Oil Seed and Pulse Processing Level-II

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Module Title: Operate by product process

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LG #50	LO #1-Prepare byproduct processing equipment for operation

Instruction sheet

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

- Preparing and confirming materials and equipment's
- Identifying and following work place documentation
- Confirming services
- Making facilities, storage and equipment available
- Following Policies and procedures
- Loading materials to defatted soybean

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 and confirm materials and equipment's
- Identify and follow work place documentation
- Confirm services
- Make facilities, storage and equipment available
- Follow Policies and procedures
- Load materials to defatted soybean

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 and Confirming Materials and Equipment's

1.1 Introduction

Oil-cake is the residue obtained after the greater part of the oil has been extracted from an oilseed. Oil-cakes are rich in protein and most are valuable food for farm animals. Oil-cake from large-scale oil mills is often an ingredient of compounded animal feeds. Some seeds, such as castor beans, yield oil-cakes unsuitable for direct incorporation into animal feed as they contain toxic substances. Acceptable feeds can be produced by blending about 30% of oil-cake from small expellers with other local ingredients such as cereals and bran. Soybean meal, or soy meal, is the material remaining after solvent extraction of oil from soybean flakes, with 50% soy protein content. The meal is 'toasted' (a misnomer because the heat treatment is with moist steam) and ground in a hammer mill. Ninety-seven percent of soybean meal production globally is used as livestock feed. Soybean meal is also used in some dog foods.

Generally some of the byproduct of edible oil industry consists:

- Defatted soybean
- Oilcake
- Soy hull pellets

1.2 Equipment required for processing oil seed processing by product

1.2.1 Oil Cake processing Machine

To come up with the highest quality of oil extracted from oil seeds, it is highly essential that oil seeds are processed and are made to go through rigorous pre-seed treatment process. This process involves cleaning, dehulling, cracking, flaking, heating, and cooking of the oil seeds. This cleaning process helps in separating all the unwanted and impure materials like stones, dust, hulls, husks, metals, etc., from the oil seeds. After the seed treatment process is completed, the oil seeds are ready for the expelling process. By heating and reconditioning the seeds, the moisture content of the seeds increases by a large level, and the oil is easily expelled. For this process, oil expelling machines or expelling presses are used.

When the seeds are being crushed with the oil expellers, the oil is duly expelled during the process. The oil then flow through the drained barrel and is collected and sent for filtering and refining. The remaining coarse residue that is left behind is then discharged through the discharge outlet of the oil press. This residue is known as oil cake. Oil cakes are used for various purposes. Some of these cakes from seeds such as cotton seed contain toxic pigments as well. The cakes that are obtained through pre pressing contains about 15-20% of oil, which need to be extracted. So these are sent for solvent extraction for removal of residual oil. The remaining residues after the extraction are further used as animal feed and fertilizers. Due to their high nutrition value, these are considered as a healthy cattle and poultry feed.

The cakes come out as large sheets from the discharging end of the expeller presses. If these sheets cool down, it becomes difficult to carry out further operations like handling and bagging. The cakes cannot be bagged is they are too hard because of cooling. So it is highly important that the cakes are broken or grounded as soon as they are discharged. For this purpose equipment like Cake Breakers are to be used.

There is other equipment that is used for cake processing, such as

- Cake Elevators
- Cake Conveyors
- Cake breaker/crusher
- Cake Silo/cooled cake bin
- Cake cooler
- Air aspirator
- Balance

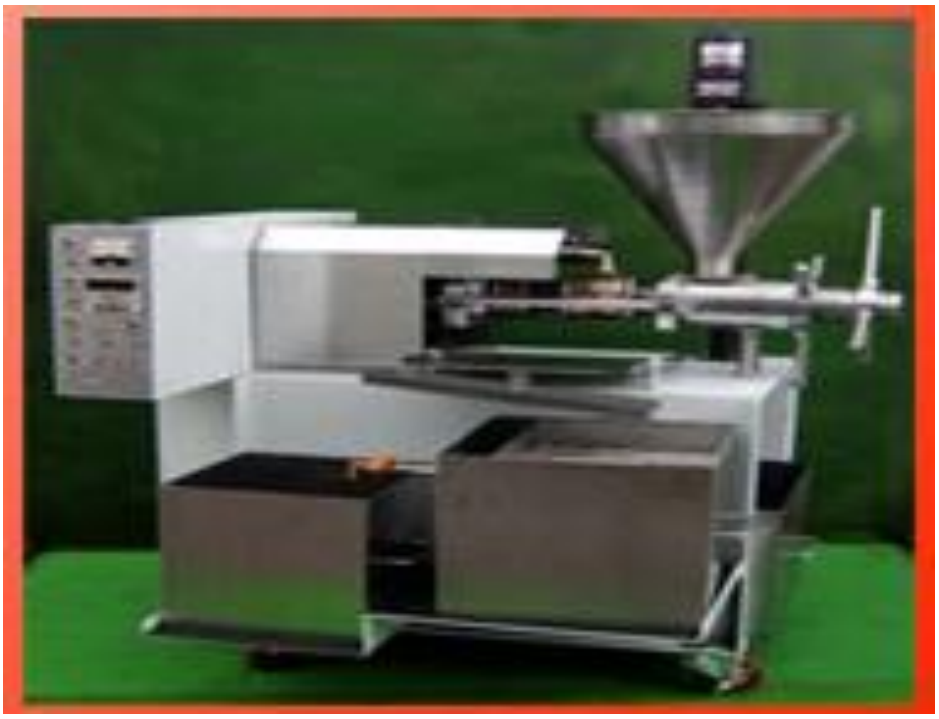

Figure.1 Oil cake processing machine

1.2.2 Oil Cake Breaker

The cleaning, dehulling, flaking, and cooking of the oil seeds are the seed preparation stage, where these are readied for oil expelling or extraction. During the seed preparation stage, all the unwanted materials like stones, dust, husks, hulls, metals etc, are separated or removed from the oil seeds. These are further cooked or heated with the use of steam, which conditions the seeds so that the moisture content in them increases. As the moisture increases, it becomes easy to extract oil from the seeds, and it also increases the yield by a large quantity. Apart from using the regular traditional methods of expelling oils from the oil seeds, the use of modern seed processing equipment and oil expellers saves precious time and also increases the output of oil quantity by a large amount.

The expelling of oil is done with the help of expellers. During the oil expelling process, the seeds are fed through the opening of the machine. The material then passes through the expeller, which crushes the oil seeds. Oil is squeezed through seed

crushing then expel through the oil discharging opening and is collected. The solid residue that is left after the squeezing is done exits from the end of the expeller shaft. This solid residue is known as Oil Cakes. These are rich in protein and minerals and are vastly used as animal feed. Some of the oil cakes obtained from seeds such as Castor seeds are known for their toxic and are used as fertilizers and not as animal feed.

These cakes or coarse residue can also be broken up. This breaking up process of the oil cakes is known as cake breaking. Special machines are used for breaking up the oil cakes. Cake Breakers are designed and built with utmost precision so as to give it a strong working construction. They can be either fitted to the press discharging chutes or are mounted directly on the discharge chute of the presses. This equipment consists of beaker blades, which cut the cakes with its scissor cutting action. The expellers / presses produce cakes in the form of large sheets. If these sheets cool down, it becomes difficult to break them. So the main function of cake breakers is to break the cakes before they cool down.

Nowadays, manufacturers are coming up with a wide assortment of cake breaking machines, which are technologically advanced as well as highly user-friendly. The various parts like breaking blades can be easily adjusted as per the requirement of the user. These parts can be easily replaced and the machine needs very low maintenance.

Figure.2 oil cake breaker

1.2.3 Oil cake elevators

After the extraction of oil through the oil expellers or expeller presses, the oil is collected and sent for refining and other such processes. When the oil seeds are crushed with the expellers, a solid residue is left, which is further discharged from the discharging end of the expelling presses. This coarse residue is known as oil cakes. These are either broken up or grounded for further use such as animal feed for cattle and poultry, and also as fertilizers. In order to break these cakes, cake breakers are used. This equipment is used to break the large oil cakes, which comes in sheets before they cool down. After the cake breaking process, these cakes have to be transported to the cake silo or to the solvent extraction plants for further oil extraction and processing.

The process of collecting the oil cakes and putting them in the storage area and for other purposes can turn out to be very time consuming. After the discharge of the oil cakes, they need to be collected and stored in silos. It also requires a lot of manual work. To make the work of collecting and transporting seeds easier, Cake Elevators are

used. Since the cakes need to be further grinded or broken up to make them into oil cake meals, these need to be transported to the various cake breaking / processing machines. The cakes are also used for solvent extraction. The cake elevators help in lifting the cakes into various locations and machines without the use of any kind of manual labour. This increases the output by a large ratio and also saves a lot of times, as a large number of cakes are lifted and transported at just one go. These elevators are constructed in a highly strong and robust manner so that the lifting work can be carried out in an efficient manner.

Cake elevators are divided into:

- the opening section,
- the discharge section, and
- the tank section.

The height of the elevators can also be easily adjusted as per the user's requirement. These are also available in different types and capacities, and are capable of transporting all types of oil cakes which come from Copra, Sunflower seeds, Sesame seeds, Rape seeds, Soybeans, and many other such seeds.

Figure.3 Oil cake elevators

1.2.4 Oil cake conveyor

Oil expellers are used to extract the oil content from various oil seeds like Sunflower seeds, Rape seeds, Copra, Sesame seeds, Mustard seeds, Palm kernels, and many more. After the extraction process of these oil seeds, the coarse residue that is left behind is let out through the discharge outlet of the oil expelling machine. This left over residue is known as oil cakes. These have various other uses such as animal feed, fertilizers, etc. For this, the oil cakes need to be further processed by grounding or breaking.

After the oil cake is formed, it needs to be processed by use of machines. Transporting or conveying them to different locations where the machines are located can be a very laborious and strenuous work. In order to make this work easier, a special kind of equipment is used. This equipment is known as a Seed Conveyor. In order to speed up the whole oil cake processing process, the use of cake elevators plays a very important and vital role.

The conveyor consists of:

- rotating drums which run on a motor and
- a belt which is used for conveying the cakes.

The belt is made up of rubber. The rotation of the drums is controllable and can be duly adjusted as per the user's requirement. The design of these conveyors is such that they prevent the mixing of the conveyors with other unwanted materials. It is very important that the cakes do not get mixed with other materials as they are used as cattle and poultry feed and are considered as highly nutritious.

Some of the salient features of Cake Conveyors are as follows:

- These are available in different capacities and types.
- These are applicable for carrying oil cakes for short as well as long distances.
- Helps in decreasing loss of time and use of manual labour.
- These have sturdy and compact fabrication.

Figure.4 Oil cake conveyors

Self-Check 1.	Written Test

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

Directions: Answer the questions listed below.

TEST I. Write short answer/s (5 pointeach)

1. Write some equipment that is used for oil cake processing.
2. Write some of byproducts of edible oil processing.

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

1. Oil-cake is the residue obtained after the greater part of the oil has been extracted from an oilseed.
2. Oil-cakes are rich in protein and most are valuable food for farm animals.

Note: **Satisfactory rating -8 points** **Unsatisfactory – below 8 points**

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

Information Sheet-2: Identifying and Following Work Place Documentation

2.1 Introduction

Documentation is important in the workplace. Workplace Environmental records are accurately and legibly maintained and stored securely in a form accessible for reporting purposes. Environmental records may include environmental data, maintenance and inspection reports, incident or accident reports, and complaints from the public. Documentation gives substance to a workplace's activities not only for legal matters, audits or disputes, but also for rules and regulations. It keeps an industry running systematically and ethically. It would be difficult for employees in a training program to remember everything if it was only presented orally. During an emergency, staff might not remember the proper procedure to exit the building without documentation. Documentation provides standards to a workplace.

2.2 Importance of identifying and following work place documentation

2.2.1 For Training

Many workplaces offer training to their employees for career development, new technology systems, or for health and safety or other policy training. To grasp what they have learned, employees rely on documentation for a point of reference. It would be ineffective and wasteful to spend training money on a trainer who lacks quick tip sheets, overviews, user guides or other training documentation, whether as hard copy or electronic.

2.2.2 For standards on procedures

A workplace policy helps employers manage staff with standards of acceptable and unacceptable behavior. They outline the repercussions if an employee does not adhere to the policies. An employee being harassed in the workplace, for example, might feel more comfortable reporting the incident knowing the workplace's position on the matter based on the workplace's anti-harassment policy. It helps an employee understand her rights.

2.2.3 For safety

The Occupational Safety and Health Act say that employers must provide a safe environment for employees. This includes posting Occupational Health and Safety Act documentation and industry regulations in a high traffic area accessible to staff. In addition, employers must post first aid regulations at first aid stations and emergency services and phone numbers near telephones. Posting documentation is important for employees to understand their rights and obligations to maintain a safe workplace.

2.2.4 In case of audit

From time to time, regulators may conduct a workplace audit for a snapshot of how an employer runs the process. Auditors will ask for documentation of written policies, rules and regulations, procedures, job descriptions and inspection reports which might involve environmental standards, health and safety and benefits to employees. If a company does not maintain up-to-date documentation, the auditors could report the company to be violation, which could cost the company time and money.

2.3 Workplace documentation

Work place documentation can include the following:

- Specifications
- manufacturing formulae
- processing instructions
- continuous production records
- Standard Operating Procedures (SOPs)

Standard Operating Procedures (SOPs)

Standard operating procedures are a set of written instructions that document a routine or repetitive activity followed by an organization. The development and use of SOPs are an integral part of a successful quality system as it provides individuals with the information to perform a job properly, and facilitates consistency in the quality and integrity of a product or end-result. A standard operating procedure is a procedure

specific to your operation that describes the activities necessary to complete tasks in accordance with industry regulations, provincial laws or even just your own standards for running your business. Any document that is a “how to” falls into the category of procedures. In a manufacturing environment, the most obvious example of an SOP is the step by step production line procedures used to make products as well train staff. An standard operating procedure, in fact, defines expected practices in all businesses where quality standards exist. Standard operating procedures play an important role in your small business. Standard operating procedures are policies, procedures and standards you need in the operations, marketing and administration disciplines within the business to ensure success. These can create:

- efficiencies, and profitability
- consistency and reliability in production and service
- fewer errors in all areas
- a way to resolve conflicts between partners
- a healthy and safe environment
- protection of employers in areas of potential liability and personnel matters
- a roadmap for how to resolve issues and the removal of emotion from troubleshooting allowing needed focus on solving the problem
- a first line of defense in any inspection, whether it be by a regulatory body, a partner or potential partner, a client, or a firm conducting due diligence for a possible purchase
- value added to your business should you ever wish to sell it

Self-Check .2	**Written Test**

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

Directions: Answer the questions listed below.

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

1. Documentation is important in the workplace.
2. Standard operating procedures are a set of written instructions that document a routine or repetitive activity followed by an organization.

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

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

5.1 Power

Edible oil processing industries are large energy consumers, making use of auxiliary boilers for the generation of steam energy. Emissions related to the operation of these steam energy sources typically consist of combustion by-products. Recommended management strategies include adoption of a combined strategy, which involves a reduction in energy demand, use of cleaner fuels, and the application of emissions controls, where required. Recommendations on energy efficiency should address in the General environmental health and safety Guidelines.

5.2 Compressor

A compressor is a mechanical device that increases the pressure of a gas by reducing its volume. An air compressor is a specific type of gas compressor. Compressors are similar to pumps: both increase the pressure on a fluid and both can transport the fluid through a pipe. As gases are compressible, the compressor also reduces the volume of a gas. Liquids are relatively incompressible; while some can be compressed, the main action of a pump is to pressurize and transport liquids. Many compressors can be staged, that is, the fluid is compressed several times in steps or stages, to increase discharge pressure. Often, the second stage is physically smaller than the primary stage, to accommodate the already compressed gas. Each stage further compresses the gas and increases pressure. Those that are powered by an electric motor can also be controlled using a power inverter, however many hermetic and semi-hermetic compressors can only work at certain speeds, since they may include built-in oil pumps. The oil pumps are connected to the same shaft that drives the compressor and forces oil into the compressor and motor bearings. At low speeds, insufficient quantities or no oil is forced into the bearings, eventually leading to bearing failure, while at high speeds; excessive amounts of oil may be lost from the bearings and compressor and potentially into the discharge line due to splashing.

5.3 Energy Consumption and management

In addition to the energy conservation recommendations provided in the General environmental health and safety Guidelines, edible oil processing industry recommendations include the following:

- Improve uniformity of feed to stabilize and reduce energy requirements.
- Increase efficiency of air removal in sterilization vessels to improve heat transfer.
- Identify and implement opportunities for process heat exchange; e.g., optimized oil-oil heat exchangers in continuous deodorization.
- Reduce stripping steam consumption by improving process efficiency; e.g., improve stripping tray design. Where possible, consider technologies such as dry ice condensing systems that may lower energy consumption.
- Consider co-generation combined heat and power to improve energy efficiency.
- Consider more advanced approaches such as the use of enzymes for processes such as degumming and oil recovery.
- Where feasible, use anaerobic digestion for wastewater treatment and capture methane for heat and / or power production

Self-Check.3	Written Test

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

Directions: Answer the questions listed below.

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

1. A compressor is a mechanical device that increases the pressure of a gas by reducing its volume.
2. Processing industries are large energy consumers, making use of auxiliary boilers for the generation of steam energy.

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

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

Information Sheet-4: Making Facilities, Storage and Equipment available

4.1 Introduction

Oil cakes are collected and putted in the storage area like in silo/bin for other purposes. After the discharge of the oil cakes, they need to be collected and stored in silos. It also requires a lot of manual work. To make the work of collecting and transporting seeds easier, Cake Elevators are used. Since the cakes need to be further grinded or broken up to make them into oil cake meals, these need to be transported to the various cake breaking / processing machines. Oilseed cakes are rich in proteins, dietary fibers, other bioactive compounds such as colorants, antioxidants, and other substances with positive health benefits, which make them suitable for valorization either as human food or feed. Oilseed cakes and meals are the residues remaining after the removal of the greater parts of the oil from oilseeds. The residues are rich in protein and most are valuable feedstuffs for all farm animals. Cakes and meals produced from soya bean, groundnut, cottonseed, rapeseed, sunflower, coconut, palm kernel, linseed and sesame seed are used.

4.2 Making facilities, storage and equipment available for byproduct

Oil cakes, which are extracted after the expelling of oil from oil seeds, are used for numerous applications. When the oil seeds are crushed, oil is expelled during the process, which flows from the discharging end. The remaining coarse residue, which are left behind known as oil cakes. This gets discharged from the cake discharging end of the oil press. These oil cakes are collected as they are to be used for further solvent extraction. They also contain some toxic content, which has to be removed. Apart from this, they are used for various other purposes such as animal feed and fertilizers. For all these processes, the cakes need to be stored.

The storing area for oil cakes is, known as a Cake Silo.
A silo can be defined as a tall cylindrical structure, which is used to store a number of materials such as grain, cement, coal, saw dust, fodder, etc. in bulk. It is also used to store oil cakes, which are extracted from oil seeds. Oil cakes can be used for various

purposes after the removal of the toxic content in them. These are then collected and stored in Cake Silos, where these are kept for further processing and use. A silo can be round or conical in shape, and are available in various capacities and sizes. The oil cakes are loaded and unloaded into the silos with the help of the un loaders that are suspended into the silos and are supported with pulleys and are mounted on top of the silos. Although Silos are very helpful in storing various materials in bulk, they need utmost care in maintenance as they could be hazardous. If not maintained in a proper manner, it could lead to fire breakouts and other mishaps.

Types of Silos

A silo is of three different types**:**

- Tower Silo
- Bin Silo
- Bunker Silo.

These silos differ in shape and construction. Tower silos are cylindrical in structure, while Bunker silos are trenches with concrete walls. On the other hand, Bin silos are more like bags that are used to store the oil cakes. These can be sealed as per requirement. Silos are available at very inexpensive rates and can be loaded and unloaded easily with the use of conveyors and trucks. Some of the main features of Cake Silos are as follows:

- Strongly fabricated
- Ability to store oil cakes in bulk
- Available in large capacities, types, and sizes.

Self-Check.4	Written Test

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

Directions: Answer the questions listed below.

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

1. What does silo mean?
2. Write types of silo used for storing oil cakes?
3. The storing area for oil cakes is known as_____

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

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

Information Sheet-5: Following Policies and Procedures

5.1 Introduction

Workplace procedures and work instructions for integrated environmental work practices for own work areas are recognized, followed(recognize and follow mean that a person will acknowledge that environmental impacts, hazards and risks exist, and that they have a responsibility to work in a manner which will minimize the impact on the environment within the guidelines established by the workplace) and conveyed to team members. Relevant legislation, codes and national standards that impact on workplace environmental practices are recognized, conveyed to team members and followed.

5.2 Following Policies and procedures

Environmental policies may include waste minimization and management, sustainability, local, regional, State and National strategies on edible oil byproduct, protection of land and habitat and the conservation of resources, energy use, and greenhouse gas emissions, use of chemicals and equipment. Legislation, codes and national standards may be award and enterprise agreements, relevant environmental legislation from all levels of government, Ethiopian standards, international agreements and relevant industry codes of practice.

Existing and potential environmental risks and hazards are identified, reported to designated personnel like manager, supervisor, and people who are responsible for work area or who may be assigned to act as a mentor/trainer to a person under instruction and dealt with. Environmental risks and hazards could include spills, leaks, pollution, planned and unplanned emissions, accidents and disposal of waste, and damage or disruption to ecosystems resulting from work practices. Unauthorized changes in land use, fire risks and threats, and inappropriate human interaction on the environment. This may include damage to habitat resources, disruption of animal behavior and territorial use.

Environmental workplace procedures may include written procedures or work instructions for environmental hazard and risk identification, avoiding or minimizing environmental risks, improving environmental performance, waste minimization and segregation, environmental monitoring, signs and labels (e.g. chemical labels), emergency procedures, hazard and incident recording and reporting procedures, and environmental data recording and reporting procedures where applicable. Verbal instructions from persons with responsibility related to environmental work practices are also included in this definition. A report may be made verbally (face-to-face or through communication equipment) and in writing (notes, faxes, email or electronic messages).

- Location and extent of the potential environmental threat are accurately recorded.
- Reports on the potential environmental threat are completed according to enterprise guidelines.

Information is gathered and improvements are suggested to support the development of improved environmental workplace practices. Suggestions may be ideas to minimize hazards and risks, reduce waste, make more efficient use of resources and improve environmental performance, reduce soil disturbance and improve habitat resources. Environmental issues and their relationship to workplace practices are discussed in the workplace. Environmental issues are sustainability, reduction and disposal of waste, water quality, energy efficiency, biodiversity and habitat protection, conservation of natural resources, air quality, land contamination, noise, soil and salinity management, and fire management.

Changes to workplace approaches to environmental practices are responded to positively and promptly in accordance with enterprise requirements. Workplace approaches to environmental practices may be preventing and minimizing the production of pollution (e.g. discharges to air, land and water, hazardous waste, reducing 'burning off', recycling materials) and improving workplace maintenance practices (e.g. using a broom instead of a hose, using environment-friendly cleaning agents). Individuals/teams are informed of the results of environmental improvements in

the workplace. Environmental training needs of the work team are identified, and training is sought where required.

Self-Check .5	Written Test

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

Directions: Answer the questions listed below.

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

1. Workplace approaches to environmental practices may be preventing and minimizing the production of pollution.
2. Environmental policies in edible oil industry can include waste minimization and management.

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

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

Information Sheet-6: Loading Materials to Defatted Soybean

6.1 Introduction

Defatted soy flour and grits are the most elementary forms of high soy protein, yet they are the soy products used in the largest volume in foods. Products with minimum heat treatment are used directly for special purposes or for production of protein isolate. Soybean is a very versatile food and a rich source of essential nutrients, including protein, fat, dietary fiber, vitamins, minerals, soy saponins and is oflavones. Defatted soy flour is a potential source of food protein, amino acids, ash and is oflavones. The supercritical carbon dioxide and a traditional organic solvent extraction method were used to remove fat from soy flour, and the quality characteristics of control soy flour.

6.2 Loading defeated soybean

Container Loading/Unloading Procedures

Portable containers (drums, totes) of oils and oil-based products are generally delivered at the Facilities, Maintenance, and Construction (FMC). The drums are then taken directly to the point of use by hand cart or fork lift. Delivery to the FMC is through an overhead door leading to the drum storage area. These temporary staging locations are strategically located that in the event of a release during staging, release response equipment would be employed, and the release would be contained as close to the source as possible. Portable containers are loaded and unloaded using the following procedures:

- All containers must be closed and sealed prior to moving.
- No obstacles should block the unloading area or delivery paths.
- Safe lifting techniques must be used.
- Loads must not be stacked on the transport mechanism or vehicle in a manner that
- Blocks the operator’s vision.
- Heavy objects should be loaded at the bottom of a forklift, hand truck, or pallet jack.
- Bulky or awkward items should be secured while in transport.

- Only trained and authorized personnel are allowed to operate a forklift or use other
- Powered material-handling equipment.
- Containerized materials are stacked and stored properly in a stable and secure manner.

Self-Check.6	Written Test

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

Directions: Answer the questions listed below.

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

1. Write procedures of loading and unloading?

Note: **Satisfactory rating - 7 points** **Unsatisfactory – below 7 points**

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

LG # 51	LO #2 Operate and Monitor the Byproduct Production Process

Instruction sheet

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

- Monitoring defatted soybean process
- Identifying out-of-specification product
- Maintaining work area
- Monitoring equipment operation
- Identifying and reporting variation in equipment operation
- Conducting legislative Requirement
- Maintaining workplace documentation

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

- Monitor defatted soybean process
- Identify out-of-specification product
- Maintain work area
- Monitor equipment operation
- Identify and reporting variation in equipment operation
- Conduct legislative Requirement
- Maintaining workplace documentation

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Read the specific objectives of this Learning Guide.
3. Follow the instructions described below.
4. Read the information written in the information Sheets
5. Accomplish the Self-checks
6. Perform Operation Sheets
7. Do the “LAP test”

Information Sheet 1- Monitoring Defatted Soybean Process

1.1 Introduction

It is well known to defat soybeans by extraction with solvents such as hexane and to use the defatted protein containing residue in the preparation of various food products. Soy beans defatted commercially by the presently accepted art generally contains 1 to 5% total lipid and a residue of bound fat, principally phospho-lipid, amounting to about 1 percent or more. However, it is this residual bound fat that is responsible for much of the residual off-flavor or beaniness instability in the product.

1.2 Importance defatted soybean

Soy protein is nutritionally equivalent to animal proteins from egg, milk, fish and beef. The high fat content of soy flour may limit the extraction of proteins, amino acids and encourage the oxidation reaction that leads to rancidification, and produces off flavors with volatile compounds, makes them undesirable to consumers as well as shorter the shelf-life. After removing fat from soybeans, the remaining material is referred to as defatted soy flour that can use to produce high-protein, low-fat diet food and a promising protein source for the future. When used in food production, defatted soy flour has a range of attractive functional properties such as being solubility, water and oil absorption capacity, and emulsifying, swelling, gelling and foaming properties. In addition to high nutritional value, defeated soybean is widely available, highly digestible and inexpensive. The special formulas used for infants feeding, geriatric nutrition, postoperative diet, and other therapeutic diets that provide the complete nutrition.

1.3 Major kinds of soybean meal

Three main kinds of soybean meal are produced:

1.3.1 Full-fat soybean meal, made from whole soybeans.

It has a high metabolisable energy concentration. For example, metabolisable energy for swine in this product is about 3.69 mega calories i.e. 15.4 MJ per kg dry matter. Crude protein concentration is about 38 percent (as feed).This kind of product is sometimes fed to various classes of livestock.

1.3.2 Defatted soybean meal, containing no hulls.

This product has an intermediate energy concentration. For example, metabolisable energy for swine in this product is about 3.38 mega calories i.e. 14.1 MJ per kg dry matter. Crude protein concentration is about 48 percent. This percentage which is commonly used in describing the product is calculated at the typical as-fed moisture content of 88 percent. Thus, crude protein concentration expressed on a dry matter basis is 54 percent. This product is commonly fed to swine, broilers and layers.

1.3.3 Defatted soybean meal, containing soybean hulls.

The hulls are readily digestible by ruminant livestock. This product is often fed as a protein supplement for domestic ruminants. Ruminant-metabolisable energy concentration is about 3.0 megacalories i.e. about 12.5 MJ per kg dry matter and crude protein concentration is about 44 percent. The latter percentage which is commonly used in describing the product is calculated at the typical as-fed moisture content of 90 percent. Thus, crude protein concentration on a dry matter basis is 49 percent.[

1.4 Preparation of soybean flour

1.4.1 Defeating

To defeat the soybeans by organic solvent extraction, soybean seeds were first coarsely milled into soy grits with a pin mill. Then a batch approximately 500 gm of soy grits was immediately defatted in a custom built Soxhlet extractor using petroleum ether boiling range 40–60 °C with a sample-to-solvent ratio of 1: 4 for 6 hr. The defatted soy grits were left in a fume hood overnight to let the residual petroleum ether fully evaporate.

1.4.2 Oil press

Alternatively, whole soybeans were defatted by a single-screw oil press. During pressing, cooling was applied to maintain the temperature at 60 °C and thus avoid possible heat damage. The throughput of the press was 660 g soybeans per hour. The soybean oil was discarded and the defatted soy cake was collected for further use.

1.4.3 Milling

The defatted soy grits and soy cake were ground with an impact mill, at ambient room temperature. Classifier wheel speeds of 2000, 3000, 4000, and 6000 rpm were evaluated. The other milling parameters were as follows: impact mill speed of 8000 rpm, gas flow rate of 80 m^3/h, and feed rate of 2 rpm (circa 0.5 kg/h). The milling yield was calculated from the weight of the milled flour over the weight of the feed material. The milled flours were collected and stored in 4 °C before used.

1.5 Monitoring defatted soybean process

In the present invention dehulled, flaked raw soybeans are extracted with ethyl alcohol (95%) or equivalent polar solvent in order to release the phospholipids and other undesirable flavor-bearing lipids. The ethanol treated soybean flakes are then extracted with a succession or plurality of hexane rinses until substantially all of the fat has been removed. The defatted soybean flakes are de-solventized to remove the solvent by applying mild external heat initially at 40°C to 60°C.

Soybeans are cleaned, size-graded, exposed to circulating hot air (about 99° to 104°C) for approximately three minutes in order to remove a small amount of moisture from the soybeans causing the cotyledons to shrivel thus facilitating removal of the hulls by passing the soybeans through a properly spaced burr mill. The hulls are subsequently removed by passing the beans through an aspirator. The soybean cotyledons are then flaked by passing the beans through a properly adjusted roller mill.

The soybean flakes are then extracted with undiluted ethanol (95%). The ethanol can be applied in a stirred vat or by spraying onto the soybean flakes. A succession of 95% ethanol sprays can be used to extract substantially all of the ethanol extractable materials if so desired. The ethanol is then drained from the mixture thereby removing the ethanol soluble materials. If desired, residual ethanol can be recovered from the flakes by vacuum evaporation applying external heat at about 40°C - 60°C. The soybean flakes with or without residual ethanol are then extracted with a succession of

extraction steps utilizing hexane or its equivalent non-polar solvent as the extraction solvent until substantially all of the fat contained in the soybeans is removed.

A succession or plurality of hexane extractions is utilized to increasingly reduce the fat level of the soybean flakes at each extraction step. The hexane utilized in each extraction step can be recycled from the previous extraction step. However, the final hexane rinses must be essentially fat free as initially applied in order to remove the final one percent or less of fat from the soybean flakes. The final hexane extraction liquor can then be recycled as the initial hexane extraction rinse on following batches. The hexane extraction sprays or stirred-vat treatments prior to the final hexane rinse can contain minimal amounts of fat therein consistent with commercial practice. Standard techniques for removal of fat from the hexane after each extraction step can be utilized prior to recycling if too much fat accumulates in the extraction solvent.

The removal of the final one percent of fat from the soybean flakes is dependent upon the initial application of ethanol. Although the 95% ethanol begins to exert its effect as soon as it penetrates the flaked soybeans, it is desirable that the ethanol be applied for at least 15 minutes and preferably for up to one or two hours.

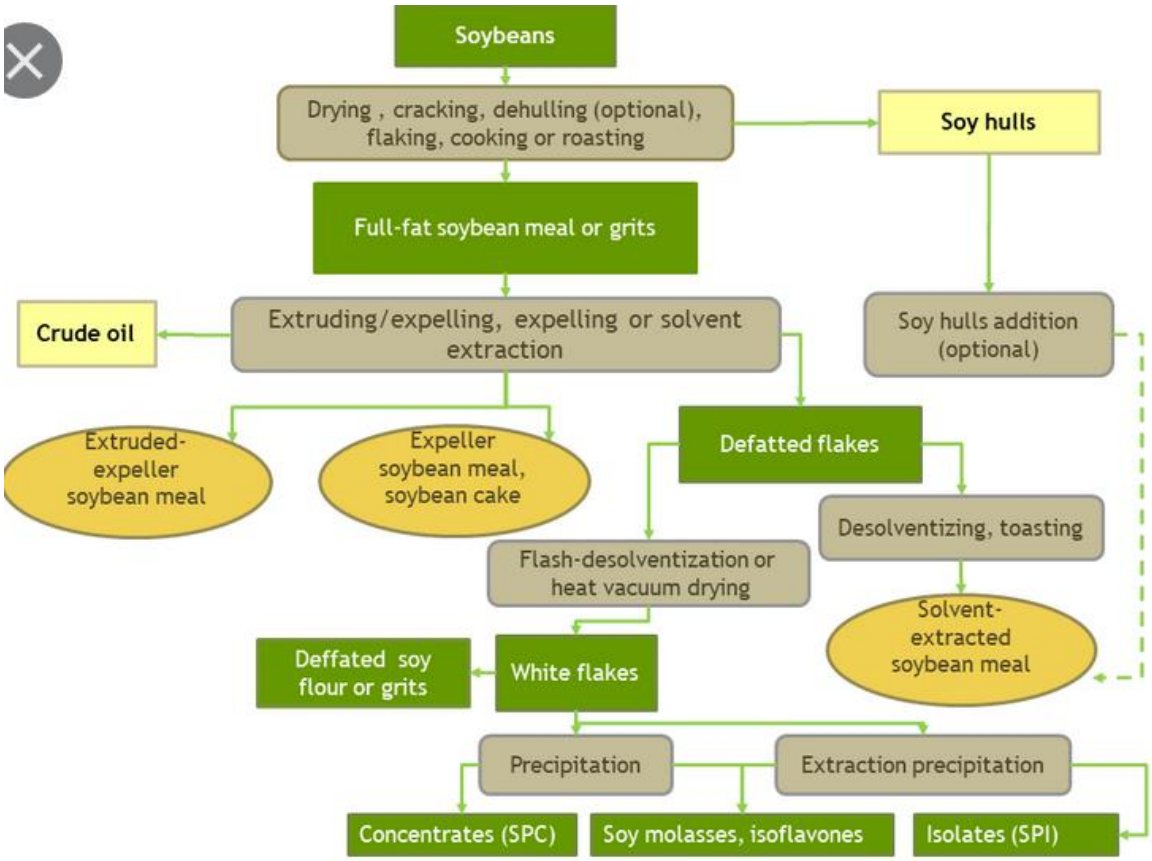

Figure 1 Defatted soybean process

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

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

1. Defatted soy flour and grits are the most elementary forms of high soy protein
2. The defatted soy grits and soy cake were ground with an impact mill, at ambient room temperature
3. The high fat content of soy flour may limit the extraction of proteins, amino acids and encourage the oxidation reaction that leads to rancidification

Test II: Short Answer Questions

1. Explain mechanism of releasing phospholipids? (5 points)
2. Write the functions of aspirator? (5 pts)
3. Write down the importance of defatted soybean? (5 pts)

Note: **Satisfactory rating - 20 points** **Unsatisfactory - below 20 points**

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

2.1 Out of specification products

The term out of specifications, are defined as those results of in process or finished product testing, which falling out of specified limits. The out of specifications (OOS), may arise due to deviations in product manufacturing process, errors in testing procedure, or due to malfunctioning of analytical equipment. When an out of specifications (OOS) has arrived, a root cause analysis has to be performed to investigate the cause for OOS. The reasons for OOS can be classified as assignable and non-assignable. When the limits are not in specified limits called out of specifications. When OOS has occurred, the analyst should inform to quality control (QC) manager. Each out of specification will be identified with a unique identification number.

E.g.: OOS/RM-001/2020.

Where, OOS out of specification

RM -raw material (department)

001 -OOS for that year 2020Year.

2.2 The OOS investigation phases

The OOS investigation involves 2 phases.

2.2.1 Phase I: (laboratory investigation)

The purpose of the laboratory investigation is to identify the cause for OOS result. The reason for the OOS may be defect in measurement process or in manufacturing process. Irrespective of the rejection of batches, the OOS results must investigate for their trend. The investigation can be done to only those batches that are resulted in OOS, or also to other batches and even other products associated with OOS. The OOS investigation should be thorough, timely, unbiased, well documented and scientifically sound.

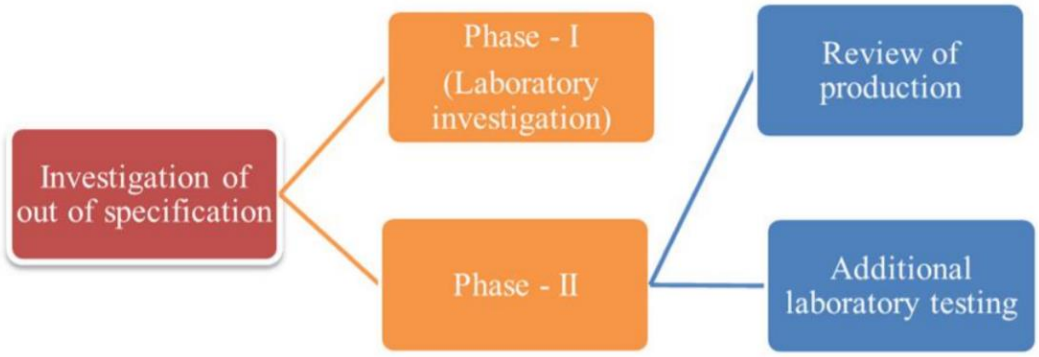

Figure 2 Investigation of out of specification result

2.2.2 Phase II investigation

When there is no possible outcome has obtained from the phase I investigation, the phase II investigation should be commenced in context to investigate the errors occurred in manufacturing processes, sampling procedures along with other additional laboratory testing.

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Define out of specification products? (5 points)
2. Write out of specification investigation phases? (5 points)

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**

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

Information Sheet 3- Maintaining Work Area

3.1 Maintaining work place

The work environment, facilities and amenities are required to be maintained in a safe and healthy condition, and need to be hygienic, secure and in a serviceable condition. This includes replenishment of consumables, repair of broken or damaged furnishings and equipment and ensuing cleanliness of these areas.

Steps to Creating and Maintaining a Safe Workplace

- Eliminate potential hazards.
- Make sure all workers are properly trained.
- Ensure workers have the proper equipment.
- Provide visual safety aids and messages.
- Create a safety committee and hold monthly safety meetings.
- Make safety fun.

3.2 Work layout

The layout of the workplace is required to allow persons to enter and exit the workplace and move within safely, both under normal work conditions and in an emergency.

- **Entry and exit**

Entries and exits are required to be safe to allow impeded access and egress for all workers, students and visitors including those with special needs.

3.3 Work areas

The layout of the work area should be designed to provide sufficient clear space between machines, fixtures and fittings so workers can move freely without strain or injury also evacuate quickly in case of an emergency. In determining how much space is required, the following should be considered:

- The physical actions needed to perform the task
- The need to move around while working
- Whether the task is to be performed from a sitting or standing position

- Access to workstations
- The equipment to be handled and the personal protective equipment that may be worn to perform the work.
- Environmental factors including heat or noise may require an increase to the space, as will work activities that involve manual tasks or the use of equipment.

3.3.1 Floors and other surfaces

Floor surfaces shall be suitable for the work area and be chosen based on the type of work being carried out at the workplace, as well as the materials used during the work process, the likelihood of spills and other contaminants, including dust, chemicals, and the need for cleaning.

3.3.2 Lighting

Sufficient lighting is required to allow safe movement around the workplace and to allow workers to perform their job without having to adopt awkward postures or strain their eyes to see. Emergency lighting is to be provided for the safe evacuation of people in the event of an emergency.

The following factors are to be taken into account:

- The nature of the work activity
- The nature of hazards and risks in the workplace
- The work environment
- Illumination levels, including both natural and artificial light
- The transition of natural light over the day
- Glare Workplace Environment Guidelines
- Contrast
- Reflections.

3.3.3 Air quality

Workplace are to be adequately ventilated which includes provision of fresh, clean air drawn from outside the workplace, uncontaminated from flues or other outlets and be

circulated through the workplace. Workplace inside buildings may have natural ventilation, mechanical ventilation or air conditioning.

3.3.4 Heat and cold

Refer to the Thermal Comfort Guidelines for further information on managing health and safety risks associated to hot and cold environments

3.3.5 Welfare facilities

Workers, including those who have particular needs or disabilities, must have access to the facilities provided.

Workers are to be provided with:

- Adequate breaks to use the facilities
- Facilities which are within a reasonable distance from the work area
- Shift workers have similar access to those who work during the day
- A means of access which is safe.

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer

1. Mention welfare facilities should be fulfilled in the work area? (5 points)
2. What the types of work place? (5 pts)
3. Write at list three items that a work environment, facilities and amenities are provided for basic health and welfare of employees, contractors and visitors? (5pts)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**
You can ask you teacher for the copy of the correct answers.

4.1 Monitoring Equipment Operation

Defatted Soybean Process equipments include the following:

- Screw conveyor
- Cake crusher
- Cake cooler
- Air aspirator
- Cooled Cake bin
- Balance
- Defatted soy bean mill machine

4.1.1 Screw conveyor

Screw conveyor conveys the seeds through the press cage and against the cage bars. The action of the seeds being conveyed against the cage bars squeezes the oil out of the meal. When the meal reaches the end, the cake falls out and is conveyed to the next process.

Figure 3 Screw conveyer

The most common areas for monitoring screw conveyer include:

- Bearing temperature,
- Speed / motion, level / plug indication and
- Door / gate position

4.1.2 Cake crusher

Figure 4 Cake crusher

- **Cake cooler**

The task of the cooler is to guarantee the prevention of protein de-naturation in the meal. Remove heat and vapor from extruded meal products prior to storage.

Figure 5 Cake cooler

Self-Check – 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write function of screw conveyer? (5 points)
2. Mention the main defatted Soybean Process equipments? (5 points)
3. Write the function of cooler? (5 points)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

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

5.1 Identifying variation in equipment operation

5.1.1 Techniques of identifying equipment variations

- Assessing quality of received components, parts or materials
- Continuously checking received components, parts, materials, information, service or final products against workplace standards and specifications for conformance
- Demonstrating an understanding of how the received components, parts or materials, information or service relate to the current operation and how they contribute to the final quality of the product or service
- Identifying and isolate faulty components, parts, materials or information that relate to the operator's work
- Recording and/or report faults and any identified causes in accordance with workplace procedures.
- Following machine manufacturers manual

5.1.2 Steps of corrective action in response to variations

- **Define the Problem**

Take time to adequately define the problem (who, what, when, why, where, how much and how often).

- **Interim Actions**

Once a problem as been detected, the first priority should be to contain the problem, and prevent shipment to the customer. If already shipped, the customer needs to be notified to prevent further liability.

- **Root Cause Analysis**

The key to resolving a problem is identifying the true root cause. There may be several underlying causes, a new operator, a change in procedure, or another 'rush job' circumventing the system. This is why it is important to find the root cause of the issue and define a permanent solution.

- **Permanent Actions**

The process should be reviewed to arrive at a solution for correcting the root cause. This review should engage the 7 basic quality tools. The solution may involve longer term planning, requiring milestone dates, capital justification, training, and/or approval from the customer. It is good to review progress in management review to assure accountability after the Interim Actions have 'stopped the bleeding'.

- **Verification**

Checkpoints in the process should be created to verify effectiveness. This could be accomplished by inspection, internal audits, and/or measurement.

- **Control**

If mistake proofing was not part of the solution, then a measurement to detect the root cause early should become part of the system. A procedural change should become part of the system by updating the work instruction and training for accountability. Consider putting a reaction plan in place should the problem reoccur.

- **Prevention**

Very few organizations reach this step. For example, all the above steps are completed, yet the problem returns 6 months later. Perhaps, a new operator shows up who may have been qualified through 'On-the Job' training without verification of their competency. Or the filter was replaced as part of the solution, but it is dirty again and hasn't been placed on the Preventive Maintenance schedule.

Self-Check – 5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What are the techniques used in identifying equipment variations? (5pts)
2. Mention some techniques of identifying equipment variations? (5 points)

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

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

Information Sheet 6- Conducting legislative Requirement

6.1 Legislative requirements

A person conducting a business or undertaking at a workplace must ensure so far as is reasonably practicable, the following:

- The layout of the workplace allows, and the workplace is maintained so as to allow, for persons to enter and exit and to move about without risk to health and safety, both under normal working conditions and in an emergency,
- Work areas have space for work to be carried out without risk to health and safety,
- Floors and other surfaces are designed, installed and maintained to allow work to be carried out without risk to health and safety,
- Lighting enables:
  - ✓ Each worker to carry out work without risk to health and safety, and
  - ✓ Persons to move within the workplace without risk to health and safety, and
  - ✓ Safe evacuation in an emergency,
- Ventilation enables workers to carry out work without risk to health and safety,
- Workers carrying out work in extremes of heat or cold are able to carry out work without risk to health and safety,
- Work in relation to or near essential services does not give rise to a risk to the health and safety of persons at the workplace.

Ethiopian food standard code

- Mandatory by-product standard
- weights and measures legislation
- EFDA (Ethiopian Food and Drug Authority) legislation
- Environmental management (Ethiopian Environmental Protection Authority) legislation of OHS environmental management (Ethiopian Environmental Protection Authority)

Self-Check – 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write legislative requirements that the person who conducting a business? (5 points)
2. Mention Ethiopian food standard codes? (5 points)

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

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

Information Sheet 7- Maintaining Work Place Documentation

7.1 Maintain Workplace documentation

Workplace documentation include to:

- Specifications
- manufacturing formulae
- processing instructions
- continuous production records
- Standard Operating Procedures (SOPs)
- OHS information, including Material Safety Data Sheets (MSDS)

7.2 Standard Operating Procedure (SOP)

What is a Standard Operating Procedure (SOP)?

SOP is a set of written instructions that document a routine or repetitive activity followed by an organization. The development and use of SOPs are an integral part of a successful quality system as it provides individuals with the information to perform a job properly, and facilitates consistency in the quality and integrity of a product or end-result.

An SOP is a procedure specific to your operation that describes the activities necessary to complete tasks in accordance with industry regulations, provincial laws or even just your own standards for running your business. Any document that is a “how to” falls into the category of procedures. In a manufacturing environment, the most obvious example of an SOP is the step by step production line procedures used to make products as well train staff. An SOP, in fact, defines expected practices in all businesses where quality standards exist. SOPs play an important role in your small business. SOPs are policies, procedures and standards you need in the operations, marketing and administration disciplines within your business to ensure success.

These can create:

- efficiencies, and therefore profitability
- consistency and reliability in production and service
- fewer errors in all areas
- a way to resolve conflicts between partners
- a healthy and safe environment
- protection of employers in areas of potential liability and personnel matters
- a roadmap for how to resolve issues – and the removal of emotion from troubleshooting – allowing needed focus on solving the problem
- a first line of defense in any inspection, whether it be by a regulatory body, a partner or potential partner, a client, or a firm conducting due diligence for a possible purchase
- value added to your business should you ever wish to sell it

Benefits of standard operating procedures (SOP)

The development and use of SOPs minimizes variation and promotes quality through consistent implementation of a process or procedure within the organization, even if there are temporary or permanent personnel changes. SOPs can indicate compliance with organizational and governmental requirements and can be used as a part of a personnel training program, since they should provide detailed work instructions. It minimizes opportunities for miscommunication and can address safety concerns. When historical data are being evaluated for current use, SOPs can also be valuable for reconstructing project activities when no other references are available.

In addition, SOPs are frequently used as checklists by inspectors when auditing procedures. Ultimately, the benefits of a valid SOP are reduced work effort, along with improved comparability, credibility, and legal defensibility.

7.3 Materials Safety Data Sheets (MSDS)

A material safety data sheet is a technical document which provides detailed and comprehensive information on a controlled product related to:

- Health effects of exposure to the product
- Hazard evaluation related to the product's handling, storage or use
- Measure to protect workers at risk of exposure
- Emergency procedures.

The data sheet may be written, printed or otherwise expressed, and must meet the availability, design and content requirements of WHMIS legislation. The legislation provides for flexibility of design and wording but requires that a minimum number of categories of information be completed and that all hazardous ingredients meeting certain criteria be listed subject to exemptions granted under the hazardous materials information review act.

Self-Check – 7	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is standard operating procedures (5pts)
2. Write benefits of SOP? (5pts)
3. Define material safety data sheet? (5pts)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10points**

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

Operation Sheet – 1 Procedures of Processing Defatted Soybean

Sequence of processing defatted soybean

1. Wear personal protective equipments
2. Prepare materials and equipments
3. Receive defatted flakes
4. Flash de-solventize or dry with vacuum at 40 to 60°C
5. Precipitate to get concentrate protein and soy molasses
6. Record the process

Operation Sheet – 2 Steps of Clean and Sanitize Equipments

Sequence of cleaning and sanitizing equipments

1. Wear personal protective equipments
2. Prepare cleaning materials and detergents
3. Un plug power
4. Dismantle or open the equipment
5. Disconnect lines
6. Remove waste with brush, shovel, broom, or other appropriate tool
7. Rinse surfaces to be cleaned with water
8. Clean surfaces with hot water with an added detergent
9. Use cleaning aids, such as high pressure or brushes, to remove tenacious deposits
10. Complete the cleaning by thoroughly flushing with hot water to remove detergent residues
11. Rinse with cold water to cool equipment below 27 °C (80 °F).
12. Allow equipment to drain and air dry
13. Record cleaning process

LAP TEST	Performance Test

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **4:00** hour. The project is expected from each student to do it.

Task-1 Process defatted soybean
Task-2 Clean and sanitize equipments

LG # 52	LO #3 Shut Down the Mechanical Extraction Process

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics: • Shutting down process • Identifying and Reporting maintenance requirements This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to**: • Shutting down process • Identifying and Reporting maintenance requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Read the specific objectives of this Learning Guide.
3. Follow the instructions described below.
4. Read the information written in the information Sheets
5. Accomplish the Self-checks
6. Perform Operation Sheets
7. Do the “LAP test”

5.2 Introduction

The shut-down procedure is just as important as the start-up procedure for an extruder. By properly shutting down defatted mill equipment, the start-up will be much quicker and most effective. Shut down the line can have a major impact on your capacity to restart production promptly. In an upcoming article, we will help you restart your machinery, taking the best steps and precautions.

5.3 Shutting down process

In mechanical defatted soy bean extraction process, oil extraction equipment such as Screw conveyor, Cake crushes, Cake cooler, Air aspirator, Cooled Cake bin are shut down after finishing product manufacturing.

Shutdown procedure may include:

- The appropriate shutdown procedure is identified.
- The process is shut down according to shutdown procedures.
- Maintenance requirements are identified and reported according to workplace reporting requirements.

During hydraulic press operation, after extracting the oil and separating the by-product (cake or meal) you have to shut down the extraction process. These processes are:

- First switch off power
- Un-plug power socket
- Clean external parts
- Clean internal parts like, screw or barrel
- If maintenance is needed, check all parts, tied bolts.

Self-Check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write down shut down procedure? (5 points)
2. Mention shut down process? (5 points)

Note: **Satisfactory rating - 20 points** **Unsatisfactory - below 20 points**

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

Information Sheet 2- Identifying and Reporting Maintenance Requirements

3.1 Introduction

Maintenance can be defined as working on something to keep it in a functioning and safe state and preserving it from failure or decline. Maintenance procedures are written instructions that, when followed by the maintenance personnel, will ensure that equipment operates as designed within safe operating limits.

Maintenance may include:

- Cleaning,
- Lubricating,
- Tightening
- Simple tool repairs and adjustments.

3.2 Types of maintenance

3.2.1 Preventive or proactive maintenance: is carried out to keep something functional. This type of activity is usually planned and scheduled.

3.2.2 Corrective or reactive maintenance: is repairing something to get it working again. This is an unscheduled, unplanned task, usually associated with greater hazards and higher risk levels.

3.3 Routine maintenance tasks

Routine maintenance tasks refer to:

On-going scheduled tasks that are performed in order to keep hand tools and basic equipment functioning properly.

It could include tasks such as

- unblocking pipes and nozzles,
- sharpening blunt tools,
- cleaning nozzles on sprayers,
- checking, cables and plugs

Some tips on routine maintenance:

- Use the correct tool for the job.

- Keep tools in good condition.
- Handles should be tight and free from defect.
- Cutting tools should be kept sharp.
- Use and maintain power tools according to their operator instructions.
- Make sure power tools are properly grounded or are double insulated.
- Switch off and unplug power tools before changing blades or servicing and repairing.
- Wear clothing that is free of strings or loose ends that could catch.
- Wear appropriate personal protective equipment (PPE), such as glasses, goggles, dust masks, face shields, hearing protection, etc.
- Keep all guards and shields in place.
- Unplug and store tools after use.
- Consider keeping power tools locked up to prevent unauthorized use.

Table.0.1 maintenance check list

	Tool	Yes	No	Remark
1	Are tools in safe condition?			
2	Are instruction manuals available?			
3	Are power tools properly grounded?			
4	Are guards and shields in place?			
5	Is Personal Protective Equipment available?			
6	Are tools properly stored?			

If necessary:

- Tighten nuts and bolts.
- Smooth off splinters and sharp points.
- Tighten shafts.
- Unblock pipes and nozzles.
- Sharpen blunt tools.

3.4 Reporting faults and problems:

Every work shop has a different maintenance schedule and it is important that you are familiar with the schedule implemented on the work shop where you work. There will usually be a routine schedule for particular tools that states how often maintenance checks have to be performed. These will also specify the checks that have to be performed. Some tools may require daily checks and maintenance after use. A maintenance schedule assigns a specific date to specific maintenance tasks. It states what has to be checked and will require that the assigned person signs off the document assuring that the checks were done. If faults are found, the tool must be sent for maintenance and the assigned person that fixes the tool has to report on exactly what was done and when it was completed.

Table.2 Maintenance schedule

Date	**Tool/equipment**	**Maintenance check points**	**Signature**	**Maintenance required**	**Signature**

Maintenance Performed	Date	**Signature**
Splinters shaved off		

3.1 Perform safe maintenance

Do maintenance safely:

- Always disconnect powered tools before servicing, adjusting, oiling, cleaning or repairing them, sharpening or changing accessories such as blades.
- Follow the manufacturer's instructions in user's manual for maintenance and servicing (e.g. lubrication, cleaning) and changing parts and accessories.
- Use appropriate tools and equipment while carrying out maintenance
- When maintenance is complete workers have to check if the maintenance has left the portable tools in a safe and functioning condition:
- Test the functionality of the tool
- Replace all guards and safety devices
- Record your inspection and actions, sign out and pass the tool to the worker or store it safely

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Define the two types of maintenance (5pts)
2. How do perform maintenance safely? (10pts)
3. Define maintenance and write what maintenance may include. (5pts)

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**

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

Operation Sheet – 1 Steps of Shutting Down the Defatted Soybean Extruder

Sequence of shutting down the defatted soybean extruder

1. Wear personal protective equipments
2. Switch off power
3. Un-plug power socket
4. Shut down compressor
5. lockout hazardous energy sources
6. Shutdown specific components to be serviced or maintained
7. Clean external and internal parts like, screw or barrel
8. Record the process

LAP TEST	Performance Test

Name……. ID……..
Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1:00** hour. The project is expected from each student to do it.

Task-1 Shut down defatted soybean extraction machine

Reference Materials

Book:

- Troy W. Crowea and Lawrence A. Johnsona, (2001), Department of Food Science and Human Nutrition and bCenter for Crops Utilization Research, Iowa State University, Ames, IA 50011
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WEB ADDRESSES

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

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