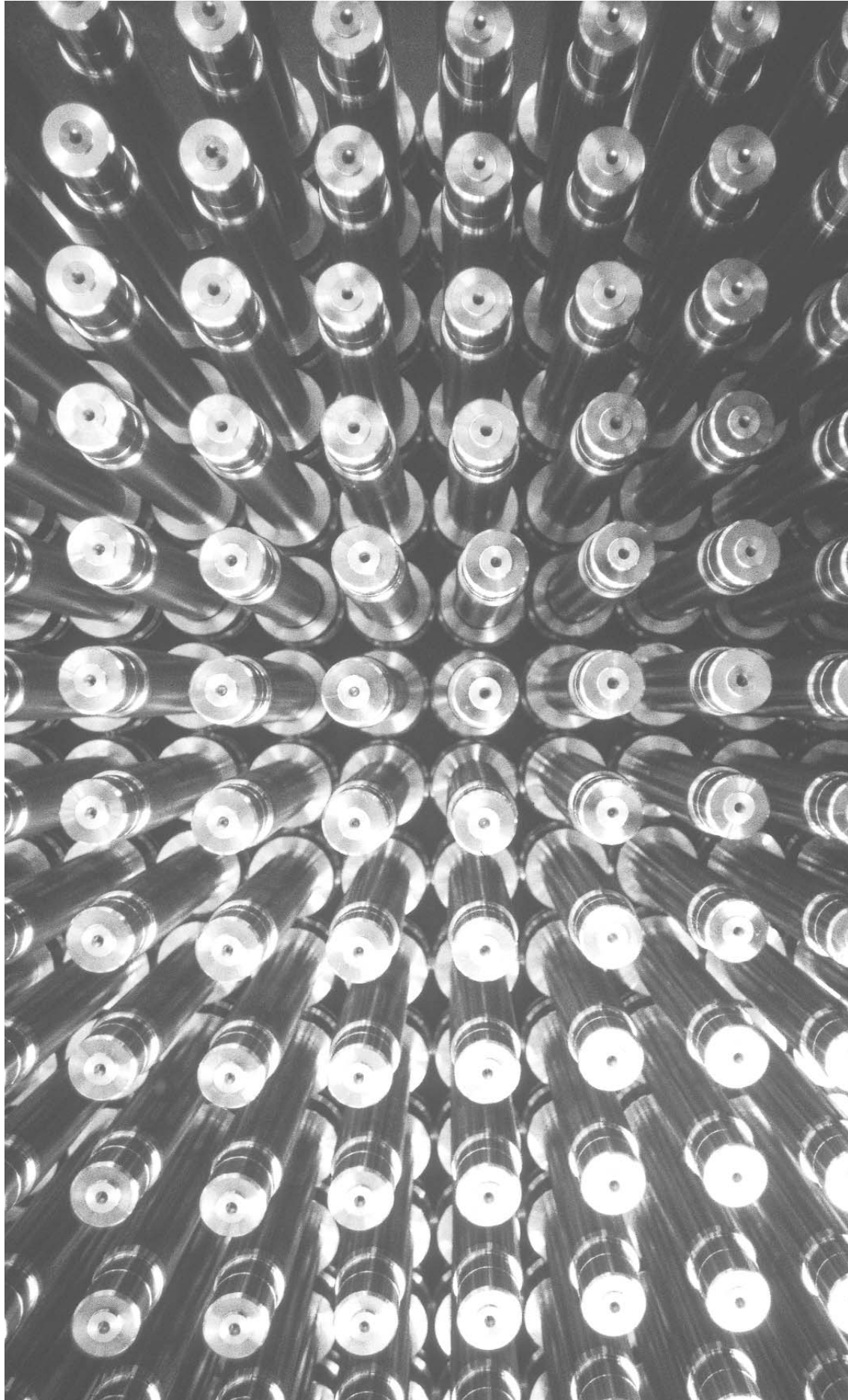


Machining of turbocharger impellers



Foundry branches out into machining of turbocharger impellers

Coventry-based foundry, Doncasters Sterling, took the decision in early 2000 to add further value to the castings it produces for the automotive turbocharger market. Under the direction of Machine Cell Manager, Gary Hopkins, who had previously worked for a turbocharger manufacturer, the company installed in the June of that year an automated system to mill-turn the aluminium alloy impellers. The cell comprised a specially adapted INDEX G200 twin-spindle, twin turret lathe and a Schenk CNC balancer.

Within two years the equipment was working 24 hours a day, seven days a week, producing machined and balanced impellers for export to the Italian and US factories of a major turbocharger manufacturer. The business ramped up so quickly that capital expenditure for a second, similar cell had not been approved by Doncasters Group's board of directors before the first line reached capacity. So an INDEX machine was hired from UK agent, Geo Kingsbury, to allow production targets to be met in the interim. The second INDEX/Schenk line was installed in April this year (2003) and by July over half of its capacity was being used.

Commented Mr Hopkins, "This is a mass production environment where tolerances are very tight, so we needed to buy the best equipment available. For SPC purposes we have



Close-up of the working area of the INDEX G200 lathe

to hold better than 4 microns dimensional tolerance to achieve a Cpk of 1.33, while perpendicularity and roundness are both within 5 microns and surface finish is better than 0.2 Ra.

"There are not many machines on the market capable of achieving that level of accuracy, day in day out. My previous employer's German factory used 10 similar INDEX lathes to mill-turn turbochargers to equivalent tolerances, so after comparing 15 different lathes it was not surprising that the INDEX made it to our final shortlist of three before being selected as the machine of choice.

"We were confident that the machines would perform, and so it has proved, but service back-up is just as important in high volume production. I have been immensely impressed with Geo Kingsbury's in-depth knowledge and response to our needs, from the original applications engineering and early program writing through to telephone help and the promptness of visits made by their engineers on the few occasions that on-site attendance has been needed."

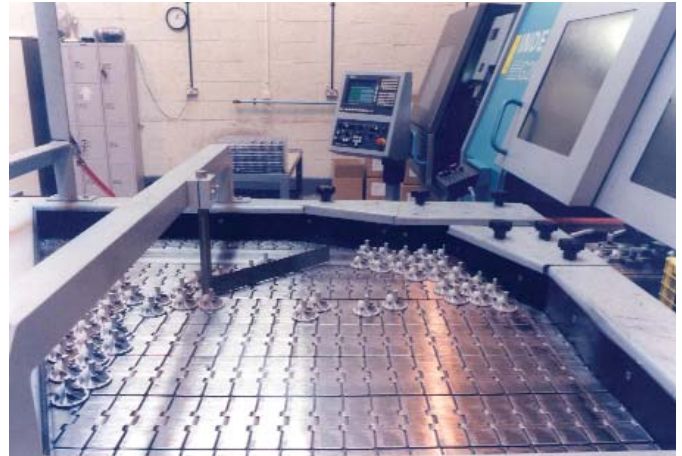
The process starts with aluminium alloy castings which are placed onto an accumulator table capable of holding four hours' production. A moving channel along one side of the table transports castings to a pick and place unit where a work handler places the next component into an orientation pot. It is then transferred in a known position into the main spindle of the INDEX G200 lathe.



Gary Hopkins, Machine Cell Manager, checking a turbocharger impeller machined in one hit on the latest INDEX G200 mill-turning lathe at Doncasters Sterling's Coventry foundry

Front-end operations include rough and finish turning, cross drilling, reaming, chamfering and blade deburring using a nylon brush in a driven turret station. Air sensing on the counter spindle ensures that the component is not damaged when it is clamped on its outside diameter during automatic transfer from the main spindle. The nose is then parted off followed by intermittent rough and finish turning of the blades (which can be as thin as 0.5 mm), chamfering and deburring. Although both turrets are able to work at either spindle, in this application the upper turret is devoted to the main spindle and the lower turret to the counter spindle.

Meanwhile, the work handling unit picks up another casting in its orientation pot. When the reverse-end cycle is complete, it removes the finished component from the counter spindle, loads the new casting into the main spindle, and travels across to deposit the machined part onto the input conveyor feeding the balancing machine. Here it is tested and has material milled from the nose and base to ensure that it is within tolerance prior to delivery.



A view from the other side of the cell showing cast impellers on the accumulator table awaiting machining

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