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PROTOCON ENGINEERING TOOLS UP WITH FANUC MACHINES FOR AEROSPACE PART PRODUCTION

The first UK installation of the latest high speed Fanuc F-Series vertical machining centres (VMC) with 24,000 revs/min spindle, 54 m/min rapid traverse rates and 1.6 secs chip-to-chip toolchange has gone directly into production of Airbus and Boeing aerospace components at Protocon Engineering. The T21*i*F machine joins three existing Fanuc machining centres and a Fanuc wire EDM – also supplied by 600 Centre of Shepshed near Loughborough – that will significantly help to satisfy a rapidly rising order book at the 18-employee Southend-on-Sea (Essex) specialist sub-contract machinist.

Maintains Matthew Smith, director of the family-owned £1.1 million turnover business: "We are enjoying the highest order book ever in our 43-year history – and we are still being asked by customers to increase production further and provide shorter deliveries as well as tool up for new contracts. This is where the Fanuc machines are playing such a critical role."

He recounts that customers in the medical, MoD and motorsport sectors all seem to be busier than ever and are putting more work to subcontract companies able to provide the appropriate levels of service and quality. To which he adds: "We would really be under considerable pressure if we had not invested in the right equipment to produce the type of work now being presented to us."

Experiences of high reliability, a fast cycling ability and a means of providing consistent quality were the motivators for Matthew Smith and father, managing director Geoff Smith, to install the latest Fanuc VMC – based on their in-depth experiences over 15 years with the Fanuc machine range.

Protocon Engineering began life in 1964 as a prototype machinist under Matthew's grandfather using manual equipment. It moved into pre-production work then eventually offered a full production turning, milling and drilling service with a very early Fanuc Drill Mate from 600 Group.

The Drill Mate's reputation of being a workhorse led Protocon to install a Fanuc Robodrill T10A through 600 Centre, which was eventually traded-in for a much improved performance Fanuc T14*i*B VMC. Over the last few years, two further Fanuc T21*i*D VMCs have been installed alongside the T14 to create a bank of machining centres characterised by quick cycling as well as common setting, tooling, programming and operation. It is this machine portfolio that the Fanuc T21*i*F has joined.

With a total of 18 CNC machines in the 5,000 ft^2 premises Matthew Smith maintains he always checks out competitor specifications and prices, but such has been the positive feedback from the Fanuc installations that it would take a major discrepancy to direct Protocon to another supplier. "The on-going support received from 600 Centre also makes us reluctant to change our source for milling and drilling capacity," he maintains.

Indeed, such is the relationship with 600 Centre and the Fanuc product that a Fanuc Alpha O wire EDM was installed some seven years ago – this, too, has given sterling service and is largely used in unmanned mode for toolmaking, prototype and production machining.

Protocon's capability has been well-rewarded with both civil and military aerospace contracts including a wide range of small components for Airbus A320 and A380, Boeing 777 and C17, Typhoon and F22. In the past, the company has also supplied Nimrod, Jaguar and Tornado plus several helicopter projects. Typical components include items for fuel management, power generation, fly-by-wire control, relays and actuators that demand strict attention to tolerance, geometry and surface finish, and they reflect Geoff Smith's 'roots' as an apprentice in an aerospace systems company.

Matthew Smith too, completed an automotive tooling apprenticeship that now stands the business in good stead and enables the pair to approach projects from different angles. With the use of both the Fanuc VMCs and wire EDM for toolmaking, prototype and spares production, as well as batch work, the business effectively has several strings to its bow of capabilities. As Matthew Smith admits: "Our ability to provide a wider spread of machining services also helps us to gain other work and has contributed to the doubling of turnover in the last six years."

This prototype-to-production capability has also led the business into the medical sector for components used in drug testing devices, computerised medical trolleys, fibroscopes and endoscopes as well as parts for the MoD and motorsport – thus reducing risk and total dependence on one sector.

With such a background, a wide spread of ferrous and non-ferrous materials – including aluminium, various alloys and stainless steels, Titanium, brass, copper, nylon, phosphor bronze, nickel iron and nickel silver as well as the occasional difficult to machine Inconel - are machined in batches that range from 50 to a more consistent supply run of over 1,100 parts a week through the Fanuc machines.

Most of the materials are processed on the Fanuc machines, and Matthew Smith quotes the recent machining of a part from a solid Inconel billet that was extremely complex involving very detailed milling and drilling. “The material was very difficult,” he maintains, “and certainly brought all our toolroom skills into the production equation. We were not hogging out material, rather it was a delicate process involving small tools but here the Fanuc T21iF was able to maintain the five micron tolerance on one particular feature right across the batch.”

The latest Fanuc T21*i*F, launched in Europe during September at the EMO 2007 exhibition in Hannover, has a working volume of 500 m/min in X by 300 mm in Y and 330 mm in Z and incorporates thermal displacement compensation in each axis to provide the advantage of an enhanced repeatability and accuracy over long periods of production. The high speed 24,000 revs/min spindle provides Protocon with the capability to increase feed rates above the D-Series machines and effectively use

small milling cutters and drills to advantage on the typical fine detail demanded by many of the parts produced.

The new machine is already proving to be more productive than its three Fanuc counterparts, with its 54 m/min rapid traverse rates reached with an acceleration of 1.5g. When this high speed positioning capability is coupled with a 1.6 sec cut-to-cut tool exchange that is some 11 per cent faster than the D-Series machines, very competitive cycle times are produced. Adds Matthew Smith: “Once we start downloading programs that have been used on the other machines for repeat orders, we expect to achieve quite significant savings on cycle times and especially reap benefit from the new processor in the Fanuc Series 31*i*-A5 control system.

The ability to switch programs and tooling between the VMCs is important to Protocon because it leaves the GibbsCAM offline programming system to be used on new work in support of the Fanucs and other CNC lathes in use.

However, the Fanuc wire EDM is always programmed at the control due to the ease of the system in its role in producing an aerospace component such as a stainless steel fuel pump impeller, with up to eight vanes that are wired from solid. The multiple part fixture is loaded with 10 pre-turned blanks and the machine, that has just been rejuvenated by a £10,000 upgrade by 600 Centre, is set to run in the late afternoon with the parts completed overnight ready for unloading the following morning. Each of the 10 parts is secured in the fixture by a central Allen screw, and eight screws to retain each segment as it is cut from the blank.

Stainless steel valve plates are also machined in the same way except that two stacks of 25 parts are loaded to the fixture giving a totally unmanned production overnight of 50 parts.

One particular component for a Boeing fuel system is initially turned then milled on the Fanuc T21*i*D to produce two cut out sections and a slot in the wall of the cylindrical part from which a highly accurate internal cam form is wire cut. Once again, autocycling of both the VMC and wire EDM leads to very cost-effective production and ensures the precision demands of this critical component are maintained.

Currently they are run through 11 hour days over a six day week but with the continued influx of work, another shift could be instigated to give total around-the-clock production while requiring limited supervisory attendance.

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