

STEEL USED IN TURNING TOOLS A PRACTICAL GUIDE

The main component of steel is iron, usually over 90 percent. Steel also contains carbon and other elements. Carbon is the material that has the greatest effect on the properties of steel. The hardness and strength of steel increases as the carbon percentage is increased. Unfortunately, the steel also becomes more brittle. A small amount of carbon makes the steel softer and more ductile (able to be shaped without breaking), but also weaker.

By experimentation, elements were added to steel to find the ones that would chemically bond to the iron and carbon and create steel with greater strength. Also, the new steel needs to be ductile and maintain its strength at high temperatures. The main elements used in these high-strength steels are chromium, tungsten, molybdenum, vanadium, and cobalt. In addition to these elements, the steel must also be heat treated to acquire high-strength properties.

The right combination of iron, alloying elements, and heat treatment led to steel that had high strength, high surface hardness, and did not lose its strength with high temperature. This steel is called high speed steel, HSS, because it could cut at high speeds and not lose its strength. The first high speed steel was called T1.

The letter "T" was used because the main alloy element was tungsten. Tungsten is expensive and in short supply. During World War II, molybdenum was substituted for tungsten and the M2 high speed steel was created. This is the steel used in quality turning tools.

The designation M2 refers to a specific grade of high speed steel. Other common grades are M7, M35, and M42. Look for the M2 designation in purchasing any cutting tool.

The ASP 2030 and ASP 2060 steels are superior to even the HSS M2 steel. The designation APS refers to the Asea Stora Process where powdered elements are mixed, put under pressure, and heated for a period of time. Under these conditions the elements self weld and create a very strong and heat-resistant material. These steels are used to create turning tools that hold their edge longer than HSS tools.

Cryogenics is the study of the effects of very low temperatures on the properties of matter. Steel exposed to very low temperatures for a period of time will show increased strength and hardness. Henry Taylor offers turning tools under the Kryo trade name. These tools are made from HSS that is treated by exposure to very low temperatures.

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