

Tooling Application Story

- Large Scale Broaching



HORN BROACHING SYSTEM MAKES THE BIG TIME ON FORGEMASTERS BROACHING TASK

By using the Horn broaching system, engineers at Sheffield Forgemasters International Ltd., have been able to reduce the time needed to broach a single 28 mm wide key-way slot by nearly 24 hours. In fact the most time consuming aspect of the operation was setting up the 68 ton component, which took around fifteen hours; production of the slot, which measured 184 mm long by 9.5 mm deep, was accomplished in less than half an hour.

The component was a large back-up roll for a steel rolling mill, measuring 7.5 m in length by over 1 metre diameter; Sheffield Forgemasters is a leading producer of back-up rolls and has the facilities to manufacture rolls up to 200 tonnes. The 3%CrMoV forging was produced in the company's foundry and subject to a number of operations including turning and grinding of the roll and journal surfaces, and milling/boring of end features prior to broaching of the slot.

Forgemasters' tooling engineer Andy McLean commented. "Though we have a lot of experience with this type of component we had previously manufactured only one roll requiring this particular feature. At that time we were unaware of the Horn broaching system but managed to generate the key-way using HSS tooling produced in-house. The component was mounted on one of our large capacity lathes and the tooling located on the cross slide."

In this instance the job required about 40 hours including set-up. However when a second, similar job was scheduled, Forgemasters staff were keen to adopt an improved method if one were available. This devolves from both the high operational costs attached to the type of machine tool capable of handling this class of workpiece, and the need to offer competitive cost and delivery on high value components.

Andy recalled. "One of the engineering team had seen some of the publicity for the Horn broaching system and it appeared to offer the solution we needed. When we contacted Horn UK they were very helpful and undertook design and manufacture of customised tooling and inserts for our application. From initial order to delivery of the tool took about six weeks, with its arrival being well in advance of scheduled use."

Sheffield Forgemasters had hoped to conduct a trial run using the tool to prove its capability and assess optimum cutting data. In the event, machine availability did not allow this so the first opportunity to use the tool was on the roll.

The component was set up on a large capacity CNC horizontal boring machine with an additional bolster to support the 'free' end. Machining was accomplished with the tool mounted in the machine's spindle with the spindle locked. The column Y-axis provided the forward/backward motion of the cutting edge, and the Z-axis was used to apply vertical feed of the cutting edge and lift it clear of the feature during the backward return stroke. Cutting data was 5 m/min feed rate with 0.04 mm depth of cut, giving an overall machining cycle time of around 25 minutes.

"The operation went very smoothly," Mr McLean remarked. "Horn were in attendance throughout and provided very helpful back-up. The end result was a very good quality key-way, produced in a fraction of the time that we had previously needed. Even though we used a special tool and produced just one feature the exercise was highly cost effective as it saved a full 24 hours of machine time. As a result we will certainly look to use the Horn system on other applications."

Editors Note:

Sheffield Forgemasters International Ltd (SFIL) is based on Brightside Lane in Sheffield and is a world leader in supplying total engineering packages to solve industry's needs.

It specialises in a broad range of heavy forged and cast steel products as well as stocking ingot and bar. SFIL can design, establish material requirements, produce material specifications and manufacture products to the highest quality.

SFIL produce some of the largest bespoke engineered products in the world with capacity for castings of up to 350 tonnes and forgings of up to 200 tonnes.

SFIL are the world's leading supplier of castings to the offshore sector and have designed and manufactured more than 45,000 tonnes of components. The company has operated in this market for 20 years and SFIL castings are tried and tested in structures around the world.

SFIL use a proprietary offshore steel grade CSN400, which is a low alloy, readily weldable steel. It is widely accepted by all the major oil companies and contractors worldwide and is complemented with an extensive portfolio of pre-qualified material data.

Further information is available from:

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