Manual grinding a thing of the past. Fettling of castings is easier and better when done by robots. It also means higher production.

Bradken is a specialist foundry that manufactures wear-resistant iron and steel castings used in the production of grinding, crushing and shot blasting equipment. Its Darlaston site in the West Midlands in the United Kingdom specializes in the production of high chromium white cast irons, low alloy tool steels and normal carbon grade steels for these markets. Fettling of castings at the Darlaston site has traditionally been carried out using manual grinding techniques – a method that, though reasonably effective, accrues significant disadvantages in terms of possible white finger and repetitive strain injuries and the knockon effect of the Health & Safety requirement for operators to take frequent, mandatory breaks. Thus, as operators take their enforced breaks, disruption to production flow is inevitable.

With the decision taken at senior management level to initiate automation within casting finishing operations, Bradken turned to Vulcan Europe, a specialist automation company within the foundry sector and a company with which Firth Rixson Castings has considerable experience.

Right fit
Reviewing the requirements of Bradken, Vulcan Europe suggested that its “plug and play” 424FS T Foxall casting finishing cell would be the right fit for the Darlaston site and the system was installed in May 2005. Focal point of the cell is an ABB IRB 4400 Foundry Plus robot. In addition to its normal six axes of operation, the IRB 4400 has been modified to
Vulcan

incorporate a 15kW (20hp) high speed spindle fitted with an automatic tool changing facility. Two types of grinding wheel are used: resin bonded abrasive wheels for rapid stock removal and CBN wheels for lighter, dressing work, with the former carrying out the bulk of the work.

Immediately adjacent to the robot fixture is a two position, 180° rotary table with fitments for two NPL pneumatically operated workholding jigs, diametrically opposed at either side of the table. Thus, operators can simultaneously load or unload workpieces while the fettling cycle is in operation. CBN wheels were initially trialed for all working cycles, as CBN wheel diameter does not diminish significantly from cycle-to-cycle through wear. Bradken, however, has had considerable success with bonded abrasive media for manual grinding and this ultimately proved to be the most viable and compatible option.

Major impact on operations

Finishing Shop supervisor Alan Price says: “Chromium alloys can be susceptible to cracking if subjected to excessive heat build-up, which propagate further during heat treatment. We have found with experience that rapid stock removal using bonded abrasives causes less heat build up than slower stock removal using CBN wheels. The downside is that wheel wear is significant, so much so that the grinding wheel contact surface has to be recalibrated by laser every 5-6 cycles.”

Programming and operation is through a Foxall HMI, which uses Vulcan TruTeach offline automatic programming. So far, 72 individual component fettling programs have been developed on the system by Alan Price.

Supervisor Price, who had no robot experience whatsoever until he undertook pre-installation training at Vulcan Europe and programming training at ABB Milton Keynes, believes the robot cell has had a major impact on the site’s operations and its personnel. “Three operators have moved across from manual grinding operations and been trained up on the robot cell – and all are positive about the experience,” Price says. “Though product cycle times are similar to manually based operations, the robot can, if necessary, work 24 hours a day without a break – and operators can carry out other tasks while the cycle is in progress. Though we still carry out some manual grinding work, robot-based operations are definitely the way ahead.”

FACTS

Benefits
Bradken’s 424FS T Foxall casting finishing cell with an IRB 4400 robot provides:

- Flexibility via programming, with 72 individual component fettling programs developed on the system already
- Improved productivity, since robot can work 24 hours a day if needed
- Better health and safety of workers improved with fettling no longer being done manually

Some 30,000 PCB housing boxes for automotive lighting systems are produced weekly.