



All shapes and sizes: Multi-segmented diaphragm membrane with swing clamps and work supports

THE RING OF CONFIDENCE

Mike Richardson gets a firm grip on some of the latest trends, demands and challenges facing workholding solution provider Ringspann in dealing with those difficult-to-hold and complex aerospace components.

Components come in all shapes and sizes, so the selection of the correct clamping and fixturing method is increasingly important in the final operational efficiency and economics of any production process. Ringspann claims to provide practical solutions wherever the clamping and centring of cylindrical bores or diameters are required. All Ringspann solutions result in a quick and reliable method for difficult applications, and are particularly suitable for short length registers or thin walled and distortion prone workpieces.

Although initially established as a provider of workholding solutions to the automotive industry, Ringspann is making the transition to the aerospace sector. Aerospace components are particularly suitable for Ringspann technology.

“We found that there was a healthy

synergy between the automotive and aerospace industries, but the main difference is that in aerospace cost isn't generally the key motivator,” states a member of Ringspann's workholding team. “In a short space of time, we have gone from supplying standard catalogue-based solutions along with a few specials, to mainly focusing on bespoke solutions.

“Components have become much more complicated than when we were concentrating on automotive. Back then I don't think we could have considered solutions at the levels of complexity we can now because we didn't have technology like 3D CAD systems. The kinds of components we are currently working with require the clamping of large diameters on very small land areas. We're also improving the tool path access for sophisticated CNC machine tools by enabling customers to machine more

features in one hit.

In terms of the kinds of demands placed on Ringspann by today's aerospace manufacturers, it's the aerospace components consisting of large diameters with thin walls made from exotic materials that provide the major technology challenges. Furthermore, because of some antiquated methods of workholding still prevalent in the sector, the length of time that some jobs took to set up prior to machining was also causing major headaches for some customers.

Repeat performance

In the team's view, one of the main drivers in aerospace is a demand for repeatability in machining geometric features. They claim the company's workholding solutions offer single figure micron repeatability, and go on to describe the team's recent fixturing

solution for a jet engine exhaust system being machined on a 5-axis CNC machining centre.

“This is a thin walled titanium component over a metre in diameter,” the team explains. “When it arrives with us, its condition of supply is broadly cylindrical and has no datums that we can physically locate from. When the component sits on our fixture, the first operation is to create these datums. At this point, we can’t impart any geometry into the component. We can’t flex it, we can’t pull it – it must sit exactly as it’s presented upon the fixture.”

Ringspann provides a solution where combined with one of its diaphragms, the component locates onto three pins to achieve stability. It also uses automatic probes that contact the underside of the component to support it underneath. Clamps are then used to locate over the top of the corresponding points underneath so that the fixture isn’t imparting any geometry and yet still holds the component securely. Ringspann also makes provision for three receivers, which position a support frame to maintain the component shape.

The customer can then machine the top face of the component to create the first set of datums. Ringspann also uses swing clamps that hold the component for additional operations. From the first design meeting to final delivery, the completed fixture took 18 months, despite parameters such as the geometry and manufacturing methodology changing continually throughout the project.

The company is increasingly finding that its customers want their involvement at a very early stage in the manufacturing process and there is now awareness within the industry that fixturing is absolutely key to a successful manufacturing process. The company gets involved early because customers increasingly require its valued input and expertise.

Such is the level of specialisation within the aerospace industry that Ringspann rarely provides the same type of workholding solution twice. “This is



Getting a grip: Segmented diaphragm mandrel used for large gear manufacture



Expanding possibilities: Collet mandrel used for manufacture of precision large diameter bearings

what we call ‘consecutive’ prototyping,” the team explains. “Although we integrate proven technology, such as the diaphragms or elements, the majority of whatever we design is brand new.”

All together now

The team goes on to point out that the University of Sheffield’s Advanced Manufacturing Research Centre (AMRC) has become more involved in workholding solutions for the aerospace sector because it realises that when suppliers become more aggressive with their manufacturing operations by taking increasingly heavier cuts in the early stages of a component machining operation, it can create vibrations within the part.

“We’re all learning together, and if we know about these issues early enough, then we can help to alleviate them,” it maintains. “However, we require the help of R&D centres like the AMRC to simulate these types of test conditions.”

Typically, the kinds of technological barriers Ringspann has needed to overcome in order to help customers find the right workholding solutions have been brushed aside by the evolution of the 6-axis simultaneous CNC machining centre.

“Manufacturing processes are evolving rapidly and it’s only recently that 6-axis adaptive milling machines have become so common that these new machines require the fixturing solution to be more adaptable and invisible to

these innovative processes,” a team spokesperson contends.

According to Ringspann, there’s a limit to how much the company’s technology can improve, and only by investing every year in new manufacturing equipment can the company keep at the leading edge of manufacturing with the machine tools it uses to manufacture workholding solutions upon.

“Our solutions have become much more accurate through this philosophy,” the team confirms. “It’s really the innovations in technology happening elsewhere that continue to drive us forward, and before the advent of the 6-axis CNC machining centre, there wasn’t the necessity to have the kind of fixturing that could work within this environment. We need constant technological innovation to keep us moving forward and then we keep pace with it. Sometimes we rely on being driven by the imagination of our customers contacting us with a particular problem and can how we help them.”

The good news for Ringspann is that it has just received a request for a quotation to provide a second set of these fixtures. “It’s always very satisfying when you win repeat business,” the team concludes. “We derive as much satisfaction from solving the smaller problems and seeing our customers experience a ‘Eureka’ moment as we do from a project as large as the jet engine exhaust system project.”

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