9

TLE – Industrial Arts:

Electrical Installation and Maintenance

Quarter 1 – Module 7

Lubricating Electric and Hydraulic Tools

(Week 7)

DepED
DEPARTMENT OF EDUCATION

What I Need to Know

This module was designed to guide you in maintaining electric and hydraulic tools.

This will lead you in selecting the proper lubricating materials and the safety precautions in the process of lubrication

In this lesson, you will be guided on how to:

- lubricate Power and Hydraulic Tools;
- select the right lubricating materials; and
- follow safety procedures in lubricating tools

What I Know

Please do not forget to write the following in your answer sheet:

Name: _____ Yr. & Section: _____

Yr. Level & Subject (Specialization): _____ Module No: _____

Name of the Activity (e.g., What I know) _____ Date: _____

Multiple Choice

Directions: Read each statement carefully. Write the letter of your correct answer in your answer sheet.

1. It is used without the safety alert symbol indicating a potentially hazardous situation which, if not avoided, may result in property damage.

A. 

C. 

B. 

D. 

2. It indicates an imminently hazardous situation which, if not avoided, may result in death or serious injury.

A. 

C. 

B. 

D. 

3. It indicates a potentially hazardous situation which, if not avoided, may result in minor or serious injury.

A. 

C. 

B. 

D. 

4. It is a symbol for reading and understanding the instruction manual.

A. 

C. 

B. 

D. 

5. It is a sign for prohibition.

A. 

C. 

B. 

D. 

6. It is used to clean upholstery and other furniture.

A. diesoline B. gasoline C. kerosene D. soap and water

7. It is used to wash out spilled paint on the floors and walls as well as on the tools/ equipment.

A. gasoline B. kerosene C. soap and water D. thinner

8. It is used to wash out oil, and grease from tools and equipment.

A. gasoline B. kerosene C. soap and water D. thinner

9. It is used to clean oil engine, transmission, and other parts of the vehicle.

A. gasoline B. kerosene C. Diesoline D. thinner

1o. It is used to remove dust, grease and oil.

A. gasoline B. kerosene C. soap and water D. thinner

What's In

If you take care of your tools, they will return the favor. Proper care and routine maintenance of your power and hydraulic tools makes any home improvement or repair project easier, safer and more successful. Proper tool care also saves you money because the better they're cared for, the longer they'll last. Power tools such as electric drills, saws, electric grinder, hydraulic pipe bender, etc. need routine maintenance just like your hand tools. Because of their mechanical and electrical parts, power tools are more susceptible to problems caused by poor maintenance, dust and debris accumulation and general malfunction.

What's New

Lubrication

The following features contribute to safety and economic lubricating machine tools:

1. Plates on machines clearly show the grades of lubricant, quantities and intervals are required. The machine name, type, and model should be visible.
2. Maintain the proper level of lubrication reservoirs.
3. Suitable methods of lubrication should be followed to minimize or prevent metal–to–metal contact at all times.
4. Sufficient lubricant capacity is needed to prevent overheating and thermal distortion of machine tool structures.
5. Adequate sealing should be properly observed. Install provision for removal of contaminants collected by the lubricant (e.g., filters).

Types of Lubricant

1. Liquid
2. Solid
3. Grease
4. Paste

- **Liquid lubricant.** A lanolin or natural water repellent lanolin is derived from wool grease and a safe alternative of those common petrochemical based lubricants. These lubricants are also preventive agents against corrosion.
- **Water**. It can also be used as a major component aside from other based oils.
- **Vegetable oils**. These are primarily derived from plants and animals.

Purpose of Lubricating:

Lubricating performs the following key functions:

- Keeps movable part apart
- Reduces friction
- Transfers heat
- Carries away contaminant and debris
- Transmits power
- Protects against wear
- Prevents corrosion

MANUAL OF SPECIFICATION

Instructional manual is a booklet which serves as a user guide in knowing desirable and undesirable feature of certain product such as electrically operated equipment devices and appliances. Information in the instructional manual typically includes:

- *Safety instruction* which includes warnings and precaution in using the product.
- *Assembly instruction* for dismantling and case of repair.
- *Set up instructions* for devices that keep track of time or which maintain user accessible state.
- *Normal usage instruction* for obtaining usual features.
- *Maintenance instruction* for long life use
- *Troubleshooting guide* for separation and maintenance

- *Service location* which contains the location of the factory and the authorized technician to be consulted.
- *Regulatory code* compliance information for approval of regulatory standards.
- *Warranty information* for some agreement and conditions set by the company.

Safety Symbols

Your power tool and its owner's manual may contain "WARNING ICONS" (a picture symbol intended to alert you to, and/or instruct you on how to avoid a potentially hazardous condition). Understanding and heeding these symbols will help you operate your tool better and safer.

SYMBOLS:	MEANING:
	**Safety Alert** (Potential Personal Injury Hazards)
	**PROHIBITION**
	**DANGER**: It indicates an imminently hazardous situation which if not avoided, may result in serious injury or death.
	**WARNING**: It indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	**CAUTION**: It indicates a potentially hazardous situation which if not avoided, may result in minor or major injury.
	**CAUTION**: It indicates a potentially hazardous situation which if not

avoided, may result in property damage.

WEAR EYE PROTECTION

Read and Understand Instruction Manual

BASIC LUBRICATION

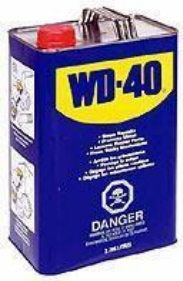
The function of a lubricant is simple. It reduces friction between moving metal surfaces. A lubricant coats surfaces and resists being displaced by the pressure keeping the metal parts separated. Lubricants also prevent corrosion, block contaminants and can serve as a coolant. A good lubricant flows easily under pressure and remains in contact with moving surfaces. It does not leak out from gravitational or centrifugal forces nor does it stiffen in cold temperatures.

There are several types of lubricants:

- **Oils** cover a broad class of fluid lubricants which has particular physical properties and characteristics. Petroleum oils (mineral oils) are made from naphthenic or paraffinic oils. Naphthenic oils contain little wax and their low pour point makes them good lubricants for most applications. Paraffinic oils, on the other hand, are very waxy, which makes them useful for hydraulic equipment and other machineries.
- Ideal for lubricating bearings, gaskets, seals and other moving parts, **greases** consist of an oil or synthetic fluid (~80%), a thickening agent (~10%) and additives (~10%). The consistency of greases is usually ranked by their relative hardness on a scale set by the National Lubricating Grease Institute (NLGI). The softest greases are rated at 000 (which is a flowing liquid) with higher numbers indicating harder grease. Most grease falls in the range between 1 and 4.
- **Solid lubricants** are usually fine powders, such as Molybdenum Disulfide (Moly), graphite and Teflon® (PTFE). They can be used alone, or as additives in grease or dispersions, or as dry film bonded lubricants. Lubricating solids can last longer than unfortified oils and greases because of their ability to form burnished films on surfaces.

- **Rust remover** is used mainly to dissolve rust. It is also used

as an excellent cleaner. For example, to remove a rusted bolt, spray remover directly on the bolt, wait for approximately five minutes; and unscrew. For a bicycle chain, apply the rust remover to clean the chain, and then apply a thick lubricant (oil or PL-100). *WD-40* and *Release All* are two of the many brands of rust removers on the market.



- **Dry lubricant** is a product that, although greasy when applied, dries in a few minutes and leaves a protective film. Since it dries rapidly, it doesn't attract dust, so there is no mess. This is why it is recommended to be used on rubber, car door gaskets, handsaws, mitre saw, saw sliders, window sashes, etc. It can also be used on balky wooden drawers, but cabinet makers usually prefer floor wax because it is more durable. JIG-A-LOO is the common brand of a dry lubricant

Locksmiths also use a dry lubricant, graphite, to free stuck door locks. This product, commonly found in stores, should be applied sparingly into the keyhole, as it is very messy. Graphite lubricant is composed of a fine black powder that no cleaner can remove, so it is wise to protect the door when graphite is applied.

- **Penetrating lubricant.** Its lubricating properties persist even after having removed residues, as it penetrates into metal. It is ideal for door hinges, even the fridge, hard to open pliers, ski bindings, and as it does not hold dirt and dust. The PL-100 is thick and very efficient.

- **Synthetic lubricants** cover a broad category of oils, greases, and pastes of varied properties. Synthetic lubricants are more inert, generate less waste, are capable of a wider range of temperatures and have a longer life than petroleum materials. They are even applicable to elastomers, seals and O-rings.
- Synthetic oils are used to lubricate instrument bearings, hydraulics, air compressors, gas and steam turbines, and other applications. They have excellent viscosity-temperature characteristics, good resistance to oxidation and an extremely wide operating temperature range.

- Synthetic greases can last a lifetime, making them very cost-effective. They are chemically inert, and their high thermal stability makes them useful for aerospace, electrical, automotive and other high-tech or industrial applications. Some of these lubricants keep their viscosity in temperatures ranging as high as 550° F and are nonflammable up to 1,200° F.

Silicones are very stable and very inert lubricants, which provide a wider range of operating temperatures than non-silicone synthetic lubricants. Other advantages include water repulsion and electrical insulation. Flourosilicones have a higher resistance to harsh environments and the ability to carry bearing loads.

Lubricant manufacturers can provide technical data sheets on their products to advise you on the best applications of each type of lubricant.

Kinds, Uses, and Properties of Cleaning Solvents

Kinds of Cleaning Solvents

Solutions are homogeneous mixture of two or more components; can be gaseous, liquid, or solid. When we speak of a solution, we usually think of a solid dissolved in water. While water is the most common solvent, other liquids are frequently employed as solvents for certain substances – for example wax may be dissolved in gasoline. The dissolved material in a solution is termed as solute (e.g. wax) while the dissolving medium is called solvent (e.g. gasoline). However, the term can be interchanged depending on which substance is of greater amount.

Solvent is a component of a solution that dissolves solute and is usually present in large proportions or amounts. It can be classified as polar or nonpolar. Polar solvents are solvents which dissolve or are soluble in water; while nonpolar solvents are solvents which do not dissolve or are insoluble in water.

Solvents that are usually used for cleaning in automotive shops are water, gasoline, kerosene, thinner and detergent soap.

The table below shows the kinds of cleaning solvent based on their solubility in water.

Cleaning Solvents	Solubility in Water	Polar	Nonpolar
a. water	soluble	x	
b. gasoline	insoluble		X
c. kerosene	insoluble		X
d. thinner	insoluble		x
e. detergent soap	soluble	x	

Uses of Cleaning Solvents

Cleaning Solvents		Uses
1. Gasoline	-	It is used to wash oil/greasy tools/ equipment.
2. Diesoline	-	It is used to wash oil engines, transmission, and other parts of the vehicle.
3. Kerosene	-	It is used to remove dust, grease oil, and paint.
4. Thinner	-	It is used to remove spilled paint on the floor, walls and tools.
5. Soap and water	-	It is used to wash, clean upholstered furniture such as seats, tables, cabinets.

Occupational Health and Safety Practices in Handling Cleaning Solvents

Disregarding the basic precautionary measures could lead to eye injury and cuts in using cleaning solvents. You should never use compressed air to clean your clothes, hands or body. The pressure can cause the cleaning solvents and dirt particles to penetrate your skin, resulting in infection and /or blood poisoning.

Do not use compressed air to clean an object immediately after it has been removed from a hot cleaning tank. Rinse the cleaning solvents away with water. Do not use carbon tetrachloride as a cleaning solution. The fumes, when inhaled, can cause serious internal injury and possibly result in death. When steam-cleaning, place the object to be cleaned on a pallet and wear a face shield and rubber gloves for protection against loose debris.

If a job or cleaning task requires the use of gloves, use the appropriate gloves. If you have cut, nicked, or burned yourself, or something has got into your eyes, report immediately to the first-aid person.
Keep all inflammable cleaning solvents in closed tin containers and whenever possible, store them in a separate area.

5S (METHODOLOGY)

5S is a reference to a list of five Japanese words translated into English. It is a method of organizing a workplace, especially shared workplaces (like a shop floor or an office space, even in school). It is sometimes referred to as a housekeeping methodology; however, this characterization can be misleading because organizing a workplace goes beyond housekeeping.

The key targets of 5S are workplace morale and efficiency. The assertion of 5S is that time must not be wasted. Additionally, it is quickly obvious when something is missing from its designated location. 5S advocates believe the benefits of this methodology come from deciding ***what*** should be kept, ***where*** it should be kept, and ***how*** it should be kept. This decision-making process usually comes from a concept of standardization which builds a clear understanding, among employees how work should be done.

The 5S's stands for:

1. **SEIRI: SORT (CLEAN UP).**
   This is the first in the 5S program.

   "**Sorting" means to sort everything in each work area**. Keep only what is necessary. Put in a separate storage area materials/tools that are not frequently used and discard the ones that are no longer functional.

   Sorting is the first step in making the work area tidy. It makes it easier to find the things you need. In the sorting process, you can eliminate broken equipment and tools. It frees up additional space when we discard the things that we no longer need.

   Obsolete fixtures, molds, jigs, scrap material, waste and other unused items/materials are disposed of.

2. **SEITON**: **SET IN ORDER (ORGANIZE)**
   This is the second step in the Five S program: Step two is to organize, to arrange or organize everything.

   Commonly used tools should be readily available. Storage areas, cabinets and shelves should be properly labeled. Always keep the floor clean and paint floors for you to make it easier to spot dirt, waste materials and scattered parts and tools. Outline areas on the floor to identify work areas, movement lanes, storage areas, finished product areas, etc. Put shadows on tool boards, making it easy to be located.

   In an office/school, there should be a designated area for bookshelves for frequently used manuals, books and catalogs. Label the shelves and books so that they can be easily found.

   The objective of this step is to put everything in the workplace and properly identify and label it.

   This means that there are two important parts to systematic organization. The first part is putting everything in its proper place and setting up a system so that it is easy to return each item to its proper place. The second part is where

good labeling and identification practices are important. Both the equipment/tools and materials you use, as well as their proper storage locations, need to be clearly identified and labeled.

3. SEISŌ: SWEEP (REGULAR CLEANING)

Step Three: requires you to do regular cleaning. Once you have everything from each individual work area up to your entire facility sorted (cleaned up) and organized, you need to keep it that condition. This requires regular cleaning or to go along with our third S, "shining" things up.

Regular, usually daily cleaning is needed, or everything will be returned to their original places. This can be done by regular inspection. While cleaning its needed also to inspect the machines, tools, equipment and supplies you work with.

Regular cleaning and inspection make it easy to spot lubricant leaks, equipment misalignment, breakage, missing tools and low levels of supplies. If these minor problems are not addressed, they can lead to a serious loss in production.

4. SEIKETSU: STANDARDIZE (SIMPLIFY)

Step Four: is to simplify and standardize our actions so that it will be a habit in our routine.
The good practices developed in steps 1 through 3 should be standardized and made easy to accomplish. Develop a work structure that will support the new practices and make them into habits. As you learn more, update and modify the standards to make the process simpler and easier.
One of the hardest steps is **avoiding old work habits**. It is easy to slip back into what you have been doing for years. It gives comfort most of the time for this is part of your habit. Use standards to help people work into new habits that are a part of your Five S program.

Use labels, signages and banners in the workplace to make people aware of the standards being observed.

5. SHITSUKE: SUSTAIN

Step Five: The final step is to continue training and maintaining the standards. Have a **formal system for monitoring the results** of your 5S program. Constant monitoring is crucial at this stage.

Continue to educate people about maintaining standards. When there are changes - such as new equipment, new products, new work rules - that will affect your Five S program, make the necessary adjustments to accommodate

those changes. Make needed changes in the standards and provide training that addresses those changes.

Translations and modifications

Often in the west, alternative terms are used for the five S. These are *"Sort, Straighten, Shine, Systemize and Sustain". "Standardize"* is used as an alternative for *"Systemize"*. Sometimes *"Safety"* is included as 6th *S*.

- Clear out and Classify
- Clearing items no longer required
- Tagging items that may be required and storing away from workplace

- Configure
  - A specific place for specific items
  - "A place for everything and everything in its place"

- Clean and check
  - Identify the cleaning zones and establishing cleaning routines

- Conformity

- Custom and practice
  - Monitoring process adherence
  - Continually validating process
  - Customer satisfaction by doing scientific training to workers
  - Continually focus on man, machine, material and method

Alternative acronyms have also been introduced, such as **CANDO** (Cleanup, Arranging, Neatness, Discipline, and Ongoing improvement). Even though he refers to the ensemble practice as "5S" in his canonical work, **Hirano** prefers the terms Organization, Orderliness, Cleanliness, Standardized Cleanup, and Discipline because they are better translations than the alliterative approximations.

Practice Good Housekeeping

Good housekeeping is one of the surest ways to identify a safe workplace. You can tell how workers feel about safety just by looking at their housekeeping practices. Good housekeeping is not the result of cleaning up once a week or even once a day. It is the result of keeping cleaned-up all the time. It is an essential factor in a good safety program, promoting safety, health, production, and morale.

Whose responsibility is housekeeping? It is everyone's. Clean work areas and aisles help eliminate tripping hazards. Respecting "wet floor" signs and immediately cleaning up spills prevents slipping injuries. Keeping storage areas uncluttered reduces the chances of disease and fire as well as slips, trips, and falls. Accumulated debris can cause fires and clutter slows movement of personnel and equipment during fires.

Other housekeeping practices include keeping tools and equipment clean and in good shape or keeping hoses and cables or wires bundled when not in use. Broken glass should be picked up immediately with a broom and dustpan, and never with bare hands. Be aware of open cabinet drawers, electric wires, sharp corners, or protruding nails. Unsafe conditions should be addressed immediately.

How a workplace looks makes an impression of employees behavior at work. A visitor's first impression of a business is important because that image affects the amount of business it does. Good housekeeping goes hand-in-hand with good public relations. It projects order, care, and pride.

Besides preventing accidents and injuries, good housekeeping saves space, time, and materials. When a workplace is clean, orderly, and free of obstruction; work can get done safely and properly. Workers feel better, think better, do better work, and increase the quantity and quality of their work.

Preventive Maintenance of Electrical Tools and Equipment

There have been a large number of workplace incidents where workers have been electrocuted or suffered electrical shock or burns while using electrical tools and equipment. Most often, the lack of proper maintenance is the cause of these incidents.

Preventive maintenance is a schedule plan maintenance actions aimed at the prevention of breakdowns and failures. The primary goal of preventive maintenance is to prevent the failure of equipment before it actually occurs. It is designed to preserve and enhance equipment reliability by replacing worn components before they actually fail. Preventive maintenance activities include equipment checks, partial or complete overhauls at specified periods, oil changes, lubrication and so on. In addition, workers can record equipment deterioration, so they know when to replace or repair worn parts before they cause system failure. Recent technological advances in tools for inspection and diagnosis have enabled even more accurate and effective equipment maintenance, the ideal preventive maintenance program would prevent all equipment failure before it occurs.

There are multiple misconceptions about preventive maintenance. One such misconception is that PM is unduly costly. This logic dictates that it would cost more for regularly scheduled downtime and maintenance than it would normally

cost to operate equipment until repair is absolutely necessary. This may be true for some components; however, one should compare not only the costs but the long-term benefits and savings associated with preventive maintenance. Without preventive maintenance, for example, costs for lost production time from unscheduled equipment breakdown will be incurred. Also, preventive maintenance will result in savings due to an increase of effective system service life.

Long term benefits of preventive maintenance include:

- Improved system reliability
- Decreased cost of replacement
- Decreased system downtime
- Better spares inventory management

The following safety precautions should be adopted to prevent possible electrocution.

ALWAYS:

- Test and tag electrical leads, tools, and equipment regularly.
- Visually inspect electrical leads, tools, and equipment for damage before each use.
- Use safety switches when using electrical tools and equipment.
- Use flameproof electrical tools and equipment in areas where there is the potential for flammable and explosive atmospheres.
- Let competent people repair damaged electrical leads, tools, and equipment.

NEVER:

- Use damaged electrical leads, tools, and equipment.
- Use electrical leads, tools, and equipment in damp or wet conditions unless they are specially designed for use in those conditions.
- Place electrical leads in areas where they may be damaged (on the ground, through doorways and over sharp edges).

PREVENTIVE MAINTENANCE TASKS

The following tasks should be performed at least every three months:

1. Clean the exterior and the interior of the equipment cabinet, using a vacuum cleaner and/ or a clean cloth.

2. On larger systems clean air filters using a vacuum cleaner to remove accumulated dust or dirt.

3. Visually inspect all wiring and cables for cuts, fraying, deterioration, kinks, strains, and mechanical holders. Tape, solder or replace any defective wiring or hooded connectors.

4. Inspect all mechanical security: key switches, indicating lamps, control knobs, fans, and data entry keyboards. Tighten or replace them as required.

5. Inspect all modules mounted in panels on I/O slots to ensure that each module is securely seated in its connector. Remove and clean any module which may have collected excess dust or dirt.

6. Inspect the power supply for proper voltages and check components such as capacitors or resistors for leakage or overheating. Replace any defective components.

7. Check disk drive for proper speed. Adjust speed according to the manufacturer's specifications.

8. Clean disk drive heads, magnetic tape heads, or optical paper tape reader.
9. Perform all preventive maintenance procedures for each peripheral device included in the system.

What's More

Directions: Illustrate the following safety symbols. Use long size bond paper.

1. DANGER
2. WARNING
3. CAUTION
4. WEAR EYE PROTECTION
5. READ AND UNDERSTAND INSTRUCTION MANUAL

What I Have Learned

1. Long term benefits of preventive maintenance include:

_____

_____

_____

_____

2. The 5S's stands for:

_____

_____

_____

_____

Assessment

Please do not forget to write the following in your answer sheet:

Name: _____ Yr. & Section: _____

Yr. Level & Subject (Specialization): _____ Module No: _____

Name of the Activity (e.g., What I know) _____ Date: _____

Multiple Choice

Directions: Read each statement carefully. Write the letter of your correct answer in your answer sheet.

1. It is used to clean oil engines, transmission, and other parts of the vehicle.

   A. gasoline B. kerosene C. Diesoline D. thinner

2. It is used to remove dust, grease and oil.

   A. gasoline B. kerosene C. soap and water D. thinner

3. It is used without the safety alert symbol indicating a potentially hazardous situation which, if not avoided, may result in property damage.

   A. 

   C. 

   B. 

   D. 

4. It indicates an imminently hazardous situation which, if not avoided, may result in death or serious injury.

   A. 

   C. 

B. 

D. 

5. It indicates a potentially hazardous situation which, if not avoided, may result in minor or serious injury.

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8. It is a sign for prohibition.

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10. It is used to wash out oil, and grease from tools and equipment.

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Answer Key

What I Have Learned

1. Improve system reliability.
   Decreased cost of replacement.
   Decreased system downtime.
   Better spares inventory management
2. SEIRI: SORT
   SEITON: SET IN ORDER
   SEISO: SWEEP
   SEIKETSU: STANDARDIZED
   SHITSUKE: SUSTAIN

References

Department of Education Learner's Material, first edition 2014

Online Source:

https://tinyurl.com/lubricant-materials