

Hold tight, please

Standard workholding systems, common in EDM, are increasingly finding a place in the metalcutting arena, finds Steed Webzell

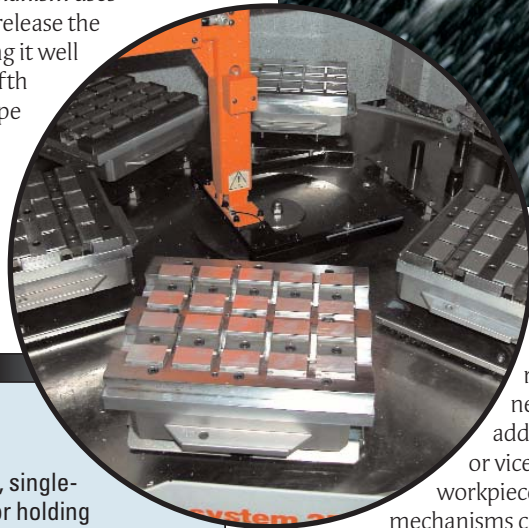
Over the years, standard fixture systems applied to EDM have delivered a high-precision (approx 0.002 mm), successful method of transferring workpieces and electrodes between various disciplines such as milling and grinding. Traditionally these systems have been categorised as beyond both the budgetary and accuracy targets of manufacturers that deploy conventional metalcutting processes – but attitudes are changing.

"In more and more instances, work traditionally done by EDM machines can now be completed by high-speed milling machines and the accuracy of conventional machining has leapt forward into realms that can be achieved by EDM. Therefore the need to use accurate tooling has followed suit," says Pete Mangan, UK sales manager of Hirschmann. "From another perspective, the demand for EDM tooling in the UK has declined in parallel with the toolmaking sector and tooling suppliers have had to listen a little harder

to the requirements of general engineering sectors such as aerospace and automotive."

PRECISION AND FLEXIBILITY

To meet these needs, Hirschmann has introduced its 9000 System, a modular zero point system for the transfer of workpieces or fixtures between disciplines. Key factors include low investment levels, precision in the order of 0.01 mm and flexibility in application. The clamping mechanism uses compressed air to release the component, making it well suited for use on fifth axis units where pipe work can interfere with movement. The location element of the system is a simple drawbar that can be located directly



into the workpiece or production fixture, removing the need to purchase additional pallets or vices. For large workpieces, the clamping

mechanisms can be arranged in a matrix (multiplying the clamping force) to offer a system that can clamp anything from a 1 kg aluminium block to a 2 tonne billet of steel.

Other innovations in the Hirschmann portfolio include the 8000 system that is widely used on large machining centres to provide the accuracy for workpiece transfer in FMS systems. Mr Mangan says this is "a growth area for a pallet system used previously in the automation of EDM

Universal workholding solution

Kostyrka Universal Holding Fixtures aim to make the high-cost, single-purpose fixtures and long set-up times traditionally required for holding large, contoured and/or variable geometry parts and structures a thing of the past. UHF fixtures, available in the UK from Roemheld, offer passive and active workholding solutions for cutting, drilling, milling, riveting and assembling in the aircraft, aerospace and defence industries. They allow a high density of jack posts and can withstand high axial and radial loads without deflection.

Kostyrka UHF systems offer significant advantages over conventional (fixed) fixtures. They use up to several hundred computer controlled variable height shafts to rigidly hold curved and shaped panels such as aircraft wing skins, significantly reducing set-up time. (See *Machinery*, June 2005, page 41 for details of Roemheld's Stark Zero Point system used in aerospace part machining).



Above, System 3R's Vibration Damped Pallets resulted from a £0.5 million benchmarking programme. Left, Hope's WorkPal and, right, GKN's automated System 3R set-up

and milling operations".

On the automation front, Hirschmann offers its own Erobot for standard, cost-effective automation, but for the past 18 months has also been working with Fanuc Automation. "I believe that the lack of automation in UK toolmaking can be attributed to the high levels of investment required previously for bespoke systems from tooling suppliers turned automation manufacturers," explains Mr Mangan. "By partnering with Fanuc, we can offer off-the-shelf systems at very attractive prices."

Elsewhere, System 3R shares a similar view to Hirschmann that the trend for standard systems is moving towards metalcutting. "Although our penetration of the EDM market is over 65 per cent, during the past five years there has been

greater emphasis on precision engineering and metalcutting where the need for manufacturers to remain competitive globally has driven the search for greater productivity," says Peter Clampitt, CEO of System 3R in the UK. "Manufacturers are seeking to gain greater productivity from existing machines and with our help have progressed from fixture standardisation through to palletisation (including setting up outside the machine), on to full automation in order to minimise downtime and gain extra productivity from unmanned 24/7 working."

VIBRATION DAMPING SYSTEM

System 3R's Vibration Damped Palletisation is a result of a £0.5 million benchmarking programme. "Operating

conditions are always changing depending on the size and type of work, the material, the cutting parameters and the variation in weight as material is removed," says Mr Clampitt. "The dynamic stability of palletised workholding systems can be improved with VDP to almost eliminate the problems associated with vibration. This has a demonstrable impact on productivity and quality."

System 3R indicates that customer tests with VDP suggest a reduction in subsequent polishing time by a factor of five, thanks to improved surface finish. Tool wear is reduced by at least 30 per cent, while higher material removal rates can also be achieved.

Another System 3R innovation, Delphin, is an 'open' reference system not limited by standard pallet sizes: the pallets are made by the customer or by System 3R to the customer's instructions. In principle, Delphin can be said to consist of only two parts: a chuck and a drawbar, which can be fitted directly to the workpiece or the fixture, giving a low overall height.

The system is modular, so the user decides the number of chucks to be mounted on each machine table, angle shelf or cube. With Delphin, processes are interconnected with a positioning accuracy better than 5 micron. Several consecutive machining operations can be completed on different machines with only one alignment procedure



Kostyrka Universal Holding Fixtures from Roemheld are flexible – literally

(undertaken away from the machine).

System 3R can boast a growing number of automation product customers. For instance, Hope Technology, a mountain bike component manufacturer based in Barnoldswick, Yorkshire, is using a WorkPal Compact pallet changing robot to overcome the inefficiency of manually loading small aluminium bike parts such as brake levers and brake cylinder caps to a Fanuc Robodrill vertical machining centre.

A total of six System 3R GPS 240 pallets ensure that machine capacity is optimised. A rotary indexing magazine makes it easy for the robot arm to select a pallet and load it through the automated sliding door on to the machine table. Brake levers are machined eight parts to a pallet and cylinder caps 20 to a pallet. The WorkPal Compact compensates for the variations in cycle time to allow seamless production. "We have achieved what we set out to do," says Simon Sharp, director of Hope Technology. "We have gained extra hours and extra production. The WorkPal delivers unmanned running during shift breaks, after hours and while loading, without stopping the machine."

Another success story is the System 3R WorkMaster robot installed at GKN Sinter Metals in Bad Godesberg, Germany, which tends one Rödgers and two Kern micro-

milling machines arranged in a 300° arc. "What took us three to four weeks to manufacture a year ago now takes only three to four days," says Karl Borsch, toolshop operations manager. The cell operates 24/7 and incorporates 100 System 3R Macro holders for electrode manufacture and 10 MacroMagnum pallets with clamped workpieces. System 3R's CellManager software is used to program the WorkMaster to select them from positions on the magazine racks, activated by an ID system carried by each pallet/holder.

PRODUCTION SHIFT TREND

Another major player in this market is Erowa, supported in the UK by REM Systems. Like its competitors, the company is also aware of the shift towards metalcutting. "While our systems are still used extensively on EDM machines, there is a clear shift towards 'production' as applications such as toolmaking decline in the UK," says joint managing director Peter Ryland. "As a result, for some time Erowa has been active in metalcutting applications in industries such as aerospace, medical, electronics and motorsport. Non-EDM applications have definitely seen significant growth in recent years."

Automation is a big feature of the Erowa product portfolio and the company has been supplying automated systems for the past 20 years. "For most of that time the UK was slow to embrace the technology," says Mr Ryland. "However, more recently there has been much greater demand as competition from the Far East gathers momentum. Manufacturers are looking to eliminate labour in order to negate the difficulties of competing with the low-wage factor.

"While many machine tool manufacturers supply integral pallet changers, they can be limited in their capacity and can be inflexible and expensive," he adds. "We recently had an instance where the machine manufacturer offered one of our customers a 10-position pallet changer for £120,000; Erowa was able to supply a 60-position pallet changer for the same

machine for £75,000. Also, with Erowa's automation it is possible to have a mix of pallet sizes within the robot. The pallet size matches the workpiece; it is not dictated by the machine pallet."

Erowa says there are four steps to achieving real automation. The first is the adoption of a common pallet receiver, the Erowa chuck, which allows fixtures to be re-set in seconds and also makes small batch throughput more cost-effective. Second is off-line pre-setting, which can measure the position of the workpiece relative to the chuck and relay its position to the machine. The adoption of steps one and two makes the next step easy: automation. Standard Erowa pallets (various sizes) with parts clamped and set are loaded into the machine ready for machining. The automation unit loads pallets into the machine, extending productive hours into the night and weekends. Step four is integration, required to ensure that the right NC program runs with the right job on the right pallet, satisfied by Erowa's job management system, JMSPro.

One company that has adopted Erowa automation technology recently is Cosworth (known formerly as Cosworth Racing), which has installed an Erowa Robot PX for the lights-out manufacture of high-performance pistons. The robot tends a Deckel Maho DMU 50v and is configured with 60 pallet positions. Half of these 148 mm diameter pallets are fitted with special-purpose fixtures, while the remaining pallets are fitted with three-jaw chucks. From day one, Cosworth achieved 13 hours unattended running overnight. Today the company can run the machine from Friday night through to Monday morning.

Standard workholding and palletisation enhanced by automation is making nights and weekends 'disappear'. In today's highly competitive manufacturing environment, 168-hour-week output is becoming the modern reality. No rest for those unprepared to invest, however!□

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