NVE/506 Pump

Owner's Record

Date of Purchase: _____

Purchased from: _____

Serial Number: _____

National Vacuum Equipment, Inc.

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General Information

About National Vacuum Equipment, Inc.

Congratulations! You now own a quality vacuum/pressure pump proudly manufactured in the U.S.A. by National Vacuum Equipment, Inc. You have not only acquired a superior piece of equipment from a qualified dealer, you have hired a team of vacuum experts. We stand ready to work with your dealer to answer your questions and provide you with the information necessary to keep your equipment in peak working condition.

Thank you for using National Vacuum Equipment.

OUR MISSION:

We are dedicated to the manufacture and wholesale distribution of quality vacuum system products at a reasonable price, on a timely basis. We are a “one-stop shop” for manufacturers and distributors of vacuum equipment.

OUR HISTORY:

National Vacuum Equipment, Inc. was founded in 1980 by Bruce Luoma. The Company started as a retailer of vacuum pumps. Soon after it started, the Company secured the rights to exclusive distribution of the Battioni vacuum pumps in North America. This helped the Company to evolve into its current status as a wholesale supplier.

To reach the goal of becoming a full service supplier of vacuum system components, the Company began fabricating its own line of componentry. Developed its own line of vacuum pumps, high vacuum blowers and piston gate valves while also purchasing for resale various valves and accessories.

Today, NVE has full service machine and fabrication shops complete with CNC-controlled production equipment designed for close tolerance work. The company has a highly trained staff all of whom are dedicated to quality.

Limited Warranty

NVE/506

National Vacuum Equipment, Inc.

guarantees that the product it provides is free of manufacturer's defects, including materials and workmanship. Properly installed and maintained product is warranted for a period of one (1) year subject to the following conditions:

1. A properly completed warranty registration card must be received by us within 30 days of sale to end user for pump sales to be considered warrantable. All pumps received for warranty consideration must retain the original NVE serial number tag.
2. The one (1) year period shall begin the day the product is shipped from our warehouse, unless we are provided with an authentic copy of the original resale invoice, in which case the one (1) year period shall begin at such invoice date.
3. The covered product must be used in an application for which it was intended. We do not recommend our product for particular uses or applications.

4. Vane breakage, or damage caused by vane breakage, is not warrantable.
5. Damage caused by improper use or lack of proper maintenance is not warrantable.
6. Manufacturer's liability under this or any other warranty, whether express or implied, is limited to repair of or, at the manufacturers option, replacement of parts which are shown to have been defective when shipped.
7. Manufacturer's liability shall not be enforceable for any product until National Vacuum Equipment, Inc. has been paid in full for such product.
8. Except to the extent expressly stated herein, manufacturer's liability for incidental and consequential damage is hereby excluded to the full extent permitted by law.
9. Manufacturer's liability as stated herein cannot be altered except in writing signed by an officer of National Vacuum Equipment, Inc.
10. Certain products provided by National Vacuum Equipment, Inc. are covered by their respective manufacturer's warranties (e.g., engines used in the NVE engine drive packages). These products are not covered by the National Vacuum Equipment, Inc. Manufacturer's Warranty.

Should a potential warranty situation arise, the following procedures must be followed:

- Contact your dealer or NVE immediately upon the occurrence of the event and within the warranty period.
- Customer must receive a return goods authorization (RGA) before returning product.
- All serial-numbered products must retain the NVE serial number tag to be qualified for warranty.
- Product must be returned to NVE intact for inspection before warranty will be honored.
- Product must be returned to NVE freight prepaid in the most economical way.
- Credit will be issued for material found to be defective upon our inspection, based upon prices at the time of purchase.

NVE/506 Pump

Model-Specific Information

Application

Designed for extended operation

- The NVE/506 is a severe duty vacuum pump, designed to be used in liquid waste pumping systems where extended operation is desired.
- This pump incorporates a water cooling system with full length cowling to provide superior cooling allowing for extended operation.

Pump Specification

		PRESSURE PSI						VACUUM – INCHES OF MERCURY								
RPM		25	20	15	10	5	0	3	6	9	12	15	18	21	24	27
1150	HP	49	43	36	27	25	18	20	21	22	23	24	25	26	28	29
	CFM	408	431	438	447	457	519	500	470	458	453	440	438	425	404	351
1000	HP	43	38	32	24	20	15	17	18	19	20	21	22	23	24	25
	CFM	355	375	381	389	398	452	435	409	399	394	390	381	370	352	306
800	H.P	36	32	25	19	15	13	14	14	15	16	17	18	19	20	21
	CFM	302	319	324	331	342	385	374	348	339	333	331	324	315	303	242

1500 RPM
Intermittent Operation Only

Recommended Setup
for optimum performance

System requirements

Cooling System 10 to 20 GPM

- Connect the 3/4” NPT coolant ports to a remote cooling system or the trucks cooling system. Inlet water should be taken from the coolest point possible, (bottom of the radiator) for maximum cooling of the pump.

High quality components

- The NVE/506 is a high performance vacuum pump and requires compatible, high quality components.

Shutoffs

- We recommend the use of our part F-802C, 12" portal shutoff and our part F-901-5C, 14 gallon scrubber/secondary shutoff.

Hose

- Use 4” or larger hose to plumb your system. We recommend you use a hose that can withstand high temperatures such as hot tar-asphalt hose.

Pressure relief and vacuum relief valves

- A pressure relief valve and vacuum relief valve should also be incorporated in the system.

- Our relief manifold A-301-4A contains both the vacuum and pressure relief along with a pressure/ vacuum gauge and diesel flush port
- The relief valves should be set to where the pump operates at a maximum exhaust temperature

  of 350° F.

Muffler

- We recommend the use of an oil catch muffler with filter element, our part F-1002-2C

Drive system

- The pump should be mounted on a level, horizontal surface, secured with Grade 5 or better fasteners.
- The drive system should be sized to supply the required horsepower to the pump plus a reserve to insure long life.
- Make certain that all shafts, pulleys or turning parts are properly guarded and aligned.
- Check the ratio of the drive system prior to installation to verify that the pump will be turning at the proper speed.

Direction of rotation

- The direction of rotation is marked on the housing of the pump.
- The direction of rotation required by your drive system should be determined prior to ordering the pump.

Factory Settings

- The automatic lubrication pumps are set at the factory during pump testing and should require no further adjustment during pump installation.
- The pumps are adjusted to one drop every two seconds per outlet. This oil rate equals 2.7 fluid oz. per hour, per port, or approximately 1 gallon in 8 hours.

Adjusting Factory Settings

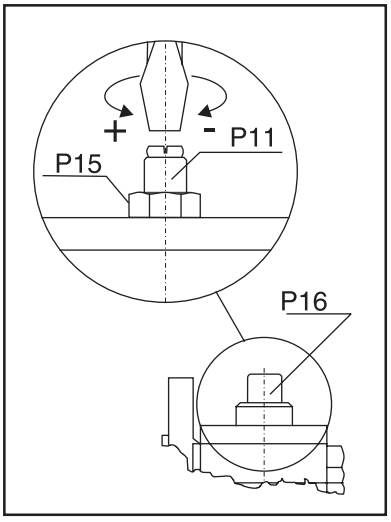
The automatic oil pump is a metered piston-type pump. If you wish to adjust the pump, please follow these instructions:

Adjusting the oil rate

Oil flow is changed by adjusting the length of the stroke of the piston.

1. To adjust the oil rate, remove cap #P16. Under this cap you will find a jam nut #P15 and adjusting screw #P11.
2. To adjust oil rate loosen jam nut and turn adjusting screw clockwise to reduce oil flow or counterclockwise to increase oil flow.
3. When making adjustments do so one quarter of a turn of the screw at a time and test before making further adjustments.

Testing flow rate after adjustment



1. Disconect oil line to observe oil drip rate ensuring adequate lubrication.
2. Adjustments should be done gradually so as not to starve the vacuum pump of oil.

Operating Instructions

NVE/506

Normal Operation

Oil reservoir

- Check oil reservoir daily and fill as required. This pump is provided with a remote 5 qt. oil reservoir

Temperature

- Check exhaust temperature it must not exceed 350° F at any time.

Recommended rpm

- Do not continuously operate the pump faster than the recommended RPM. See chart on page10.

Suction valve

- To operate the suction valve, move the handle in the appropriate direction for either vacuum or pressure; center is neutral.

Vacuum levels

- Do not operate your pump for extended periods of time at vacuum levels which cause the pump to exceed 350° F exhaust gas temperature.

Guards

- Make certain all guards are in place prior to running your pump. Think safety!

Recommended Lubricant

- We recommend that turbine oil be used in our pumps. Turbine oil is much more resistant to breakdown due to heat than normal motor oil, thereby avoiding the problems associated with motor oil such as lacquering and excessive wear.
- Acceptable oils:

  Penzoil Penzabell 68 T.O.

  Shell Turbo 68

  Mobil D.T.E. Heavy – Medium

  Texaco Regal R & O. 68

Maintenance

Washing

- Periodically wash the mud and dirt off your pump. The NVE/506 is a liquid cooled pump.

Flushing

We recommend periodic flushing of your pump. To do this:

1. Connect the hose to the flush valve located on the side of the inlet port.
2. Put the end of the hose in a one pint container of diesel fuel. Start your pump and run as slow as possible.
3. With the suction valve in the vacuum position, monitor the diesel flow to your pump.
4. When the diesel fuel is gone switch the suction valve to neutral and run the pump for 2 minutes.
5. Speed the pump up to normal RPM, switch the suction valve to vacuum.
6. Remove the hose and close the valve.
7. Properly dispose of used oil and flushing fluid.

Checking vane wear

- We recommend checking vane wear at least every 6 months.
- A new vane is flush with the outside diameter of the rotor.

• Remove the plug from the vane check port, insert a 3/16” rod to the rotor O.D., rotate the rotor until the rod falls into one of the vane slots. If the rod falls more than a 1/4“ into any of the 6 vane slots, it’s time to replace the vanes.

• Vanes should be replaced in sets and it is always a good idea to have an extra set of vanes on hand for emergencies.

Cold Weather Operation

Confirm pump is not frozen.

- Prior to engaging the pump, turn by hand to confirm it is not frozen.

If pump is frozen, thaw it.

- If the pump is frozen circulate warm engine coolant through the pump housing if your plumbing allows, or thaw it out by heating the bottom of the pump with a torch or move the truck into a heated building.

Avoid freezing problems.

- You can avoid freezing problems by putting a small amount of diesel fuel into the pump at the end of the day.

Troubleshooting

NVE/506 Pump

Pump overheats

- No oil in pump
- Oil adjustment set too lean
- RPM too fast
- Prolonged operation at excessive vacuum or pressure levels
- Pump dirty
- Clogged inlet filter
- No Coolant Flow

Pump uses too much oil

- Oil pump set too rich; see operating instructions
- Leaving Pump under Vacuum

Pump doesn't turn

- Broken vane or bearing
- Frozen
- Problem in the drive train

No vacuum or low vacuum

- Suction valve in neutral
- Worn seals or vanes
- Pump not turning fast enough
- Check valve or suction valve clogged
- Leak in tank or fittings
- Collapsed hose between pump & shutoffs
- Clogged inlet filter

System Troubleshooting—Locating the source of the trouble

If you notice a decrease in pumping performance, start troubleshooting at the pump.

1. Remove the suction and discharge hoses at the pump.
2. Start the pump and run it in vacuum only at its normal RPM.
3. Check the vacuum level at the pump inlet. The NVE/506W in new condition will develop 27.5-28.5" hg.
4. If the pump checks out OK, check the vacuum level at the secondary, then the primary shutoff. Keep working your way back until you find the problem.

Making a vacuum tester

1. Procure a flange to mount on your four-way valve, a short 4" pipe nipple, a 4" pipe cap and a vacuum gage.
2. Drill and tap a 1/4" N.P.T. thread in the pipe cap.
3. Assemble the flange, nipple, pipe cap and vacuum gauge.
4. Remove a flange from the four-way valve on your pump.
5. Start the pump and confirm the location you have chosen to test from is at vacuum.
6. Using the existing O-ring, fasten the testing flange to your pump.
7. Start your pump and read the vacuum level on the gauge.

Pump Rebuilding

NVE/506 Pump

Please read these instructions completely before attempting repair.

There are two types of pump repair—vane replacement and total rebuilding.

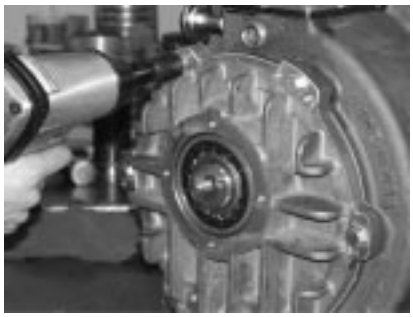
Vane Replacement

1.Clean off the exterior of the pump.

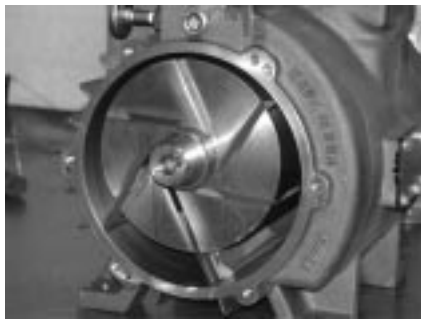
2. Disconnect and remove the oil lines that go to the front bearings and pump inlet from the oil pump.

3. Remove the four bolts that hold the oil pump mount to the end plate, and remove the pump and pump mount.

4. Remove the oil pump drive key from the end of the rotor.



5. Remove the eight bolts that attach the rear end plate and slide the end plate off the rotor shaft.



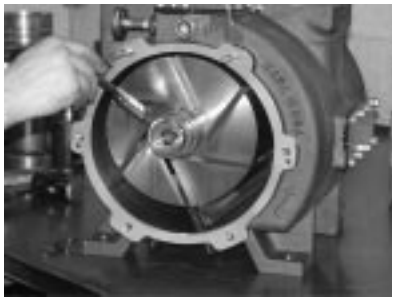
6. Remove the old vanes.

7. A new vane is flush with the outside diameter of the rotor. If they are worn more than 1/4" they should be replaced.

8. We recommend replacing vanes in sets. If the ends of the vanes are chipped or delaminated they should be replaced. The seals should be soft and pliable. The bearing should turn smoothly.

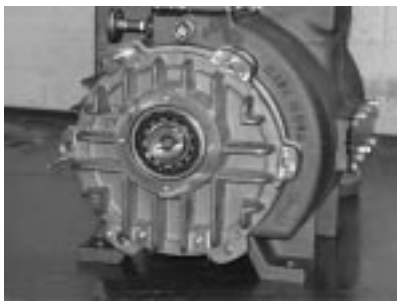
9. Clean the vane slots. Coat the vanes with oil and install the vanes in the rotor. The vanes should slide freely in the vane slot.

9. Locate the two 3/8–16x2 1/2 inch bolts and insert them in bolt holes on either side of the endplate. Locate the long 1/4" dowels and place them into the housing to locate and guide the endplate into place.

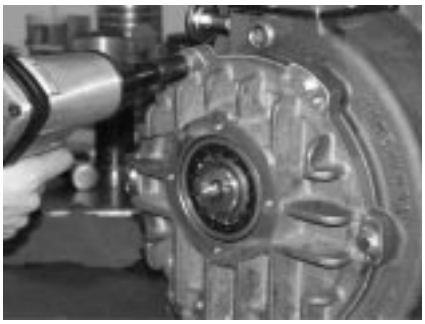


10. Locate the gasket and install it on the endplate. Lubricate seal sleeve and install the endplate on the end of the rotor and

11. Carefully slide the endplate on the rotor and over the guide pins.



12. When the endplate is close enough to the housing bolt it into place. Tighten endplate bolts to 35–40 ft. lb of torque.



13. Remove the dowel pins after tightening the endplate bolts.

14. At this point you should be able to turn the pump by hand. If you can not reseat the bearings in both endplates with a bearing driver or punch.

15. Reinstall the oil pump drive key and oil mount-oil pump assembly.

16. Be sure to line up the oil pump drive key and the oil pump shaft prior to tightening the assembly to the pump

17. Reconnect the oil lines to the bearing plates, oil inlet and to the oil pump mount assembly.

18. Reattach the intake oil line to the remote oil tank and fill tank with oil. The pump is now ready to run.

19. Start the pump at a slow RPM and run to allow oil to fill the lines. Allow the pump to run for a few more minutes. The pump is now ready to go to work.

Complete Rebuild

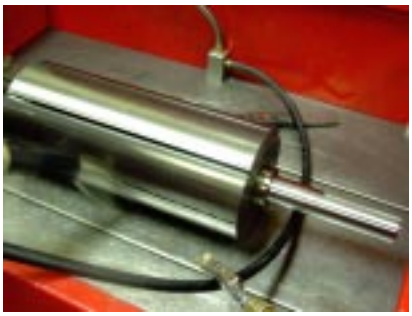
1. Follow steps 1-6 in the vane replacement instructions.

2. Place a cushion under the rotor to prevent damage when the front endplate is unbolted.

3. Remove the front bearing plate and endplate from the rotor.

4. Put an identifying mark on the endplate so as to not confuse it with the rear.

4. Once the rotor is removed, cut off the old bearing inner race on both ends of the rotor. Be sure to line up the cutting wheel with one of the vane slots so as not to damage the rotor or seal sleeve.



5. Clean the rotor, rotor slots and housing, inspect for wear or damage.

If the housing needs to be bored or honed, remove only as much material as is necessary to give a smooth clean bore.

The maximum overbore we recommend is .060 inch. A new housing has a bore of 7.875 inches.

If you bore or hone the housing, remove the four way valve assembly and internal check valve prior to machining.

6. After the housing is clean lube the inside of the housing and place the clean rotor inside with the drive end in the same orientation it originally was.

7. Locate the replacement seals and install them in the endplates with the seals positioned back to back.

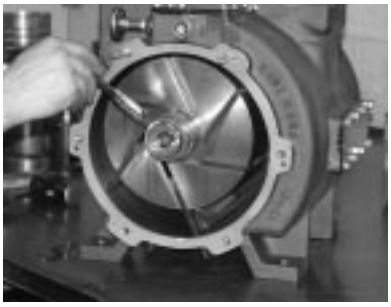
8. Lubricate and install the bearings in the endplates.

9. Place the inter races onto a hot plate and get them hot. Do not leave them on the plate so long that they become disscolored.

10. Use a welding glove to take the hot inner race from the hot plate and slide it onto the rotor shaft. So that the bearing race shoulder is tight against the seal sleeve.

Install on both sides of the rotor.

11. Insert the new lubed up vanes, they should slide easily into the rotor slots.

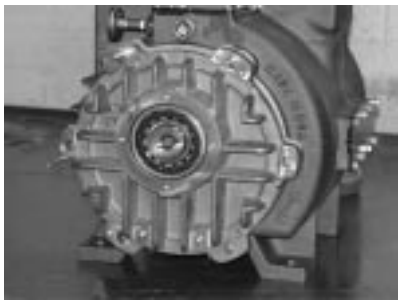


12. Locate two pieces of threaded rod 3/8–16 thd. to use as guides and screw them into the two top holes in the housing. Find the two 1/4" dowel pins and insert them into the dowel holes on each side of the housing.

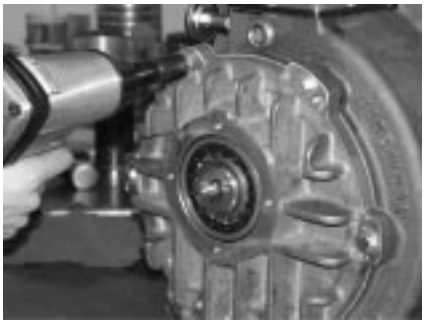
Locate the gaskets and slide it on the threaded rods and dowel pins.

Do not use any gasket sealer.

13. Lubricate seal sleeve and slide the proper endplate on the end of the rotor.



14. When the endplate is close enough to the housing bolt it into place. Tighten endplate bolts to 35–40 ft. lb of torque.



15. Remove the dowel pins after tightening the endplate bolts.

16. Turn the pump around and use the same procedure to mount the front endplate.

17. Seat the bearings in both endplates with a bearing driver or punch.

18. At this point you should be able to turn the pump by hand.

19. Replace the pump drive key, lubricate the seal surface on the rotor and reinstall the rear bearing cover.

Reinstall the oil pump drive key

Be sure to line up the oil pump drive key and the oil pump shaft prior to tightening the assembly to the pump.

20. Lubricate the seal surface on the rotor and reinstall the front bearing cover.

21. Reconnect the oil lines to the oil pump mount assembly from the front of the pump.

22. Reattach the intake oil line to the remote oil tank and fill tank with oil. The pump is now ready to run.

23. Start the pump at a slow r.p.m. and run for a few minutes to allow oil to fill the lines. Allow the pump to run for a few more minutes. The pump is now ready to go to work.

Parts List – NVE/506W Pump

See Parts Diagram Foldout on page 37

Key	*Part #*	*Description*
	506-0	Rebuilt Kit
	506-OBV	Rebuild Kit w/o Bearings
1	506-67	Cover Plate
2	506-67G	Cover Plate
3	A-2005D009G2	Water Temperature Gauge
5	BT17	5/16-18 x 7/8 Lg. Hex Head
6	B8-0503	Flat Washer
7	460-54	Bearing Cover
8	460-53V	Seal - Viton (45–62–8)
9	460-18V	Seal - Viton (65–85–8)
10	367-67G	Cover Plate Gasket
11	367-67	Cover Plate
12	460-13	Gasket
13	460-W93	Bearing
14	360-LP51	Oil Fitting (4mm Tube x 1/8" NPT 90º Elbow)
15	360-LP56	Oil Fitting (4mm Tube x 1/8" BSPT 90º Elbow)
19	466-3D	End Plate *(Right Hand Turning)*
	466-3S	End Plate *(Left Hand Turning)*
20	506-7	Vane (6 per set)
21	506-5CCW	Rotor (Counter Clockwise)
	506-5CW	Rotor (Clockwise)
22	LF8	Pump Drive Tab
23	466-4	End Plate Gasket
24	506-1W	Pump Housing
25	506-54/OP	Oil Tank Mount
27	R31	Gasket
28	LW32AD	Oil Pump *(Clockwise)*
	LW32AS	Oil Pump *(Counterclockwise)*
30	466-3D	End Plate *(Right Hand Turning)*
	466-3S	End Plate *(Left Hand Turning)*
40	460-311	Check Valve
41	460-311/R	Check Valve Retainer
42	460-312-4/F	Valve Flange
43	AP-312-4FO	O-Ring
44	A-318-4	Valve Housing
45	AP-318-VFHG	Gasket

Key	Part #	Description
46	AP-318-T	Valve Top
47	AP-312-3/RH	Handle
48	AP-312-3/W	Washer
49	B1-0608	3/8-16 x 1 Lg. Hex Head
50	AP-312-3/S	Seal
51	AP-318-SPR	Spring
52	AP-318-P	Valve Plug
53	460-39	Gasket (Garlock)
56	460-9	Seal Sleeve
57	460-6	Key 3/8 x 3/8 x 2 Lg.
59	AP-311-3/S	Spring
61	A-20025D009G2	Thermometer
62	460-3	Drain Valve
63	P2-0400-B	Brass Plug
64	506-W-LP95D	CW Oil Line
	506-W-LP95S	CCW Oil Line
65	506-W-LP97D	CW Oil Line
	506-W-LP97S	CCW Oil Line
67	506-W-LP96D	CW Oil Line
	506-W-LP96S	CCW Oil Line
68	P9-0824	Dowel Pin