A. Chemical Hazards

Operators in oil seed and pulse processing facilities may be exposed to hazardous substances via, inhalation of hexane or other solvents used for extraction; inhalation of toxic chemicals (e.g., sodium methylate can cause burns on the skin and lung tissue if inhaled); eye or skin exposure to acids or bases; inhalation of dust from the

transportation of raw materials (e.g., seeds and beans to the crushing plant); inhalation of dust from meal treatment and shipment; inhalation of dust from bleaching earth, filter aid, and nickel catalyst; and inhalation of aflatoxins present in raw materials.

B. **Physical Hazards**

Physical hazards in vegetable oil production and processing facilities are similar to those present in other industry sectors and include the potential for falls caused by slippery floors and stairs; injuries caused by unprotected machinery or moving parts; hazards associated with potential collisions with internal transport, such as trucks; and accidental contact with conveyor systems, such as those used in crushing plants and in the removal of spent earth. In Oil industry grain silos present a significant risk of death from asphyxia. Extremely toxic nitrogen oxides and CO2 begin to accumulate in the head space of the silo within hours of its filling. Tank cars may also represent asphyxia risks if, for example, a tanker is flushed with nitrogen prior to loading.

C. **Electrical systems**

Electrical systems are a source of danger for workers that can lead to injuries or fatalities. The General Guidelines provide guidance on hazard prevention and control of electrical systems. Sector-specific recommendations applicable to silo safety are identified below.

D.**Risks of fire and explosion**

Risks of fire and explosion occur at different stages of oil seed and pulse production and processing and can lead to loss of property, as well as possible injury or fatalities among project workers. General fire safety management should be handled according to the General EHS Guidelines. Sector-specific risks are related to the combustibility of vegetable oil and the high volumes of combustible dust present both in grain and oil-seeds handling and in storage facilities. The control and removal of this dust and the control or removal of potential ignition sources are key to eliminating the explosion hazard. The storage of grains and seeds represents a combustion risk, owing to the potential for self-heating and ignition. Silo safety for these products, as well as for oil

storage, is critical. Vegetable oil facilities also present the risk of explosions resulting from the volatilization of solvent dissolved in the oil (e.g., hexane), along with the risk of fire from spent bleaching earth with a high iodine-value oil, high ambient temperature, and high circulation-draft of air. Fire and explosion hazards at crude oil product terminals may result from the presence of fuels and liquids, oxygen, and ignition sources during loading and unloading activities, and / or leaks and spills of flammable products. Possible ignition sources include sparks associated with the buildup of static electricity, lightning and open flames. In addition to recommendations for hazardous materials and crude oil management, and emergency preparedness and response provided Guidelines

The following measures are recommended as a means of preventing and controlling fires and explosions from combustible dust:

- Use recognized international standards in design and operation.
- Classify areas according to respective hazard classes following practices and requirements found in recognized international standards6and deploy intrinsically safe electrical circuits and anti-explosion electrical devices (including lighting).
- Develop and implement a comprehensive maintenance program to avoid dust build-up. Compressed air should not be used for cleaning dust due to the risk of raising the dust level in the atmosphere; all maintenance equipment, especially welding sets and other electrically driven tools, should be regularly inspected and approved for use.
- Avoid heat sources from friction by adopting appropriate practices or technologies.
- Control static electricity. For example, elevator belts should be constructed of anti-static material or have anti-static properties; during pneumatic transfer of combustible substance, ensure electrical bonding and grounding of tanker vehicles to prevent static electricity.
- Provide proper grounding and lightning protection for tanks following internationally recognized standards.

- Control access to areas with a high risk of explosion, e.g., limit access to qualified personnel only.
- Ensure the tipping area is completely enclosed and that the design and maintenance of the grid in the tipping area prevent stones and metal from entering.
- Separate heating systems and surfaces from dust.
- Deploy dust suppression/control systems in silo elevators and conveyor belts to avoid dust accumulation in grain transferring areas; e.g., in tipping areas, a dust control system should be used, ideally installed below the grid and above the receiving hopper.
- Ensure that emergency plans and procedures are developed and understood by staff. Install suitable detection equipment in silos, such as temperature sensor cables and gas detectors. Spark/heat detectors should be connected to an extinguishing system installed in transport systems (belt conveyors, dust extraction systems, etc.) to reduce the risk of ignition.

Examples of fire suppression equipment include

- mobile / portable equipment such as fire extinguishers, and
- specialized vehicles, as well as
- automatic or manually operated fixed fire suppression systems.

E.Confined Spaces

Confined space hazards, as in any other industry sector can, in the worse case scenario, potentially lead to fatalities if not properly managed. Confined space entry by workers and the potential for accidents may vary among terminal facilities depending on design, on-site equipment, and infrastructure. Confined spaces in crude oil terminals may include storage tanks, some secondary containment areas, and storm water / wastewater management infrastructure. Facilities should develop and implement confined space entry procedures

7.3 Factors that may increase worker exposure to different factors

a. Produced Fluid and Reservoir Characteristics

- Condensate and lighter crude
- Un stabilized crude oils
- High temperature fluids
- High production volumes/early in production

b. Operational and Task-related Factors

- Drilling out plugs during completion operations
- Tanks that are not isolated prior to opening hatch
- Interconnected tanks (tank batteries)
- Tanks using flare systems with backpressure on the vapor space
- Flow back operations
- Working around tanks with vapor recovery units
- Maintenance work
- Working around separators/enclosed spaces

c. Environmental Factors

- Higher temperatures
- high wind speed

7.4 Factors that may Decrease worker exposure to different factors

- Remote or automatic gauging and sampling
- Tank sampling taps
- Thief hatch pressure indicators, etc.
- Working with standard principles
- Flame retardant clothing
- Appropriate respiratory protection
- Impermeable glove

Self-Check 7	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s

1. Write the equipment's used for fire suppression at storage tank of crude oil. (4points)
2. Write the occupational health and safety issues during the operational phase of crude oils. (6points)

Note: **Satisfactory rating – 5 points** **Unsatisfactory – below 5 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-8 monitoring equipment Operation

8.1 Introduction

When crude oil is produced, it is accompanied by foreign material and other unwanted debris. Water and solvents is also added to allow easier pumping into the pipeline. These impurities are removed in the refining process. Until the crude oil is delivered to the refinery, bottom sludge & water can settle on the bottom of an oil tank, which forces the tank operator to empty the tank and engage in a lengthy, expensive and environmentally challenging cleanup. Before starting processing, oils are brought from storage tanks into a day tank which is thoroughly mixed and sampled for analyses to determine the treatments to be applied. These tests include free fatty acids, phosphorous, moisture, insoluble impurities and colour.

8.2 Monitoring operation

Mounted on the flange of the tank, side-entry mixers feature fewer moving parts, minimize vibration, offer a longer mechanical seal life and are easier to maintain. While running, the mixers' impellers generate the right fluid velocity distribution to provide the highest and most efficient performance. Impeller provides the industry's highest flow at the lowest horsepower, delivering a 15-20-percent energy savings over traditional mixers. Because of the proprietary lockout design, tank operators can safely replace the mixer mechanical seal quickly and easily, even if the tank is full. For storage tanks that use a floating roof, the smaller blade design makes the operational tank volume greater when compared to conventional mixing technology. Fast and efficient shut off actuation capabilities also help to ensure limited environmental impact, by lessening the potential for oil spills or leaks. The operator may have the skill of Identifying and taking the corrective action when failure of equipment is happen before starting the process of storing the crude.

Monitor the storing process and equipment like contaminated product, equipment faults, and Services faults.

8.3 Typical equipment faults and related causes

Typical equipment faults and related causes to be identified as:-

1. Signs and symptoms of faulty equipment and
2. Early warning signs of potential problems

Identifying variation in equipment operation should followed by gathering and taking records used to give clear information for the supervisor or another person involved in operation. Gathering and recording any fault and even action to be taken has advantages to minimize the time and resources required.

Generally the following things are more important during monitoring the equipment operation of crude oil storage,

- Conducting pre-start checks of crude oil storage tank operation
- Inspecting equipment condition to identify any signs of wear,
- Confirming that equipment is clean and correctly configured for processing requirements
- Positioning sensors and controls correctly, ensuring any scheduled maintenance has been carried out
- Confirming that all safety guards are in place and operational
- Identifying variation in equipment operation and maintenance requirements
- Checking the location of emergency stop functions on equipment

Self-Check 8	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true for correct statement and false for in correct statement

1. Efficient shut off actuation of storage tank capabilities helps to ensure limited environmental impact, by lessening the potential for crude oil spills or leaks.(3point)
2. Identifying variation in equipment operation should followed by gathering and taking records which is used to give clear information for the supervisor. (3point)

Note: **Satisfactory rating – 3 points** **Unsatisfactory – below 3 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-9 Identifying and reporting Out of specification process and equipment

9.1 Introduction

Crude oils obtained by pressing and/or extraction are sometimes used directly for food and feed purposes. In most cases, however, the crude oils are refined in a multistage process. The Quality Specifications for various crude vegetable oils obtained from the processing of oilseeds industry are important. Requirements of State health acts and regulations must be observed where appropriate. Sampling procedures must be followed to ensure that the Official Sample used for analysis is representative of the consignment. The crude oil shall have

- a clean,
- fresh flavour and
- Shall be free from rancid, beany, painty, sour or other objectionable flavours or odors.

The crude oil shall be free from foreign material such as dirt, insect parts, hair, wood, glass or metal. The crude oil shall be processed in accordance with good manufacturing practices.

Monitor the storing process and equipment to identify out-of-specification results or non-compliance. This may include:

- contaminated product
- equipment faults
- services faults

9.2 purposes

Identification of product/processes outcomes used to check either the products or processes are out of specification or not because every products or processes have their own specifications and have effects on the outcome after processing. The main

objective of Identifying and rectifying out-of-specification product/process outcomes is in order to take corrective action in response to out-of-specification results.

9.3 Identifying and reporting out of specification process

Crude oils might contain substances and trace components, which are undesirable for taste, stability, appearance, and odour or may interfere with further processing. These substances and trace components include seed particles, impurities, phosphatides, carbohydrates, proteins, and traces of metals, pigments, waxes, oxidation products of fatty acids, polycyclic aromatic hydrocarbons and pesticide residues. All the above things are should have identified and reported to the concerned personnel

Internal specifications developed by the oils and fats sector stipulate that crude oils should meet certain quality requirements. In fact, this is a key step in ensuring that when refining is applied to this raw material, the fully refined oil is suitable for human consumption.

Contact of crude oil with oxygen, present in the atmosphere, causes chemical changes in the product which down grade the quality. Some of the effects of oxidation may be rectified within an edible oil refinery with some extra processing and, therefore, extra cost. However, the effects may be so severe that rectification is not possible. Much can be gained by reducing the amount of air contact and this principle is the basis of several of the recommendations. Oxidation proceeds more rapidly as temperature increases, so each operation should be carried out at the lowest practicable temperature. The rate of oxidation is greatly increased by the catalytic action of copper or copper alloys, even when trace amounts are present. Because of this, copper and copper alloys must be rigorously excluded from the systems. Other metals, such as iron, also have catalytic effects although less than that of copper.

Undesirable contamination may be from residues of a previous material handled in the equipment, dirt or through the accidental addition of a different product. In storage installations and ships, particular difficulty may be experienced ensuring cleanliness of valves and pipelines, particularly where they are common for different tanks. Contamination is may be avoided by

- good design of the systems,
- adequate cleaning routines and
- an effective inspection service, and on ships by the carriage of oils in segregated tank systems.

Self-Check 9	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true or false

1. Identification of product/processes outcomes are used, to check either the products or processes are out of specification. (3point)
2. The crude oil should have a clean, fresh flavour and shall be free from rancid, beany, painty, sour or other objectionable flavours or odors. (3point)

Note: **Satisfactory rating – 3 points** **Unsatisfactory – below 3 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet-10 Identifying and reporting the performance of process and equipment

10.1 Introduction

Identification and rectifying Reporting performance of products/process outcomes will effective only followed by reporting. The reporting out-of-specification products/process outcomes include procedures and responsibility for reporting production and performance information. Information to be report comes from recorded from the activities of identifying and reporting processes. There must be clear marking or identification systems for the pipelines and storage tanks. The condition such as cleanliness of storage tanks, road tankers, ship's tanks and pipelines should be inspected by a suitably qualified superintendent for every loading or unloading of crude oil and written reports provided. The receiver may wish to keep tank sediments separate from the bulk. Records of the ship's heating log should be provided. Ship loading samples, properly marked and sealed, should be delivered as required.

For instance:

- maintaining working area
- equipment maintenance
- faulty equipment
- Status service materials like
    - ✓ power,
    - ✓ ventilators,
    - ✓ vacuum,
    - ✓ Lightening
    - ✓ Noise and etc…

Ventilation: - From the worker should expect to report to his/her supervisor if any occurrence which related to ventilations such as Odors, Dusts, Gases, Vapors, Fumes and Smoke. And ensure that ventilation system conforms to the National Building Code and the Local Fire and Public Health Regulations.

Lighting: - Make sure that your eyes have time to adapt to changes in lighting level as you move from one area to another. We cannot see properly when we first move from a brightly illuminated area to a darker area. The eyes need a few minutes to adjust to the dark area.

Noise: - The best method of protection is to use quieter equipment, enclosures, and noise reducing materials. Using hearing protection is recommended as required. Need to keep mixer, blender and trolleys in good running condition.

Heat: - the most serious illness is heat stroke, which may be fatal. Heat stroke occurs as a result of working in very hot environments. The symptoms include poor coordination and abnormal behavior which the person may not be aware of, hot and dry skin, and loss of consciousness.

10.2 Purposes

- ✓ It shows all variations of processes and products to be make adjustment
- ✓ It is good indicators for the process and final product quality

Self-Check 10	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s

1. Write the purpose of Identifying and reporting the performance of process and equipment.(5points)
2. Write the Information to be report at work area of crude oil storage.(5points)

Note: **Satisfactory rating – 5 points** **Unsatisfactory – below 5 points**

You can ask your teacher for the copy of the correct answers.

Operation Sheet 1	Monitoring equipment in operating crude oil storage

Procedures

- Select and use personal protective clothing and/or equipment
- Prepare checklists for keeping records and reporting of equipment in operating conditions
- Conduct pre-start checks of crude oil storage tank operation
- Inspect equipment condition to identify any signs of wear,
- Select appropriate settings and/or related parameters, cancelling isolation or lockouts as required
- Confirm that equipment is clean and correctly configured for processing requirements
- Position sensors and controls correctly, ensuring any scheduled maintenance has been carried out
- Confirm that all safety guards are in place and operational
- Identify variation in equipment operation
- Identify maintenance requirements of equipment
- Check the location of emergency stop functions on equipment
- Summarize the all the recorded information in reporting formats
- Record and Report all equipment in operating condition in to the appropriate person

LAP TEST: Performance test

Name_____ ID_____

Time started: _____ Time finished: _____

Instructions: Given necessary equipment and materials you are required to perform the following tasks within 2 hour. The activity is expected from each student to do it.

Task-1 Undertake monitoring equipment in operating crude oil storage

LG #49	LO #3 Record workplace information

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Recording work place information
- Signing records
- Communicating recorded information with supervisor
- Keeping workplace information records

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- Record work place information
- Sign records
- Communicate recorded information with supervisor
- Keep workplace information records

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet- 1 Recording work place information

1.1 Introduction

Dealing effectively with information and records is necessary and important for any organizations. The quantity and variety of information kept by an organization can be huge. Information needs to be sorted into related groups so that it can be stored easily and found when needed. An organization's success depends largely on how well it manages its information. The type of information used at job and the way records are organized so you can collect, file, store and find information quickly and easily. Finding and using information is a large part of many jobs, so knowing how to deal with it is an important workplace skill. Being confident and efficient in this skill helps you and your organization succeed. Collecting information that meets the organizations needs Using equipment and technology to obtain, maintaining security and confidentiality when handling information. For example by using Computerized or electronic and Paper-based records:

There are different ways to deal with work place information. Each company will have a system that suits its needs. For instance, a large company might have a centralized, electronic system that allows its workers to access information from any location throughout the world. A small company may have a specialized system that integrates different types of work place information into the way staff works for example, paper-based filing systems and databases. Every organization or industry is different. The most important thing is to know how your workplace operates. Each work place relies on the exchange of information to carry out its daily activities. Information is passed from employee to employee, customer to employee, supervisor to team member, supplier to customer, and so on.

1.2 Work place information records

The types of records held by an organization vary depending on the objective of the industry. The following information of condition will maintain in work place records:-

- Work environment (ventilations, lighting, noise and heat)
- Cleaning and Sanitation
- List Equipment in the workplace
- Guidelines of workplace
- Procedures and policies of workplace
- Standard Operating Procedures
- specifications and
- Production schedules
- Storage equipment
- Filing systems
- Cleaning the storage tank

Self-Check -1	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s

1. What is the information may be maintained and/or recorded at work place? (5points)

Note: **Satisfactory rating – 2.5 points** **Unsatisfactory – below 2.5 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet- 2 Signing records

2.1 Signing Records

All Activities being recorded Sign has effective messages to address security policy and protection concerns. All activities being recorded sign are a helpful tool to help protect the health and safety of personnel, and are not a replacement for required protective measures for lessening or removing hazards. All activities which are undertaken starting from setting up of the crude oil storage to storing the crude oil should be recorded and signed by the concerned personnel.

The activities which may be recorded and signed by concerned personal are:

- Amount of crude oil stored
- Faulty equipment
- Maintenance of equipment required
- Accident happened
- Corrective action may be taken
- Different control point measurements like temperature, gauge records,
- Work area maintenance
- Performance of different Pipe, fittings, valve, storage tank etc.

Workplace information is recorded clearly and accurately in the format and at the time required by the organization. Records provide the industry manager with data, information and knowledge.

Self-Check -2	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true or false (3points each)

1. All activities which are undertaken starting from preparation of storage area to storing the raw materials should be recorded and signed by the concerned personnel.
2. Workplace information is recorded clearly and accurately in the format and at the time required by the organization.

Note: **Satisfactory rating 3 points** **Unsatisfactory – below 3 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet- 3 Communicating recorded information with supervisor

3.1 Introduction

All workplaces have their own preferred systems for organizing information. It is important to work within your organizations systems so that information can be easily communicated within the organization. Reporting, units must submit the following information to the implementing agency or supervisor. All reports submitted shall be routed systems, which includes certification of installation for new systems Performing reasonable ground inspections and title or other document searches for the presence of any tank which may have been taken out of service. Corrective actions planned or taken including initial abatement measures, initial site characterization, free product removal , investigation of pipe and its fittings, pumps, compressors, ventilators cleanup and corrective action plan and Notification prior to permanent closure or change in service.

3.2 Purpose

- Preventing or resolving problems
- Providing clarity and direction
- Creates better relationships
- Increases engagement
- Improves productivity
- Promotes team building

Self-Check -3	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Write short answer/s

1. Write the purpose of communicating recorded information with supervisor. (5points)

Note: **Satisfactory rating 2.5 points** **Unsatisfactory – below 2.5 points**

You can ask your teacher for the copy of the correct answers.

Information Sheet- 4 keeping workplace information records

4.1 Keeping work place information

There are many ways of storing and/ or keeping information. It may vary from company to companies. For instance, records can be centralized or decentralized. They can also be filed in different ways and stored in different types of equipment.

All work is carried out according to company policies and procedures, regulatory and licensing requirements, legislative requirements, and industrial awards and agreements. All activities should document and reported daily through the production time on appropriate format. Whenever a person observes what appears to be an unsafe or harmful condition the person must report it as soon as possible to a supervisor or to the employer, and the person receiving the report must investigate the reported unsafe condition or act and must ensure that any necessary corrective action is taken without delay. Workplace information is recorded clearly and accurately in the format and at the time required by the organization. Clean up at the completion of the operation should undertake. Waste is collected and disposed of or recycled to minimize damage to the external environment. Tools and equipment are cleaned and stored according to organization work procedures.

4.2 Regular checkup of work place

Every employer must ensure that regular inspections are made of all workplaces, including buildings, structures, grounds, excavations, tools, equipment, machinery and work methods and practices, at intervals that will prevent the development of unsafe working conditions. A special inspection must be made when required by malfunction or accident.

Self-Check -4	Written Test

Name_____ **ID**_____ **Date**_____

Directions: Answer the questions listed below.

TEST I. Say true or false (3point each)

1. Every employer must ensure that regular inspections are made of all workplaces.
2. All work is carried out according to company policies and procedures, regulatory and licensing requirements.

Note: **Satisfactory rating 3 points** **Unsatisfactory – below 3 points**

You can ask your teacher for the copy of the correct answers.

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AKNOWLEDGEMENT

We wish to extend thanks and appreciation to the many representatives of TVET instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

We would like also to express our appreciation to the TVET Instructors and respective industry experts of Regional TVET Beau rues, TVET College/ Institutes, BEAR II Project, UNESCO and Federal Technical and Vocational Education and Training Agency (FTVET) who made the development of this Teaching, Training and Learning Materials (TTLM) with required standards and quality possible.

This Teaching, Training and Learning Materials (TTLM) were developed on October 2020 at Bishoftu Management Institute Center.

The trainers who developed the learning guides

No.	**Name**	**Qualification**	**Educational background**	**Region**	**E-mail**
1	Wodemagegn Tamiru	B	Chemical engineering (Food Eng.)	Sidama	wondet2011@gmail.com
2	Sefinew Abere	A	Agronomy	Amhara	sefinew14@gmail.com
3	Misganaw Molla	A	Agronomy	Amhara	mmisganaw2011@gmail.com
4	Adisu Shambel	B	Plant science	Oromia	adisushambel2011@gmail.com
5	Fistum			FTA facilitator	