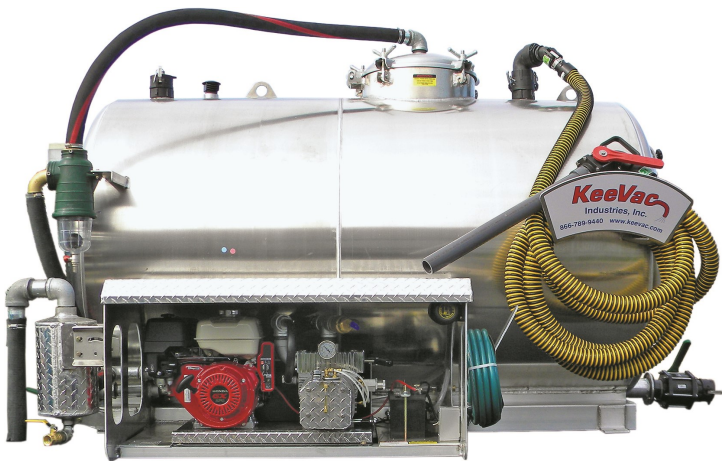




SLIDE-IN VACUUM TANK OPERATOR'S MANUAL



Covers SC (Flat head) and FD (flanged and dished heads) models.

Also including information for models: RE (rear engine), SE (side engine), and TV (transverse).

Date of Purchase: _____

Tank Model: _____

Tank Serial Number: _____

The manufacturer reserves the right to change specifications or make improvements without notice and without incurring obligations to products previously sold. Information contained herein is from data available at time of printing. As the tank installer, the customer assumes all risk and liabilities associated with mounting and operating the tank.

TO THE PURCHASER

Congratulations on your purchase of a KeeVac product. Your slide-in vacuum tank will give you years of dependable service if the proper operating and maintenance instructions are observed. We recommend that you read this manual carefully to become thoroughly familiar with your slide-in equipment prior to operation.

This manual contains sections on safety, setup, specifications, operation, maintenance, and trouble shooting. Each section in this manual is clearly identified to help you easily find the information you need.

WARNING: Study this manual before operating or maintaining your slide-in vacuum tank and any of its components. You must understand and follow the instructions in this manual; otherwise you and/or others can be seriously injured. **DO NOT** operate this equipment if you have not read and understood all of the safety and operating instructions. Also, **DO NOT** allow any other person to operate this equipment if they have not read and understood all of the safety and operating instructions.



This safety alert symbol will identify important safety messages. When you see this symbol, carefully read the message that follows.

The information in this manual covers all Slide-in Vacuum Tanks. It is important to record your tank model number, tank serial number, and date of purchase in the spaces provided on page 1. This information will be useful to your dealer when ordering parts for repair.

Your vacuum tank warranty appears on the last page of this manual. Please read it carefully, making sure you understand the warranty coverage as well as its exceptions and limitations. The warranty for your equipment is through the original manufacturer and additional warranty information can be found by calling the manufacturer.



Precautionary statements dealing with machine safety are preceded by signal words **NOTICE** and **IMPORTANT**. These precautions are intended to help protect against damage to your equipment and to inform operators of helpful information.



SAFETY PRECAUTIONS

Throughout this manual, and on machine decals, you will find precautionary statements followed by specific instructions. In the interest of safety, take the time to learn these precautions.

Precautionary statements dealing with personal safety are preceded by the signal words **DANGER**, **WARNING**, and **CAUTION**. These precautions are intended for your personal safety and for the safety of those working with you.



DANGER

Indicates a hazard or unsafe practice that, if not avoided, could result in serious injury or death.



WARNING

Indicates a hazard or unsafe practice that, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazard or unsafe practice that, if not avoided, could result in death or serious injury.



NOTICE

Indicates a possibly dangerous situation that, if not avoided, could result in damage to equipment.



IMPORTANT

Indicates helpful information on operation of equipment.

GENERAL SAFETY PRECAUTIONS

Read and follow these safety precautions, and insist that those working with you follow them as well.

Most industrial equipment accidents can be avoided by observing safety precautions. A careful operator is the best insurance against an accident.

WARNING

Sewage effluent and/or septage produces dangerous gases. **DO NOT** breathe sewer gases. **DO NOT** smoke or use an open flame when sewer gases are present. Sewer gases are noxious and can be fatal to humans and animals. Sewer gases can also create an explosive atmosphere. When agitating or pumping sewage effluent, always observe the following safety precautions as a minimum.

DANGER

DO NOT stand near the oil catch muffler or discharge valve when loading or unloading the tank. Sewer gases vented out of the oil catch muffler will settle downward. Sewer gases can also be expelled out of the discharge valve when releasing tank pressure. Inhaling sewer gases can cause severe injury or death.

WARNING

DO NOT allow children or irresponsible people or unauthorized persons near the work area or equipment. Ensure everyone is clear of the truck and immediate area before starting the engine, engaging power, and operating the equipment. The hazards of septic pumping can cause serious injury or death to untrained persons that enter this area.

WARNING

Sewage and wastewater contain bacteria, fungi, parasites, and viruses that can cause disease. While handling sewage or waste water effluents, sewage workers may be exposed to a variety of these diseases causing organisms including, but not limited to: E-coli, hepatitis A virus (HAV), salmonella, typhi (which can cause typhoid fever), shigella (which can cause dysentery) and parasitic protozoa and worms (such as *Guardia lambia* and roundworm).

Proper work practices and personal protective equipment (PPE) can help protect you from becoming infected by these agents. When handling sewage and/or wastewater effluents, or after contact with surfaces exposed to them, observe the following recommendations (as a minimum) regarding work practices and PPE.

■ IMPORTANT

- **DO NOT** eat, drink, or smoke while you are working with, or in the area of sewage effluent.
- Wash your hands thoroughly with clean water and soap before eating, drinking, or smoking and at the end of your work day.
- The Portable Sanitation Association International (PSAI) recommends rubbing your hands together for at least ten (10) to fifteen (15) seconds after you have worked up a good lather with the soap. The friction of rubbing your hands together loosens bacteria from your skin and traps them in the lather to be rinsed down the sink.
- Use PPE such as coveralls or water-resistant suit, water-proof gloves and boots, respirators, safety glasses, goggles, and face shields.
- Properly store, clean or dispose of contaminated PPE.

- Keep all cuts and wounds covered with clean, dry bandages and protect them from exposure to sewage effluent.
- Change out of your work clothing and boots before leaving work. DO NOT wear them home. DO NOT keep your soiled clothing with your other or your family's clothes. Wash your work clothing separately in hot water.
- Both the CDC (Center for Disease Control) and the Building and Construction Trades Department of the AFL-CIO recommend that sewage workers maintain up-to-date tetanus-diphtheria immunizations to counter the risk of soil-contaminated injuries.
- While studies in Scandinavia, England, and the United States have not found a substantial increase in the prevalence of HAV among sewage workers (CDC publication: MMWR, Vol. 48, No. RR-12), stay advised of any Hepatitis A outbreaks in your area, and contact your doctor about a vaccination should you have any concerns about coming in contact with this virus.
- While the fecal coli form bacteria E-Coli has been regarded mainly as a food-borne illness, contact with farm animals and contaminated water have arisen as other sources of infection. In a number of cases, water supplies were contaminated due to runoff from structures such as septic systems and agricultural manure lagoons that contain human and animal fecal material respectively. For more information on this and other example cases, please visit the CDC website.
- In addition, even though public concern remains high, the blood-borne viruses Hepatitis B and HIV (Aids) have not been linked in the U.S. to exposure to sewage. For more information, visit the Center to Protect Workers' Rights.

- Finally, as more data is collected on biohazards, and as new biological threats emerge, it is your responsibility as a waste industry worker to remain educated about the hazards involved in working with sewage and wastewater effluents. Several sources for obtaining up-to-date information are listed below:

National Center for Infectious Diseases (NCID)

www.cdc.gov/ncidod

National Institute for Occupational Safety and Health (NIOSH)

[1-800-35-NIOSH](tel:1-800-35-NIOSH) or www.cdec.gov/niosh

OSHA

[1-800-321-OSHA](tel:1-800-321-OSHA) or www.osha.gov

WARNING

Always wear protective gloves, eye protection and, appropriate clothing when working with sewage effluent or septage. These materials may contain hazardous chemicals and bacteria, which can cause infection, injury, or even death due to contact.

SAFETY PRECAUTIONS FOR CONNED SPACES

WARNING

DO NOT reach into the tank for cleaning without protective clothing. Sewer gas can be absorbed through the skin causing serious injury.

WARNING

DO NOT attempt to enter the tank of a portable slide-in unit. The hatch provided on some tanks is intended to provide reach-in access for cleaning only. **DO NOT** place your face or head into the tank when reaching into it. These tanks are not designed to permit entry, and any attempt to enter them could result in serious injury or death.

SAFETY PRECAUTIONS FOR OPERATING EQUIPMENT

WARNING

VACUUM TANK OPERATION INVOLVES POTENTIAL HAZARDS

Personal injury may result if certain safety precautions are not followed while operating vacuum tanks. While these may not cover all possible hazardous situations, carefully learn and observe the following safety precautions as a minimum.

DANGER

Stop the truck motor, remove all persons from the truck cab, and chock the truck tires before servicing any of the components on your slide-in unit. A truck that begins to roll is a crushing hazard that can lead to death.

DANGER

Make sure the gas engine on your slide-in unit is shut off before servicing the vacuum pump. Contact with a rotating mechanism can cause entanglement that can lead to death.

WARNING

Keep hands, feet, hair, and clothing away from moving parts. Contact with a moving mechanism can cause entanglement that can lead to dismemberment or death.

WARNING

Keep all shields in place. Shields and covers are designed to protect the operator from entanglement in moving parts, which can lead to serious injury or death. **DO NOT** remove shields from the unit except when servicing; then replace immediately.

WARNING

The truck's cornering and braking abilities are reduced when the tank is loaded. Drive at a reasonable speed with a loaded tank on rough or inclined terrain, before making an anticipated stop, and when cornering.

WARNING

DO NOT allow anyone to ride in the bed of the truck when the slide-in unit is installed in it. Failure to follow this precaution could result in persons falling off the truck and possibly getting run over, which could cause serious injury or death.

WARNING

Before backing-up the truck, inspect the area to be backed into, and clear all hazards, pets, and people from it.

WARNING

When off-loading under pressure, maintain control of the end of the hose. Pressurized discharge can cause a hose end to whip around and create the potential for spraying persons in the area with effluent.

WARNING

Avoid contact with the vacuum pump during or immediately after operation. Operating temps can range from 200° F to over 300° F depending on the make and model of the pump and on the working conditions. Contact with a hot vacuum pump can cause severe burns.

SET UP

Your portable slide-in unit comes assembled from the factory. The slide-in unit is ready to put into use when you receive it, aside from some necessary owner setup. This includes lifting the unit into your truck bed, securing it to prevent shifting, connecting the battery cable to start the engine, and installing the vacuum pressure gauge.

CAUTION

As the installer of the slide-in unit, it is your responsibility to meet any and all Department of Transportation (DOT) regulations for your state and operational area.

All vehicle mounting and setup is at the responsibility of the customer. Customer and installer should refer to all DOT regulations and all payload specifications listed on the drivers side door jam.

CAUTION

As a note of caution, the advertised payload weight for a particular truck may not be the actual load you can carry with the truck.

Advertised payloads often do not account for the weight of options such as automatic transmissions, which can add up to 100 pounds to your vehicle. In addition, the advertised payloads may not take into account the weight of passengers and gear (such as tools) being carried by the truck. Ignoring these factors could result in your truck being found to be overloaded during a roadway weight inspection.

Have your vehicle weighed prior to installation of your slide-in unit to ensure you are not found overloaded.

WARNING

DO NOT exceed the Gross Vehicle Weight Rating (GVWR) or the Gross Axle Weight Rating (GAWR) for your vehicle when carrying your portable slide-in unit. Exceeding the GVWR or the GAWR of your vehicle can cause damage to the vehicle and can impede the braking performance of the vehicle causing traffic accidents and serious injury or death to others.

SECURING UNIT TO PREVENT SLIDING

This slide-in unit is not attached to any vehicle. Once the unit arrives, it requires installation at the customer site. As the customer, you are responsible for installing this unit to all DOT regulations and to ensure the safety of the driver.

WARNING

Before welding, make sure the cap on the engine gas tank is affixed tightly, disconnect the battery terminals, and attach the ground cable of the welder as close as possible to the area being welded. **DO NOT** perform welding if gas fumes are present. Gasoline is highly explosive, and can result in serious injury or death if caused to ignite.

WARNING

Before transporting your slide-in unit, make sure it is securely fastened into the truck bed in order to keep it from sliding. If not fastened, the unit can crash into and break the tailgate, and possibly fall from the truck causing a traffic accident and/or severe injury or death to persons in the area.

ELECTRICAL SETUP

Your portable slide-in unit comes with a 12 volt battery for providing power to the electric start gas engine and the motor for the water pump. Your unit also comes with a cable to connect to your truck battery. To make sure the battery maintains its charge, it is disconnected during shipment. Connect the battery before placing your slide-in unit into service. In addition, check the 15 amp system fuse to make sure it has not been damaged during shipment.

OPERATION

The main components of your portable slide-in unit are detailed in Figure 3.1. This illustration provides an introduction to the components on your slide-in that are referred to throughout this manual.



OPERATION SAFETY

Operating vacuum tanks, and pumping septic effluent, involves potential hazards. Before operating your portable slide-in unit, you must understand and follow all of the safety precautions in this manual.

Hazards frequently encountered in pumping include dangerous chemicals, exposure to bacteria, explosive atmospheres, falls, high-pressure water jets, rotating drivelines, and poisonous gases. Each job is unique, you may experience other hazards as well.

When dangerous situations arise, it is your responsibility to make sure that no harm comes to persons, equipment, or the surrounding environment. Make sure your jobsite is secured and safe for others, both when you carry out the job and when the job is complete.

CAUTION

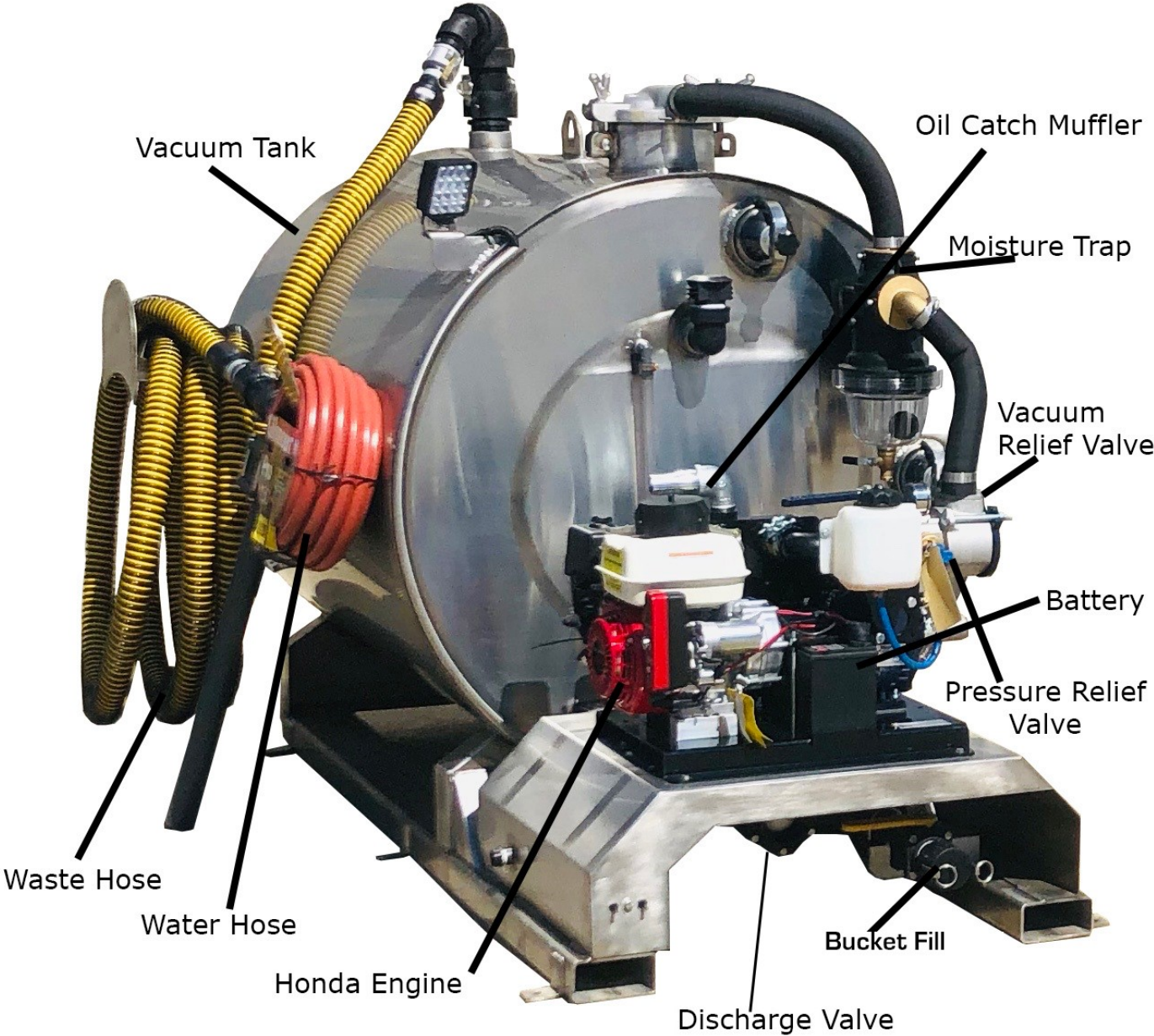
Vacuum tank operation involves potential hazards. Personal injury may result if certain safety precautions are not followed while operating vacuum tanks. While these may not cover all possible hazardous situations, carefully learn and observe all safety precautions in this manual as a requirement.

VACUUM RELIEF VALVE

The vacuum relief valve serves to safeguard against vacuum pump damage. It is located in the airline circuit just above the vacuum pump (Figure 3.1). The vacuum relief valve is factory set to 18Hg. This is the maximum continuous vacuum rating (MCVR) of the vacuum pump. This vacuum level also generates the recommended maximum limit on horsepower draw for the engine.

If you notice that the vacuum relief valve is not relieving vacuum when your tank reaches 18HG, you might need to reset it. Use the following procedure to set the valve:

Figure 3.1 Main Components of Slide-In



1. Loosen the locking nut located near the top of the vacuum relief valve. Rotate the inner cylinder clockwise one to two revolutions to reduce the setting at which the valve opens. Retighten the locking nut after making the adjustment.
2. Run the pump in vacuum mode, and check to see if the valve opens at the MCVR as listed above.
3. Repeat steps one and two until you attain the proper setting.

► NOTICE

DO NOT run vacuum pump above the pump manufacturer's maximum continuous vacuum rating. Exceeding the maximum vacuum rating could cause damage to the pump and/or unit.

For more information on continuous vacuum ratings for your specific pump, please refer to the operator's manual for your specific pump.

PRESSURE RELIEF VALVE

A pressure relief valve is located in the airline circuit next to the vacuum relief valve (Figure 3.1). This valve serves to prevent damage to the tank and motor. It opens to release air when the pressure in the tank reaches 6 psi to 8 psi.

When the pressure relief valve opens to release excess air, you should be able to hear a hissing sound. Listen for this sound, and if the valve does not open at the above pressure, reset it. Exceeding the recommended 6-8 psi pressure can create excessive horsepower draw on your engine causing it to overheat.

Figure 3.2 Vacuum/Pressure Gauge



! CAUTION

DO NOT exceed a maximum pressure of 6-8 psi with your vacuum tank. Exceeding the pressure can create the engine to overheat, which could result in damage to equipment.

Use the following procedure to set the pressure relief valve:

1. Purge all air from the tank by slowly opening the rear dump valve. Stand off to the side of the valve to prevent possible injury from the direct flow of releasing pressure.
2. After purging the tank of air, loosen the setscrew located near the top of the pressure relief valve. Rotate the inner cylinder clockwise one to two revolutions to reduce the setting at which the valve opens. Retighten the setscrew after making the adjustment.
3. Run the vacuum pump in the "pressure" mode, and check to see if the valve opens at the specified setting as listed above.
4. Repeat steps one through three until you attain the proper setting.

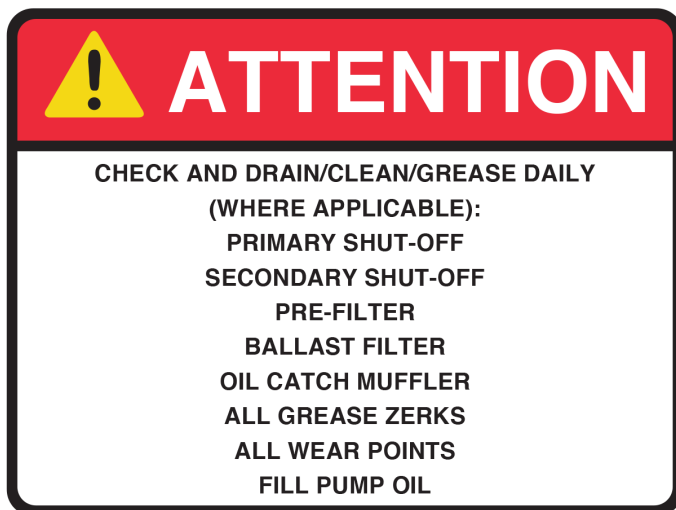
VACUUM/PRESSURE GAUGE

A vacuum/pressure gauge is located on your tank (Figure 3.2). As the gauge needle moves counter-clockwise of zero, the gauge reads vacuum in inches of mercury (in. Hg). As the gauge needle moves clockwise of zero, the gauge reads pressure in pounds per square inch (psi). Use the gauge to determine when the tank has reached operating vacuum or pressure.

MOISTURE TRAP (SECONDARY SHUTOFF)

The moisture trap (also referred to as the secondary shutoff) serves as a safety device to prevent liquid from entering the vacuum pump. Check the moisture trap daily for accumulation of liquid. Use the easy access drain located at the bottom of the moisture trap.

While the moisture trap helps prevent liquid from entering the pump, excess accumulation may be an indicator that some contamination has passed into the pump. When excess liquid shows up in the moisture trap, clean your vacuum pump using the procedure on page 19-21 of this manual.



■ IMPORTANT

Anytime that excess liquid accumulates in the moisture trap, clean the inside of your pump. Liquid contamination that enters the pump can cause damage if you do not clean the pump shortly thereafter.

OIL CATCH MUFFLER

The oil catch muffler collects oil expelled from the vacuum pump and reduces pump noise.

Drain the oil catch muffler daily by opening the drain at the base of the muffler chamber. You may need to drain the muffler more frequently when subjecting the pump to heavy use. Properly dispose of the used oil. **DO NOT** reuse any oil.

If you notice water has collected in the oil catch muffler, dry out the vacuum pump interior using the procedure outlined in this manual.

FILL INDICATOR

Your portable slide-in unit comes with a sight tube (or sight eyes) and a fill indicator. The sight tube displays the liquid level in the freshwater compartment and sewage compartment.

LOAD AND DUMP VALVES

Your portable slide-in unit comes with manual load and dump valves.

Use the handle mounted to each valve to open and close it.

To allow for easy coupling and uncoupling of the vacuum or discharge hose, both the load and the dump valves are equipped with cam lock fittings.

There is a cam lock fitting cover for the dump valve. When the discharge hose is uncoupled, place this cover over the dump valve opening to keep dirt and debris from collecting in it.

Dumping arrangements vary widely. Discharge hose is not included with your portable slide-in unit. Based upon your specific requirements, procure the correct length of 3" discharge hose and a 3" cam lock attachment to couple to the discharge outlet.

VACUUM PUMP

The portable slide-in units have numerous configurations of pumps and motors. Consult the OEM Operation Manual for your pump which is included in the literature packet that you received with your portable slide-in unit. Review and follow the operation procedures outlined in that manual.

LOADING THE TANK

Use the following procedure to load the tank on your portable slide-in unit:

1. Set the vacuum/pressure handle on the pump to the “vacuum” mode.
2. Move the throttle control lever on the gas engine to about 3/4 of the way toward the FAST position. This will provide the recommended 1250 to 1300 rpm at the vacuum pump.

Moving the throttle lever all the way open will result in about 1600 rpms at the vacuum pump. The manufacturer rates this pump for 1300 rpm. If the pump exceeds 1300 rpm, the engine throttle lever must be backed down just a bit from the fill throttle position.

Making sure the throttle on the gas engine is set to provide the optimum speed for the pump requires the attentive observation of the operator. If the pump is running too slow, the vanes will make a clanking sound as they move in the rotor slots. If the pump is running too fast, it will overheat.

3. Allow the vacuum to build to the desired level (usually about 15” Hg), and then open the valve on the suction wand and load the tank.
4. When the tank is full, close the fill valve and turn off the engine in order to shut down the pump.

Pay close attention to the fill indicator on your tank so that you can promptly shut down your vacuum pump when the tank is full.

If for any reason you can’t visually tell when the tank is full, listen for a change of sound in the vacuum pump. When the tank is full, the primary shutoff stops airflow, creating a noticeable change in the sound of the vacuum pump.

In the unlikely event that the primary or secondary shutoff activates due to extreme air velocity, promptly shut down the vacuum pump. A change in sound in the vacuum pump is your indicator to stop operation. This will deactivate the shutoff, at which point you can resume operation.

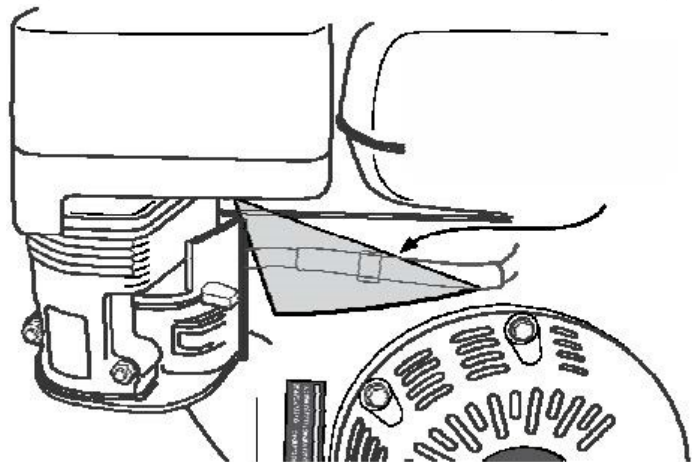
► NOTICE

DO NOT operate the pump faster than the recommended rpm. Operation above the recommended rpm will cause the pump to overheat, resulting in damage to the pump.

► NOTICE

Shut down your vacuum pump promptly when the tank is full. In addition, any time the primary or secondary shutoff activates, stop pump operation. At the point when either of the shutoffs activates, the pump is susceptible to overheating if kept running. This can damage your pump.

Figure 3.3 Throttle Control Lever Operating



MECHANICS OF PNEUMATIC-

TRANSPORT (transfer by means of vacuum)

A vacuum, as pertaining to pumping of liquid waste, is a space with some of the air removed from it.

Your vacuum pump extracts air from your vacuum tank, lowering the pressure inside of it. Atmospheric pressure pushing against the liquid does the actual loading of your vacuum tank. The liquid flows toward the area of lower pressure created in the tank.

Vacuum is measured in inches of mercury (in.Hg. Or Hg). This type of measurement is based on a barometric mercury column. Standard atmospheric pressure at sea level causes the mercury in this instrument to rise 30 inches up into a glass tube with a vacuum. The dial type pressure/vacuum gauge on your tank gives the same in.Hg. Reading as a mercury column.

Pumps should operate at 15" Hg of vacuum without placing undue stress on your pump. Table 3.3 lists the approximate vacuum levels required to lift water a given distance. However, these figures must be adjusted to compensate for the weight of the material and the length and diameter of suction hose being used. Effluent or sewage may often weigh more than water. Pumping these products through a hose creates friction. Both of these factors result in reduced lifting efficiency.

Both attainable vacuum and pumping height decrease at higher altitudes as the atmospheric pressure decreases with height, creating less pressure to load your tank. Table 3.4 lists the percentage loss of attainable vacuum for every 1,000-footrise in elevation over sea level.

Table 3.3 Vacuum Levels vs. Lift Height

Vacuum in.Hg	Lift Height (for water)
10	11'4"
15	17'
20	22'8"
21	23'8"
22	24'9"
23	26'
24	27'2"
25	28'4"
26	29'5"
27	30'6"
28	31'7"
29	32'8"
30	34'

While it is necessary to create enough vacuum to handle pumping height, product weight, and hose friction, it is important not to overstress the pump. Pay close attention to your pump if it is necessary to operate at a high in.Hg vacuum level. Air-cooled pumps are especially vulnerable to overheating when being operated for extended periods at high vacuum levels. Liquid cooled pumps can handle this type of operation much more readily. Please consult the manual for your individual pump for additional information.

Operation at high in.Hg levels can also result in moisture condensation in the pump. As vacuum increases, water begins to evaporate from the surface of the liquid in the tank. Anytime that vacuum pump operation exceeds 15"Hg, water vapor can begin to show up in the air circulating in the vacuum system.

Most of this moisture collects in the oil catch muffler, however some of it will also accumulate inside the pump.

In order to prevent problems connected with water collection in your vacuum pump, dry it out anytime that you notice that water has collected in the oil catch muffler.

Table 3.4 Vacuum vs. Elevation

Elevation	Attainable Maximum	Percentage of loss per 1,000 feet
0	29.921	—
1,000	28.85	3.6%
2,000	27.82	7.0%
3,000	26.82	10.4%
4,000	25.84	13.6%
5,000	24.89	16.8%
6,000	23.98	19.9%
7,000	23.06	22.9%
8,000	22.20	25.7%
9,000	21.38	28.5%

Use the following procedure to dry the pump out:

- Unload the tank
- Open a load or dump valve (to keep from building vacuum)
- Run the pump in vacuum mode for two to five minutes

Water that is allowed to remain in your vacuum pump can diminish performance and cause serious damage. When water is present inside the pump, sludge forms. This can restrict the vanes from moving freely inside the rotor slots, reducing the efficiency of your pump. In addition, water inside your vacuum pump can freeze during cold weather operation. Attempting to operate your pump if it is frozen inside with ice will damage it.

NOTICE

DO NOT run your vacuum pump above the pump manufacturer’s maximum continuous vacuum rating. Exceeding the maximum vacuum rating could cause damage to the pump and/or tank.

IMPORTANT

After operating your pump at high in.Hg vacuum levels, dry the pump interior out using the procedure outlined above. Water in your vacuum pump can cause sludge formation and freeze up in cold weather.

UNLOADING

You have two options when unloading the tank on your slide-in unit; gravity dumping or pressure dumping. Either method will effectively empty the tank, however pressure dumping increases discharge flow rate.

Begin the unloading procedure by placing the vacuum pump control handle into neutral to relieve any vacuum in the system, then use one of the following procedures:

For gravity dumping:

1. Set the control handle on the pump to the “neutral” mode.
2. Open the dump valve.

For pressure dumping:

1. Place the pump into operation using the procedures outlined in the pump manufacturer’s manual.
2. Set the vacuum pressure control handle on the pump to the “pressure” mode.

3. Move the throttle control lever on the gas engine to about 3/4 of the way toward the FAST position (Figure 3.3, on Page 14).
4. Open the pump valve to begin unloading when the pressure reaches the desired level (up to the maximum psi set on the pressure relief valve).

CAUTION

DO NOT exceed a maximum pressure of 6 psi to 8 psi with your vacuum tank. Exceeding this pressure can cause the engine to overheat, which could result in damage to equipment.

After unloading the tank, stop the gas engine, and close the dump valve. It is important to stop the engine before closing the valve to avoid pressure buildup in the system.

WASH-DOWN SYSTEM

You will have received an OEM manual for the pressure water pump (included in your packet). Review and follow the operation procedures outlined in that manual. Please refer to this manual for all operation and maintenance procedures.

WARNING

DO NOT use a tight fitting on the fresh water compartment fill port. This port is designed to be self venting and performs this function with the use of your fill line of a smaller diameter. Failure to allow the vent to function can result in damage to the tank and serious personal injury.

NOTICE

DO NOT allow water to freeze inside the pump. Do not attempt to start the pump if water has frozen inside it. Freezing water can damage your pump. Take the truck into a warm area and allow the pump to thaw out.

COLD WEATHER OPERATION

Use the following guidelines when operating your vacuum tank in temperatures below 32° F.

Extremely cold weather can result in formation of ice inside the vacuum pump, due to residual moisture. If the pump freezes up due to ice, take the truck into a warm area and allow the pump to thaw.

DO NOT use a blowtorch or other similar device to attempt to thaw a frozen vacuum pump.

Frigid temperatures could also cause the dump or load valves to freeze shut. Hot water poured over a frozen valve should loosen the ice. **DO NOT** use a blowtorch or similar device to thaw a frozen valve. This method could damage the valve.



DANGER

TOXIC GAS HAZARD

Do NOT enter tank without special breathing equipment

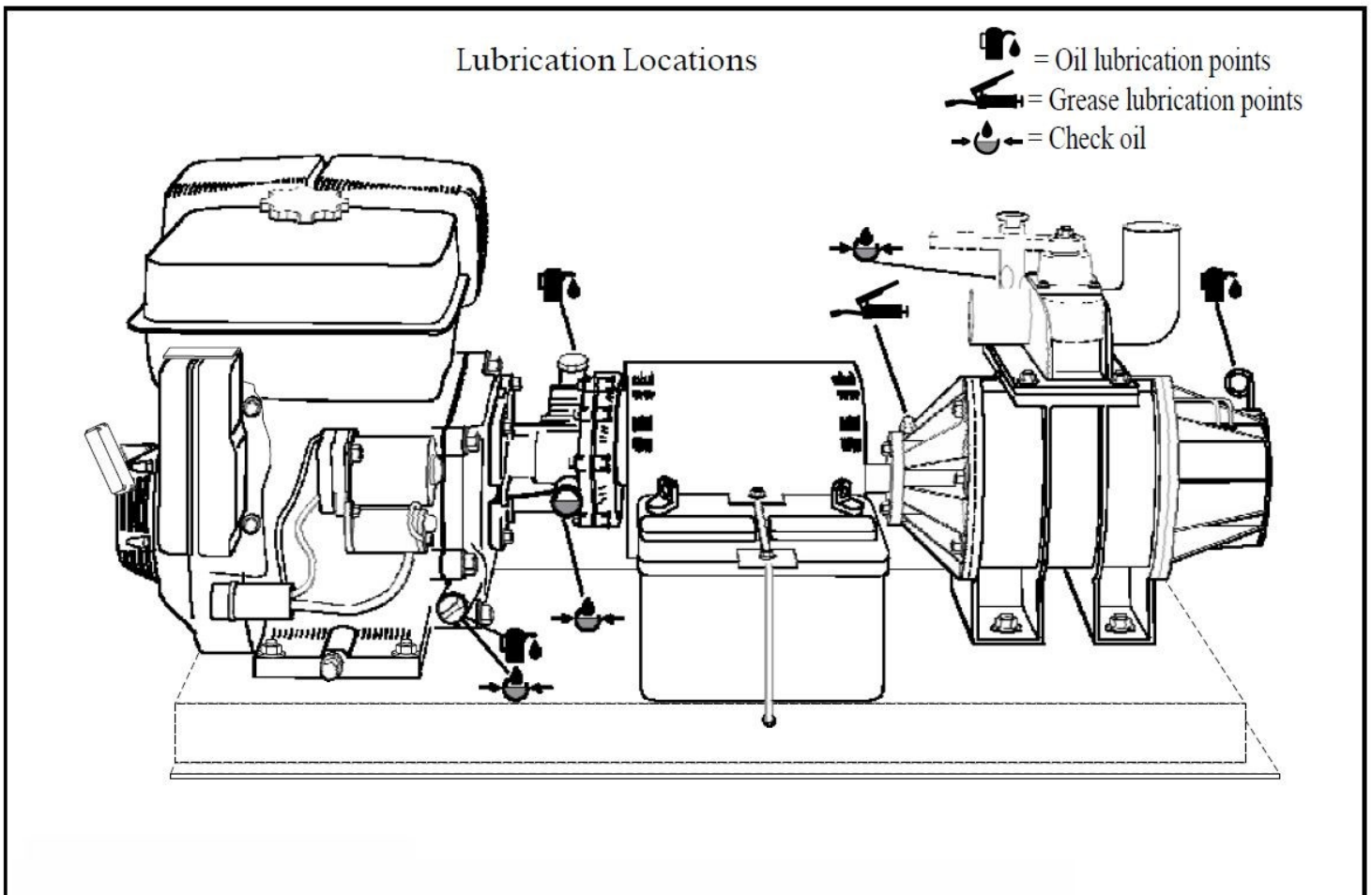
FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS INJURY OR DEATH

MAINTENANCE

Table 4.1 Vacuum Levels vs. Lift Height

Required Lubrication	Lubrication Interval
Gas Engine— Check engine oil level	EVERY time before startup
Vacuum Pump— Grease front bearing at grease fitting	Per pump manufacturers recommendations or at a minimum every 4 hours of operation/daily.
Vacuum Pump— Re-fill oil level in the rear housing	Per pump manufacturers recommendations or at a minimum every 4 hours of operation/daily.
Reduction Gearbox— Check the oil level in the gearbox	Weekly
Gas Engine— Check transmission oil level	Weekly
Vacuum Pump— Change oil in the rear housing	To correspond with oil weight requirements for given air temperature

Figure 4.1 Lubrication Locations



LUBRICATION AND MAINTENANCE INTERVALS

Safe and reliable service from your slide-in unit depends upon a regular schedule of lubrication and maintenance. Figure 4.1 details the lubrication locations on your slide-in unit. Tables 4.1 and 4.2 list intervals for lubrication and maintenance. The following sections detail the required lubrication and maintenance for individual components.

WARNING

Before performing any lubrication and maintenance, review and follow the “**SAFETY PRECAUTIONS**” on pages 4-6 and all safety precautions listed below.

MOISTURE TRAP/SECONDARY SHUTOFF

Check the moisture trap daily for collected liquid. Use the easy access drain valve to empty the trap. The drain is located at the bottom of the moisture trap.

In addition to checking for liquid, inspect the ball seat and the fasteners every two (2) weeks.

Check all moisture trap fasteners and tighten as necessary. Road vibration over time can loosen fasteners.

Remove the moisture trap cover to examine the ball seat for hardened rubber, nicks in the rubber, and buildup of debris. Any of these conditions may prevent proper sealing. Clean and/or replace the ball seat as necessary.

Anytime that excess liquid accumulates in the moisture trap, clean the inside of your pump. While the moisture trap helps prevent liquid from entering the pump, excess accumulation may be an indicator that some contamination has passed into the pump.

Contaminates entering the pump (including effluent) is a major cause of pump failure. Refer to the manual for your specific pump for vacuum pump cleaning procedures.

Clean and/or replace the ball seat in the primary shutoff any time that excess liquid accumulates in the moisture trap. Excessive liquid in the moisture trap can be traced to improper sealing of the ball seat in the primary.

IMPORTANT

Any time that excess liquid accumulates in the moisture trap, clean the inside of your pump. Liquid contamination that enters the pump can cause damage if you do not clean the pump shortly thereafter.

PRIMARY SHUTOFF

Inspect the primary shutoff every two (2) weeks to check the rubber ball seat and the tightness of all fasteners.

To inspect the ball seat, begin by first removing the cap screws that fasten the primary shutoff access lid to the portal flange on the tank (Figure 4.2). After the fasteners are removed, lift the entire shutoff assembly (which is fastened to the access lid) out of the tank. Be careful not to let the portal gasket fall on the ground or into the tank.

Next, remove the cap screw at the bottom of the float cage and reach up through the cage tube to remove the seat.

Examine the ball seat for hardened rubber, nicks in the rubber, and a buildup of debris. Any of these conditions may prevent proper sealing. Clean or replace the seat as necessary.

Reassemble the primary shutoff in the reverse order. Be sure to tighten all fasteners adequately.

This is important because fasteners may become loose due to vibration. This is especially critical when driving extensive miles with an empty tank.

CAUTION

Wear protective gloves, eye protection, and appropriate clothing when inspecting and cleaning the primary shutoff. Being a component of the vacuum system, the shutoff is exposed to sewage effluent or septage. These materials may contain hazardous chemicals and bacteria, which can cause infection, injury or even death due to contact.

IMPORTANT

Check the primary shutoff regularly for the condition of the ball seat and fastener tightness. Improper maintenance of the primary shutoff may allow liquid to flow into the vacuum pump, which will result in damage to the unit.

VACUUM PUMP MAINTENANCE

The OEM Operator's Manual for your vacuum pump is included in the literature packet that you received with you slide-in unit. Review and follow the maintenance procedure outlined in that manual.

KeeVac Industries recommends following the additional safety warnings when maintaining your vacuum pump.

IMPORTANT

Follow the maintenance procedures outlined in your OEM pump manual in order to keep your warranty valid and receive maximum service life from your pump.

IMPORTANT

When adjusting your vacuum pump oiler, use small adjustment increments (no more than one turn at a time). This helps protect against running the pump dry due to turning the adjustment knob too lean or in the wrong direction.

NOTICE

Check the oil level in the rear housing at regular intervals. Allowing the pump to run low on oil during operation will result in damage to the pump.

NOTICE

Follow the manufacturer's recommended lubrication for your specific vacuum pump. Oil pump types and heat generation characteristics vary among vacuum pumps. Using the incorrect oil can lead to overheating and mechanical failure.

IMPORTANT

DO NOT over grease the pump bearings. Over greasing can damage the seals.

PERIODIC VACUUM PUMP MAINTENANCE

Other maintenance for your vacuum pump includes cleaning the exterior of the pump, cleaning the interior of the pump, checking rotor vane wear, and replacing worn rotor vanes. Please refer to your OEM manual for more information on this procedure.

Table 4.2 Maintenance Intervals (in addition to lubrication)

Component	Required Maintenance	Maintenance Interval
Moisture Trap	Check for accumulation of liquid	Daily
Primary Shutoff	Clean rubber ball seat, check fastener tightness	Every Two (2) Weeks
Moisture Trap Secondary Shutoff	Clean rubber ball seat, check for hardened rubber, nicks in the rubber, and build up of debris. Also check fasteners tightness	Every Two (2) Weeks
Mounting Brackets	Check tension on spring mounts	Every Month
Vacuum Pump	Clean pump interior. Check for excess moisture, liquid, dirt, and contaminants.	Every Three (3) Months
Vacuum Pump	Clean pump exterior (to avoid overheating)	Regularly
Vacuum Pump	Clean drip oiler sight glass	Periodically
Vacuum Pump	Check rotor vane wear	Per pump manufacturers recommendations. (Replace vanes that exceed 1/4" wear limit)

CLEANING THE EXTERIOR OF THE VACUUM PUMP

Clean the mud and dirt off the exterior of your vacuum pump on a regular basis. This is especially important for air-cooled pumps that need to be clean to allow heat to radiate from them.

CLEANING INSIDE OF THE VACUUM PUMP

Occasionally a small amount of liquid, dirt, or other contaminate may enter the pump, restricting the ability of the vanes to glide in the rotor slots.

To prevent vane-restricting buildup in your vacuum pump, clean the inside of your pump with a flushing fluid at least every three months.

In addition, clean the inside of your pump anytime that water shows up in the oil catch muffler or if excess moisture begins to accumulate in the moisture trap. Pay attention to periodic cleaning because it will increase the life of your pump.

Figure 4.2 Primary Shutoff for Slide-In

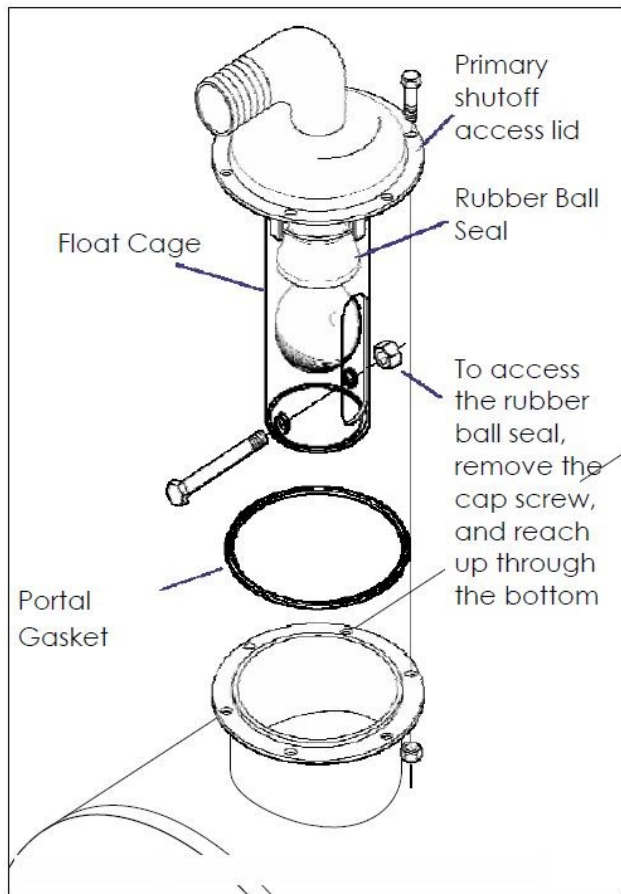
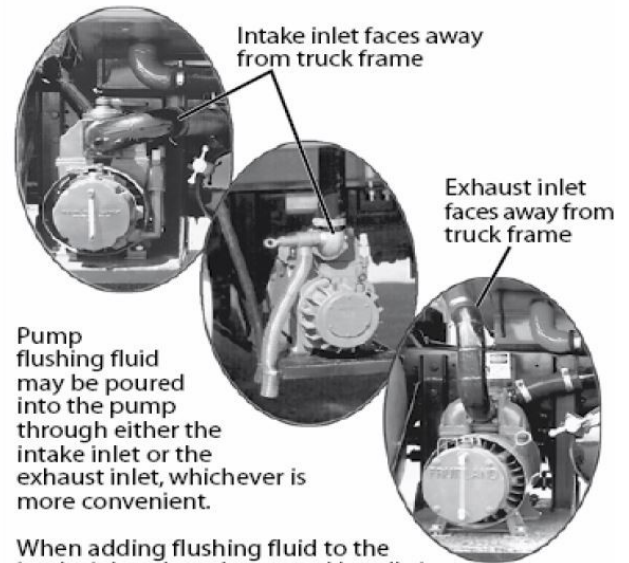


Figure 4.3 Vacuum Pump Cleaning



When adding flushing fluid to the intake inlet, place the control handle in the vacuum mode.

When adding flushing fluid to the exhaust inlet, place the control handle in the pressure mode.

After flushing fluid has been added, place the control handle in the neutral position before cycling the pump.

Also, be sure to reassemble the intake or exhaust hose (or access plug) before cycling the pump - in order to guard against inadvertent discharge of flushing fluid through the opening.

DANGER

Stop the truck motor, remove all persons from the truck cab, and chock the truck tires before servicing the vacuum pump. A truck that begins to roll is a crushing hazard that can lead to death.

DANGER

Make sure the gas engine on your slid-in unit is shut off before servicing the vacuum pump. Contact with a rotating mechanism can cause entanglement that can lead to death.

IMPORTANT

The procedure outlined below can be used in ADDITION to the recommendations of your specific pump OEM Operator's Manual. Always consult your OEM Operator's Manual prior to performing any maintenance on your slide-in unit.

Use the following procedure to clean your vacuum pump:

1. Turn the gas engine off, make sure the ignition switch is turned to off, and make sure your pump is in the non-operating mode.
2. Remove the vacuum relief valve from the air line. (Figure 4.3).
3. Create a flushing fluid with a 50/50 mixture of diesel fuel and vacuum pump oil. Place the control handle on the pump in the "vacuum" mode.
4. Pour 1/2 pint of the flushing mixture directly into the pump inlet.
5. Turn the control handle to the neutral position to close the changeover valve.
6. Replace the vacuum relief valve.

7. Start the gas engine and run the pump at operating speed for about one minute.
8. Stop the gas engine and use the control handle to switch the pump to vacuum mode.

■ IMPORTANT

Be sure to replace the vacuum relief valve in the inlet air line before placing the pump in the vacuum mode to expel the flushing fluid.

CAUTION

DO NOT position the control handle to the “pressure” mode, which would expel the fuel through the pump inlet. Incorrectly expelling the flushing fluid through an open inlet (without the vacuum relief valve replaced) could cause it to spew out at the operator.

9. Restart the gas engine, and run the pump at operating speed for about ten (10) seconds, and then stop the engine.
10. After completing the above cleaning sequence, make sure that the ignition switch on the gas engine is in the off position, and then rotate the driveline slowly by pulling on the gas engine starter rope. Listen for a clicking sound as each rotor vane drops in its slot. If not all the vanes are sliding freely in the pump rotor slots, repeat the above procedure until they do slide freely.

DANGER

Before rotating the driveline manually by pulling the gas engine starter rope, make sure the ignition switch is turned to off. Contact with a rotating mechanism can cause entanglement that can lead to death.

11. After completing the pump cleaning, pour four (4) to eight (8) oz. of oil into the pump. This will require you to remove and reassemble the vacuum relief valve one more time. At this point, use Teflon tape, Teflon thread sealant, or any other good quality thread sealant for the final reassembly of the valve.
12. Run the pump in neutral for about a minute, and then drain the oil catch muffler of the used flushing fluid. Properly dispose of the used flushing fluid. Your pump is now ready to put back into service.

► NOTICE

Add oil directly into the pump after cleaning and before putting back into service. This is important because the cleaning procedure will rid the pump of both dirt and the necessary oil for lubrication.

Table 4.4 High Vane Wear Operating Conditions

The conditions below will reduce vane life and necessitate more frequent vane wear checking.

- Fine grit in intake air (e.g. sand, rust, or soil dust particles)
- Many long intervals of operation *
- Many intervals of high Hg. Operation * (e.g. as when required to lift product a great distance).
- Consistent use of pressure dumping
- Running the pump dry of oil
- Using the wrong oil in pump (use only manufacturer recommended oil in your pump).
- Any situation in which the pump overheats
- Lack of periodic pump flushing maintenance
- Lack of pump flushing maintenance after water has entered the pump.
- Attempting to engage a pump that is frozen with ice (before thawing the pump completely)

*Note: Pumps rated for continuous or heavy duty operation (such as liquid cooled pumps) can handle these conditions more readily.

Check vane wear at the interval recommended in your OEM pump manual. It is important to keep up with all recommended maintenance for vane wear as most pump manufacturers do not warranty damage caused by vane breakage.

You may need to change your vanes more often than the manufacturer's recommendation if your pump is subjected to very heavy use. See Table 4.4 for examples of heavy use factors that can shorten vane life.

When vane wear exceeds 1/4" (for most pumps), the vanes must be replaced. New vanes, when bottomed in the rotator slots, will be flush with the outside diameter of the rotor. Vane wear is determined by measuring how deep the edge of the worn vane sits below the outside of the rotor.

If the pump volume declines significantly (i.e. it takes longer and longer to fill the tank), then the vanes probably need to be change.

Checking the vanes involves disassembling one of the end plates from the pump in order to gain access to the rotor. It is advantageous to have a fresh set of vanes on hand before checking. Then, the new vanes will be ready for installation if necessary.

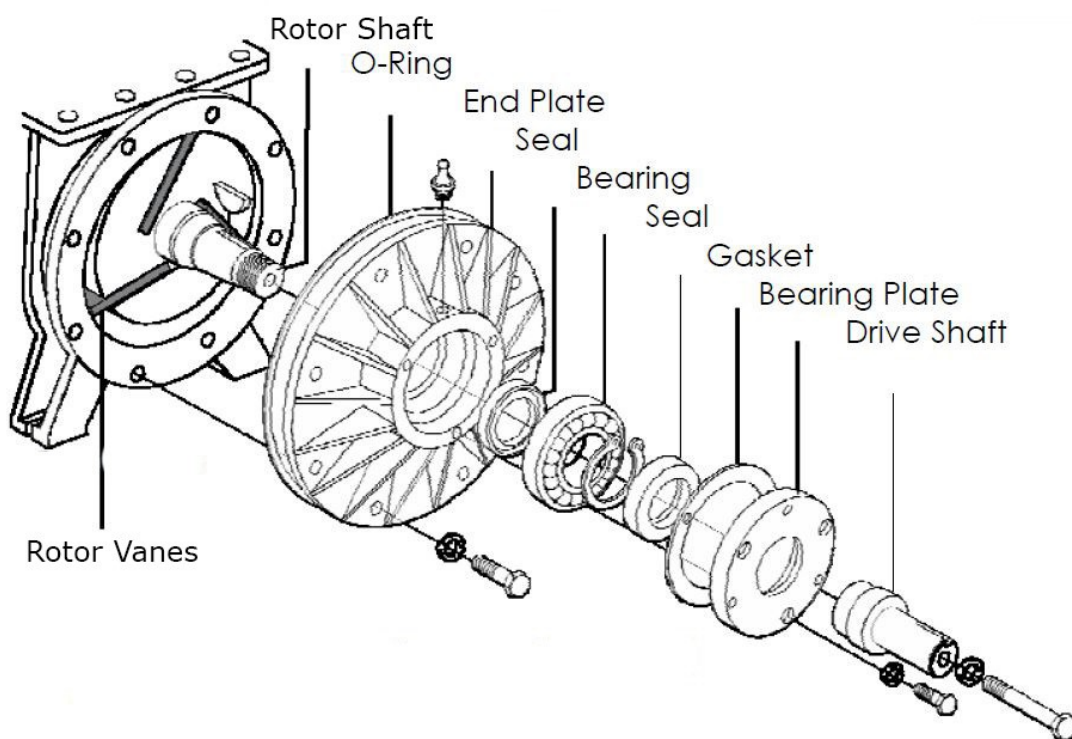
REPLACING ROTOR VANES

Refer to the following instructions and the pump assembly diagram in Figure 4.4 when changing the rotor vanes on your vacuum pump.

■ IMPORTANT

The procedure outlined below can be used in ADDITION to the recommendations of your specific pump OEM Operator's Manual. Always consult your OEM Operator's Manual prior to performing any maintenance on your slide-in unit.

Figure 4.4 Slide-In Vacuum Pump—Front End



Replacing the rotor vanes requires that the pump be removed from the slide-in unit. To remove the pump, first remove the coupling guard and the inlet and outlet airline hoses. Then, unbolt the pump from the slide-in mounting stand. Remove the pump along with the pump side of the coupling. The coupling should separate freely. Place the pump on a solid work bench to change the vanes.

WARNING

Wear protective gloves, eye protection, and appropriate clothing when working with sewage effluent or septage. These materials may contain hazardous chemicals and bacteria, which can cause infection, injury, or even death due to contact.

IMPORTANT

When replacing rotor vanes, be sure to have replacement gaskets, O-rings, and seals on hand in case any of these items should need replacing and/or be damaged during disassembly.

IMPORTANT

It may be advantageous to replace gaskets, O-rings, seals, and bearings when replacing rotor vanes.

PROPER TOOLS FOR THE JOB

Replacing rotor vanes will require disassembly of the front end of the vacuum pump including removing bearings and covers that may be press-fit into place. It is important to gather together the correct tools, including tools for pulling parts free from press-fits, before beginning the job.

IMPORTANT

Be careful not to damage bearing fits, shaft threads or sealing surfaces by hammering, prying or gripping with pliers.

Assemble the following tools before replacing rotor vanes:

- Stiff blade putty knife
- Wrench set
- Pry bars (two blunt tip pry bars or two heavy duty, flat end, screw drivers)
- Properly sized sleeves for installing bearings.
- Replacement gaskets, O-rings, and seals or a re-build kit
- Soft head mallet

PROPER TOOLS FOR THE JOB

Use the following procedure to replace the rotor vanes in your vacuum pump:

1. Remove the coupling attached to the drive shaft, and then unbolt the drive shaft from the rotor shaft.
2. Remove the drive shaft from the end of the rotor shaft. If needed tap the drive shaft with a soft mallet to help free it from the tapered rotor shaft.
3. Remove the bolts from the bearing plate, and then remove the bearing plate from the end plate. The bearing plate should come off relatively easily, and the seal should stay with it.

NOTICE

Be careful to avoid damaging the seal as it slides off of the rotor shaft. Be careful not to damage the gasket between the bearing plate and the end plate.

4. Unbolt the end plate, and then remove it from the pump housing.
5. Use the following procedure to remove the end plate:
 - Use a stiff bladed putty knife to pry the cover away from the housing until there is a small gap all around.
 - Once there is a big enough gap behind the end plate, use two blunt tipped pry bars or two flat head screw drivers, placed opposite each other, to pry the cover (and bearing) free of the rotor shaft.

► NOTICE

Be careful not to damage the O-ring between the end plate and the pump housing.

■ IMPORTANT

The rotor bearing will usually remain pressed into the end plate upon removal. Be careful when pulling the bearing free of the rotor shaft that the rotor does not fall down inside the pump housing. It may be necessary to provide a means of support for the rotor, such as a block of wood under the rotor shaft.

6. Remove the rotor vanes, one at a time, by first rotating the rotor so as to position a vane at the bottom of the housing. With the vane placed downward, there will be enough clearance around the rotor to grasp the vane and slide it out the end of the rotor slot.
7. After removing each vane, simply slide a new vane (that has been dipped in oil) into the rotor slot.

■ IMPORTANT

Always replace vanes in sets.

8. Before reassembling, inspect the rotor bore, bearings, seals, and gaskets, and replace as necessary. Seals should be soft and pliable, gaskets should not be torn, and bearings should turn freely.
9. Reassemble the vacuum pump in the reverse order of disassembly.
10. Reassemble the vacuum pump and coupling assembly back into the slide-in unit. Be sure to replace the coupling guard after assembly.

⚠ WARNING

Keep all shields in place. Shields and covers are designed to protect the operator from entanglement in moving parts, which can lead to serious injury or death. **DO NOT** remove shields from the unit except when servicing; then, replace them immediately.

■ IMPORTANT

Be sure to use the correct size sleeve (one that fits against the inner race of the bearing) when installing the bearing back on to the rotor shaft. Use a soft mallet against the sleeve to press fit the bearing into the shaft.

Table 5.1 Trouble Shooting Vacuum /Pressure Pumps

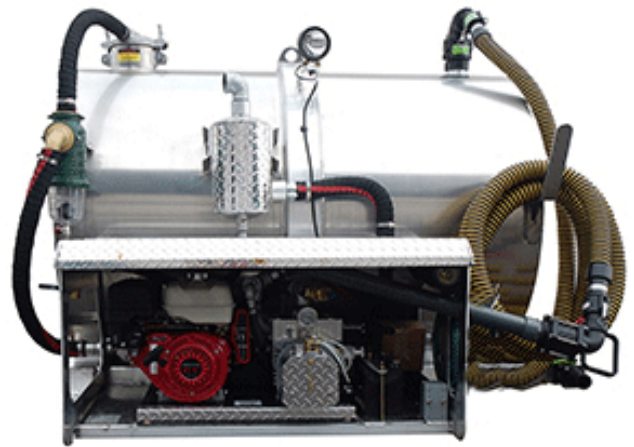
SYMPTOM	CAUSE	SOLUTION
ROTOR DOES NOT TURN	Broken vanes (due to foreign objects or lack of lubrication)	Disassemble, clean well, change vanes, check oil level, and check float on tank
	Frozen pump due to ice	Take slide-in unit into warm area and thaw out
	Frozen pump due to corrosion	Take pump apart and replace necessary parts
	Problem in the drive train	Check driveline, reduction gearbox, and couplings for mal-
	Pump endplate bolts too tight (and in effect caus-	Loosen the bolts
PUMP IS NOT GETTING OIL	Not enough oil in housing	Fill rear housing
	Oil weight too heavy	Check for correct oil weight per table 3.1
	The oil line is blocked	Remove and clean
	The filter on the oil pump is blocked	Remove and clean
	The oil pump piston is jammed on the bushing	Remove oil pump and examine spring and piston
	The oil pump worm gear is out of alignment	Remove rear cover and re-align oil pump
PUMP OVERHEATS	Not enough oil in pump	Fill oil tank
	Oil flow rate set too lean	Readjust the drip rate of the oiler
	The pump isn't receiving lubrication	Check to make sure the oil pump is working
	Incorrect oil type or oil weight used in pump	Replace oil in pump with OEM recommended oil.
	RPM too high	Reduce RPM
	The pump operation interval is too long, or the	Stop the pump and let it cool
PUMP CON-SUMES TOO MUCH OIL	Oiler set too rich	Re-adjust oiler per instructions in OEM pump manual
	Oiler set light	Replace oil with correct weight per OEM pump manual
	Pin in drip oiler not seating	Clean the related seat
LITTLE OR NO VACUUM PRESSURE IN TANK	Control handle in the neutral position	Place the control lever in the "vacuum" position
	Primary shutoff seal leaking	Clean or replace the seal
	Pump rpm-s not high enough	Run pump up to OEM recommended rpm
	Worn vanes	Replace vanes
	Vacuum line between pump and tank blocked	Remove blockage from line
	Intake/Suction line blocked	Remove blockage from line
	Valve, gasket, or pipes leak on tank	Locate and repair leaks
	Vacuum or pressure relief valves leaking and/or set too low	Repair or reset valve (WARNING: DO NOT set pressure or vacuum relief valves above the maximum settings listed on pages xx & XX of this manual)

Table 6.1 Styles of Slide-In Units



SC Model—Rear Engine (RE)

- Flat Head Model
- Tank-in-a-tank Design
- Rear Engine



SC Model—Side Engine (SE)

- Flat Head Model
- Tank-in-a-tank Design
- Side Engine

SC Model—Transverse Engine (TV)

- Flat Head Model
- Tank-in-a-tank Design
- Transverse Engine
- Dual Service Standard



FD Model—Rear Engine (RE)

- Flanged and Dished Heads
- Side-by-side Design
- Rear Engine



FD Model—Side Engine (SE)

- Flanged and Dished Heads
- Side-by-side Design
- Side Engine