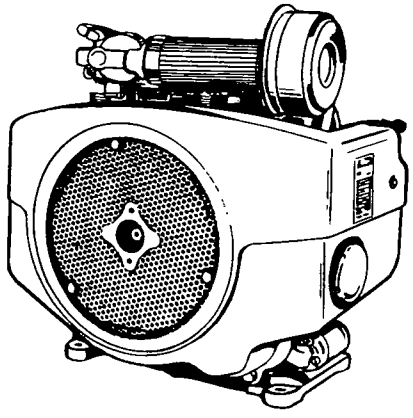
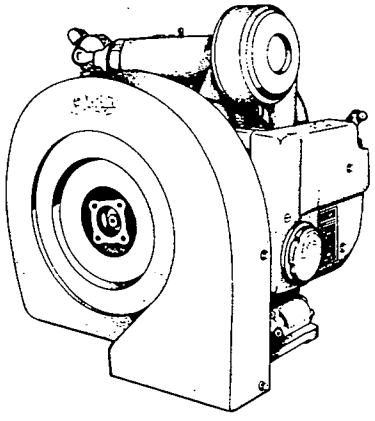
OPERATING AND MAINTENANCE INSTRUCTIONS





NHP-NHPV

INDUSTRIAL GAS ENGINES

ONAN 1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432
A DIVISION OF ONAN CORPORATION

940-0150

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7-75
(SPEC C)

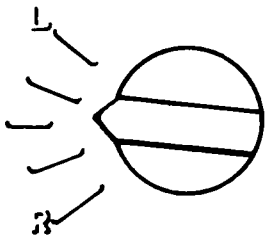
ADJUSTMENTS

CARBURETOR ADJUSTMENTS

Gas engines with LPG carburetors maintain low exhaust emissions (Carbon Monoxide CO, Hydro Carbons HC, and Carbon Dioxide CO_2) as long as: the carburetor is adjusted properly, the engine remains in good service condition, and high temperature, low ash crankcase oil is used.

Main Power Adjustment:

1. Run new engine at least ten hours at normal service load. Avoid high loads before proper adjustments are made.
2. Run engine at maximum throttle and normal load for ten minutes, or set main power mixture near mark between L and R as shown in Figure .
3. Set main power mixture as lean as possible without noticeable loss in power output. If frost develops and remains on regulator for more than five minutes, check for propane leaks and ensure that vaporizer coil wraps tightly around exhaust pipe.
4. If engine functions properly but frost remains on regulator, the carburetor power mixture is too rich. Adjust for maximum efficiency.
5. Recheck head bolt torque and valve lash after carburetor is adjusted.



INITIAL START ADJUSTMENT

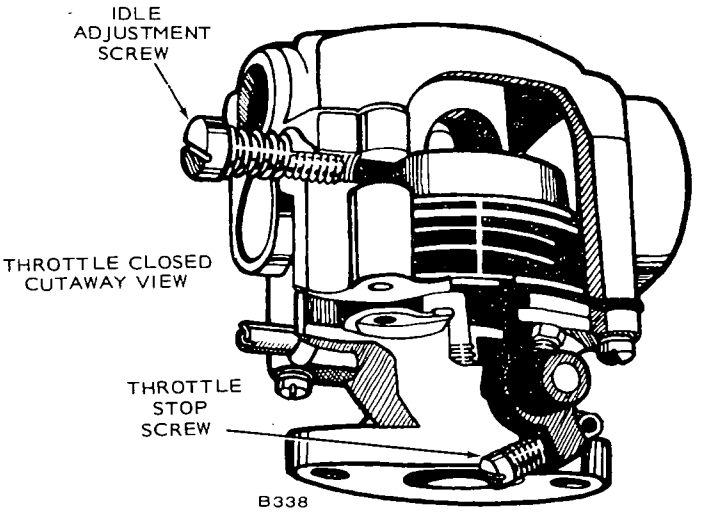
When the fuel system functions properly, the regulator should be frost free after about five minutes running time.

Idle Screw Adjustment:

1. Run engine at idle speed (1200 rpm) for ten minutes.
2. Adjust idle screw for maximum speed; maximum speed should be attained when idle screw is turned fully clockwise into carburetor.
3. Set idle stop screw speed at 1350 rpm.
4. Turn idle screw out until engine speed slows to 1200 rpm.

THROTTLE STOP ADJUSTMENT

1. Adjust throttle stop clamp for maximum service load; throttle should be 20 degrees from vertical position at wide open throttle. Throttle travel from



CARBURETOR ADJUSTMENTS

open to closed position should be 50 degrees.

CAUTION **Do not change the throttle stop to increase the throttle opening. Increasing the throttle opening beyond this point does not increase the power output of the engine because the carburetor is designed for even larger engines. It may, however, adversely affect governor operation.**

2. Check throttle linkage for freedom of movement.

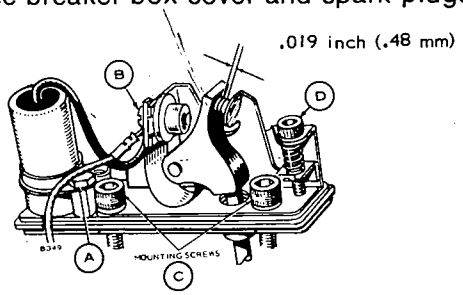
BREAKER POINTS — TIMING

To maintain maximum engine efficiency, change the breaker points every 200 hours of operation. Proceed as follows:

1. Remove spark plugs and rotate flywheel TC mark to 25 degrees BTC (points open); then rotate it another 90 degrees clockwise to ensure points open fully.
2. Remove breaker box cover and unplug coil wire at coil (+) terminal.
3. Remove condenser (screw A) and detach condenser lead and coil lead (screw B).
4. Remove two Allen screws (C) and lift breaker assembly from engine.
5. Replace condenser and point assembly with new parts and reinstall using above procedure in reverse order of removal.
6. Using Allen wrench at screw (D) adjust point gap .019 inch (0.48 mm) using a clean, flat thickness gauge.

Setting point gap accurately adjusts engine timing.

7. Replace breaker box cover and spark plugs.



BREAKER POINT ADJUSTMENT

PRE-START INSTRUCTIONS

Inspection: Inspect the engine visually before starting. Check for loose or missing parts and any damage which may have occurred in shipment.

Crankcase Oil: Be sure the crankcase has been filled with high temperature, low ash "SE" oil to the "FULL" mark on the oil level indicator.

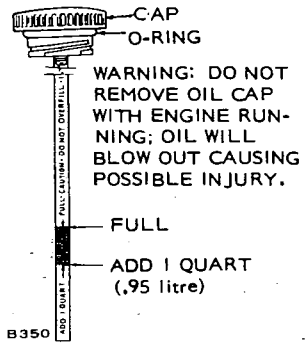
The oil capacity is 3-1/2 U.S. quarts (3.3 litre); 4 quarts (3.8 litre) with filter. Fill to the "FULL" mark on the oil level indicator. Engine oil should always be drained when the engine is warm. Remove pipe plug to drain engine oil.

CAUTION **For best results, use high temperature, low ash engine oil specially formulated for gas engine operation. Do not use regular motor oils or excessive carbon will accumulate on the rings and the valves will wear faster requiring more frequent overhauls.**

Farm Co-op Stations and Diesel truck stops are possible sources of supply. The major oil companies also supply ashless oils for LPG gas engines.

CAUTION **Do not overfill crankcase. Do not mix brands nor grades of motor oil.**

Oil consumption may be higher with a multigrade oil than with a single grade oil if both oils have comparable viscosities at 210° F. Therefore, single grade oils are generally more desirable, unless anticipating a wide range of temperatures. Use the proper grade oil for the expected conditions.



OIL LEVEL INDICATOR

TEMPERATURE	GRADE
Below 0°	5W
0° to 30°	10W
30° to 90°	30
Above 90°	50

Refer to Periodic Service section for recommended oil change intervals.

Fuel: Be sure propane tank has sufficient LP gas for the operating period.

Onan recommends that HD-5 propane be used in Onan LPG engines.

STARTING

The LP Gas engine should start and run in weather as cold as -40° F (-40° C) with lightweight oil in the crankcase. If the carburetor is adjusted and everything else is functioning properly, the engine will start promptly when the START switch and the throttle are closed simultaneously. If the engine does not start within 20 seconds, check the following:

1. Make sure fuel is getting to carburetor.
2. Make sure throttle is closed for maximum engine vacuum at cranking speed.
3. Make sure engine vacuum is sufficient enough to open fuel shutoff devices.
4. Check for low head bolt torques; it should be 15 lb-ft. (20 N.m).
5. Check ignition system and timing (25° BTC).
6. Check oil pressure cutoff switch, if installed.
7. Make sure no propane leaks exist, especially in cold weather.

WARNING **If no leaks are present, external heat can be applied to the vaporizing coil before starting and until exhaust heat is warm enough to vaporize the liquid propane and keep the engine running.**

If engine starts but is low in power:

1. Check for low head bolt torque.
2. Check for proper valve lash (Intake—.003 inch; Exhaust—.014 inch).

   CAUTION **The proper valve adjustment is essential for maintaining low exhaust emissions. Never exceed 200 hours of operation between valve lash adjustments. Never regrind exhaust valves; replace them instead.**

STOPPING THE ENGINE

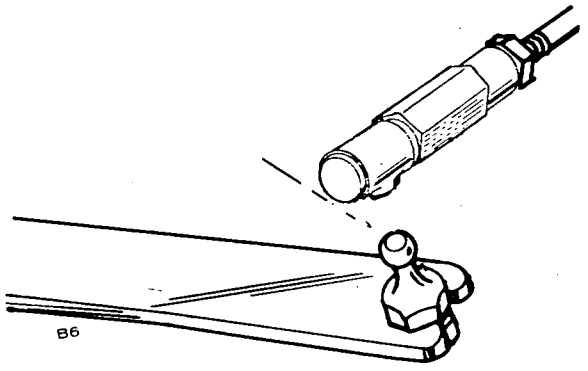
Disconnect all load before stopping the engine. Engines equipped with battery ignition are stopped by positioning the ignition switch to the OFF position.

MAINTENANCE

GOVERNOR LINKAGE

The linkage must be able to move freely through its entire travel. Every 50 hours of operation clean the metal joints as shown in Figure . Also inspect the linkage for binding, excessive slack and wear.

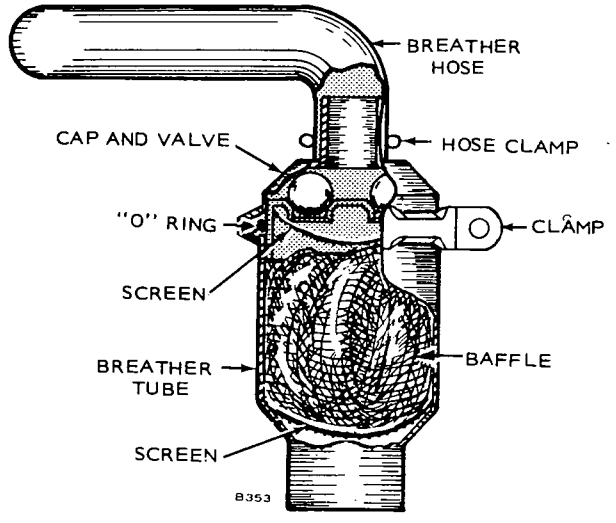
Clean and lubricate metal ball joints. Don't lubricate plastic joints.



CRANKCASE BREATHER

This engine uses a crankcase breather valve for maintaining crankcase vacuum. No maintenance is generally required. If the crankcase becomes pressurized as evidenced by oil leaks at the seals, clean baffle and valve in a suitable solvent.

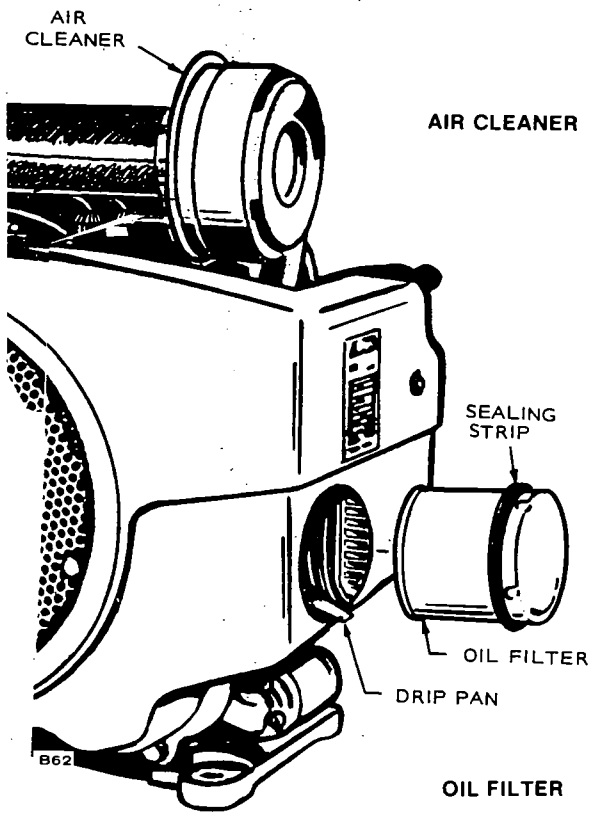
Clean or replace crankcase breather baffle periodically. Be sure baffle material doesn't come apart and work into the manifold.



AIR CLEANER

The NHP and NHPV gas engines use a replaceable, spin-on air cleaner. Remove and replace every 200 hours.

CAUTION **Do not run engine with air cleaner removed. Intake of dirty air or solid materials could cause severe damage to engine parts.**



OIL FILTER

OIL FILTER

Change the crankcase oil filter every 200 hours. Remove the filter (Figure) by turning counterclockwise, using a filter wrench. Add the strip provided with the filter to prevent air loss in the area indicated. It is advisable to wipe dry the drip pan located below the filter. Coat rubber gasket on filter with a film of oil before installing. Install the filter finger-tight plus 1/4 to 1/2 turn. If oil becomes so dirty that the markings on the oil level indicator cannot be seen, change the filter and shorten the filter service period.

OPERATION

BREAK-IN PROCEDURE

Controlled break-in with proper oil and a conscientiously applied maintenance program will help assure satisfactory service for many hours from your Onan engine.

Break-in or ideal fitting of all internal moving metal parts can best be achieved by maintaining proper cooling and correct lubrication during the running-in period. Run the engine at about half load for the first three hours with intermittent periods of full load to control engine break-in. Engine damage can be caused by using the wrong grade and weight of oil and high engine operating temperatures during break-in.

Check the oil level at least every five operating hours. Add oil to keep it at the proper level, but never overfill as overfilling may cause the oil to foam and enter the breather system.

HOT WEATHER OPERATION

When operating the engine in temperatures above 75° F pay particular attention to the following items to prevent damage:

1. Keep the engine cooling fins clean and free of obstruction which would decrease air flow to and from the engine.
2. See that nothing obstructs air flow to and from the engine.
3. Ensure that you are using the proper grade and weight of oil for the temperature the engine is being used in. Check the oil level each time you fill the fuel tank.
4. Check the battery water level more frequently than every 50 hours which is recommended under normal conditions. High temperatures cause faster evaporation.

COLD WEATHER OPERATION

When the engine is being used in temperatures below 30° F, check the following items closely:

1. Use correct SAE No. oil for temperature conditions. Change oil only when engine is warm.
2. Use fresh fuel. Protect against moisture condensation.
3. Keep fuel system clean and batteries in a well charged condition.
4. Partially restrict cool air flow, but use care to avoid overheating.

DUST AND DIRT

1. Keep unit clean. Keep cooling system clean.
2. Service air cleaner as frequently as required.
3. Change crankcase oil and filter more often than recommended under normal conditions.

MAINTENANCE

CRANKCASE OIL

The oil capacity is 3-1/2 U.S. quarts (4 with filter). Fill to the "FULL" mark on the oil level indicator.

Recommended oil numbers for expected ambient temperatures are as follows:

Above 32° F (0° C) ..... SAE 30
0° F to 32° F (-18° C to 0° C) .... SAE 10W or 5W-30
Below 0° F (-18° C) ..... SAE 5W-30

OIL LEVEL

Check oil level at least every eight hours of operation. Check more frequently on a new or overhauled engine as oil consumption is higher until piston rings seat properly.

OIL CHANGE

Change crankcase oil after the first 25 hours of operation; change every 100 hours after that. If operating in extremely dusty conditions, change oil more frequently.

WARNING **Do not remove oil fill cap with engine running; oil will blow out causing possible injury.**

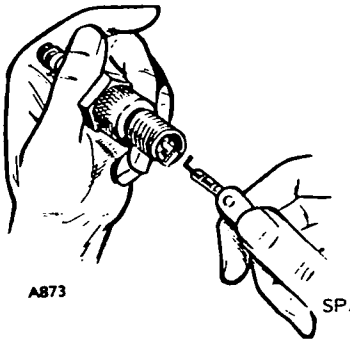
COOLING SYSTEM

Check and clean cooling fins at least every 50 hours. Remove any dust, dirt or oil which may have accumulated.

CAUTION **Plugged or clogged cooling fins can cause overheating and engine damage.**

SPARK PLUGS

Check, clean and reset spark plugs every 200 operating hours. Replace spark plugs that show signs of fouling or electrode erosion.



GENERAL INFORMATION

ENGINE MODEL REFERENCE

Identify your model by referring to the MODEL and SPEC (specification) NO. as shown on the unit nameplate. Always use this number and the engine serial number when making reference to your engine.

How to interpret MODEL and SPEC NO.

1. Factory code for general identification purposes.
2. Specific Type:
   MS—ELECTRIC STARTING
3. Factory code for optional equipment supplied.
4. Specification (Spec Letter) advances with factory production modification.

If your engine needs service or repair, contact an Onan Service Center. Trained mechanics will assure expert repair service on your Onan engine.

OUT-OF-SERVICE PROTECTION

Protect an engine that will be out-of-service for more than 30 days as follows:

1. Run engine until thoroughly warm (5 to 10 minutes).
2. Turn off fuel supply; run engine until it stops.
3. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
4. Remove spark plugs. Pour one ounce (two tablespoons) of rust inhibitor (or SAE #50 oil) into the cylinders. Crank engine over a few times. Install spark plugs.
5. Service air cleaner per maintenance schedule.
6. Clean governor linkage and protect by wrapping with a clean cloth.
7. Plug exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
8. Wipe entire unit. Coat rustable parts with a light film of grease or oil.
9. Provide a suitable cover for entire unit.
10. If battery is used, disconnect and follow standard battery storage procedure.

RUNNING REPLACEMENT PARTS

Oil Filter	122-0323
Oil Filter Air Seal	122-0347
Spin-on Air Filter	140-1175
Breather Tube Baffle	123-0865
Spark Plug	167-0240
Breaker Points	160-1183
Condenser (Breaker Box)	312-0196
Spark Plug Cable (16-3/4")	167-1462
Spark Plug Cable (19-inch)	167-1463
Ignition Coil	166-0535

A complete Parts Catalog is available—contact your Onan Parts and Service Center or authorized dealer.

SPECIFICATIONS

Displacement (cubic inch)	60 (983 cm^3)
Cylinder Bore	3-9/16 in. (90.48 mm)
Piston Stroke	3 inch (76 mm)
Horsepower—NHP (Pressure Cooled)	25 BHP @ 3600 rpm
Horsepower—NHPV (Vacu-Flo Cooled)	22.5 BHP @ 3300 rpm
Compression Ratio	7.0 to 1
Ventilation Required (cfm @ 3600 rpm) NHP	1080 (30.59 m^3)
(cfm @ 3600 rpm) NHPV	1200 (33.98 m^3)
Oil Capacity	3-1/2 quart (3.3 litre)
Oil Capacity with Filter Change	4 quart (3.8 litre)
Combustion Air (cfm @ 3600 rpm)	80 (2.27 m^3)
Fuel	LP Gas
Battery	12 Volt

TUNE-UP SPECIFICATIONS

Cylinder Head Torque	15 lb-Ft (20 N•m)
Spark Plug Gap	.025-inch (0.64 mm)
Breaker Point Gap	.019 inch (0.48 mm)
Ignition Timing (Fixed), Electric Start Units	25° BTC
Tappets (Cold) Intake	.003-inch (0.08 mm)
Exhaust	.014-inch (0.36 mm)

PERIODIC SERVICE GUIDE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS						
	8	50	100	200	500	1000	2000
* Inspect Engine Generally	x						
Check Fuel Supply	x						
Check Oil Level	x						
Clean Governor Linkage		x*					
Change Crankcase Oil			x*				
Check Breaker Points				x			
Check Battery Electrolyte Level			x				
Adjust Valve Lash				x1			
Check Spark Plugs				x			
Replace Oil Filter				x*			
Replace Air Cleaner				x*			
Inspect Valves, Grind if Necessary						x1	
Complete Reconditioning							x1

* - Check for exhaust leaks, fuel leaks, proper mounting, etc.
x* - Perform more often under dusty or extreme cold weather conditions.
x1 - For detailed maintenance-contact your Onan Service Center.

PERIODIC MAINTENANCE SCHEDULE

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the unit. The schedule can be used as a guide. However, actual operating conditions under which a unit is run should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions, some of the service periods may have to be reduced. Check the condition of the crankcase oil, the filters, etc. frequently until the proper service time periods can be established. When any abnormalities occur in operation—unusual noises from engine or accessories, loss of power, overheating, etc.—contact your Onan Service Center.

EXHAUST SYSTEM

Make regular inspections of the exhaust system throughout the entire life of the engine. Locate leaks in muffler and piping while the engine is operating. Repair all leaks immediately after they are detected for personnel safety.

WARNING **Leaky exhaust systems emit noxious carbon monoxide fumes which are a potential safety hazard in enclosed areas.**

BATTERY

Check charge condition. Check electrolyte level. Add distilled water to keep electrolyte at its proper level. In freezing weather, run engine immediately after adding water. Keep battery connections tight and clean.

Onan recommends that all major service be performed by qualified service personnel. An engine service manual and complete parts catalog is available at additional cost. Contact your nearest authorized dealer or Onan Parts and Service Center.

SAFETY PRECAUTIONS

The following symbols in this manual signal potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

WARNING **Onan uses this symbol throughout this manual to warn of possible serious personal injury.**

CAUTION **This symbol refers to possible equipment damage.**

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that could result in serious, personal injury. Take care in following these recommended procedures.

- **Use Extreme Caution Near Gasoline, Gaseous Fuel And Diesel Fuel. A constant potential explosive or fire hazard exists.**

  Do not smoke or use open flame near the unit or the fuel system.

  Be sure fuel supply has a positive shutoff valve.

  Use black pipe on natural gas or gaseous fuels. Piping at the engine should be approved flexible line.

  Fuel lines must be of steel piping, adequately secured and free from leaks. Do not use copper piping on flexible lines as copper becomes hardened and brittle.

  Have a fire extinguisher nearby. Be sure extinguisher is properly maintained and be familiar with its proper use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.

- **Guard Against Electric Shock**

  Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.

  Jewelry is a good conductor of electricity and should be removed when working on electrical equipment.

  Use extreme caution when working on electrical components. High voltages cause injury or death.

  Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.

- **Do Not Smoke While Servicing Batteries**

  Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

- **Exhaust Gases Are Toxic**

  Provide an adequate exhaust system to properly expel discharged gases. Check exhaust system regularly for leaks. Ensure that exhaust manifolds are secure and not warped.

  Be sure the unit is well ventilated.

- **Keep The Unit And Surrounding Area Clean.**

  Remove all oil deposits. Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and may present a potential fire hazard.

  Dispose of oily rags. Keep the floor clean and dry.

- **Protect Against Moving Parts.**

  Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be permitted because of the danger of becoming caught in moving parts.

  Make sure all nuts and bolts are secure. Keep power shields and guards in position.

  If adjustments *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

  Do not work on this equipment when mentally or physically fatigued.