

Steam Treatment Tool Life Improvement for M2, M7 and A6 Tools

Steam treatment puts a thin black oxide layer on a finished tool, and the layer changes what happens at the cutting edge and on the working face of a punch. It is bought for tool life, not for appearance. The two tables below record what that layer was worth in production, tool by tool, for high-speed steel cutting tools and for the punches and trim dies used in nut and bolt forming.

Reference only. This is a reference summary of published practice and not a specification of ours. Both tables report production comparisons, where each tool was run to failure in the condition the shop normally used and then re-run after the oxide layer had been applied, with no other change to speed, feed or tool material. Confirm the treatment cycle for the grade and the application before it is written into a process sheet.

Tool life gains on cutting tools

Results by tool and workpiece material

Tool	Application	Tool life before steam treating	Tool life after steam treating
M2 broachers	Cutting AISI 1010 latch	20 h per grind	70 h per grind
M2 drills	Drilling Bakelite plastic insulating blocks	10 holes	25 holes
M2 drills	Phenolic terminal plates	1700 holes per grind	8500 holes per grind
M2 drills	Drilling AISI 4030 steel 25 mm (1 in.) thick	17 holes	81 holes
M7 end mill tools	Cutting 8740 steel forgings	30 pieces	200 pieces
A6 hobs	Cutting teeth on AISI 3140 forged gear	not stated in the source	62.2% increased life
M2 milling cutters	Two slots in 1020 steel	150 cuts per grind	306 cuts per grind
M2 milling cutters	Slotting 1020 steel bars	2000 per grind	7000 per grind
M2 saw blades	Cutting 75 mm (3 in.) rods, austenitic steel	100% endurance at 0.52 m/s (102 sfm)	120% endurance at 0.57 m/s (112 sfm)
M2 taps	Cutting SAE 52100 steel	1800 pieces	3000 pieces

Source, Tool Steels (G. A. Roberts and G. Krauss), Table 16-1, Machining tool life improvements due to steam oxidation, printed page 307. The source prints the three M2 drilling applications on separate lines, each with its own tool life values, and gives the A6 hob entry as a percentage gain with no baseline life. Written as printed, including the spelling broachers. This is a reference summary of published practice and not an Aobo Steel specification.

Tool life gains on forming punches and trim dies

Results in nut and bolt forming

M2 tool	Application (steel type)	Tool life before steam treating (a)	Tool life after steam treating (b)
4th station punch	Castle nut (1030)	21,000 nuts	42,000 nuts
4th station punch	Slotted insert nut (1030)	22,000 nuts	38,000 nuts
4th station punch	Castle nut (1030)	29,000 nuts	80,000 nuts
3rd station punch	Castle nut (1110)	20,000 nuts	35,000 nuts
4th station punch	Castle nut (1110)	15,000 nuts	35,000 nuts
Trim die	Bolt head (1335)	7,000 bolts	16,000 bolts

Source, Tool Steels (G. A. Roberts and G. Krauss), Table 16-2, Effect of steam oxidation on tool life in forming various carbon steel nuts and bolts, printed page 307. In the source, (a) hardened and triple tempered and (b) hardened, triple tempered and steam treated. All punches in the table are M2. This is a reference summary of published practice and not an Aobo Steel specification.

Read the two tables together. The cutting tools gained most where the operation was abrasive or where the tool ran hot, and the forming punches and the trim die roughly doubled the parts they produced before replacement. The treatment is cheap next to a change of grade, and on M2 it was applied without any change to the tool itself.

Aobo Steel, tool steel supplier

Aobo Steel supplies tool steel to distributors and tool, die and machine shops, including D2, D3, O1, O2, A2, S7, H13, H11, H10, H21, M2, M42, L6, P20, P20+Ni and 420 and 440C stainless.

Forged or hot rolled, annealed or pre-hardened, cut to your sizes, with test certificates.

Compiled from Tool Steels (G. A. Roberts and G. Krauss), Table 16-1 and Table 16-2, on printed page 307, in the surface modification chapter. Both tables were read from the page image and cross-checked against the searchable text of the file. The tables are reproduced as published and are a reference summary rather than an Aobo Steel specification, so confirm the treatment cycle for the grade and the application before it is written into a process sheet.

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