

Ultra cleaning with ultrasonics

Cleaning parts is a tedious, messy job at the best of times, but is crucial for the reliability of any assembly. By Josh Giumelli

Hydraulics, engine parts and fuel systems all require scrupulous cleanliness during overhaul, as any included contaminants will cause problems down the track. Typical cleaning methods have involved degreasing baths, a wash in petrol, a blast with the pressure cleaner, a blow-out with compressed air or even a hot wash with a steam cleaner.

But a heavy-handed approach to cleaning parts is not always the best approach. Sensitive items can be damaged, parts lost, and the cleaning method itself may simply not be appropriate for the component. Cleaning attempts may often lead to dirt and debris finding their way into areas they shouldn't be.

Ultrasonic cleaning may be an unfamiliar method to many of us, but it has a lot to offer the average farm workshop. In the past, small ultrasonic cleaners have been used for cleaning jewellery, dentures and medical equipment. But they are also ideal for cleaning sensitive items like carburettors, injectors, hydraulic valves and engine parts.

In recent years the cost of larger ultrasonic cleaners has fallen markedly. Previously, small units of less than a litre capacity cost several hundred dollars. Now, a much larger capacity cleaner can be had for the same money. The 15L unit featured in this article cost about \$240 from an online supplier.

HOW IT WORKS

Ultrasonic cleaners scour the surface of an item with tiny bubbles caused by cavitation. Buried inside the ultrasonic unit are ultrasound transducers which generate an inaudible sound wave in the vicinity of 20,000 to 40,000 Hertz, or cycles per second. An adult can generally hear frequencies of up to 15 to 17kHz maximum.

The ultrasound waves create compression waves in the liquid bath which form



Ultrasound appointment: It sounds a bit like black magic, but ultrasonic cleaning has been in use for decades. The technology is now cheap enough to add to the farm workshop. Photos: Ben White and Josh Giumelli

microscopic bubbles, which then collapse with enormous energy. This cavitation generates massive temperatures and pressures on a small scale which scour the surface of the item, removing contaminants.

Anyone familiar with pump cavitation will be aware of the scouring ability of

cavitation, and the damage that can occur to parts on a larger scale.

Fortunately, the cavitation occurring in an ultrasonic cleaner is so microscopic that it does not harm even the most delicate of components and can be used on a wide range of materials.



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THE BENEFITS

Ultrasonic cleaning is gentle in nature and vigorous in action. While you can achieve good results by simply soaking dirty components in a suitable cleaning solvent, an ultrasonic cleaner will get the job done more effectively, with a lower concentration of chemical, and in a much shorter time.

The best part about ultrasonic cleaning is you can simply turn it on and let it go about its job while you do something else. The only drawback is the intensely irritating

noise the cleaner makes which is due to the vibration of the unit itself, and not the ultrasonic sound waves which are inaudible.

As water is used as a cleaning medium, many parts may corrode or tarnish if not thoroughly dried or treated with a protectant of some kind. This is exacerbated by the use of caustic or acidic cleaning solvents. Alkali cleaners are generally best with carbon, oil and grease deposits, as well as dirt and dust, while acidic based cleaners will do a better job of removing scale, oxidation and tarnish.



Small, low cost ultrasonic cleaners such as this 2.5L unit cost as little as \$50 and will do a good enough job for small items such as jewellery, diesel injectors, gun parts, eye glasses, chainsaw and stationary engine carburetors. But the tank size is a limiting factor. While rated as a 2.5L unit, the tank capacity is only 2.0L. It has adjustable timer settings and a heater function.



This 15L unit was purchased online for \$240 including freight and features a digital timer and heater function. There are also other models available with analogue dials for temperature and cleaning time adjustment. The construction is largely stainless steel, and it features a basket for easy removal of parts from the cleaning solution.



The first step is to add clean water to the unit. It doesn't have to be filled to capacity, and depending on the volume of the items being cleaned, it may overflow if too much water is added. Items just need to be fully submerged.



Water by itself will clean items, but the addition of a detergent or cleaning fluid will greatly improve the process. A wetting agent or surfactant reduces the surface tension of the water, which increases the cavitation levels and resulting cleaning action. Note the bubbles and dirt streaming from the surface of this part placed in water which has a squirt of dishwashing liquid added to it.



Here we are adding a jug of soluble degreaser which is caustic by nature. In terms of safety in the workshop, it is far better to have an open container of non-flammable liquid than a flammable one of degreaser or kerosene. The other advantage is cleaning solutions do not have to be overly concentrated.

S-406
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(S195)



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(B014)



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TB-60
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Digital Control
(T606)



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SAVE \$396



5

The digital controls on this cleaner are pretty straightforward. The temperature adjustment controls the thermostat cut-out for the bath heater. In general, use a warmer temperature for more stubborn dirt and grime. The heater needs to be switched on and off separately, and it is a good idea to pre-heat the bath before switching on the heater. Set the temp to about 50 or 60 degrees for the most stubborn work. Note the display on the right of the set temperature which indicates the current temperature (19 degrees).



6

The ultrasonic timer simply allows the cleaning time to be preset. If unsure, start with a five minute clean. Items can always be subjected to further cleaning cycles if still dirty. One benefit of ultrasonic cleaning is the speed at which it works. We have found a 15-minute cleaning cycle to be more than adequate for most items.



7

Ultrasonic cleaners are perfect for cleaning stationary engine carburettors. Ultrasonics work well to remove fuel varnish and gunk, and can free up debris lodged in jets, drillings and orifices with minimal stripdown. We've all had those stationary engines which never seem to run properly, especially when they have sat for a while. It only takes a 10mm spanner and five minutes to whip the carby off.



8

It is best to strip the carby right down, but in this case we want to get things cleaned up quickly, so have removed the fuel bowl and tap bowl. Note the accumulation inside the fuel bowl.



9

Place items in the basket, with the fuel bowl facing down. This will allow freed-up crud to fall down and out of the bowl. While the cleaner is good at freeing off grime, sometimes parts need a rinse or blow-down to remove the loosened-off dirt.



10

The results after 15 minutes of cleaning in a warm degreaser bath are pretty evident.



11

Bearings are difficult to clean at the best of times. Sometimes we need to give them a touch-up if they have been contaminated from new, and other times we may wish to reuse old bearings that are still in otherwise good shape.



12

This 70 year old bearing had nothing more than 15 minutes in the ultrasonic bath. A good rinse under running water then a spray with a water dispersant (eg CRC or WD40) will protect it from corrosion.



13

Tools also benefit from a run in the cleaner bath and can come up like new in many instances. Always rinse them off in water after they are done, and apply corrosion protection such as lanolin if required. These sockets are pretty filthy and in need of a clean.



14

After cleaning for a few minutes in the degreaser solution these sockets have been rinsed in water.



15



With a large capacity ultrasonic bath it can get expensive to fill it with a higher-cost solution such as a solvent degreaser, especially when cleaning only small parts. One option is to place small items in a ziplock bag and fill with a small amount of cleaner. Then it can be placed in the bath, which only needs to be full of water. Here we have stripped an injector for cleaning before overhaul. Another advantage of using a bag is it helps avoid losing small parts. A glass jar can alternatively be used to contain items if need be.



16

The ultrasonic waves travel through the bag, cleaning the items as effectively as if the bag wasn't there and the entire bath were full of solvent. It has also freed the needle which was jammed in the nozzle.



17

While ultrasonic cleaners are not really designed for rust removal, they do a pretty good job, especially on fiddly parts. Caustic degreaser can be used, or even vinegar as a cleaning solution.



18

Fifteen minutes at 50 degrees has done a reasonable job of cleaning up these nuts and bolts. They have been rinsed off then sprayed with WD40 to prevent further corrosion.



19

When finished, the unit can be drained and cleaned of accumulated sludge. Larger units such as the one in this article have a handy drain valve on the side, but tend to clog with gunk on the drain hole inside the bath.