Testing Different Types of Penetrating Oils

by Lloyd Bender

A question that is often raised by mechanics is the effectiveness of penetrating oils in loosening rusted fasteners. Do the commercial products really loosen bolts and, if so, which one works the best? To find out, four of these (Kano Kroil, Liquid Wrench, PB Blaster, and WD-40) were tested for performance, along with a home-brew mix of one part automatic transmission fluid with one part acetone.

Natural exposure would be representative of real world applications, but requires a very long time and a number of replicate samples to handle the wide sample-to-sample scatter encountered in natural exposure. Using artificially accelerated corrosion reduces the time required and provides nearly identical test samples. The testing done was not on bolts, since I don't have access to equipment for measuring the torque on threaded fasteners, but can measure the load on a sliding fit.

So you can decide if this was a fair test or not, this is what I did. A 5/8" diameter rod of cold-finished low carbon steel was lathe drilled, parted off in 0.50" lengths, and numbered sequentially. Each length was individually reamed to 0.250". All pieces along with commercial ground 1/4" x 1" dowel pins were ultrasonically cleaned together for twenty minutes in methanol to remove all machining fluid and oil. A dowel was inserted into each length using light finger pressure leaving 1/4" of dowel exposed at each end. Years of exposure were simulated by twelve hours of alternate immersion using ten minutes in a 3% solution of NaCl (table salt) followed by 50 minutes of drying in 105° F air.

The corroded samples were randomly divided into five groups (*Photo 1*), plus one control group left as-corroded. One fluid ounce of penetrating oil was used to immerse each group of three samples for a period of twelve hours. Samples were then drained on paper towels to remove the excess oil for ease in handling. A Baldwin compressometer on 1200-pound scale was used to determine the load required to move the dowel pin. This was done in numerical sequence in a single blind test – samples only identified by number and not with the penetrating oil used.

PENETRATING OIL	AVERAGE LOAD	PRICE PER FLUID OUNCE
ATF / Acetone Mix	53 pounds	$0.10
Kano Kroil	106 pounds	$0.75
Liquid Wrench	127 pounds	$0.21
PB Blaster	214 pounds	$0.35
WD-40	238 pounds	$0.25
None	516 pounds	—

The first and foremost conclusion I reached from the results: Any oil is better than trying to strong-arm things apart dry. These products actually do free up rusted parts. The price and performance of mixing your own penetrating oil is interesting, but keep in mind that most of the cost in the commercial products comes from the easy applicator can. If you have the time and opportunity for soaking overnight, the home brew method appears to be a winner.

By the way, on the subject of cost, the price quoted is what I paid locally to obtain the minimum quantity possible. Buying in bulk and shopping around can reduce the price of the commercial penetrating oils substantially. MW

Photo by Author