



Total precision engineering

Precision in manufacturing is about much more than tight tolerances and accurate machines. Delivering high productivity and reliable quality calls for an integrated approach.

LUVATA
Partnerships with a Promise



High-value manufacturing industries, such as the automotive, aerospace, medical or power generation sectors, require complex components made in difficult materials to extremely high levels of accuracy. The search for providers capable of fulfilling their quality, cost and delivery requirements often leads companies to create elaborate supply networks, with individual process steps completed by specialised subcontractors.

That approach can be an effective way to access suitable production capacity, but such complexity carries costs, like additional transportation, higher levels of in-process inventory and longer lead times. It also creates more work for procurement and supplier management teams.

Perhaps more critically, however, fragmented subcontract supply chains mean companies lose key opportunities to drive up quality, eliminate waste and capture additional value. That's because those opportunities depend as much on the way different process steps are managed and integrated as on what happens within them.

At Luvata Welshpool, we are proud of our core manufacturing capabilities: we operate some of the most advanced cold forming and CNC machining equipment available today. And we continually invest to expand and upgrade our equipment to meet the evolving needs of our customers.

What many of those customers appreciate most, however, is our ability to provide a fully integrated, one-stop solution that covers the full component lifecycle. It's an approach we call Total Precision Engineering.

Here's how Total Precision Engineering delivers more value for our customers.



Design

To maximise quality and productivity, a component must be designed to suit the requirements of the chosen production process, the machinery involved and the capabilities of the supplier. Starting with our customer's specifications as a baseline, we can often suggest refinements and modifications that produce the best design from a process perspective.

In general, the earlier you can think about the details of the manufacturing process, the better the result. Increasingly, we start to work with our customers during the initial design process, helping them to refine their specifications to create components that can be manufactured consistently and productively.

Materials

The grade and quality of the material selected for a component can have a significant impact on both in-service performance and the cost and complexity of manufacture.

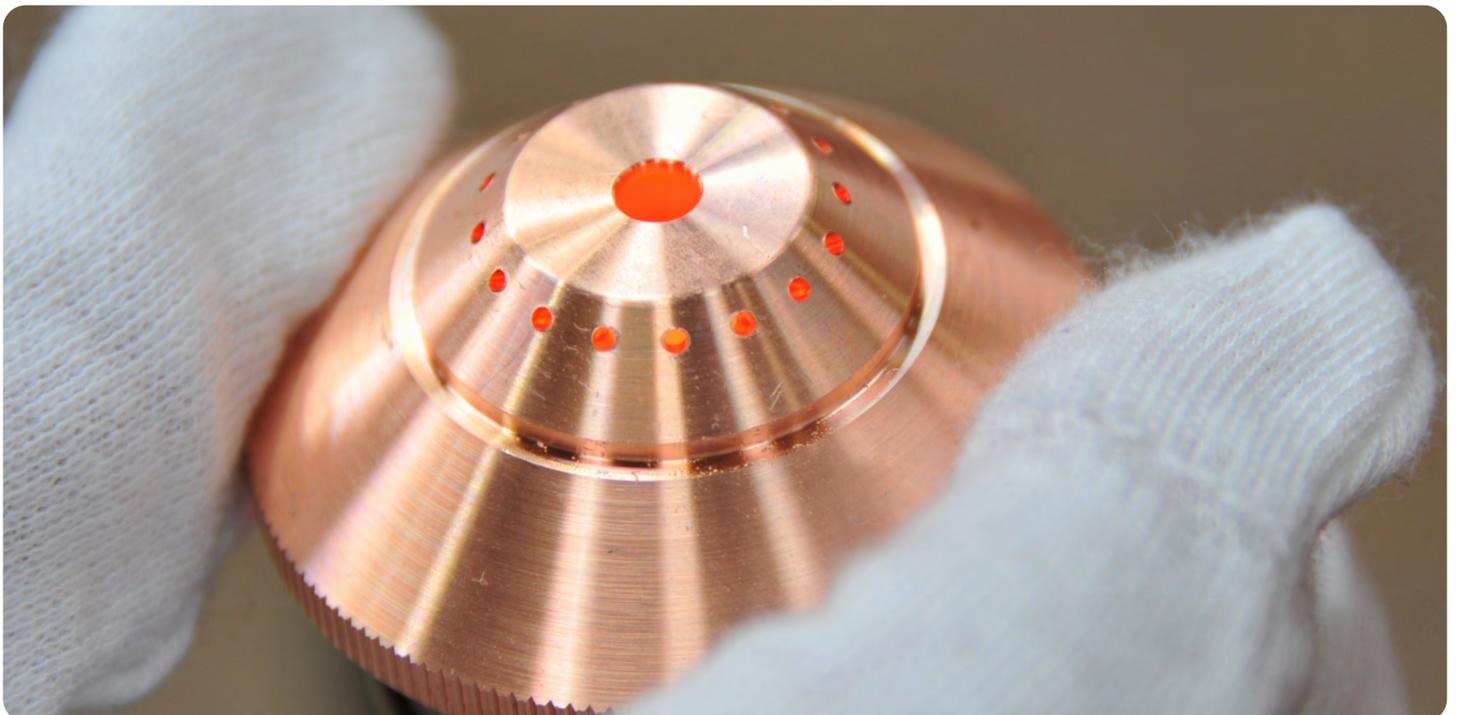
Even quite small changes in material specification and composition can lead to very different behaviour during manufacture. If a supplier is working with an unfamiliar material, they may struggle to achieve the required level of quality and consistency, especially as production volumes rise.

At Luvata Welshpool, we have extensive experience of precision cold forming across a wide range of ferrous and

non-ferrous metals, including aluminium, alloy steels and copper. That allows us to help our customer pick the optimum material for every component.

When one customer came to us with a design for an advanced electrical connector, for example, they had specified a standard grade of copper for the application. Our engineering team suggested they alter the specification to use a higher grade, oxygen free high-conductivity copper instead. While the raw material price was higher, we knew that the quality and the consistency of the alternative material would ensure much greater consistency in the manufacturing process. That allowed us to improve the overall accuracy of the cold forming process, reducing the complexity of secondary operations and eliminating defects. The result for the customer was a higher quality part and lower overall costs.

In another case, a customer was suffering in-service failures of a high voltage connector that was softening at high operating temperatures. We recommended replacing the original oxygen-free copper with an alternative silver bearing copper that was being used successfully in high temperature applications in diesel engines. Since we had both manufacturing experience and access to samples of the material, we could produce prototypes for the customer that proved the performance of the alternative material, giving the customer the confidence they needed to make the change.



Process design

The manufacture of most components involves multiple process steps. At Luvata Welshpool, for example, precision cold forming is usually followed by secondary machining and maybe a surface finishing activity like coating or plating. Some parts may also require heat treatment to achieve the right combination of strength and ductility.

The ultimate precision of the end part depends on the design and execution of those individual process steps, but also on the interactions between them. Certain features may be obtained directly in the cold forming process using a more complex tool, for example, or they may be added in a subsequent machining step. When one customer was expecting a lengthy and expensive machining process to add splines to a key component interface, we were able to show that the required features could be incorporated into the cold forming process, greatly simplifying production.

In other cases, we have made the opposite recommendation, eliminating cold-formed features that would create excessive complexity or quality challenges during cold forming, and substituting a faster, more controllable machining step.



The best way to achieve the desired result may depend on multiple factors, including the required volumes and production rates and the availability of suitable equipment. Bringing all those process steps under one roof at a single supplier simplifies those trade-offs. It also creates clear accountability for part quality and delivery performance.

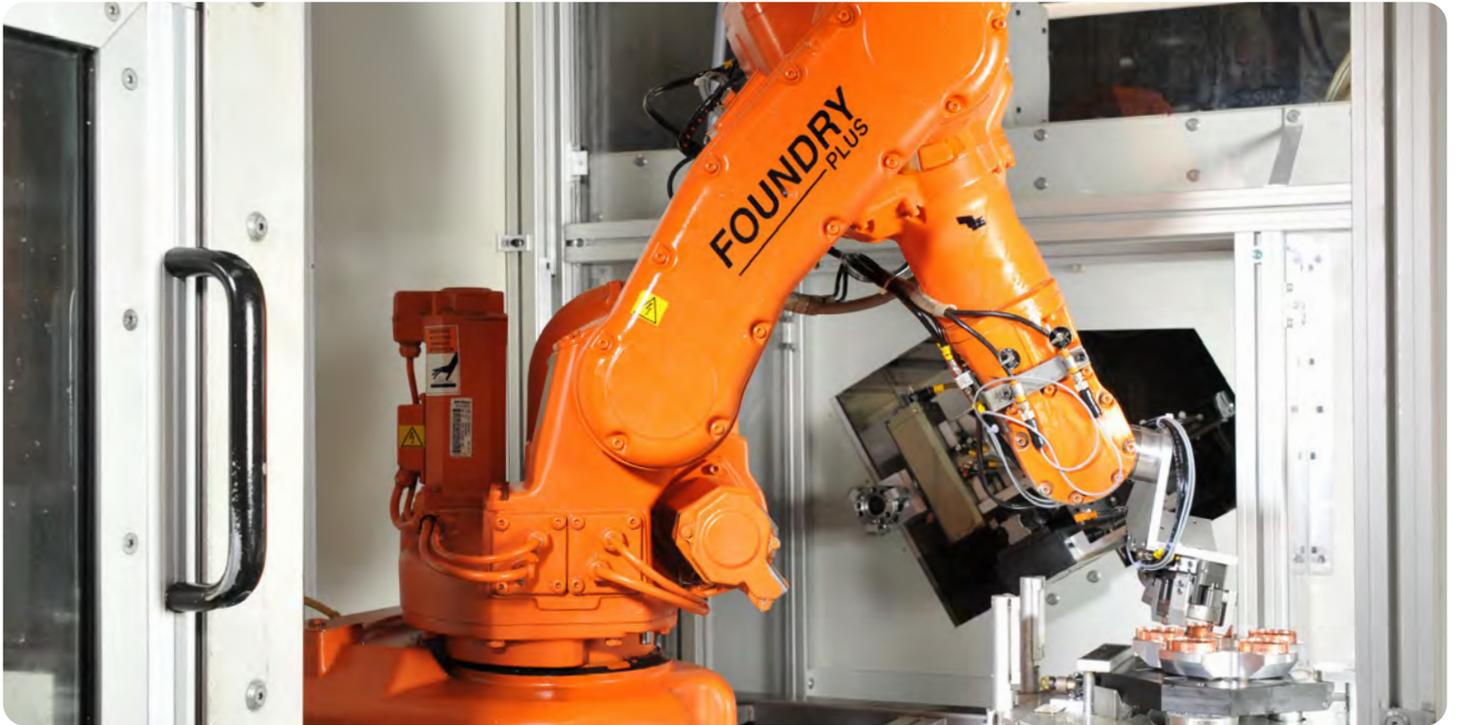
Machine selection is also of paramount importance in high volume manufacturing. Luvata Welshpool has invested in a very wide range of CNC turning lathes and mills. That means we can select the tool with the capacity, accuracy and speed required to suit the customer's component specification and productivity requirements.

Total precision engineering

Total Precision Engineering is not just about the tolerances achievable in a particular process step. It requires meticulous attention to multiple dimensions, from raw material specifications and the design and accuracy of tooling to the selection of the right sequence of processes and the best machines.

It calls for sophisticated management too, whether that's the up-front application of advanced simulation and risk analysis techniques or the use of statistical methods to keep processes under control.

Choosing a subcontractor that can understand and integrate all these elements can help you find better ways meet your current precision manufacturing requirements, unlock hidden sources of additional value, and prepare you to meet new challenges as they emerge.



Tooling

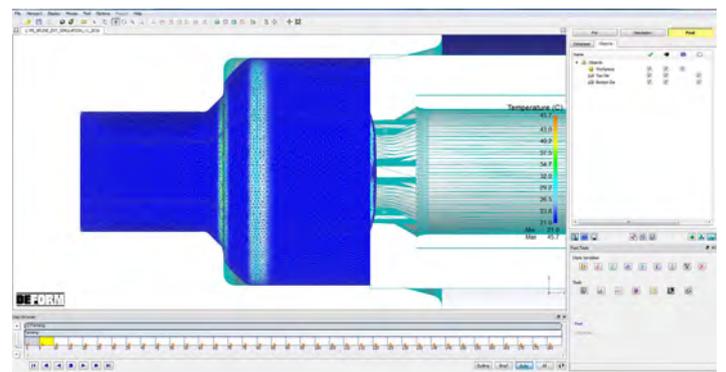
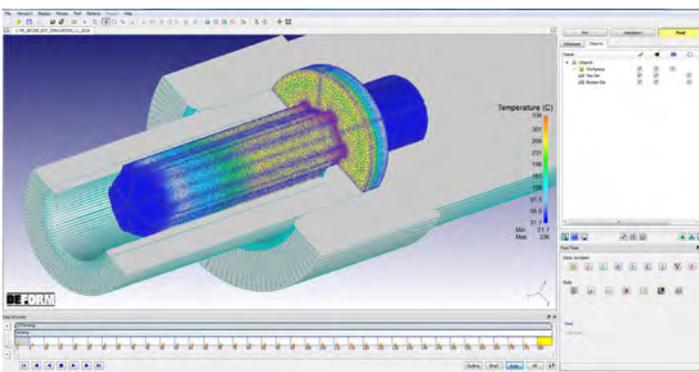
Proper tooling is essential to deliver a robust process. In cold forming, poorly designed or insufficiently rigid tools can lead to problems with part geometry and tolerances. Poor tools wear out faster too, increasing the probability of quality deviations in production and driving up costs.

Good tooling design requires experience and knowhow. It also requires the right design approach. We make extensive use of computer simulation techniques to evaluate the performance of the manufacturing process in a virtual environment before the metal for any tool is cut.

That helps to identify and eliminate potential problems earlier, reducing the need for costly repeated rounds of trial production and process modification by greatly increasing the likelihood that a new tool will produce good parts first time.

Parts must be held in place during machining operations, and that calls for appropriate fixture design, ensuring accurate location, sufficient rigidity and ease of loading and unloading operations. The cutting tools themselves, meanwhile need to be selected carefully to suit the operation. For demanding materials like copper, for example, we often use diamond tools for the most consistent repeatable results.

Investment in specialist cutting tools can make a decisive difference to productivity. For example, some customised tools can allow the machining of several features in one hit, greatly reducing cycle times, without compromising precision.



Quality systems

Process details matter, and they don't happen by chance. Luvata Welshpool makes extensive use of proven quality management approaches, like failure mode and effects analysis (FMEA) when we design the process for any component. That helps us to understand what can go wrong in production, where it can go wrong and the probability of issues occurring. Armed with that knowledge, we can create a comprehensive quality plan that recognises the most significant risks to part quality.

Then we put measures in place to prevent deviations where possible, along with appropriate checks to ensure defective parts are never carried forward to subsequent processes or delivered to the customer.

Once processes are under way, statistical process control techniques are used to ensure that they continue to perform as expected, allowing issues to be addressed before they result in deviations or defective parts.

You need the right measurement equipment too, and the ability to use it in a repeatable and reproducible manner. That's something else that doesn't happen by chance. We invest in high quality measuring equipment, including sophisticated computer-controlled coordinate measuring machines, and we run regular gauge R&R (Repeatability and Reproducibility) studies to ensure they are delivering consistent results on customer parts.

Downstream activities

In total precision engineering, we think about every component we make in the context of our customer's broader value stream. We are always looking for ways we can help our customers simplify their processes, eliminate waste and more value. That can include additional in-house manufacturing processes, like heat treatment or laser marking, or the management of external services, like plating.

We also conduct assembly activities, from tasks like the automated installation of bushings into machined parts, to the end-to-end manufacturing of complete subassemblies. We help our customers manage their supply chains too, holding inventory and managing world-wide logistics activities.

Through-life improvement

The improvement opportunities don't stop when production starts. Issues and ideas can emerge as we gain experience of the manufacturing process, and the customer learns more about the performance of the component in use. We work closely with our customers in an ongoing process of revision and refinement in pursuit of higher quality and lower costs.

Sometimes, process requirements can change significantly during the lifetime of part. Increasing volumes may alter the balance of costs and benefits between different manufacturing options, for example. In some applications, we have seen for demand for a component rise from 4,000 to 20,000 a week. That kind of increase inevitably demands process changes to reduce cycle times and achieve the desired level of productivity.





About Luvata Welshpool

We specialise in the design, prototyping and precision engineering of high quality, customer specified components and assemblies, for use in a wide range of applications worldwide.

We offer a unique combination of in-house cold forming, precision CNC machining and assembly techniques, backed by an unrivalled level of customer support.

We started out as a manufacturer of critical parts for anti-lock braking systems on military aircraft almost a century ago. Since then, we've partnered with customers in almost every sector of industry, from automotive and motorsports, to aviation, power distribution, electronics and medical.



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