



Collaborating for Success

When faced with the challenge of satisfying short delivery times, the machining of a complex design and international competition to secure the production contract of a new critical aerospace engine component, the Kenard Engineering team focussed on driving operational improvements to achieve a 70% cycle time reduction on a single part.

With more than 50 years' experience as a precision engineering subcontract manufacturer, the company is well placed to respond to such challenges without compromising the high quality levels that are the cornerstone of the business. Working with customers to determine optimised production processes for prototyping and for the introduction of new products is becoming a more frequent requirement as component designs become ever more ambitious and complex. Meeting these challenges requires the provision of highly skilled services that necessitate in-depth experience and breadth of engineering knowledge.

A combination of factors determined that a conventional approach to the machining of a particular component would not be suitable, at least not at a commercially competitive level. The primary factors that needed to be considered were the component's material, its extremely tight tolerances⁽¹⁾ and difficult machining access. Whilst the properties of Inconel render it well suited for use in extreme conditions, it is a particularly difficult metal to machine by the use of traditional methods. Specialist expertise is needed due to properties such as the materials rapid work hardening. Kenard has been working with Inconel and other such exotic materials for over a decade. In this time, the company has produced a wide range of complex, close tolerance components for a variety of demanding industrial sectors; from deep subsea seals to some of the latest turbine engines on the market. Kenard's proven ability to produce and reliably repeat the most challenging of parts gives the company's customers the confidence to push the boundaries with their designs.

⁽¹⁾Machining tolerances: +/-0.0115 mm diameter, +/- 0.020 mm length and runout of 0.020 mm

Despite having advanced in-house capabilities to design specialist tooling, demanding tolerances and access difficulties continued to present the most significant challenge to the Kenard team related to this specific component. When using conventional machining approaches the demanding part needed to undergo multiple operations across different machines. The first two operations were machined on a horizontal CNC lathe. The component was then heat treated before undergoing a further three operations on a 4-axis vertical CNC machining centre. Subsequent surface treatments, non-destructive testing (NDT) and grinding to within final tolerance, resulted in an extended production time of several days. Achieving FAIR right first time was a significant achievement, proving the team's ability to understand and deliver the customer's design and specification requirements. The next step was to drive down the cycle time.

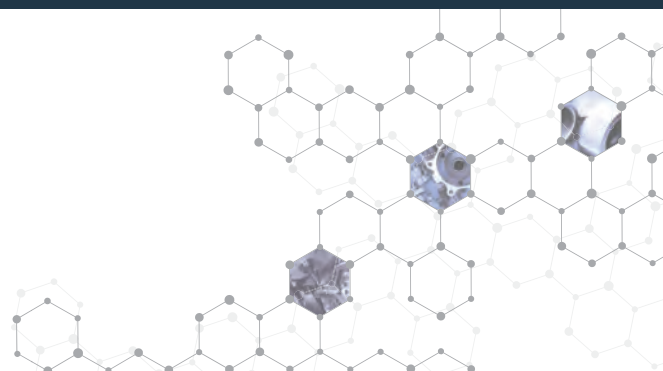
After proving the component in application, Kenard worked closely with the customer's design team to explore whether any design changes were possible to help ease the machining access problem. With very limited scope for even minor amendments, the emphasis was then placed on the application of innovative engineering to reduce production times.

Matt Cornford, Kenard Managing Director explained, "With the potential volumes involved, we knew we needed to be ambitious and aggressive in our approach to finding improvements. Our quality and procedures are closely monitored and controlled by comprehensive manufacturing systems, which include our internally developed KIDS ERP and scheduling system, integrated with Seiki Systems' monitoring and DNC software. This gives us the confidence and opportunity to be creative".

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Kenard has always had a positive approach to making capital investments in the latest technologies and were prepared to build justifications around this project. Recognising that the complexity of this component demanded a more versatile, high performance machine than the current capacity could provide, the team conducted numerous machine tool and tooling studies in order to identify suitable solutions. The Mazak INTEGREX i400 proved to be the most attractive package, with its multi-tasking capability, 72 tool carousel and Capto C6 quick change tooling, as well as a high pressure coolant provision in three stages (70, 50 and 30 Bar). The delivered coolant is also temperature controlled to within +/- one degree of ambient to help negate the effects of residual heat from the pumps, thus further improving cutting accuracy. The i400 also offers sister tooling, enabling the tools to be preset using the tool ID and then the offsets automatically loaded into the machine. Whilst other suppliers offered this system, it was always an optional extra. Mazak were offering it as a semi-standard option with this package. Matt Cornford continues, "Comparing machine specifications is relatively easy. It was the support service that Mazak were able to offer us that stood out. We needed a supplier that we could work with, drawing on their engineering experience. The Mazak team has provided invaluable support, setting up the machine and training the operators on the Mazatrol Matrix 2 controller, which was new to us."

The i400 investment helped to make productivity and efficiency improvements by significantly reducing the number of machining operations on a single resource. The next invaluable collaboration was with tooling specialist ISCAR, to tackle the access issues presented by the component's complex design. Rather than simply being a provider of cutting tools, ISCAR's knowledgeable technical team were quickly able to understand all of the relevant issues and to provide an innovative, cost effective solution. With the bespoke tooling in place, Kenard invested once again in an advanced ISCAR Shrink Fit toolholding system. Designed to optimise tool performance the ISCAR Shrink Tooling system uses heat shrinking to create a truly uniform pressure along the length of the cutting tool providing an evenly distributed clamping force. The bespoke tools also benefit from an efficient integral coolant supply through the spindle, delivering coolant straight to the cutting tip. This detailed focus on tooling improvements helped to eliminate run-out, it has also produced enhanced surface finish characteristics and substantially increased tool and spindle life. As a result, tooling costs per part have been reduced by nearly 50%.

The rapid evolution of manufacturing technologies along with global competition provides both opportunities and challenges, which Kenard is keen to embrace head on. Matt Cornford concludes, "Taking such a collaborative approach has been somewhat of a departure for us but we've really seen the advantages of working closely with Mazak and ISCAR in maintaining our high quality standards, whilst improving tool life and cycle times to become more cost competitive. I think that we'll see a lot more of this type of collaboration going forward as we look to take advantage of the benefits that continual advances in technology offer and to do our best to retain work in the UK."



- AS9100 Rev C
- ISO 9001:2008
- NADCAP - Nonconventional Machining
- Various Customer Approvals
- ISO 14001:2015
- Rolls Royce SABRE



 Precision Machining

 First Article Inspection Requirements (FAIR)

 Production Part Approval Process (P.P.A.P)

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