GENERATOR SAFETY AND BASIC MAINTENANCE

These guidelines have been developed to assist WAMFVA members to ensure workplace safety when using portable generators.

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1. INTRODUCTION

Properly maintaining your generator is crucial if you want to know that it will start every time you need it. In this document, we will be sharing some tips about maintaining a generator. At the end of this document and as a bonus material, we will provide you a downloadable maintenance checklist for portable generator to print out and use.

2. CHANGING THE OIL FREQUENTLY

Regardless of what generator you use, there are some simple measures that you can implement to dramatically extend its lifespan. The first seems simple enough but most people really overlook this one.

The **most important thing you can do is CHANGE THE OIL FREQUENTLY**

We are so accustomed to changing the oil in our vehicles every 5000km's; however, most of us overestimate the length of time that we can go in between oil changes in our generators.

One thing that you should know about generator maintenance is that since they don't have odometers like your car has, the maintenance schedules are based on the number of hours that the generator has run since its last service date. Some generators have hour meters on them and on others hour meters can be added without too much effort.

If the generator you use doesn't have an hour meter use a clipboard or notebook to record how many hours your generator has been used since the last service.

Whoever starts the generator is responsible for writing the date and time that they started it. Whoever turns it off is responsible for writing the time that it was turned off and writing the total number of hours that the generator ran during that cycle on the chart.

Don't make the mistake of thinking that you'll just keep track of how many hours your genset has run and that you'll just know when it's time to perform the required maintenance. No matter how hard you try to keep track of this in your head, you'll forget and you'll nearly always end up going past the recommended service interval.

Remember that most portable generators have low oil capacities, no oil filters, and non-magnetic drain plugs. Since the oil capacity is so low, it's relatively cheap to change the oil and it only takes a few minutes. If you will be diligent in changing your oil at the manufacturer's recommended time intervals, your generator will love you for it.

Another important thing to keep in mind is that a generator that is left to sit for a long time could accumulate water in the crankcase with the oil.

Magnetic drain plugs are cheap and they are a life saver. Should any metal shavings begin to accumulate in the oil (this is very common by the way), the tiny

shards of metal will stick to the plug and prevent future damage to your generator.

If you can, we highly recommend replacing the drain plug that your generator has with one that is magnetic. Having a magnetic drain plug also gives you some valuable data when it comes time to change the oil.

If you're used to only seeing a few shiny flakes of metal that stick to your plug and you change the oil and you suddenly start seeing quite a few metal shavings, you know that something is wrong that will require more extensive maintenance or even repair by a qualified technician. This could help you identify a problem early on and instead of an expensive bill to replace a generator, you only have to spend a little money to have the problem fixed.

If your generator has a replaceable oil filter, make sure that you replace it when the manufacturer recommends doing so. This is typically a feature that you'll only find on high end generators but it's worth knowing for sure whether your generator has one or not. Don't just assume that it doesn't.

3. WINTERTIME OIL CHANGES

Oil has a tendency to be much thicker during the cold winter months. When oil gets cold, it becomes thick. This can make starting your generator's engine in the winter very difficult; especially if your genset doesn't have an electric starter.

The reason cold morning starts are a problem is because it has an internal low oil shut down switch.

The total oil capacity of the generator is about a half of a quart. When you try and start the generator on really cold days, the oil is thick and isn't flowing well yet so the generator will run for a few seconds and then the low oil shut off sensor will think that there isn't enough oil in the crankcase and shut the unit down. When this happens, you have to wait until the low oil light goes out before you can try and start it again. Sometimes it takes as many as ten of these cycles before the oil warms up enough that the unit doesn't shut itself down.

We found that if we change to a *lighter weight oil in the winter time, cold morning starts are much less of a hassle*. Another benefit of switching to a lower viscosity oil in the cold months is that the oil will start lubricating the moving parts on cold mornings sooner because it is thinner and it flows better at lower temperatures than thicker oil. One other thing, don't just pick the viscosity of oil that you use at random. Consult your owner's manual for the recommended winter time oil to make sure that you don't void the warranty.

4. STORING YOUR GENERATOR

If you're going to store your generator for a prolonged period of time, it is recommended to put fuel stabilizer in the tank & run the generator out of gas. Petrol that has been left in the tank and carburettor for a long time will go stale and start to varnish. This means that it will form a sticky sludge in your tank, fuel lines, and carburettor.

If you let this happen to your petrol, you'll be really frustrated when you go to start your generator and find that it's out of commission. If you decide to store your generator with fuel in it, make sure to keep the petrol tank completely topped off.

A partially filled tank is more likely to collect water condensation and this water will settle in the bottom of your tank making it difficult if not impossible to start your engine when you need it.

There is a fuel additive that you can add to your gas periodically that some people say will help dissolve any varnish that has already accumulated. It's called Seafoam. You can get it at most auto parts stores, just follow the instructions.

5. CHANGING THE FUEL FILTER

Not all generators have fuel filters on them. However, It's not very difficult to install an inline paper fuel filter on most generators and doing so is probably a good idea.

The clear plastic fuel filters are great so we can easily see if there is crud in them. You can also often see if water has gotten into the fuel by looking at these see through filters. If you do install one, just make sure it's big enough that it won't restrict the flow of fuel into your carburettor and starve the engine of the fuel it needs. This could cause your engine to run lean.

6. HARD TO START GENERATORS – CHECK SPARK PLUG

Of course, you should change the spark plug at the recommended time intervals that are provided in your owner's manual but if you notice that it is becoming increasingly difficult to start the engine, you could have what is called a "fouled spark plug".

The longer a spark plug is used, the more carbon and sludge accumulate on the electrode. As such, the plug will no longer be able to deliver a hot enough spark to ignite the petrol in the engine and it either won't start, or it will be hard to start, or it will run really poorly. Try cleaning spark plugs when they start looking bad. Spark plugs are cheap and it is highly recommended keeping a few on hand so you always have one when you need it. By the way, if you notice that the plugs in your engine are fouling sooner than they should be, this is a sign that it's time for a tune up.

7. MAINTAINING THE STARTING SYSTEM ON YOUR GENERATOR

If you don't give the starting system the attention that it needs, it's bound to fail you when you need it most. We've learned this the hard way on two occasions now. If your unit has an electric starter, you don't want to let the battery sit for very long without being recharged. If you use your generator every day, this isn't going to be a problem because your engine will constantly be keeping the battery charged up. If, however, you only use this backup power source occasionally, it's a good idea to *put a trickle charger on the battery and top it off at least once a month*. Otherwise your battery will self-discharge from sitting too long.

The other thing to keep in mind is that unless your battery is a sealed "no maintenance" battery, you'll need to check the electrolyte level to make sure it doesn't get low. Not keeping up on this is one of the main causes for premature battery failure.

Next, you'll want to inspect the pull cord to make sure it's in good shape. If you pull the cord on the generator at a weird angle and when he does this, it causes the cord to rub and fray. As I'm sure you can imagine, this never happens at a convenient time. If you notice that the pull cord on your recoil starter is starting to fray, keep a close eye on it and have it changed before it breaks.

8. KEEP YOUR ENGINE BREATHING WELL

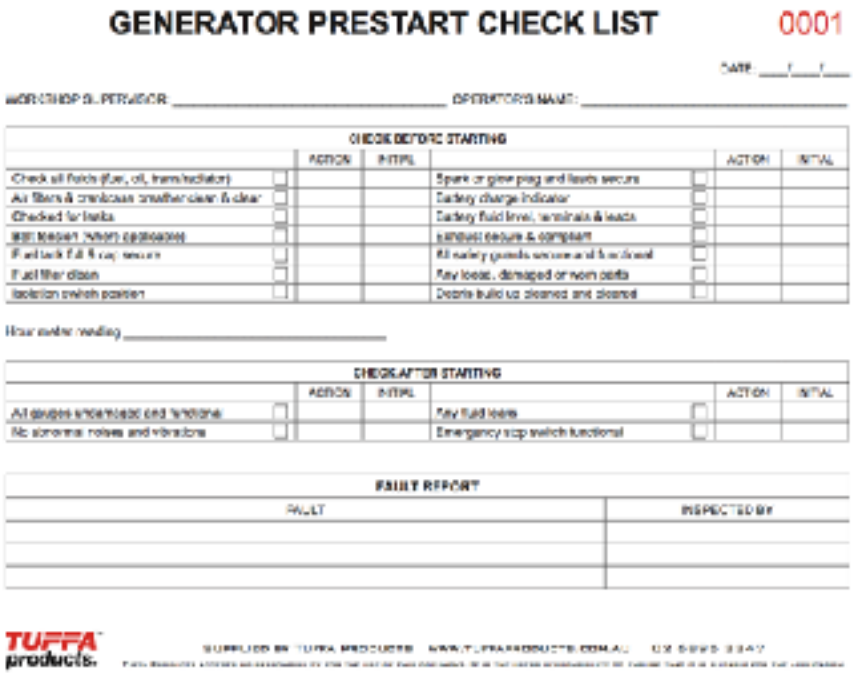
If you neglect the air filter on your generator's engine, it will eventually become clogged. When this happens, less air is able to make its way into the engine which alters the fuel to air ratio. A *dirty air filter makes engines run rich* which is often the main culprit behind a fouled spark plug. Some air filters, like ours, are designed to be cleaned and others are designed to be replaced.

9. ROUTINE CLEANING

Keep your generator as clean as possible. Keeping the unit clean will help you notice problems that come up. If you are in the habit of making a big mess when you change the oil, there's a really good chance that you won't notice things like bad seals or gaskets that are leaking oil. If you don't notice that your system is leaking oil, enough could leak out that as you continue to run the engine, you'll damage or destroy it.

10. GENERATOR MAINTENANCE CHECKLIST

On the next page there is a Prestart Generator Checklist. Members should complete one of these each time you plan to use your generator.



GENERATOR PRESTART CHECK LIST 0001

DATE ___/___/___

WORKSHOP SUPERVISOR: _____ OPERATOR'S NAME: _____

CHECK BEFORE STARTING

	ACTION	INITIAL		ACTION	INITIAL
Check all fluids (fuel, oil, trans/radiator)			Spare or glow plug and leads secure		
Air filters & crankcase breather clear & clear			Battery charge indicator		
Checked for leaks			Battery fluid level, terminals & leads		
[illegible] (where applicable)			exhaust secure & compliant		
Fuel tank Fill & cap secure			All safety guards secured & functional		
Fuel filter drain			Any loose, damaged or worn parts		
Isolation switch position			Debris build up cleaned and cleared		

Hour meter reading _____

CHECK AFTER STARTING

	ACTION	INITIAL		ACTION	INITIAL
All gauges engine load and readings			Any fluid leaks		
No abnormal noises and vibrations			Emergency stop switch functional		

FAULT REPORT

FAULT	INSPECTED BY

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11. FOLLOW THE RECOMMENDATIONS IN YOUR OWNER'S MANUAL

Be sure and follow the recommendations that are provided in your owner's manual. If anything in the manual is contrary to what is published in this article, the manual takes precedence. If you can't find your manual you can probably google it online.

12. FIRE EXTINGUISHER CHART

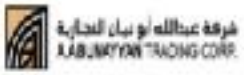
Mobile Vendors should ensure they have the correct fire extinguisher to put out electric fires if they use a portable generator. The chart below will help guide you in purchasing the right one. All your staff should be trained to use your fire extinguishers and they should be tagged and tested every six months.


YES
NO
TYPE OF EXTINGUISHER
Cooler scheme - AS 1841.1
A
Wood, Paper & Plastic
B
Flammable & Combustible Liquids
C
Flammable Gases
E
Energised Electrical Equipment
F
Cooking Oils & Fats
Powder ABE
Carbon Dioxide (CO2)
Water
Foam
Wet Chemical
Vaporising Liquid
Fire Blanket
Fire Hose Reel

13. GENERATOR CHECKLISTS

Elec 39 - Emergency Generator

M01	Aggregate annual costs for maintenance of the emergency generator.	Annualized Cost	Annually
M02	Conduct visual inspection of emergency generator unit for leaks, wear, damage, loose connections and components, corrosion, dirt and debris, on exhaust, fuel, battery, cooling and engine systems. Clean, repair [illegible] and leaks as required.	Maintenance Level 1	Weekly
M03	Check fuel level in storage tank. Check fuel delivery systems for leaks and pressure. Drain fuel filter and water from fuel tank. Replace fuel filter as required. Refuel as required.	Maintenance Level 1	Weekly
M04	Check engine coolant heater by monitoring discharge temperature.	Maintenance Level 1	Weekly
M05	Check engine coolant level, only use coolant products recommended by manufacturer.	Maintenance Level 1	Weekly
M06	Check engine oil level. ensure that oil has drained from upper components of engine to the crankcase before taking reading.	Maintenance Level 1	Weekly
M07	Check charge air piping and cooler for leaks, holes, cracks or loose connections. Check air inlets and outlets for debris. Check and clean air cleaner. Service or replace air filters as required.	Maintenance Level 1	Weekly
M08	Check battery charger operation and charge rate.	Maintenance Level 1	Weekly
M09	Perform automatic start of emergency generator and transfer to site load or load bank with a minimum capacity of 30% of nameplate rating for at least 30 minutes. check for leaks, connections, [illegible], abnormal operating conditions. Check emergency system operation.	Maintenance Level 1	Monthly
M10	Check drive belt tension and fan/coupling drives for tension, wear, weather cracking and damage. Repair, tighten and replace parts as required.	Maintenance Level 1	Monthly
M11	Visually inspect fuel sample and filter and replace filter as required. Diesel fuel should be turned over or replaced on an annual basis.	Maintenance Level 1	Monthly
M12	Check coolant concentration.	Maintenance Level 1	Monthly
M13	Drain exhaust condensate.	Maintenance Level 1	Monthly
M14	Check wiring and connections for corrosion and damage.	Maintenance Level 1	Monthly
M15	Check starting batteries. check battery electrolyte level and specific gravity. Check battery posts, connections, cables and charger for corrosion and proper operation. Test batteries under load to determine terminal voltage.	Maintenance Level 1	Monthly
M16	Inspect ignition system. Replace parts if necessary.	Maintenance Level 1	Semi-Annually
M17	Inspect spark plugs. Clean and re-gap spark plugs or replace as necessary.	Maintenance Level 1	Semi-Annually
M18	Change oil and filter.	Maintenance Level 1	Semi-Annually
M19	Check generator output voltage and adjust as necessary. Check meters and gauges for proper operation and reading levels. Check generator set auto shutdown system and alarms. Check frequency and governor [illegible]; adjust as necessary. Check water pump hole is not plugged. Repair as required.	Maintenance Level 1	Semi-Annually
M20	Check engine heater operation. Check thermostats and seals. Inspect all hoses for signs of distress. Check engine alternator and charge rate. Touch engine block to confirm heater is operational. Repair and replace parts as required.	Maintenance Level 1	Semi-Annually



PROJECT096-CSR

Generator Daily Inspection Checklist

Name of Operator/Tender:								Badge No:
Plate No:								Model:
Project/Location:								
Week Start:				Week End:				
S.No	Items to Check	Date of Inspection						Remarks
		Sat	Sun	Mon	Tue	Wed	Thu	Fri
1	Check for Oil, Fuel, Water leakage							
2	Electrolyte Level.							
3	Fan Impeller or Radiator Coolant Level							
4	Air Cleaner dust Indicator							
5	Fuelling Pipe							
6	Check for Emission (Smoke)							
7	Check Wiring and Piping for loose connection							
8	Check Correct Function of each Instruments attached.							
9	Check Grounding of Machine							
10	Check Out Put Power Open Voltage							
11	Check Leads Status / Receptacles							
12	Check Tires							
13	Check Monthly Color Coding Inspection Stickers							
14	Check Fire Extinguisher							

Contractor Supervisor/ Foreman

Name: _____

Signature: _____

Date : _____

Rev 0

Back

PORTABLE GENERATOR SAFETY

Front

PORTABLE GENERATOR SAFETY

- Inspect portable generators for damage or loose fuel lines.
- Keep generators dry.
- Follow manufacturer's use and safety instructions to maintain and operate generators.
- DO NOT attach a generator directly to the electrical system of a structure (home, office, trailer) unless it has a properly installed transfer switch.
- Use supplied cords to plug electrical appliances directly into the generator.
- Use undamaged heavy-duty extension cords that are grounded (3-prolonged.)
- Use ground-fault circuit interrupters (GFCIs) as per manufacturer's instructions.
- SHUT DOWN the generator before refueling.

14. KNOW THE DANGERS – SAVE YOUR LIFE

Knowing the dangers of carbon monoxide poisoning from portable electric generators could About 40% of all portable generator related deaths occurred during the winter months when homeowners often need an extra power boost due to weather related outages. Almost 70% of deaths related to portable power generators occur at home, often with the generator operating in the basement, crawl space, garage or enclosed carport of owners seeking convenience without considering safety. The U.S. Consumer Product Safety Commission (CPSC) indicated that 179 carbon monoxide poisoning deaths associated with portable generators were reported in the years from 1990 to 2002.

15. USE YOUR GENERATOR SAFELY

1. Do not connect generators directly to household wiring without an appropriate transfer switch installed This is because power from gensets connected directly to household wiring can back feed along power lines and electrocute anyone encountering them including line workers conducting repairs.
2. Make sure your generator is properly grounded.
3. Keep the generator dry.
4. Make sure extension cords used with generators are rated for the load, and are free of cuts, worn insulation, and have three-pronged plugs and tagged and tested.
5. Do not overload the generator. A portable generator should be used only when necessary, and only to power essential equipment or appliances.
6. Never operate the generator in enclosed or Opening doors and windows or operating fans to ventilate will not prevent CO build-up in the home.
7. Even with a CO alarm, you should NEVER use a gasoline-powered generator inside your home or in a garage. partially enclosed spaces.
8. Use carbon monoxide detectors in nearby enclosed spaces to monitor levels. Generators can produce high levels of carbon monoxide very quickly, which can be deadly.
9. Use a ground fault circuit interrupter (GFCI) to help prevent electrocutions and electrical shock injuries.
10. Turn off all appliances powered by the generator before shutting down the generator.
11. Keep children away from portable generators at all times.
12. Make sure fuel for the generator is stored safely, away from living areas, in properly labelled containers, and away from fuel-burning appliances. Before re-fueling, always turn the generator off and let it cool down.

13. Gasoline is extremely flammable and explosive under certain conditions; refuelling shall be carried in a well-ventilated area and away from cigarette, smoke, and sparks.
14. Wipe out spilled gasoline at once.
15. Operate the generator on a level surface; if the generator is tilted, fuel spillage may result.
16. The muffler becomes very hot during operation and remains hot for a while after stopping.
17. The engine exhaust system will be heated during operation and remain hot immediately after stopping the engine; keep away from the exhaust system in order to avoid scalding

Electricity is a powerful tool. It can also be a lethal hazard. Better safety standards have reduced electrical hazards that cause deaths, injuries and property damage. But good safety habits are still the best prevention against electrical hazards.

16. KILL SWITCHES

Make sure that prior to purchase your generator is fitted with a kill switch so you can turn it off quickly in an emergency. If your generator is not fitted with a kill switch we recommend you get one fitted to protect the public, your workforce and you.