



Tooling Application Story - Exotic Materials

HORN TOOLING GIVES DOUBLE M ENGINEERING THE EDGE **WHERE IT MATTERS**

Application of a variety of turning and milling tooling supplied by Horn UK has played an important role in the success enjoyed by contract manufacturer Double M Engineering Ltd.

Founded in the early 1980s, Double M is a key supplier of small to medium sized precision components for aerospace (ejector seat) and Formula One race car applications. Many of these are produced from aircraft grade aluminium alloy, stainless steel, PEEK and titanium. Components are produced on high accuracy CNC turning, milling and twin spindle mill-turning machines, housed at two factories in West Drayton and Harefield.

Managing director Mark Phillips credits the wide ranging use of Horn tooling with the company's ability to provide competitive turn-around and excellent repeatability on precisely machined components produced in difficult materials. "In general, Horn tooling provides excellent tool life coupled with high productivity and accuracy," he remarked, "whilst we have certain jobs that would be nigh on impossible without it."

The company's portfolio ranges from tiny stud type components produced in thousands off, to single figure batches of thin wall 'box' and cylindrical aluminium parts machined from solid aluminium. As machined dimensional accuracy ranges from 0.0125 mm to 0.1 mm dependent on the customer's specification.

Many of these components require grooving operations of one sort or another. Double M uses Horn for groove milling and groove turning as well as boring and part-off. A key advantage is Horn UK's ability to supply inserts with customised cutting edge dimensions and profiles, such as are needed on aircraft seat-to-rail mountings.

Similarly, the need to locate internal O rings on hydraulic fittings is an area where the Horn grooving system comes into its own.

For some time Double M has been a first tier supplier to a specialist hydraulics company providing systems used on Formula One Grand Prix cars. A regular job is manufacture of titanium swivel nuts; these comprise a right angled elbow with a serrated hose coupling on one leg and a smooth cylindrical pipe section on the other. The pipe locates in the precisely machined bore of a threaded nut. Primary location is by a locking wire that mates an internal groove on the nut with an external groove on the elbow. Sealing is by an O ring that locates in a second groove deeper within the nut.

Both components are finish machined to a high standard and polished to eliminate potential stress raisers. Tolerance on the machined bore is H8.

Company director Andy Phillips comments. "We make quite a lot of these with minor variations to suit end user requirements. We've produced the part for around four years and have progressively refined the manufacturing process. In the very early stages we had a go at grinding our own tool to produce the internal grooves but quickly acknowledged that we needed specialised tooling and handed the task over to Horn. They developed tooling based on the Type 105 Supermini® system"

The capability provided by Horn Supermini® stems from highly rigid location of the insert, which is manufactured from micrograin carbide. This provides a surprisingly strong tool - even though it looks very delicate. The business end is ground to provide a very sharp edge with positive geometry, which is then slightly relieved to maximise edge toughness; it also allows coatings to adhere. Through tool coolant is delivered close to the cutting edge, whilst cutting data is carefully tailored to the application ensure operational success.

Three Horn-supplied tools are used to machine the internal features of the nut. All are based on the Type 105 Supermini®. The 2.8 mm diameter bore is initially drilled and then bored out to the finish dimension using a Supermini® boring tool. The groove for the locking wire is plunge cut using a short reach insert with a profiled cutting edge.

The O ring groove is further inside the bore, requiring a longer reach. For this feature it was elected to profile cut the groove; from a tool life standpoint this kept cutting forces reasonably low and helped to control swarf. It also minimises the possibility of vibration-induced chatter/tool breakage and ensured a burr-free finish on the groove to provide perfect seating for the O ring.

External operations, including thread cutting are also performed using Horn tooling, whilst a Horn part-off tool is used to machine the serrations on the hose end of the elbow - as well as parting off the finished swivel nut.

“There is basically no way that we could produce the O ring groove without the Supermini® grooving tool.” Andy Phillips remarked. “Furthermore it provides tool life comparable with the other tools used in the process so it is genuinely a no-compromise solution.”

Over the years that DM Engineering has been producing this type of component Horn Supermini® has proved to be a very reliable performer. This has encouraged its use on other components.

Mark Phillips concluded. "Since we brought Horn on board we've really never looked back when it comes to machining difficult materials. On those jobs where the tooling is applicable it is now our automatic first choice as the expenditure on the tooling is quickly repaid via the quality, consistency and productivity that it provides."

Further information is available from:

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