

PROPER AC GENERATOR STORAGE

DATE: 04.15.15

AUTHOR: J. Petersen

PART NO.:

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I. SUMMARY

POOR STORAGE PRACTICES RESULT IN GENERATOR DAMAGE AND START UP DELAYS OF DAYS, OR EVEN WEEKS - WITH ASSOCIATED COSTS FROM A FEW HUNDRED TO TENS OF THOUSANDS OF DOLLARS. DELAYS THAT CAN COST YOU A RIG CONTRACT AND JOBS.

It is imperative that you do practically everything possible to minimize this damage so your can be relied on to go to work when needed. We realize that being practical is a balance on what would be ideal versus what can be done efficiently - that is, based on a company by company, rig by rig, basis. Most damage is caused when your generator sits idle as it is not designed to live this way. When exposed to humid atmosphere, the electrical insulation may absorb an excessive amount of moisture leading to the motor winding failing to ground. As with any machine, rust is also problem being that the shaft, seal area, bearings, couplings, and any unpainted surface can rust.

NOTE: The following storage action items checklist is a guideline only. It must be performed by qualified and trained personnel who are trained on the equipment, instruments and safety requirements of the below.

II. INSPECTION AND STORAGE PREPARATION

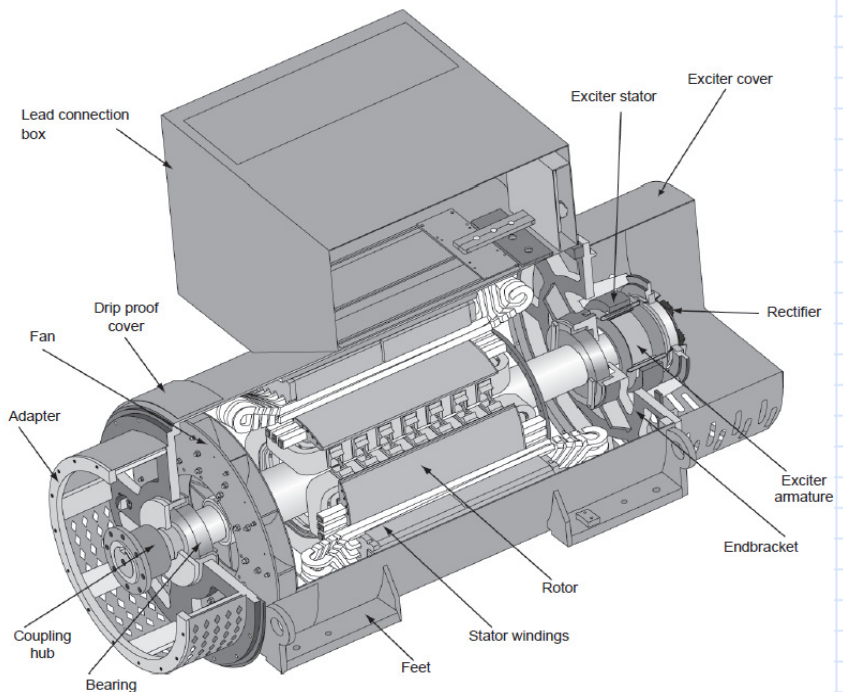
CHECK BOX AFTER EVERY COMPLETED ACTION

1. MegOhmeter each winding at the connection box with 500VDC. Record these values so they may be compared to future values.

2. Protect couplings, exposed shafting, bearing caps and any unpainted or machined surface with **** spray or other rust inhibitor.

Be careful to cover and/or avoid belts, tachometers or Rubber components that will degrade due to the **** spray.

Circle the areas that have been treated on the diagram to the right.



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II. INSPECTION AND STORAGE PREPARATION *continued*

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A. HEATERS

3. Energize the space heaters to inhibit moisture from infiltrating electrical insulation. Note, in some cases this is not possible because no electrical power is available. Check off in the column to the right if the heaters are energized or not. Make a note of the source of the power, in case it is turned off in the future (aka camp generator or land power).

4. Install desiccant bags in the junction box to help keep the windings dry. Affix them to the junction box where they cannot reach the electrical connections. Tag-out the generator to show that these must be removed before putting the generator back in service. Mark a D with a circle around on the generator it to show where desiccant bags have been placed.

B. COVERS

5. Make sure all covers are installed and secured with all bolts in place.

6. Make a note of any covers that need to be replaced.

7. Check air inlet, exhaust and inspection port covers for wear or damage. These covers are often damaged in the field allowing water, excessive contamination, rodents, snakes, etc. inside the equipment. Rodents often nest inside and eat the insulation. Water can also pool and rust inside the machine causing equipment failure.

8. Make notes and take photographs of any damaged areas so they can be reviewed.

C. STORAGE

Best case scenario is to store the unit indoors in a protected environment although this is often not practical for a rig that is temporarily idled.

9. Cover and secure the entire unit. This equipment is designed for operation outdoors, but NOT long term storage, while idle – because the unit's operating covers not sealed enough to keep rain, dirt, dust and other environment hazards out and therefore, they can get trapped inside.

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II. INSPECTION AND STORAGE PREPARATION *continued*

CHECK BOX
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C. STORAGE *continued*

Some important points to consider when storing your generator:

- While there is no perfect way to store this equipment outdoors, most companies prefer to use a tarp roped down tightly to protect the unit from the rain and elements. Some use shrink wrap, and others leave them uncovered - in a desert environment. When stored indoors, a light cover of breathable fabric can be sufficient. Bottom line is you can make a judgment call on your trapping based on your application and the environment in which it is stored.
- If your unit is stored in a location with high winds and storms, tarps need to be durable and tied down tightly around the unit with strong ropes and knots to limit a sail or parachute effect.
- Before placing a cover on the unit, be sure the equipment is very dry. Entrapping retained moisture will cause damage to the unit. Think dry, sunny day - NO Rain.
- Be sure the unit is sitting at above the dew point temperature. For example, the condensation on the outside of a water glass. If the surface temperature is below the dew point, the unit sweats and moisture will be trapped inside. Again, preparing your generator for storage on dry and sunny days is preferred for best results.
- Make provisions so that the shaft can easily be rotated (see - 'rotate shaft' in MONTHLY MAINTENANCE section).

D. MONTHLY MAINTENANCE

10. Rotate the shaft. The bearings and lubricant require movement so the contact points in the bearings will not go bad (from fretting, point rusting, etc.). The lubricant can also separate into it's component parts promoting rust inside the bearing. These tend to cause failure a few days after the unit is place back in operation and therefore downtime costs are the highest. To avoid this, rotating the shaft at least 20 complete turns once a month is recommended. Rotate the equipment it is coupled to as well. This is usually best for the related equipment since it has bearings too. When it's not possible to rotate all the equipment at once, then uncoupling the unit and rotate it by itself is required.

11. Visually inspect the unit noting any changes since last inspection.

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II. INSPECTION AND STORAGE PREPARATION *continued*

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D. MONTHLY MAINTENANCE *continued*

12. Confirm that cover is securely in place.

13. Megger the windings.

14. Confirm that heaters are operating and unit has the warmth of heaters.

15. Run unit or rotate a minimum of 20 complete turns.

16. Spray additional rust inhibitor where necessary.

17. On Kato generators, add grease to bearings every 6 months, as per nameplate quantity and manufacturer of grease. Refer to your generator manual for any questions and general instructions.

III. UNPACKING AND MOVING

Caution: When transporting a single-bearing generator proper rotor support must be maintained to avoid equipment damage.

1. Reduce condensation on cold surfaces and potential wet windings by allowing the generator to reach ambient temperature before removing the protective packing.

2. Unpack the generator carefully to avoid scratching painted surfaces.

3. Inspect for and remove desiccant or foreign materials which may have fallen into the machine during unpacking.

4. Move the generator using only appropriate lifting mechanisms and hardware.

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IV. INSPECTION BEFORE START UP

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If the unit/units have not been close enough to power to energize the heaters during the "lay down time," it is recommended that either a tarp be placed over the unit/units and heat be applied not less than 24 hours to dry any moisture that may have accumulated in the windings, or energizing the blowers if equip for not less than 24 hours may perform the same function.

1. Before making electrical connections, use a Meg-ohm meter (megger) to take winding resistance-to-ground readings. Record these values and store with the generator manual and/or data sheets (see Insulation Test section).

2. Check all electrical connections to the electrical diagrams.

3. Secure all covers and guards.

4. Check the bearings to see they are properly lubricated (see Bearing Lubrication section).

5. Turn the rotor slowly through one revolution to ensure the rotor turns freely.

6. Confirm the engine rotation direction matches generator rotation direction.

7. Confirm that engine-generator protection is installed and functional.

8. Remove tools and other items from the vicinity of the generator.

V. INSULATION RESISTANCE TEST

Insulation tests discern existing weakness or faults in a winding and provide some indication of expected service reliability by determine the current flow through the winding insulation to ground.

Note: Satisfactory measurement for any/all windings is a minimum of 5 meg-ohm.

Caution: To avoid equipment damage, do not apply megger to rotating rectifier components or generator accessories such as the voltage regulator, temperature detectors or space heaters.

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V. INSULATION RESISTANCE TEST *continued*

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A. EXCITOR OR PMG STATOR

1. Disconnect the stator leads from the terminals in terminal box or at the voltage regulator.

2. Connect megger; positive clamp to stator leads and negative clamp to the generator frame.

3. Apply 500 V for 1 minute and record resistance reading.

4. Disconnect the megger clamps and ground the stator leads to the generator frame for several moments to allow voltage discharge.

B. EXCITOR AND/OR MAIN ROTOR

1. Disconnect the rotor leads from the rotating rectifier.

2. Connect megger; positive clamp to rotor leads and negative clamp to the generator shaft.

3. Apply 500 V for 1 minute and record resistance reading.

4. Disconnect the megger clamps and ground the rotor leads to the generator shaft for several moments to allow voltage discharge.

C. MAIN STATOR

1. Disconnect power connections and all control apparatus from the generator terminals.

 2. Connect megger; positive clamp to stator phase leads and negative clamp to the generator frame. **Note:** *Measure and record resistance of each phase separately with remaining phases shorted to frame.*

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V. INSULATION RESISTANCE TEST *continued*

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C. MAIN STATOR *continued*

3. Apply 500 V for 1 minute and record resistance reading, repeat for all phases.

4. Disconnect the megger clamps and ground the stator phase leads to the generator frame for several moments to allow voltage discharge.

VI. BEARING LUBRICATION

A. SHIELDED OR SEALED BEARINGS

Shielded or sealed bearings can usually be operated several years without replenishing or changing the lubrication. Replenishing the grease in shielded or sealed bearings should only be done with the machine disassembled.

B. RE-GREASABLE BEARINGS

Note: *Compatibility between original and new grease must be ensured prior to this procedure.*

1. Remove the grease relief seal fittings and clean the grease fill fittings.

2. While rotating the shaft, add new high quality bearing grease which must be capable of lubricating satisfactorily over a temperature range of the lowest ambient temperature to 250° F. Continue adding new grease until all original grease has ejected from the relief port.

3. Remove and dispose of all discharged lubricant and clean any residue from generator.

4. Replace the grease relief seal fittings and clean the grease fill fittings.

NOTES: