



PUMPS AUSTRALIA Pty
Ltd

High Pressure Water Cleaner Guidance Manual



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Welcome to Pumps Australia!!



Hi, my name is John Warne and I am the owner of Pumps Australia. I would like to congratulate and thank you for purchasing your Pumps Australia product.

You will no doubt be pleased with the quality and design of your manufactured goods. My staff and I pride ourselves on the research and development we invest in our products.

Your questions and comments are always welcome. We provide friendly, knowledgeable technical support by telephone, fax and email to all our customers.

The information provided to you in this guide has been developed in good faith, I hope that it provides you with some interesting and helpful information. Please ensure you read through this guide before operating your machine.

I hope you enjoy your product and please do not hesitate to contact us if you have any queries.

Kind Regards

J D Warne

John Warne



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1. Introduction

This guidance note has been prepared to assist individuals and companies who use small high-pressure water cleaners and pumps to provide a safe system of work.

The Guidance note applies only to “A” class equipment, for information and guidance on larger machines, please refer to the Code of Practice for the use of High Pressure Water Jetting Equipment and The Australian / New Zealand Standard for High Pressure Water Jetting Systems – AS/NZS 4233.1:1999

Class A high-pressure equipment refers to smaller pumps and systems, usually used for washing or cleaning purposes. “A” class machines are defined as follows:

The maximum pressure of the pump in bar, multiplied by the maximum flow of the pump in litres must be less than 5600 Bar-Litres. If the pump’s performance exceeds this, then additional controls and practices need to be applied.

2. Medical Advice

Please be aware that injuries resulting from the use of high pressure water equipment, have been reported to produce unusual infections with micro aerophilic organisms occurring at lower temperatures. These may be gram negative pathogens such as found in sewage.

Another particular hazard is Weil’s disease (Leptospirosis), this may cause serious and even fatal illness which presents itself in the early stages as a flu-like illness with severe headaches and sometimes aseptic meningitis. Early treatment may prevent the onset of more serious symptoms.



If injured using high pressure water equipment, please make any medical staff aware of your occupation as this will aid them in your diagnosis.

If ever in doubt please check with your doctor.

3. Applications

High-pressure water is used in a multitude of applications including:

- Domestic Cleaning
- Commercial Roof Cleaning
- Paint Stripping
- Abrasive Blasting
- Drain Cleaning
- Industrial Cleaning
- Heavy Vehicles
- Drilling Rigs
- Refinery Clean Up
- Descaling
- Cutting
- Marine

When Used correctly, pressure cleaning is a particularly useful, safe and environmentally sound alternative to many traditional cleaning methods.

Used without adequate precautions and controls, high-pressure water can cause serious injury to the people using it or in the vicinity.

4. High Pressure Equipment

Any equipment that utilises liquid under pressure to perform work carries with it certain inherent potential hazards. These however can be minimised or eliminated by using adequate maintenance and inspection or checking processes.

Components of a high-pressure system generally consist of:

- Water supply and hoses
- The high pressure pump



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- The high pressure delivery hose fittings
- The gun or any other equipment attached to the hose to do the work

It is a good idea to develop a checklist of the equipment to be used which can assist in identifying equipment and other potential hazards prior to start of work. A sample checklist is included at the back of this guidance note.

5. Water supply hoses

Water for the high-pressure pump is usually drawn from a low volume domestic tap or in an industrial situation from a water supply on site. The main thing to ensure with water delivery hoses is that they are in good condition. Hoses or fittings with leaks can create hazardous slippery areas away from the work area as well as wasting water.



6. The High Pressure Pump

The high-pressure pumps used to generate the water pressure generally require very little maintenance. They should be kept clean; all fittings should be checked before and after use and the entire system should be flushed with a water hose after every use.



Services and maintenance are usually specified by the equipment supplier and should be carried out accordingly.

All high-pressure pumps should be fitted with a shut off switch, which should be tested prior to every use.

7. High Pressure Hoses

High-pressure hoses deliver the pressurised water from the pump to the workface. The condition of them is critical to the safety of the operation. Hoses are generally made up of a steel woven inner core, covered by a protective rubber outer sheath and fitted with crimped screw or quick connect couplings.

The woven or braided inner core is what actually gives the hose its strength. Hoses should be inspected prior to and after use for:

- Broken or damaged wires
- Kinks or bends
- Damaged fittings or threads
- Deep cuts or punctures

Hoses which are found to be damaged should be marked with a tag and not used.

8. Pressure Guns and Other Equipment

A wide variety of tasks can be carried out using high-pressure water and consequently many different devices have been developed by various manufactures to enable these tasks to be carried out. These include:

- High pressure guns & various nozzles
- Pipe cleaning nozzles and attachments
- Floor cleaners



- Abrasive blasting attachments
- Chemical induction or injection systems
- Water heating systems

These devices should always be compatible with the pump unit you are using. Couplings rated at the pumps maximum working pressure should always be used and must be intended for the purpose they are to be used for. Always fit and use attachments according to the manufacturer's instructions.

9. Working Safely

All work carries with it an element of risk. It is important to recognise this and consistently minimise risk to people who may be exposed to it.

10. Minimising Hazards

Hazards are situations in the work environment, which if left unchecked can result in:

- Injury to people
- Impact on the environment
- Damage to equipment

Risks associated with hazards can be easily minimised or preferably eliminated by following some simple steps.

11. Spot the Hazard

Inspect all of the equipment and the work environment for likely hazards, walk through the job or task and talk to others who have done it before. Try to methodically analyse each step and identify hazards associated with it.



12. Assessing the Risk

All hazards have a level of risk associated with them. It is important to assess them and then to take appropriate action. To assess any risk, it's simply a matter of asking two questions about it.

- 1. How likely is it to occur?**
- 2. What will happen if it does occur?**

Based on the answers from these two questions, a level of risk can be determined. If either the event is likely to occur or the outcome of the occurrence will be serious i.e. someone will get hurt, the risk **must** be controlled.

13. Making the Changes

Ideally, the hazard should be eliminated altogether. For instance, if the work area is cluttered with rubbish, the rubbish can be removed. This is the best way to control any hazard.

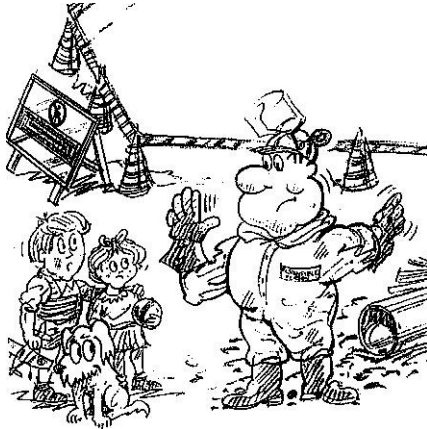
Unfortunately, this is not always possible, for instance, if someone was working on a roof and the water from the cleaning process was making the tiles slippery, it would be impossible to eliminate this hazard. The only thing that can be done in this instance is to control it, to put a system in place to prevent the person falling from the roof and making sure they are aware of the hazard.

14. General Safe Practices

- Always make sure that people not involved with the job are not going to be inadvertently exposed to hazards. Barricade, tape or warning flags should be used to cordon off the work area. When working from heights, remember the water spray either needs to be contained or a larger area barricaded off.



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- Inspect all equipment prior to use and do not use equipment which is not designed for the job or that is defective
- Shut off devices such as gun triggers should be checked and tested for operation prior to use in a controlled environment.
- Wear correct Personal Protective Equipment. This applies to anyone who is in the immediate vicinity of the work or who may be exposed to it. The minimum Personal Protective Equipment for high pressure work is:
 - Eye protection, goggles or a face mask
 - Long trousers or leg coverings
 - Hearing protection where required
 - Steel capped footwear
 - Gloves where required
- Where chemicals, abrasives or other hazardous materials are present, additional precautions may be required such as full body protection or respiratory protection
- **Never allow people to come into contact with the water jet. Water jets can cause serious or fatal injuries.**



- People using the equipment should be competent in all aspects of it.
- If working in an industrial environment or for an employer and an accident or incident occurs, it must be reported immediately to the employer. Injuries may appear small on the surface however there is the possibility of more serious internal injuries and medical advice should be sought.
- Hazards in the workplace should be rectified immediately or reported if additional assistance is required to control or eliminate them.

15. Training

General

Everyone who uses high pressure cleaning equipment must be competent to do so. Operators or people who use the equipment should, as a minimum, be competent in the following areas:

- Have an understanding of basic duty of care – Further information can be obtained from your state regulatory body.
- Understand the system operation and all controls.
- Understand the need to control hazards in the workplace and be able to do so.
- Have some experience or instruction in the operation of the equipment and be aware of the associated potential hazards.
- Have experience or instruction in the particular application of the equipment.
- If the equipment is to be used in unusual environments or situations, the operators needs to be competent to do so, for example working at heights.
- If the equipment is supplied by a hirer, the hirer needs to inform the user of the potential hazards associated with it.
- Safety or other shut off devices must never be tampered with or nullified.
- If chemical cleaning agents are to be used, the appropriate material safety data sheet (MSDS) should be obtained from the supplier prior to use.



16. Safety and Equipment Prestart Checklist

Check		Confirm (✓)
Hoses	Visual Inspection	
	All joints in good order	
Barriers	Area Secure	
	All barriers clearly visible	
Shut Down Device	In use	
	Tested	
Tagging	Isolation and tagging if required	
Hazard Inspection	Completed and all identified hazards controlled	
Emergencies	All personnel familiar with emergency procedures	



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Check		Confirm (✓)
House keeping	Completed and area inspected	
Controls	All pump controls tested	
Pump Checks	All required pump checks completed	
Nozzles and Other Cleaning Devices	All nozzles and any other equipment checked and in serviceable condition	
Faulty Equipment	Faulty equipment has been tagged and isolated to prevent use	
Personal Protective Equipment	All crew members are equipped with the required PPE and any other protective equipment required for the job	

If In Doubt Ask Your Supervisor



17.Troubleshooting

Symptom	Possible Cause(s)	Corrective Action
Oil leak between crankcase and pumping section	Worn rod oil seals	Replace crankcase piston rod seals
Frequent or premature failure of the packing	1 Cracked, damaged or worn plunger	1 Replace plungers
	2 Overpressure to inlet manifold	2 Reduce inlet pressure
	3 Material in the fluid being pumped	3 Install proper filtration on pump inlet plumbing
	4 Excessive pressure and/or temperature of fluid being pumped	4 Check pressures and fluid inlet temperature; be sure they are within specified range
	5 Running pump dry	5 Do not run pump without water
Pump fails to prime	Air is trapped inside pump	Disconnect discharge hose from pump. Flood suction hose, restart pump and run pump until all air has been evacuated
Pump loses prime, chattering noise, pressure fluctuates	1 Air leak in suction hose or inlet	1 Remove suction line and inspect it for a loose liner or debris lodged in hose. Avoid all unnecessary bends. Do not kink hose
	2 Clogged suction strainer	2 Clean strainer



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Symptom	Possible Cause(s)		Corrective Action	
Pump runs but produces no flow		Pump is not primed		Flood suction then restart pump
Low pressure at nozzle	1	Unloader valve is by-passing	1	Make sure unloader is adjusted property and by-pass seat is not leaking
	2	Incorrect or worn nozzle	2	Make sure nozzle is matched to the flow and pressure of the pump. If the nozzle is worn, replace
	3	Worn packing or valves	3	Replace packing or valves
Low pressure	1	Worn nozzle	1	Replace with nozzle of proper size
	2	Belt slippage	2	Tighten or replace with correct belt
	3	Air leak in inlet plumbing	3	Disassemble, reseal and reassemble
	4	Relief valve stuck, partially plugged or improperly adjusted valve seat worn	4	Clean and adjust relief valve; check for worn or dirty valve seats
	5	Worn packing. Abrasive in pumped in cavitation. Inadequate water	5	Install proper filter suction at inlet manifold must be limited to lifting less than 20 feet of water or 8.5 psi vacuum
	6	Worn inlet, discharge valve blocked or dirty	6	Replace inlet and discharge valve



Symptom		Possible Cause(s)		Corrective Action
Pressure gauge fluctuates	1	Valves worn or blocked by foreign bodies	1	Clean or replace valves
	2	Packing worn	2	Replace packing
Pump runs extremely rough, pressure very low	1	Inlet restrictions and/or air leaks.	1	Clean out foreign material
	2	Stuck inlet or discharge valve	2	Replace worn valves
Water leakage from under manifold		Worn packing or cracked plunger		Install new packing or plunger
Slight leak, oil leaking in the area of crankshaft	1	Worn crankshaft seal or improperly installed oil seal o-ring	1	Remove oil seal retainer and replace damaged O-ring and/or seals
	2	Bad bearing	2	Replace bearing
Excessive play in the end of the crankshaft pulley		Worn main bearing from excessive tension on drive belt		Replace crankcase bearing and/or tension drive belt
Water in crankcase	1	Humid air condensing into water inside the crankcase	1	Change oil intervals
	2	Worn packing and/or cracked plunger	2	Replace packing. Replace plunger
Loud knocking noise in pump	1	Cavitation or sucking air	1	Check water supply is turned on
	2	Pulley loose on crankshaft	2	Check key and tighten set screw
	3	Broken or worn bearing	3	Replace bearing



18. Setting Up Your High Pressure Cleaner

- Ensure that twice the stated water flow (located on name plate, on machine) from the pump is available from your water supply.
- Check oils – engine, gearbox and pump prior to starting.
- Pull trigger on gun when starting electric, petrol and diesel engines.
- Ensure pressure cleaner is not run for more than 2-3 minutes without trigger on gun being pulled. This will avoid overheating in the pump head and any damage to seals.
- Ensure that there are no leaks in the high pressure pump, hose, lance and gun. All leaks need to be fixed *immediately*.
- Check oil levels regularly and change at first service (50 hours) and every 750 hours after that or, at anytime when the oil turns from honey to grey in pump, gearbox or engine.



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- On a regular basis, check to ensure that all fasteners, nuts and bolts are tight.
- Water filters are recommended and will maintain the performance of your pump.

If In Doubt Contact Pumps Australia



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19. Limited Warranty

We certify that all pumps supplied and manufactured by Pumps Australia are guaranteed against defects in materials and workmanship for 12 months from the date of purchase.

Repair or replacement of parts or whole will be performed without charge.

General terms and conditions;

The purchaser must pay all labor and shipping charges for the return of the product covered by this warranty.

This warranty shall not apply to products which, in the sole judgement of Pumps Australia or its appointed service representative, have been subject to negligence, abuse, accident, misapplication, tampering, alteration, or have failed due to improper installation, operation or maintenance procedures.

IF THE PUMP SHOULD FAIL WITHIN THIS 12 MONTH PERIOD.

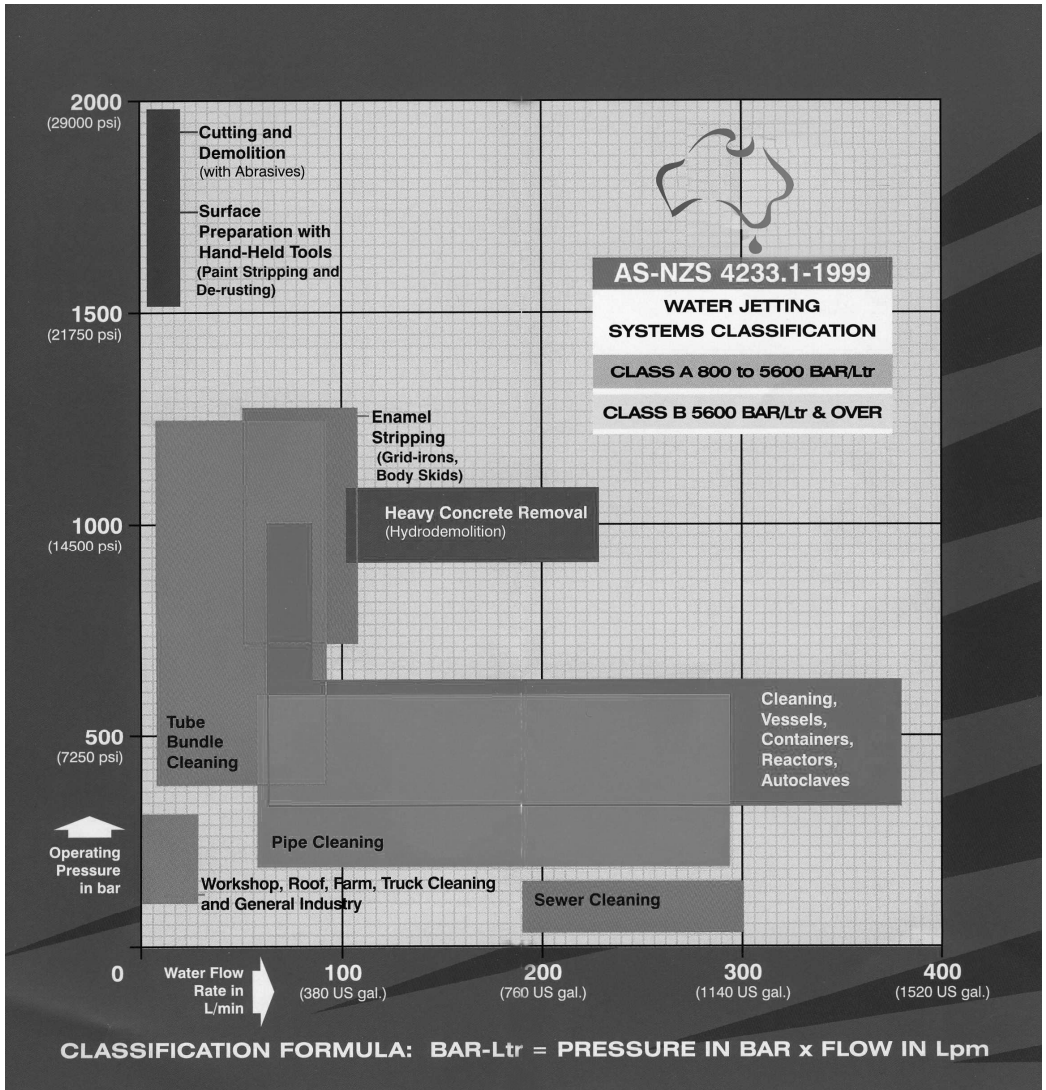
RETURN THE PUMP TO:

Pumps Australia 32 Railway Parade Bayswater 6053.

Warranty is limited to the value of the product. Pumps Australia does not accept consequential damages.



20. Classification Formula





21. Nozzle Selection

		Flow in Lts per minute at the indicated pressures												
		110 bar	120 bar	130 bar	140 bar	150 bar	160 bar	180 bar	200 bar	220 bar	250 bar	280 bar	310 bar	340 bar
Nozzle Size	Hole	1595 psi	1740 psi	1885 psi	2030 psi	2175 psi	2320 psi	2610 psi	2900 psi	3190 psi	3625 psi	4060 psi	4560 psi	5000 psi
02	0.99	4.7	4.9	5.1	5.3	5.5	5.7	6	6.4	6.7	7.6	8.5	9.4	10.3
03	1.09	7.2	7.4	7.7	8	8.3	8.7	9.2	9.6	10	11.4	12.8	14.2	15.6
035	1.15	8.4	8.8	9.2	9.6	9.9	10.4	10.9	11.4	12	13	14.2	15.4	16.6
04	1.19	9.8	10.3	10.7	11.1	11.5	11.9	12.4	13.2	14.1	14.8	15.5	16.2	16.9
045	1.27	10.6	11.2	11.6	11.8	12.5	12.6	13.2	14.4	15	15.8	16.6	17.4	18.2
05	1.35	11.7	12.1	12.9	13.4	13.8	14.3	15.1	15.9	16.9	17.9	18.9	19.9	20.9
055	1.4	13	13.5	14.1	14.7	15.2	15.7	16.4	17.5	18.6	19.6	20.6	21.6	22.6
06	1.47	14.2	14.9	15.5	16	16.6	17.2	18	19.2	20.4	21.5	22.6	23.7	24.9
065	1.52	15.5	16.1	16.7	17.4	18	18.6	19.4	20.7	22	23.2	24.4	25.6	26.8
07	1.6	16.6	17.3	18	18.7	19.3	20.1	21.3	22.3	23.7	25	26.3	27.6	28.9
075	1.65	17.7	18.5	19.2	20	20.7	21.4	22.6	23.8	25.3	26.7	28.1	29.5	30.9
08	1.7	18.9	19.7	20.5	21.3	22	22.8	23.8	25.4	27	28.5	30	31.5	33
085	1.75	20	20.9	21.7	22.5	23.4	24	25.5	27	28.2	30	31.8	33.6	35.4
09	1.8	21.2	22.1	23	23.9	24.7	25.5	26.7	28.5	30.3	31.9	33.5	35.1	36.7
095	1.85	22.7	23.8	24.7	25.9	26	26.9	28.5	30	31.5	33.2	34.9	36.6	38.3
10	1.9	23.6	24.6	25.6	26.6	27.5	28.5	29.8	31.8	33.7	35.6	37.5	39.4	41.3
11	1.98	25.5	26.7	27.7	28.8	29.9	30.8	32.6	34.4	36	38.4	40.8	43.2	45.6
12	2.08	28.8	29.4	36	31.8	32.9	34	36	38	39.8	42.4	45	47.6	50.2
12.5	2.13	29.5	30.8	32.1	33.3	34.5	35.6	37.8	39.8	41.8	44.5	47.2	49.9	52.6
13	2.16	30.8	32.2	33.5	34.8	36	37.2	38.9	42.5	44	46.6	49.2	51.8	54.4
14	2.26	33.2	34.7	36.1	37.5	38.8	40.1	42.5	44.8	47	50.1	53.2	56.3	59.4
15	2.34	35.6	37.2	38.7	40.2	41.6	43	45.6	48	50.4	53.7	57	60.3	63.6
16	2.41	37.8	39.5	41.1	42.7	44.2	45.6	48.4	51	53.5	57	60.5	64	67.5
18	2.54	40.2	43.9	45.7	47.4	49	50.7	53.7	56.6	59.4	63.3	67.2	71.1	75
20	2.69	47.3	49.2	51.2	53.2	55	56.8	60.3	63.5	66.6	71	73.4	77.8	82.2
25	2.99	59.1	61.8	64.3	67	69.1	71.3	75.1	79.8	84	89.3	94.6	99.9	105.2



22. Conversion Table

Convert From	X By	Convert To
Bar	14.503	psi - Pounds per sq. inch
psi - Pounds per sq. inch	0.0689	Bar
psi - Pounds per sq. inch	6894.8	N/m ² - Newtons per sq. metre
L/s - Litres per second	2.119	cfm - Cubic feet per minute
dm ³ /s-Cubic decimetres per sec	2.119	cfm - Cubic feet per minute
L/m - litres per minute	0.0353	cfm - Cubic feet per minute
m ³ /h - Cubic metres per hour	0.5885	cfm - Cubic feet per minute
cfm - Cubic feet per minute	1.699	m ³ /h - Cubic metres per hour
cfm - Cubic feet per minute	0.4719	l/s - litres per seconds
cfm - Cubic feet per minute	28.316	l/min - Litres per minute

BAR = 14.5psi = 100kpa =10 metres water

Column= 1Kg cm²



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23. MAINTENANCE SECTION

(Pump and Boilers only)

**For Service of Petrol/Diesel Engines
Refer to Manufacturers Service Manual**



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High pressure water cleaners are complex machines that require regular maintenance.

The schedule below indicates the average working times of the most important components of the high pressure cleaner. Working times are based on a hot water pressure washer that works 750 hours a year in normal usage conditions eg. Faultless pressure cleaner, supplied with medium hard water and water cooling before switching off. When ideal conditions change, times of servicing will also change.

Component	Replacing times
------------------	------------------------

Pump

Pump oil (1 st time)	After 50 hours
Pump oil (following times)	After 750 hours
Water Seal packing	After 2500 hours*
Valves	After 2500 hours*
Oil seals	After 2500 hours*
Roller bearings	After 3500 hours

* Or when pressure reduces

Heater

Fuel filter in line	After 500 hours
Fuel pump filter	After 500 hours
Fuel nozzle	After 1000 hours
Electrodes	After 1000 hours
Electrode caps	After 1000 hours
Ignition transformer	After 2500 hours

Internal components of the high pressure washer

By-pass valve	After 2000 hours
Inlet water filter	After 750 hours



Accessories

HP nozzle	After 750 hours
Quick couplings or Orings	After 500 hours
Spray gun	After 1500 hours

The pressure cleaner needs periodic maintenance, especially for some components that have to be regularly cleaned and other ones that have to be regularly settled, these are as follows;

Component	How often to clean	How often to set
------------------	---------------------------	-------------------------

Heater

Fuel filters cleaning	250 hours	
Burner combustion		500 hours
Fuel pressure		1000 hours
Electrodes	500 hours	500 hours
Fuel tank	500 hours	

Internal components of the high pressure cleaner

By-pass valve		2500 hours
Safety valve		2500 hours
Inlet water filter	250 hours	
Descaling	750 hours	

24. Regular Maintenance

It is recommended that you follow a regular maintenance schedule for your high pressure cleaner as follows;

The first place to start is by assembling a daily checklist. This list should include sections covering all the vital components of the equipment: fluid system, pump, engine or motor, burner, hose assembly etc. Each section



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should have subdivisions, which encompass the components in that section. Use this checklist as a visual inspection.

Example:

Daily Inspection: (i.e. cold water). Start with the inlet side.

Water Supply: Look for leaks, clean the filter and make sure there is adequate flow.

Pump: Look for water leaks around the pump and check the oil for proper level and make sure there is no water in the oil.

Engine: Check the oil level, fuel, air filter if clean.

Drive System: Check the drive belt(s) tension, condition (if your system is driven in this manner), pulley tightness, and the belt guard fits properly. Direct drive? Mounting bolts tightness, Gearbox drive? Mounting bolts tight, oil level, leaks.

Hose: Is it in good shape, fitting/connections tight, and no leaks.

Spray Gun: Proper size for the system, connected properly.

Lance: good condition.

Nozzle: In place, correct size.

Now start and test the system under pressure look for leaks, engine running properly, pressure okay?, any vibration?, everything okay?

The above list is only a sample. Time is important to everybody; this inspection will only take a few minutes, and can save you time and money and expensive down time in the long run.



25. Planned Maintenance

As well as regular maintenance when using the machine, a planned maintenance program should also be implemented.

Initially, your pump should be serviced when it reaches 50 hours of use. The oil should be replaced and a general inspection should be conducted.

The planned maintenance program shown in the following table is recommended for your pressure cleaner.



Maintenance Guidelines

Component	500	1000	1500	2000	2500
<u>Pump</u>					
By pass valve				R	
Fuel filter	R	R	R	R	R
Fuel pump filter	R	R	R	R	R
Fuel tank	C	C	C	C	C
Gear box oil	R	R	R	R	R
Hp nozzle			R		R
Inlet water filter	R	R	R	R	R
Orings	R	R	R	R	R
Oil seal			IR		IR
Pump oil	R	R	R	R	R
Pump valves			IR		IR
Quick coupling	R	R	R	R	R
Safety valve			IR		IR
Seal packing					IR
Spray gun			R		R
<u>Boiler</u>					
Burner Combust	IR	IR	IR	IR	IR
Descaling		C	C	C	C
Electrodes		R		R	
Electrode caps		R		R	
Fuel Pressure	I	I	I	I	I
Ignition transformer					R

C = Clean, R = Replace, IR = Inspect/Replace, I = Inspect



26. Boiler Use and Maintenance

Important note: It is important to ensure that when operating a hot and cold high pressure cleaner in a confined space, that appropriate venting is in place. This will ensure that the gases emitted from the boiler are not inhaled by the operator or by-standers.

When a hot and cold pressure cleaner becomes smokey it is more than likely due to the coil containing soot and carbon residues. This can be prevented by ensuring that a good maintenance program is implemented. If the soot and carbon residues exceed a certain quantity you will have a reduction of thermal exchange and thermal passages. If you want to clean the coil then you have to take it away from the air conveyer.

Chalk deposits settle inside the coil during usage; these deposits must be taken away using a special pump and a descaling liquid.



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NOTES



High Pressure Accessories



For more information, contact Pumps Australia Pty Ltd
Phone: 08 9358 2323 Fax: 08 9358 2301
Email: sales@pumpsaustralia.com.au