

ATS 34 and 154CM are Old Friends.

ATS 34 and 154 CM have been among the most widely used knife blade material for custom knives over the last twenty years. They have also shown up on an increasing number of factory produced cutlery in the last five years. There are good reasons for this popularity. Both can be heat treated to a higher hardness than most other stainless steel knife blade materials and still have reasonable ductility. Hardness equals edge holding for the most part so a few points hardness advantage over some of the other popular stainless blade materials pays off. They exhibit equal or better corrosion resistance than 440C, and are reasonably easy to grind and finish.

Before the development of laser cutting machines the dies used for stamping blade blanks in the factory would not hold up to the abrasiveness of high alloy steel. This limited materials of this type to the custom maker who could afford the time to “profile” blade blanks out on a grinder. Computer controlled laser cutting machines now enable blade blanking in large quantities for factory production runs.

The grade was developed in about 1958 as a high temperature bearing material for the aerospace industry. It was originally only available in round bar stock. Crucible Materials Corporation worked out a process for rolling rounds into sheet stock for cutlery applications. The Crucible designation is 154 CM. The current Crucible data sheet refers to it as 440C modified. It is basically 440C with 3 % less chromium and about 4% molybdenum added to the mix. The modification enables the material to hold its hardness and wear resistance up to temperatures approaching 900 degrees. The addition of molybdenum also serves to inhibit pitting corrosion.

Within this general grade designation (AISI 618 ) there are several other cold work tool steels that have slightly different compositions. In addition to ATS 34 and 154 CM, BG 42 and RWL 34 are available.

BG 42 is manufactured by Timkin-Latrobe using a double vacuum melt process and has 1% vanadium added to refine the grain structure. The end result is a very clean material that is a pleasure to work with. This material polishes up easily to a very high luster with almost no grain visible on the surface. (For a more complete discussion of BG 42 see “It is Rocket Science” by PC Wilson, published in Knives Illustrated October, 1998)

RWL 34 is available but at this time not widely recognized . It has the ATS 34-154 CM chemical composition but with a particle metallurgical base. It is made by ERA steel and imported from Sweden by Michel Walker. RWL 34 is one of the two components that are combined together to produce a particle based stainless Damascus called DAMASTEEL. RWL 34 is available by itself for knife blades. It also is a very clean material, grinds easily and takes a very nice polish. The particle metallurgy composition insures very fine grain structure and as a result has very good toughness. If one looks closely at a polished surface you can see the very small dots that are characteristic of this process. ATS 34 and 154CM can almost be used interchangeably. Both now are available in a wide range of sheet stock gages. The designation that has been around the longest is 154 CM. This is the one that started it all thanks to Bob Loveless. Bob imported ATS 34 from Japan as a replacement for 154 CM more than 20 years ago due to availability problems with 154 CM. This is all history now since Crucible Materials has taken a renewed interest in the last 10 years in supplying steel to the cutlery industry. We now have a very high quality 154 CM product that is available from many custom knife supply companies and direct from Crucible. Both ATS 34 and 154 CM polish easily and exhibit an attractive grain structure on the steel surface.

All four make excellent blade material. They all have a certain HRC 60/61 “sweet spot” hardness that seems to work out the best for knife blades. If the hardness is much under 59 then edge holding falls off quickly and over 61 it tends to be too brittle for hard use. Corrosion resistance is very good to excellent on all of them. I use both ATS 34 and 154 CM for fillet knife blades and they hold up very well in salt water environments. Impact resistance however is relatively low compared to carbon type knife steels. This grade is not the best choice for a heavy duty chopping knife unless the hardness is reduced to around HRC 55/57. It seems to be fine there for that application. In fact I have a chisel I made out of 154 CM at HRC 56 that I use every day for a staking tool in the knife shop. The impact resistance however is more than adequate for a slicing type knife. This is evidenced by the thousands of hunting and fishing knives made out of this grade that are in current use around the world.

User feed back with knives made out of all 4 has for the most part been positive. However, the most common complaint is that ATS 34 or 154 CM will not hold an edge and are hard to sharpen. In most cases this is attributable to poor heat treating.

I recently did a hardness test on a custom folding knife with an ATS blade. This was done for a friend who was complaining about the knife not holding an edge. The hardness was advertised at HRC 61. The actual hardness as measured on my machine was HRC 54. The blade was just too soft. A quality knife has to start with a quality steel. All of the above will make an excellent blade if the heat treater has done his job. This grade takes very precise heat treating to consistently fall in the “sweet spot” hardness range mentioned above.

All four are secondary hardening steels. Due to the high content of moly and chrome they can actually increase in hardness during the temper cycle. . The temperature range in which this occurs is relatively narrow. A little above or below the bump temperature, the blades are stress relieved but no hardness increase is realized. In addition a deep cryo step is beneficial to eliminate retained austenite and insure the most uniform and stable crystal structure. If an air quench is used both the hardness bump and the cryo cycle are necessary to insure that the final hardness falls in the sweet spot. If a Rockwell tester is not available then the maker may not realize that the hardness is not in the correct range. The safest heat treating method for this grade is to send blades to professional who has the equipment and experience to insure good quality control. For those who want to do it all themselves, I have developed some hard won heat treating techniques for these steels that will be outlined in a future article dedicated to heat treating this grade.

ATS 34 and 154CM are indeed the work horse steels of the custom and specialized factory knife makers today. They have an excellent record of performance over the years and will continue to be the steel of choice for a lot of knife makers. BG 42 is showing up more and more and is an excellent choice for a high quality knife. I predict RWL 34 will see more use as time goes on and makers “discover”it. It has the alloy combination that made ATS 34 and 154 CM popular and all the advantages of the particle metallurgy base.

Note:

This article was written some time ago and since then Crucible has introduced a 154 based particle metallurgy steel. It has pretty much the same chemistry as the “old” 154 CM but should exhibit some what better wear resistance and ductility due to the PM structure.