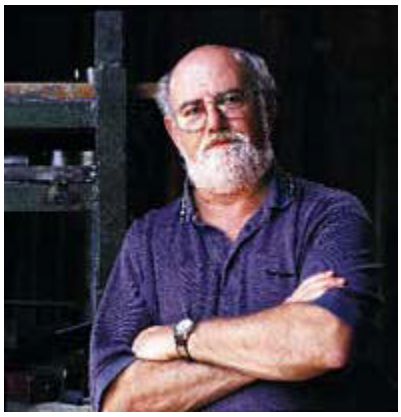
Is it tough enough for you?



Can a new tool steel that machines like butter really be tough enough to withstand the pounding that a Tier One automotive stamping plant will put it through? We ask on "old D-2 boy" what he thinks.

By Chris Cummings, 2001 issue of Canadian Machinery and Metalworking

Like most toolmakers, Marty Puncheon of Ajax Precision Manufacturing Ltd. in Toronto, is a skeptical man. As the toolroom supervisor of this Tier One automotive parts supplier, he's been around the block and knows his tooling business as well as anybody. He is a self-confessed "old D-2 boy," loyal to the tool steel that is considered the industry standard. So when asked to check out a new kind of tool steel said to be easier to machine--and yet provides a longer tool life than conventional tool steels--he was, naturally, skeptical.

But Puncheon ensured Ajax was the first Canadian plant to try **DC53** tool steel in production. He says he was as surprised as anybody to find it significantly outperforms alloy tool steel D-2--long the standard in the industry--in the applications in which he has tested it.

Because of the steel's ability to withstand compression and shock, this Toronto stamping plant reports it is getting 10 times more hits, double to triple the tool life, 30% less machining time, much faster grinding time and 30% less downtime when used in its progressive dies.

REDUCES CRACKING AND CHIPPING

The steel sharply reduces cracking and chipping and the number of processes involved in the stamping industry, and provides better hardness after heat treatment. Moreover, unlike competing die steels, it is inexpensive, costing between D-2 and the powdered metal steels.

The plant, one of three operated by Ajax Precision Manufacturing Ltd., mainly makes automotive parts for the Big Three car companies. A Tier One supplier to General Motors, Ajax is currently making almost 70 parts for the new smaller version of the Hummer vehicle manufactured by GM in the United States. For more than 20 years, Ajax has also made brake shoes for rail cars. The plant has 32 presses and 24 robotic and spot welders; it employs 205 people.

LONG-LASTING STEEL

DC53 is particularly effective in applications where long-lasting tool steel able to take shock and not crack is called for. Although Ajax has so far used it in several applications, including cutting, DC53 is a general all-purpose tool steel that can be used in forming and coining operations as well. The steel is now being used in about 20 other manufacturing plants and shops in Canada.

Puncheon was skeptical about DC53 when Titus Steel of Mississauga, Ont., offered it to him several months ago. It had no track record in Canada and he doubted anything could outperform familiar tool steels such as D-2, which has been the industry standard for decades.

"I was hesitant to try something new. I'm an old D-2 boy and I'd never found anything else around. I didn't believe it would do what they claimed it would. I was given some sample DC53 to try out. At first, I was reluctant to say it was any good because I watched how easily it machined; it cut like butter. I said any steel that machines that easily couldn't be any good. But we finished the part, had it heat-treated and installed it in the die. I had egg on my face because it worked. I couldn't believe it. In my 30 years in the business, I've never seen a steel do what it did."

Chris Martin of Titus Steel points out several more advantages of DC53 compared to other tool steels. The material has less residual stress after EDM wire cutting. You can heat it to 63 HRC without losing its toughness and without it becoming brittle. You don't have to pre-heat treat or post-harden DC53 when coating using CVD (chemical vapour deposition) or TD (thermal diffusion). DC 53 does not "move" as much as other tool steels during these hot coating processes. So you don't lose as much hardness. And you can save money on your heat-treating and post-hardening processes. Welding and general repair is much easier with DC-53 than with other tool steels.

100,000 HITS VS. 10,000 HITS

Puncheon notes that, in one particular application with D-2, he gets 10,000 hits on the stamping press. Both DC53 and Vanadis 4 give him more than 100,000 hits but DC53 costs less.

"And it's not just the ease and speed of machining I like: It cuts down on maintenance; you're not wearing out as many cutters and it gives longer life to grinding wheels."

DC53's molecular construction is what makes it perform efficiently. Its carbides are one-third smaller and more rounded and uniform than D-2's. Because D-2's carbides are bigger and more angular, kick-back is more likely to occur when machining or grinding.

"With D-2, your grinding wheel will wear down faster because of the sharp carbides in the steel," Pucheon says. "You get heat when you start grinding on a taper. DC53 does not destroy the wheel as fast; you still have that leading edge which gives you a narrower cutting face, and, obviously, less heat. So it's much better grinding. It's also easier on the cutters when you machine it; you're not breaking up cutters or making the cutters dull."

CAN BE HARDENED UP TO 63 HRC

DC-53, made by Daido of Japan, can be hardened up to 63 HRC without losing its toughness or becoming brittle.

Puncheon was particularly impressed by how the steel worked on one "nasty" 18-year-old die that has always been awkward to work with.

"The die takes a lot of pressure: It draws about 470 tons. One small round station about 3-in. diameter takes about 400 of those tons. I hadn't found a steel that would stand up to it. I'd used D-2, Vanadis 4, H13, S7. I've tried them all and nothing worked. The best was Vanadis 4; I got about 100,000 hits with it but I had to stress-relieve it all the time. It's hard to grind or machine because it's a very tough material. DC53 did the job," but it does also need some stress relieving, he adds.

The steel has helped Puncheon overcome other problems. "I have a couple of dies with developed holes. The sidewalls are extruded but it's an irregular shape. The two dies are the same: If they get a little dull where the flanges are extruded, the part rips and I get rejects from the customer. Before getting DC53, I had to sharpen the dies every two runs maximum with D-2 punches and die-sections. So I put the DC53 in and one die has been in and out of the press eight times and it's still running. The parts aren't cracking; it's holding its edge. It's giving me a better cut.

"I don't build dies, I repair them. I have presses of up to 600 tons. The number one consideration for me is that they have to run. When I have a breakdown it has to be repaired fast due to the customer's needs and press scheduling. Equally important is the quality of service; it means more than cost. The supplier who can get the steel to me in an hour, even though he's more expensive, is better than the supplier who takes two days."

EXPERIMENTING WITH COATINGS

He hasn't yet tried the tool steel with protective coatings, but plans to. "If I see a die design that looks problematic, I'll try it (a protective coating). I'd try DC53 in almost any application in the stamping industry. I will experiment with coatings. I have some dies that require a difficult draw. It doesn't matter what steel I use, the die requires a special coating on it. D-2 moves after being reheat-treated after coating. I can save money on the heat-treating cycle with DC53." The steel can be coated with PVD, CVD (chemical vapour deposition), TD and other coatings, extending tooling life.

Ajax, a recently incorporated company, has other plants besides the stamping plant, the firm's original site. It has a plant nearby in Mississauga and a new 100,000-ft2 corporate head office and stamping facility in Brampton, northwest of Toronto. Ajax was started in a Toronto basement in the 1930s, manufacturing compact cases and drafting equipment. During World War II, it made munitions for the war effort, and, afterward, began stamping automotive parts. The current owner, Bruce Mitchell, acquired the company in 1976. The steadily growing company employs more than 500 people.

Chris Cummings is a regular contributor to Canadian Machinery and Metalworking.

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