



ALL Power Labs
personal scale power

Section 8

Technician Level Maintenance



Table of Contents

1. Warning: Maintenance Hazards
 - 1.3 Scope of this Section
2. Gasifier
 - 2.1 Overhaul Gasifier
 - 2.2 Overhaul Hopper
 - 2.3 Replace Gasifier
3. Engine
 - 3.1 Governor Deep Clean Procedure
 - 3.2 Cleaning the Air Filter
 - 3.4 Spark Plug Inspection
 - 3.5 Overhaul Engine
 - 3.6 Turbo
 - 3.6.1 Turbo Maintenance
 - 3.6.1 Replace Turbo

1. Warning: Maintenance Hazards

The gas circuit is under vacuum pressure and at high temperatures during operation; doing any of the above while the machine is hot will introduce air into the gas circuit where it can mix with hot combustible gases, cause internal fires and explosions, and/or release enough carbon monoxide to seriously harm the user.

While the gasifier is hot (whether in operation or stopped), **do not**

- remove the ash collection vessel
- open the ash inspection view port
- open the reactor access door
- remove the cyclone ash can

These operations must not be done until the exposed parts of the gas circuit, such as the cyclone, are cooled to the point of being safe to the touch. Cooling may take half an hour or more, depending on ambient temperatures.

1.1 Carbon Monoxide

The gas left in the gas circuit after the machine has cooled down will still be rich in carbon monoxide, which is a poisonous gas as well as a fire hazard. Carbon monoxide exposure is also a risk when refilling the hopper. Always have adequate ventilation and do not do Power Pallet maintenance in the presence of open flames and sparks. When opening the reactor or any portion of the gas circuit, be sure to have the blowers turned on to a low setting to draw the gases away from the work area. Be sure to have the carbon monoxide detector near by when maintaining the machine to alert you to dangerous concentrations of carbon monoxide.

Operations that may involve a Carbon Monoxide hazard will be indicated with the following sign:



1.2 Re-establishing air-tight seals

Everything that can be unsealed and opened by the Power Pallet operator in the course of maintenance must be re-sealed with an air-tight seal because air leaks are hazardous to the machine. Examples of such seals include

- the hopper lid,
- the cyclone ash can,
- the gas filter lid
- the hose connections to the filter and its lid
- the reactor access door
- the ash collection vessel connection and ash removal port
- the gasifier viewport

Air leaks can cause internal fires that cause irreversible damage to the machine.

1.3 Scope of this Section

Please see the *Power Pallet Operation Manual* for the schedule of maintenance and all operator level maintenance procedures. The following are maintenance instructions that should be conducted by trained technicians only.

2. Gasifier

2.1 Overhaul Gasifier

At the suggested interval, the reactor will need to be taken out of the gas cowling and purged of any accumulation around the air lines. The gasifier and the major components attached to it must be disassembled, and everything in the way of removing the gasifier must be disconnected and removed from the skid.

Some of these steps may involve securing the item you are detaching with straps to an overhead support as you unbolt them.

- Unplug the fuel auger.
- Empty the gasifier of all feedstock and charcoal.
- Empty the hopper; secure the hopper to an overhead support and unbolt the hopper from drying bucket; set the hopper aside, and keep the nuts and bolts.
- Unbolt the drying bucket bottom plate; detach hoses.
- Secure the drying bucket to an overhead support; unbolt the drying bucket from the gasifier; set the drying bucket aside, and keep the nuts and bolts.
- Unplug all of the electric cables, pressure tubes, and thermocouples attached to the gasifier and to the ash handling system.
- Detach the ash collection vessel.
- Detach exhaust conduit from gasifier.
- Secure the gasifier to an overhead support; unbolt the gasifier from the skid, and lift it off the skid; remove the grate basket door and set this aside to be used with the new reactor.
- Detach the gas filter and all supporting gas lines for ease of access to the central electronics conduit.

Then after the gasifier is free from connections to other components, unbolt it from the gas cowling and lift it upwards. Be careful to not damage the airlines. Use a wire brush to brush off accumulation on the airlines and the inside of the gas cowling.

2.2 Overhaul Hopper

The plexiglass viewport can show some deterioration over time and may need replacing. Remove the old plexiglass view port and use the clear silicone to adhere it back onto the hopper. Reassemble the flanges and tighten evenly. Wipe off any excess silicone. Wait until it is fully dry before operating the Power Pallet.

2.3 Replace Gasifier

Remove the gasifier as described in *2.1 Overhaul Gasifier* section above. Insert the new gasifier. Assembly is the reverse of disassembly.

3. Engine

3.1 Governor Deep Clean Procedure

The daily servicing of the governor is explained in the *Power Pallet Operation Manual*. These instructions for the deep cleaning of the governor are provided in the case that disassembly may be required.

Warning: The following procedure should only be done by a trained professional. It is possible to break the internal parts which will require a replacement of the entire governor. We do not sell individual subparts to the governor.

Tools needed

- 8MM combination wrench (x2)
- 4MM Hex key
- 3MM Hex key
- 2.5MM Hex key
- Alcohol
- Mallet



Disassembly

Section 8 - Maintenance



Remove governor and throttle body from intake runner.



Disconnect the governor from the throttle body.



Remove the two screws that hold on the throttle plate.



Remove the end cap.



Remove the retaining screw.



Note the orientation of the spring.



Use a drift and mallet to remove the shaft and



Carefully note the order in which the components are



The outside bearing is held in place with a pressed-

Section 8 - Maintenance

bearings.	installed.	in retaining ring. The ring should be installed with the chamfered edge oriented inward.
-----------	------------	--

Cleaning

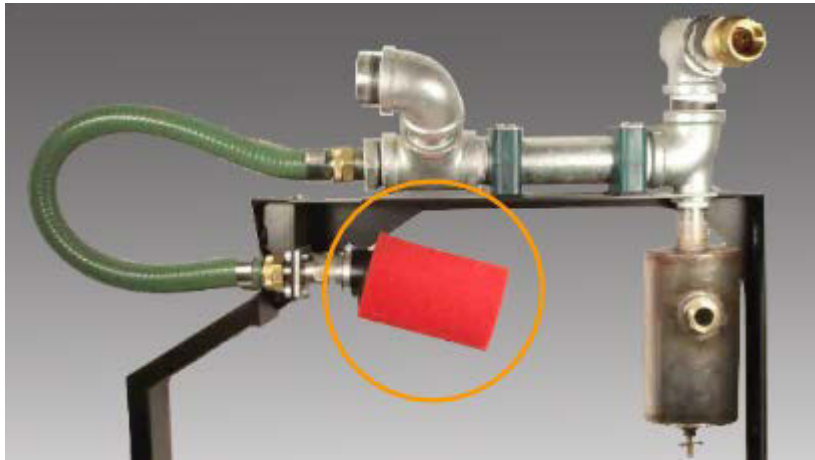
Clean all metal components in denatured or isopropyl alcohol. Tough deposits may require soaking components overnight. A wire brush may aid in faster cleaning. Bearings should turn smoothly.

Reassembly

Generally speaking, reassembly is the reverse of removal. All moving parts should be lubricated with light bearing grease. Bearings should be pressed in carefully by hand. Use light-duty thread locking compound on all screws. Verify the throttle plate is clear of the bore and does not bind anywhere in its movement.

3.2 Cleaning the Air Filter

The red foam air filter immediately preceding the air mixing system on the lid of the gas filter should be cleaned with soapy water to remove accumulated dust and lightly re-oiled with a light oil such as mineral oil or filter foam oil.



3.4 Spark Plug Inspection

The spark plugs of the Power Pallet may gradually accumulate mineral fouling when mineral rich feedstocks are used:



Examples of fouled spark plugs that caused malfunction.

At the recommended engine tune-up interval, be sure to inspect the spark plugs, and either clean the with a wire brush or replace them.

To remove the spark plug, pull the spark plug boot off and use a spark plug socket wrench to unscrew the plug.

3.5 Overhaul Engine

Overhauling the engine includes the following: flushing the radiator, replacing the starter motor, thermostat, alternator, water pump and adjusting the engine valves. Please refer to the *PSI 3.0L INDUSTRIAL ENGINE SERVICE MANUAL* for replacement instructions.

3.6 Turbo

3.6.1 Turbo Maintenance

The turbo will need to be disassembled and cleaned according to the maintenance schedule. Use isopropyl alcohol to soak the parts and use a toothbrush to clean off any accumulation. There is an O-ring located inside the turbo that may also need to be replaced.

3.6.1 Replace Turbo

To replace the turbo, disconnect all gas, exhaust and coolant line connections. Installation is reverse of removal.

3.7 Replace Oxygen sensor

To remove the oxygen sensor, use a flat head screwdriver to separate it at the connector near the sensor. Then gently unthread the sensor from the exhaust and replace with a new one. You will need to also calibrate the sensor in free air before running. These instructions are in the *Power Pallet Operation Manual*.

Section 8 - Maintenance

