same way that a reinforcing bar increases the strength of concrete. Heat-treating the casting is when its temperature is raised to a point lower than the alloy's melting point for a period of time. Cast aluminum is used for parts that don't demand high physical strength: casings, cylinder heads, cylinder barrels and production pistons.

If the alloy, instead of being cast into a finished or semi-finished part, is formed into a billet, the crystal structure is much more regular. Rolling the hot, but not molten, metal helps force the crystals into alignment, while the temperature exposure helps crystals to dissolve and re-form into longer ones. The result is a dramatic increase in strength — by a factor of up to five times for some alloys. The problem of dealing with billet stock, of course, is that the process of converting a billet into a finished part involves machining, which is expensive. Control pedals and suspension components are often machined from billet.

The third basic method of making a part is forging — beating alloy that's heated but not molten into an approximation of the part's final shape. Forging, like rolling, tends to line up the metal's grain; unlike rolling, though, forging orients the crystals so that they conform more closely to the part's final shape, providing the maximum strength. Forging a part is the most expensive method of the three: forging itself isn't cheap, and subsequent machining is required. Forging is reserved for high-performance components, such as connecting rods and replacement pistons.

### MORE NUMBERS

The question, "How strong is it?" is a common one. It's also one that doesn't have a simple answer. Any material has a number of mechanical properties, all of which are measured differently, and while an alloy or other material can excel in one type of strength, it can be quite poor in another.

The most commonly measured properties of materials are Ultimate Tensile Strength (UT), Yield Strength (Y) and Elongation (%E). UT is measured by taking a bar of the material and applying an increasing pull to its ends until it breaks. Because a bar with a cross-sectional area of one inch will require twice the pull to break than one with a 1/2-inch area will, UT is described in terms of pounds per square inch, or thousands of pounds per square inch. Yield Strength is measured in much the same way, except that the pull that's measured is the force required to permanently deform the material, rather than that needed to break it. Y is always a lower number than UT, but it's a more meaningful one since the usefulness of a stressed part is gone when the part starts to permanently deform or take a set. Elongation is a measure (expressed as a percentage) of how much the material will stretch between its yield point and its ultimate break point; the lower the elongation, the more brittle the material.

A property related to strength of an alloy is its hardness: for a given alloy, the higher its strength (Yield and Ultimate Tensile), the harder it is. Hardness is a convenient property to specify, as it's easier to measure than the other properties. While there are several ways of measuring hardness, most use a device that presses a hardened ball or a diamond-tipped point into the surface of the alloy being tested and measures how deeply the surface is penetrated. Different metals may require different ball sizes and/or pressures, and these differing conditions must be specified along with the hardness numbers. The most popular hardness measurements are the Brinell hardness number and the Rockwell C; while there isn't an exact translation between the two systems, the Brinell number (standard ball) is roughly 10 times the Rockwell C number. A Brinell number of 300 corresponds to a Rockwell C of 32. For softer alloys (Brinell numbers below 100) a Rockwell B or F scale is generally used. Rockwell B numbers are approximately equal to Brinell numbers.

The table on page 24 shows the Ultimate Tensile Strength, Yield Strength, Elongation and Brinell Hardness of various popular aluminum alloys, as well as their composition.■

PRODUCT REVIEW


The Wetbrush helped make cleaning the grunge off of this old Ironhead's crankcases much easier.

## WETBRUSH

### A simple cleaning tool that works. How could it not?

review by Chris Maida

High tech is fun, but certain things should not require a complex mechanism or even a power supply. The Wetbrush is one of those little gizmos that are good because they're simple. This is a four-ounce plastic bottle with a brush on top so that when you're trying to clean a grungy part on your bike, you don't have to keep dipping your brush in solvent.

The directions are as simple as you would expect. Just unscrew the brush head, remove the cap plug from the bottle and fill the Wetbrush's bottle with your favorite cleaning solvent. After you have screwed the brush head back on, invert the Wetbrush and get to work on the filthy area of your choice. As you work, the cleaning solvent will automatically flow (via a special force of the universe known as gravity) into the Wetbrush's bristles. If you want more solvent than what is being delivered automatically, just squeeze the bottle. When you're done, or sick of cleaning (whichever comes first), unscrew the brush head and insert the cap plug back into the bottle's neck. After you have washed the brush head with water, screw it back onto the bottle. You can then store the Wetbrush until needed for the next cleaning job.

As for replacement parts, you can get replacement brush heads with soft, medium or stiff bristles. ■

SOURCE

Finish Line Technologies Inc.
1545 Fifth Industrial Ct., Dept. *HXL*
Bay Shore, NY 11706 • 516/666-7300