



Safety Manual for Propane Powered Floor Care Equipment



Contents

Introduction.....	1
Propane Safety.....	1
Fire Safety.....	1
Emissions.....	1
Regulations.....	2
The EnviroGard Emissions Monitoring System.....	2
CO Detectors for Technicians.....	3
Testing.....	3
Hazard Communication.....	3
Operator Certification.....	4
Propane Cylinders.....	4
EnviroGard Cylinders.....	4
Refueling Cylinders.....	4
Storing Cylinders.....	5
Transporting Cylinders.....	5
Using Propane Powered Floor Care Equipment.....	6
Basic Safety Guidelines.....	6
Operating Guidelines.....	6
Machine Inspection.....	6
Appendices	
Noise and Vibration.....	A-1
Glossary.....	A-2
Suggested Guidelines Propane Powered Floor Care Machines.....	A-3
Crisis Management.....	A-5
Investigation of Accident or Claim	

Propane Safety

Introduction

Propane is a flammable gas whose vapors are heavier than air. As is the case with gasoline, propane can explode if the proper precautions are not heeded. Propane is odorized with an agent having a distinct odor that is recognizable at very low concentrations. This helps in identifying leaks, even when they are small.

Awareness and basic safety precautions are required when working with propane. As long as these precautions are followed, risk is negligible. Ignorance, however, could pose needless risk.

The two greatest hazards with propane powered floor care machines are:

Carbon Monoxide Poisoning: This is the most frequently reported incident associated with propane powered floor care machines and is caused by excessive exhaust emissions. The symptoms are headache, dizziness and nausea. A major cause involves engines with poor preventive maintenance practices, usually those with dirty air filters and machines operated in confined areas without adequate ventilation. Another cause may be sub-standard, inexpensive machines with no emissions control technology and improperly set carburetion.

Overfilled Fuel Cylinders: Nearly all fire related incidents reported result from bringing a cylinder into a building without first checking for overfill. This action is dangerous, unwise, and unnecessary.

Operating a propane powered floor care machine is not difficult and is safe. However, as in operating any piece of equipment, whether it be an automobile, lawnmower, power boat, etc., safely operating a propane powered floor care machine does require a basic knowledge of the equipment, it's safety features, safe work practices and routine maintenance of the machine.

Why Use Propane?

1. Propane is a clean burning, efficient and reliable fuel.
2. It has the unique characteristic of being a gas at atmospheric pressure and liquid when stored in a cylinder under moderate pressure. Upon release of the pressure it easily vaporizes to become a gas. It is in the gaseous state that it mixes with air and can power vapor draw engines used on floor care machines.
3. Propane is economical. It is also portable, which makes it preferable over electric units for locations having few electrical outlets.

4. Propane is extremely concentrated in its liquid state. One cubic foot of liquid propane will expand to 270 feet (82 m) of gaseous vapor at atmospheric pressure.

5. Propane is environmentally friendly. Because of its molecular structure it burns cleanly and produces low hydrocarbon and carbon monoxide emissions, far below the standards set by EPA. The OSHA limit is 50 parts per million of carbon monoxide over an 8 hour period. A properly maintained propane powered floor machine produces less than 10 parts per million carbon monoxide in the ambient or surrounding air, much less than is experienced in normal automobile traffic.

6. Propane gas is heavier than air. If it leaks or vents from the cylinder it will settle close to the floor and stay there.

7. Propane is non-toxic, unlike gasoline, diesel, methanol and ethanol. Propane is only a slight risk to health.

8. Propane has odor added for easy detection. Since raw propane has no odor, a small amount of an odorant, ethyl mercaptan, is added to give propane its characteristic pungent odor.

Fire Safety

Be aware of the potential dangers of fire or explosion when using propane, and take normal fire-safety precautions.

- Fire: There is a possibility of fire from LPG vapor leaking or venting from fuel cylinders or carburetion equipment.
- Explosion: LPG vapor concentrated or confined to a small, restricted space may explode or ignite.
- Propane may experience a BLEVE, a boiling liquid expanding vapor explosion.

Emissions

All propane powered floor care machines produce emissions. Most are harmless, but some are dangerous and can be fatal. Carbon monoxide (CO) poses the greatest risk, since CO can be lethal within as little as 30 minutes exposure at 3,000 parts per million (ppm) concentration.

Carbon monoxide is an invisible, odorless, colorless gas created when fossil fuels (such as gasoline, wood, coal, propane, oil and methane) burn incompletely. In the home, heating and cooking equipment are possible sources are possible sources of carbon monoxide. Vehicles running in an attached garage could also produce dangerous levels of carbon monoxide. Any internal combustion engine not maintained properly can also produce harmful levels of CO.

Propane Safety

Regulations

NFPA

Operating a propane powered floor care machine requires compliance with certain safety regulations. The National Fire Protection Agency (NFPA) Standard for Storage and Handling of LP Gas is the appropriate authority for safe propane use.

Among its regulations, NFPA #58 requires that all personnel employed in the handling of propane gas be trained in its proper handling and operating procedures. It also requires them to carry a written certification from their employer or training supervisor to attest to such training. Although this is directed mainly to those who fill and transport liquid propane gas, Onyx Environmental Solutions recommends that operators of propane powered floor care machines in public places be trained and certified as well.

With regard to operation of propane powered floor care equipment, even though NFPA 58 8-4.5 says "these machines shall be permitted to be used in buildings frequented by the public, including the times when such buildings are occupied by the public," Onyx Environmental Solutions suggests usage when occupancy of a given work area is minimal.

NFPA is a non-profit organization that was established in 1896 to create fire protection standards. Today, it is nationally recognized as the final authority in fire safety related matters. In fact, NFPA #58 regulations have been adopted by virtually all municipalities and stand as the basis for the propane gas safety regulations.

CARB / EPA

The California Air Resource Board (CARB) and Environmental Protection Agency (EPA) also set limits for propane powered engines used outdoors, but CARB/EPA approval does not signify that the engine is safe to use indoors.

CGA

The Canadian Gas Association (CGA) has set a limit of 1500 ppm CO in exhaust flow.

OSHA

For propane powered machines used indoors, the Occupational Health and Safety Administration (OSHA) has established a limit of 50 ppm CO for 8-hour time weighted average (TWA) in ambient air and is considering a limit of 800 ppm CO in exhaust flow.

DOT

The Department of Transportation (DOT) has established regulations regarding the safety of fuel cylinders including the ones used on propane powered floor care machines.

Local Agencies

Local law enforcement agencies such as the local Fire Marshall also rely on independent testing labs such as UL and CGA before giving their approval of the use of some equipment. These labs thoroughly test equipment and submit their stamp of approval only after rigorous testing. While not being required by all law enforcement agencies, the stamp of approval by these agencies further assures the operator that he or she is working with and around safe equipment.

The EnviroGard Emissions Monitoring System

All Onyx Environmental Solutions propane burnishers and strippers are equipped with the EnviroGard Emissions Monitoring System. This system provides a unique, state-of-the-art, fail-safe means for ensuring emissions safety to operators and other personnel in environments where propane equipment is used.

EnviroGard employs a sensor in the exhaust path between the engine and the catalytic muffler to detect the oxygen content of the exhaust before it is passed through the catalyst. The oxygen sensor does not react to nor does it measure the CO content of the exhaust. It responds only to oxygen content.

The oxygen sensor produces an electrochemical signal that is sent to the EnviroGard Control Module. If the magnitude of this signal is not within the preset control limits, the Control Module will activate the shut down sequence and the engine will stop running.

The control limits are preset in the Control Module at the Onyx Environmental Solution factory. The air-fuel ratio is then tuned before shipping such that the CO content in the tail pipe, as measured by a digital CO detector, is not greater than 15 ppm for machines with 16 HP water-cooled Kawasaki engines and not greater than 20 ppm for machines with 17 HP air-cooled Kawasaki engines.

The Control Module is set to ignore the readings from the oxygen sensor during the first three minutes the engine is running. This period allows:

1. The sensor to reach a stable operating temperature.
2. The catalyst in the muffler to reach the temperature necessary to reduce the levels of CO, nitrogen oxides (NOx) and hydrocarbons (HC) in the exhaust.

The most common event in which the Control Module shuts down an engine is when the air filter becomes dirty enough to restrict the air intake flow, which changes the air-fuel ratio such that the oxygen sensor signal is outside the control limits. Once the air filter is properly cleaned, operation of the machine can be resumed.

Propane Safety

In accurate adjustments of the air-fuel ratio by technicians in the field will also result in the Control Module shutting down the engine. The recommended settings for the air-fuel ratio for both full throttle and idle are provided by Onyx Environmental Solutions in the Operator's Manual included with each machine.

For additional information on the **EnviroGard Emissions Monitoring System** and floor care machines equipped with this technology, please contact Onyx Environmental Solutions Customer Service at 1-800-858-3533.

CO Detectors for Technicians

Onyx Environmental Solutions recommends that all operators of propane powered equipment wear Carbon Monoxide Indicator badges as an extra precaution. The plastic indicator contains a colored indicator button which darkens in the presence of Carbon Monoxide. The relative darkness of the indicator button indicates the level of CO in the ambient atmosphere. Most indicator badges have a useful life of 30 days, depending on the concentration of contaminants, humidity, and temperature.

Testing

There are a great number of instruments offered on the market to test for toxic gases. Only those designed to read carbon monoxide resulting from combustion engines are considered acceptable for testing exhaust emissions from propane powered floor machines.

Some instruments are used to read "ambient air" and may be damaged if used to take readings in the muffler or tail pipe. Selecting the proper instrument is an important part of meeting the testing requirements.

Generally speaking, units capable of reading in ppm, (parts per million), at ranges from 0 to 1000 are adequate for checking ambient air (air in the breathing zone of the operator). Instruments capable of testing carbon monoxide in the exhaust should be able to read from 0 to at least 2000 ppm and should be certified by the manufacturer for that purpose.

Some instruments and systems used for these purposes are:

AMBIENT AIR MONITORING

DRAGER Model 190: Manufactured by National Drager.

SENSIDYNE gas sampling system with YB-11038 Sensidyne detector tubes

DRAGER gas sampling system with YB-4620 Drager detective tubes

GAS-TECH Model CO-95

ENERAC POCKET 60: Manufactured by Energy Efficiency System

ENGINE EXHAUST ANALYZERS
HORIBA GAS ANALYZER
ENERAC 2000 COMBUSTION ANALYZER
ENERAC POCKET 60

DATA LOGGERS
INDUSTRIAL SCIENTIFIC CORP. MODEL STX-70
CO MONITOR, Data-Logger
BIOSYSTEMS INC. "TEXILOG" Data-Logger

All instruments used for testing must be calibrated at intervals recommended by the manufacturer. The monitor, model number and date of calibration will be recorded with all test results.

Hazard Communication

It is necessary to post a Material Safety Data Sheet for propane. You will notice on this sheet that propane is highly flammable and it has a slight health risk. Because propane is odorized, it is easily detected at levels of just a few parts per million, which is much less than the exposure limit of 1000 parts per million.

If you smell propane while operating a propane floor care machine, do the following:

1. Stop the engine: Pull the throttle to the stop position (if present) or turn the key switch to the off position.
2. Shut off the service valve on the propane cylinder.
3. Move the floor machine to a well-ventilated area.
4. Remove the cylinder from the machine and take it outside the building.
5. If the cylinder is leaking, contact a DOT approved repair shop to determine the cause of the leak and have the shop, not you, repair it.

If a fire occurs while the machine is being operated do the following:

1. Stop the engine: pull the throttle to the stop position (if present) or turn the key switch to the off position.
2. Shut off the service valve on the propane cylinder if possible. Be careful not to get burned.
3. Move the machine outside if possible. If not possible, move it to a well-ventilated area away from flammable materials.
4. Do not attempt to extinguish the flame from a gas leak. If you do, the gas will build up in the area and could re-ignite. Starve the fire by shutting off the supply of gas.
5. Have the machine and cylinder inspected before using them again.

Propane Safety

Storing Cylinders

When not in use, propane cylinders always should be stored outside in an upright position in a secure, tamperproof, steel mesh storage cabinet. This cabinet may be located next to the building but with at least five feet (1.5 m) of space between the cabinet and the nearest building opening (door or window).

Do not install the cabinet near a stairway or street elevator as vented propane gas will seek a lower level since it is heavier than air and could find its way into the basement of the building. Do not store cylinders full or empty inside a building or inside a vehicle. Although it is unlikely that propane will vent from a stored cylinder, if it should, the vapor could come in contact with an ignition source such as a spark from a power tool or other appliance and create a flash fire. Do not smoke or use a device with an open flame when handling or transporting propane cylinders.

Transporting Cylinders

When transporting cylinders to a propane dealer or to a job, make sure the cylinders are securely fastened and standing in an upright position with the service valve closed. A cylinder rattling around in the back of a vehicle and banging into other objects constitutes a hazard. Avoid dropping or banging cylinders against sharp objects. The propane cylinders are sturdily constructed but a series of hard jolts could cause damage.

Please note that any cylinder that has been filled is always considered full, no matter how little propane gas remains in it. This is because even when all liquid has evaporated into vapor there is still some propane gas vapor left in the cylinder. Because this remaining fuel is flammable, an empty cylinder should be treated with the same careful procedures as one that is filled to the 80% level with liquid propane. The only time that a cylinder is considered empty is when it is new, before it has been filled with propane.

When transporting a propane powered floor care machine, the propane cylinder may be strapped onto the machine as long as the machine itself is firmly secured in the vehicle. Of course, spare cylinders should always be secured in an upright position.

Using Propane Powered Floor Care Equipment

All machines manufactured by Onyx Environmental Solutions come with a detailed Operator's Manual. Safety dictates that before using any new equipment, it is important that all operators read and understand the Operator's Manual.

Basic Safety Guidelines Basic Safety Guidelines

- Allow only qualified and trained personnel to operate equipment.
- Follow maintenance and operating instructions.
- Check oil level before starting. • Check oil level before starting.
- Keep nuts and bolts tightened and hose connections snug.
- Never alter or reconstruct the fuel system. To do so may be dangerous.
- Use only UL, CTC/DOT listed cylinders, like the Onyx Environmental Solutions cylinder.
- Store the fuel cylinder outside and away from heat and direct sunlight.
- Never leave the machine running unattended.
- Check pad holder for cracks each time the pad is changed.
- Have the machine serviced by a Certified Technician, including an emission check, every three months.
- Before attempting any service on the machine, turn the ignition switch OFF and remove the key to avoid accidental startup.
- Operate in a well-ventilated area. • Operate in a well-ventilated area.
- Keep hands and feet clear of rotating pads and brushes.
- Do not allow the floor care machine to operate without moving the machine. It may burn the floor and damage the floor covering.
- Only use replacement parts from the manufacturer.
- Post a Material Data Safety Sheet (MSDS) for propane.

Propane Powered machines should not be used:

- In nursing homes, hospitals, day-care centers, etc.
- By unqualified or untrained personnel.
- Unless properly maintained and adjusted
- On areas with obstructions such as thresholds, floor outlet boxes, etc.
- In areas where loose tiles or other objects are present.
- In rooms without proper ventilation.

Operating Guidelines

Always read and understand the Operator's Manual for your machine before operating it.

Machine Inspection

Regular maintenance of propane powered floor care machines is a must to keep them in good, safe working condition. Every time the machine is used, the following checkout procedure should be followed.

1. Check for overfilled cylinders. Check cylinders, and vent if necessary. Do this before taking the cylinder inside to use. Never take an overfilled cylinder inside.
2. Check the recoil dust filter. The recoil dust filter should be cleaned or replaced after each use of the machine and after each hour of continuous operation. If neglected, the engine will overheat and carbon monoxide emissions will elevate. hour of continuous operation. If neglected, the engine will overheat and carbon monoxide emissions will elevate.
3. Check the oil level. The oil level should always be within the safe levels indicated on the dipstick. Add oil if necessary, but never overfill. Overfilling could cause irreparable damage to the engine.
4. Check the condition of the pad or brushes and pad holder. If the pad is dirty, it should be cleaned. Flipping the pad and using both sides will increase pad life. If the pad is torn or worn down more than 1/8" (0.3 cm), it should be replaced.
5. Enter checks in a daily maintenance log to maintain a detailed record for the machine.



IPC Eagle

3650 Dodd Rd • Eagan, MN 55123
651.686.5399 • Fax 651.686.5695 • 800.486.2775
www.ipceagle.com

IPC Eagle Corporation Sales and Service Provided By: