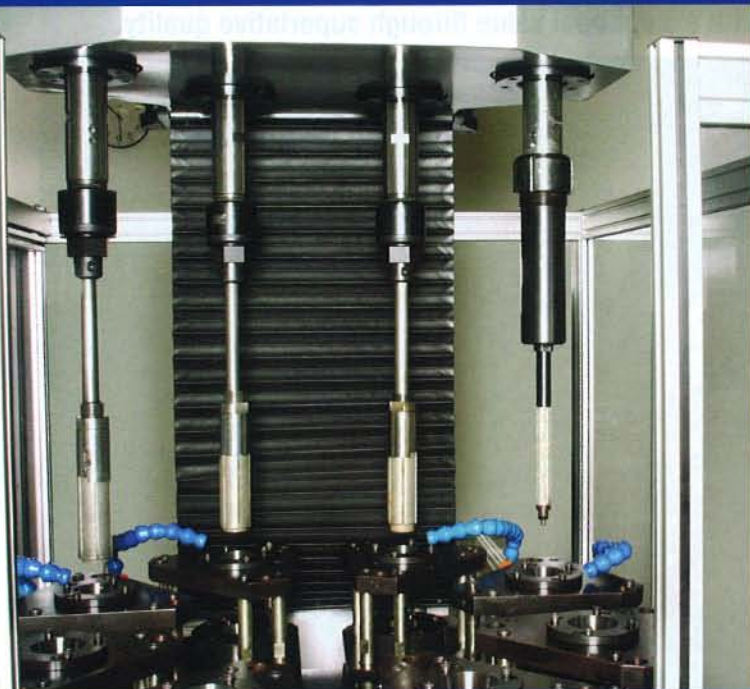


Superabrasives Come



Single-pass process involves a series of pre-set diamond coated tools that get passed through a bore with a single in-and-out stroke movement, while the tool, part or both are rotating.

The key to the single-pass process is to allow the diamond tooling to follow the existing centerline of the bore to be finished with as little pressure as possible.

A STEP BACK IN TIME...

When the writer first went to India in 1993, it was to visit an abrasives manufacturing plant near Mumbai and investigate the opportunities for selling the Indian product range into other East Asian markets. While the plant staff was well educated and charming, touring the facility gave one the feeling that one had stepped back in time 40 years, as they were utilizing very primitive equipment and manufacturing techniques. With the potential for considerable product variability inherent within their manufacturing process, the end results were predictable, and no sooner had Indian product arrived at the customer's dock that a call could be expected complaining of poor packaging or shoddy appearance.

FAST FORWARD A DECADE AND A HALF

India is today the largest democracy in the world, it's the 6th largest country, and is one of the most ancient living civilizations (between 10,000 and 34,000 years old, depending on who you believe). Not only did our own numbering system come from India, but algebra, trigonometry, and calculus originated there as well. And India boasts being the largest employer in the world, confirmed by its nationalized railway

system, which provides jobs for more than one million individuals.

PROTECTIONISM DOESN'T WORK

At the core of the challenges Indian manufacturers faced back in the 1990s was that it was a highly protected market. This was a dual edge sword while it shielded its manufacturers from global competition, metalworking companies had to make do with rather unsophisticated locally produced products for grinding, polishing, and honing applications. Most of the technology came from Norton or Universal and was decades old, at best. Superabrasives were considered far too costly and generally not suitable due to the poor condition of most Indian machine tools.

CHANGE PROJECTS INDIA AS NEXT MANUFACTURING FORCE

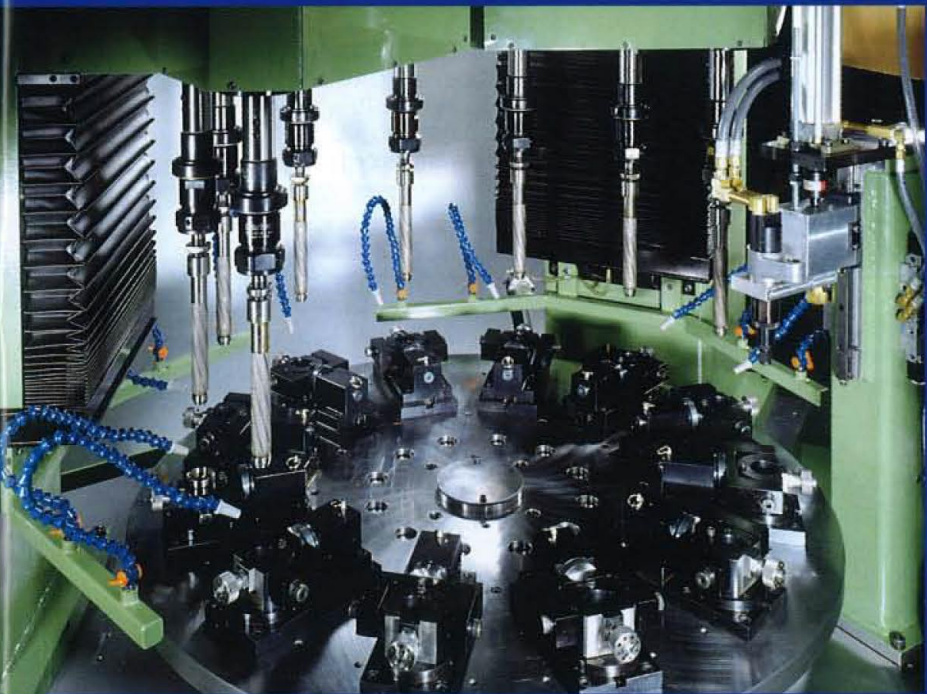
The subcontinent has really come a long way in the last thirty years. While still lagging behind China in terms of manufacturing sophistication, many pundits believe that India may indeed surpass China in the long term taking advantage of a well educated, English speaking pool of engineers and managers,

a vast supply of inexpensive labor as well as a democratic institutions and a free press. One example of the changes sweeping the Indian manufacturing sector is a greater willingness to look at total production cost, as showcased by a motorcycle manufacturer located in Pune. India is following down the same path in transportation as many of its Asian neighbors already have, from traveling by foot or on horse cart, to bicycles, then motorcycles, and finally motor vehicles. India currently produces something on the order of 7 million motorcycles per year, which equates to about four motorcycles manufactured per 1000 inhabitants. If they were to achieve the same level as Viet Nam, which manufactures 24 per 1000, this would bring production to a level of something like 42 million units per year. This compares to approximately 1.2 million produced in Japan last year.

GREATER PRECISION BY IMPLEMENTING OFFSHORE TECHNOLOGY

The customer in question began production in 1955 when it started to receive 350 cc kits from the UK for final assembly in India. They eventually began to manufacture the components themselves for assembly into complete motorcycles. As the demand for its

Of Age in INDIA



Among the most critical features in any system design is the workholding fixture.



Machine utilizing single-pass bore process with diamond tooling.

products increased, so did need for sophistication of the production processes, and the firm has been awarded not only the ISO 9001 certificate for quality but ISO 14001 for a clean and safe working environment. High precision gears are essential to effective power transmission, lower noise, and the bike's overall performance. The firm's engineering staff presented a challenge to the plant's manufacturing team to achieve greater precision on the gear's bore. The application called for removing 0.050 mm of material from a 20mm diameter gear which was made of steel hardened to 58-64 HRc. The tolerance on the bore called for 0.015mm and the cylindricity needed to be held to 0.008mm with a finish requirement of 0.8Ra. The plant's engineers had first considered attempting to achieve this with conventional honing equipment, which utilizes abrasive stones which expand and contract with each cycle. But they fell short of their quality and cost objectives, which prompted them to begin to look at offshore options. They then contacted a US superabrasive supplier who was able to design a single pass honing system utilizing electroplated diamond tools. The supplier was able to significantly improve upon the results previously achieved with conventional honing. Bore tolerances of 0.007mm, cylindricities of 0.005mm, and finishes of

0.6Ra were achieved consistently in a production environment. This was thanks to a six spindle bore finishing machine which, by double indexing, was able to process two parts at a time.

TOOLING COST REDUCED & PERFORMANCE IMPROVED

The electroplated honing tools allow for greater exposure of the diamond particles in the process than bonded products, which resulted in a cooler cut and extremely long tool life. The previous process required the conventional honing machines to be shut down every 2000 parts to change out the tooling, whereas the plated diamond tools could routinely finish 60,000 pieces. Since the tooling finishes the full periphery of the bore, interruptions such as keyways or splines do not adversely affect the performance. The total cost to the customer on finishing each part is less than \$0.01 US, which effectively reduced the cost of just the tooling by 50%, not to mention a reduction in the number of rejects and increased manufacturing efficiencies.

INDIA RECEPTIVE TO SUPERABRASIVE MANUFACTURING SYSTEMS

Based upon these results, the Indian firm purchased American made two single pass honing systems, and is now finishing 14,000 gears on a daily basis. This success is an indication that manufacturers in India are more receptive than ever to superabrasive products and systems, even when they come from an offshore source. As the standard of living in India improves, it has stimulated an increased the demand for quality manufactured goods. This trend provides a fertile environment for superabrasive applications to continue to grow, as has been demonstrated by the case study of the Indian motorcycle manufacturer. ■

Engis
Leaders in Superabrasive
Finishing Systems

Engis Corporation will be demonstrating their machine tools at the International Manufacturing Technology Show (IMTS) and would welcome any questions of their systems and processes at Booth #N-7546. Or, call direct at 847-808-9400, www.engis.com