

Rust Remover and Oil Based Penetrant Test Results

Test Limits

- The set of tests conducted were not fully scientific, rigorous, or documented in detail
 - This document merely reflects my observation notes of results documented over several weeks of trying various mix and match scenarios
- As a retired test engineer, I'm fully aware of the limitations of my approach but I believe the conclusions are not unreasonable
- A primary goal was to assess the common 50/50 ATF/Acetone mix for which issues are noted later

Water-Based Rust Remover Products Tested

- WD-40 Specialist Rust Remover Soak
 - WD-40 product was extremely thin and failed to cling to parts but works well as a soak
 - All oil based penetrants and oils tested float on top
- Evapo-Rust
 - Evapo-Rust has a thicker consistency that coats and clings to parts better
 - All oil based penetrants and oils tested float on top
- Both of these water-based rust removers far surpassed the results of all of the oil-based products, resulting in a “sand-blasted” clean, rust-free surface, with long enough soak times
- Both of these products were safe on aluminum even with extended soak times of weeks in duration
- Also tested a Rustoleum rust reformer product that is no longer available
 - Testing was concluded after it ate holes in an aluminum test tray (and nearly attacked my aluminum bench sander platform)
 - Perhaps that’s one reason why its no longer available

Oils and Oil-Based Penetrants Tested

- Dupont Release-it Penetrant
- CRC Knock-er Loose Penetrant
- Free All Penetrant
- PB Blaster Penetrant
- Liquid Wrench Penetrant
- Ace Lub-E Penetrant
- Gunk Engine Degreaser
- WD-40 Lubricant (Regular Water Dispersant)
- ATF
- ATF 50% / Acetone 50%
- DOT 3 Brake Fluid

Issues Noted

- Acetone does not mix well with many oils, particularly higher density oils
 - The mix separation test did not wait beyond 1 minute for separation to occur and some of the results were surprising
 - Some acetone mixing noted, no immediate separation noted with:
 - 3 in 1 oil
 - DOT 3 Brake Fluid
 - PB Blaster
 - Gunk Degreaser

Issues Noted - continued

- Acetone poor mixing results noted, almost immediate separation noted with:
 - ATF
 - Bar and Chain Oil
 - 5W30 Oil
 - 2 Cycle Oil
 - Liquid Wrench
- In 50/50 ATF/Acetone testing, the acetone always floated on top of the ATF fluid after separating
 - This would mean that it would have little chance of attacking the most critical varnish, lacquer, carbon, and some oil sludge and related products which would be its primary role since it has no effect on rust

Penetrants and Oils Effect on Rust

- If left to soak long enough, all tested oil-based products had at least a small effect on rust
 - No oil-based product tested had a significant effect on rust and none was a “knockout” best
 - Those with the most and fastest effect observed (waited approximately 6 hours, some surface rust loosened and dissolved into the liquid without stirring or rubbing)
 - CRC Knock-er Out
 - PB Blaster
 - Liquid Wrench
 - The following products had similar observable effects if left to soak longer (24 hours+)
 - ATF (with or without Acetone which was floating above the part being soaked)
 - A primary advantage of ATF is that it is a very good lubricant whereas the other items tested are not and leads ultimately to its good (engine stuck) results if left to soak for a sufficient duration (but not for rust reforming/freeing properties)
 - Dupont Release It
 - Free All
 - Gunk Engine Degreaser
 - WD40
 - A note on Liquid Wrench: The current product (owned by Blaster, apparently) is not the same formula as I used in the 1960s (by several reformulations per a Blaster scientist that emailed me). That product contained “benzol” (benzene) and a stronger rust reformer than the current product. The product of the 1960s turned black with the reformed rust whereas the current product barely has that effect.

Water Based Rust Reformer Results

- Both the WD40 Rust Remover Parts Soak and Evapo-Rust gave excellent results
 - A near sand-blasted appearance to all heavily rusted parts was evident
 - The WD40 product appeared to work slightly faster, possibly because the thin solution facilitates movement of the reformed rust particles into the liquid.
 - However, in an engine stuck condition, the thicker Evapo-Rust product may lead to better coating of parts and end reforming results especially if there is leakage around the rings
 - Both products worked well within 6 hours (of course thicker rust deposits require more time)
 - Excellent results occurred at 24 hours with little difference noted beyond that length of time with the particular parts tested

Conclusions

- It is likely that a 50/50 mix of acetone and ATF may be effective in some engine stuck conditions, but given the evident separation of the acetone and its floating atop the ATF, this is unlikely to be the ideal approach in many, probably most situations
- A better approach would seem to be to attack the root causes of the stuck condition individually, step by step

Conclusions - continued

- Engine stuck conditions may be caused by a combination of factors:
 - Varnish/Lacquer products from deteriorated gas and oil products
 - Gums
 - Carbon
 - Rust
 - Friction due to lack of lubrication
 - Friction due to damaged cylinder walls, rings, etc

Conclusions - continued

- Attacking the problems in the following order might be preferential:
 - 1. Dissolve varnish, lacquer, gums, carbon with acetone or a more versatile product such as carburetor cleaner, B12 Chemtool, Oops, or similar product
 - Depending on the follow-on product to be used it may be important to remove the prior step product (siphon) to eliminate any mixing/floating issues or dissolved products which would prevent the follow-on product from accessing its target crud product, but should not be necessary in most cases
 - Of course, B12 Chemtool and other products listed may destroy your plastic siphon, so beware
 - Diluting with Gunk engine degreaser might be helpful to reduce siphon damage, depending on what was used
 - 2. Introduce a water-based rust reformer and soak for a minimum of 24 hours, longer if needed (borescope)
 - My preference would be Evapo-Rust because of its superior parts coating behavior, but WD40 parts soak will work especially if the product is not leaking around the rings
 - Both products might need to be monitored and added periodically if drained
 - 3. Siphon water based products out to allow the addition of final lubrication product
 - 4. Add ATF or any very low friction lubrication product and allow it to penetrate and coat any remaining trouble spots.
- Testing shows that you can use a water based product post use of ATF, but it will take longer to diffuse to the rusted area and it is best to remove the ATF by siphoning and for any remaining around the rings, first thin with a lightweight product such as Gunk engine degreaser or WD40 to facilitate removal and to allow better access by the rust reformer
 - Using a water based product after ATF/lubricant introduction is not recommended since it may be difficult to remove enough of the ATF coating the critical rusted areas, especially the rings