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# News & Tips

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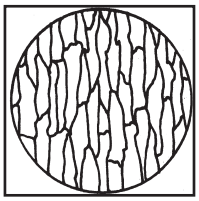
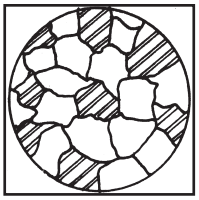
## "How to" tips for stainless and wear plate steels

So, why don't most people like drilling and cutting stainless steel and wear plate? Well, let's start with some pictures that get to the guts of the problem.The 2 pictures below are like X-rays of the inside structure of different types of steel.



**Picture (1)**
*Notice the long "stringy" structure. This is typical of stainless and wear plate steels. When you try to cut these materials, the "strings" wrap around your tool. That's why drills and cutting tools break.*



**Picture (2)**
*The shaded spots in this pic. are grains of carbon between iron granules. There's no "strings" like picture (1). This structure is typical of carbon or "ordinary" steels. The grains tend to break up, so machining is much easier.*

One of the other main problems with these materials is that if a cutting tool touches them and doesn't cut through the surface straight away, the material begins to work harden with the rubbing of the tool. Of course, then it becomes harder and harder for you to make the tool cut and you either break the cutting tool or make a horrible mess of the job.

***Query (1)*** - How do you make a drill or other tool keep cutting so that it doesn't cause work hardening by rubbing on the job? ***Answer -*** Unless you're an athletically coordinated genius, really the only good answer is a machine driven feed. It's almost impossible to control cutting "feed" and pressure with a hand held drill. So the best answer here is a drill press or milling machine with adjustable motor driven feed. Of course, if you're doing a repair job you mightn't have any choice. In that case, an understanding of why the material is hard to work with, and a few spare drill bits on hand in case of breakages will probably see you through the crisis! The other tip with a hand held tool is to keep the pressure on so that the drill keeps cutting instead of rubbing. The trick when you're machining something in a lathe etc. is to use a steady feed and a depth of cut that's not too heavy. That said, you do need to ensure that your cut and the speed of the feed are just heavy enough to keep you below the work hardening layer.

***Query (2) -*** What's the right cutting tool to use? ***Answer -*** You'd naturally expect a harder cutting tool (say solid carbide like Diamohard™ drills) would be best for the job. The problem there is anything hard is also brittle and tends to snap under load. So the answer's a tool that's as hard as possible and yet reasonably "flexible". Currently, probably the most cost effective answer is cobalt *H*igh *S*peed *S*teel (HSS) tools. Cobalt is a step above standard HSS. The cobalt alloy makes the tool tougher and also marginally harder. "Cobalt" tools also keep their cutting edge better when they heat up under working conditions. So step 2 in beating these materails is choose the right cutting tool and generally cobalt HSS is the recommended option.

***Step 3*** is - ***Always*** use a good cutting fluid or paste if you're drilling or machining. This applies to machining ***any*** type of material at all but especially to stainless or wear plate steels.

Let's tell a little story about cutting fluids. It starts with a working bee of enthusiastic young guys. The aim was to drill thousands of holes in mild steel mounting plates for seats. It was a community project. The "production line" was set up - a couple of drill presses, jigs and the team of helpers. The hole drilling project started and it wasn't long before drill bit No 1 broke, drill bit No 2 blunted and wouldn't drill, No 3 managed the grand total of 5 holes before it was useless and. . . the supply of drill bits ran out in the first 100 holes! Then came the bright suggestion of using squeeze bottles of lubricant/coolant. The effect was brilliant. Instead of a pile of busted and blunted drills, the next couple of thousand holes was soon conquered using only a few more drill bits.

The moral is, if you get in the habit of always using lubricant/coolant you can expect to save heaps on cutting tools. Your tools will stay sharper much longer, difficult materials will be far easier to deal with and the job will have a much better finish.

Tapping in these tough materials is more difficult but the same rules apply. ***Always*** use coolant/lubricant and never back off like you would in other materials i.e. don't reverse the tap any more than you have to.

One final tip from an old hand - "metho" is a great lubricant for aluminium cutting jobs.

**Stainless & Wear Plate Type Steels - Starting Point Guides**
**Approximate feed in mm and speed in RPM using cobalt HSS drill bits**

| 5-10mm Ø drill | | 10-15mm Ø drill | | 15-20mm Ø drill | | 20-25mm Ø drill | |
|---|---|---|---|---|---|---|---|
| feed/mm | RPM | feed/mm | RPM | feed/mm | RPM | feed/mm | RPM |
| 0.10 | 1150 | 0.10 | 575 | 0.16 | 390 | 0.23 | 290 |
| 0.05 | 570 | 0.10 | 280 | 0.16 | 190 | 0.23 | 120 |

NOTES:
(1) You must use cutting fluid when drilling these materials with cobalt drills - preferably applied with a constant flow by pump. Absolute minimum requirement is to use a very good quality paste type cutting compound.
(2) The speeds and feeds are only given as a guide and a suggested starting point. Obviously the bigger the diameter of the drill within a given size range, the slower the drill should be run. Feeds should remain constant within a range of diameters because it is important to stay beneath the "work hardening" layer when drilling these materials.
(3) The top (shaded) row of speeds and feeds is the suggested starting point for easier machining grades of stainless e.g. 303, 304 and also for "lower" grades of wear plate e.g. Bisaloy 60 to 80. The bottom (unshaded) row is for more difficult-to-machine grades like 316 stainless and tougher wear plate like Bisaloy grades higher than 320.

## Bargain Corner

**Cobalt HSS Drill Sets** - *2 only imported (US origin)*
*1/16"-1/2" by 1/64" ths - $200 each including free delivery*

COMPLETED

**Timesert Range Kits**
*2 only 1/4"- 1/2" UNC kits in steel kit box - $550 each*
*2 only 1/4" - 1/2" UNF kits in steel kit box - $570 each*
*Including free delivery*

**PRICES ARE PLUS GST**