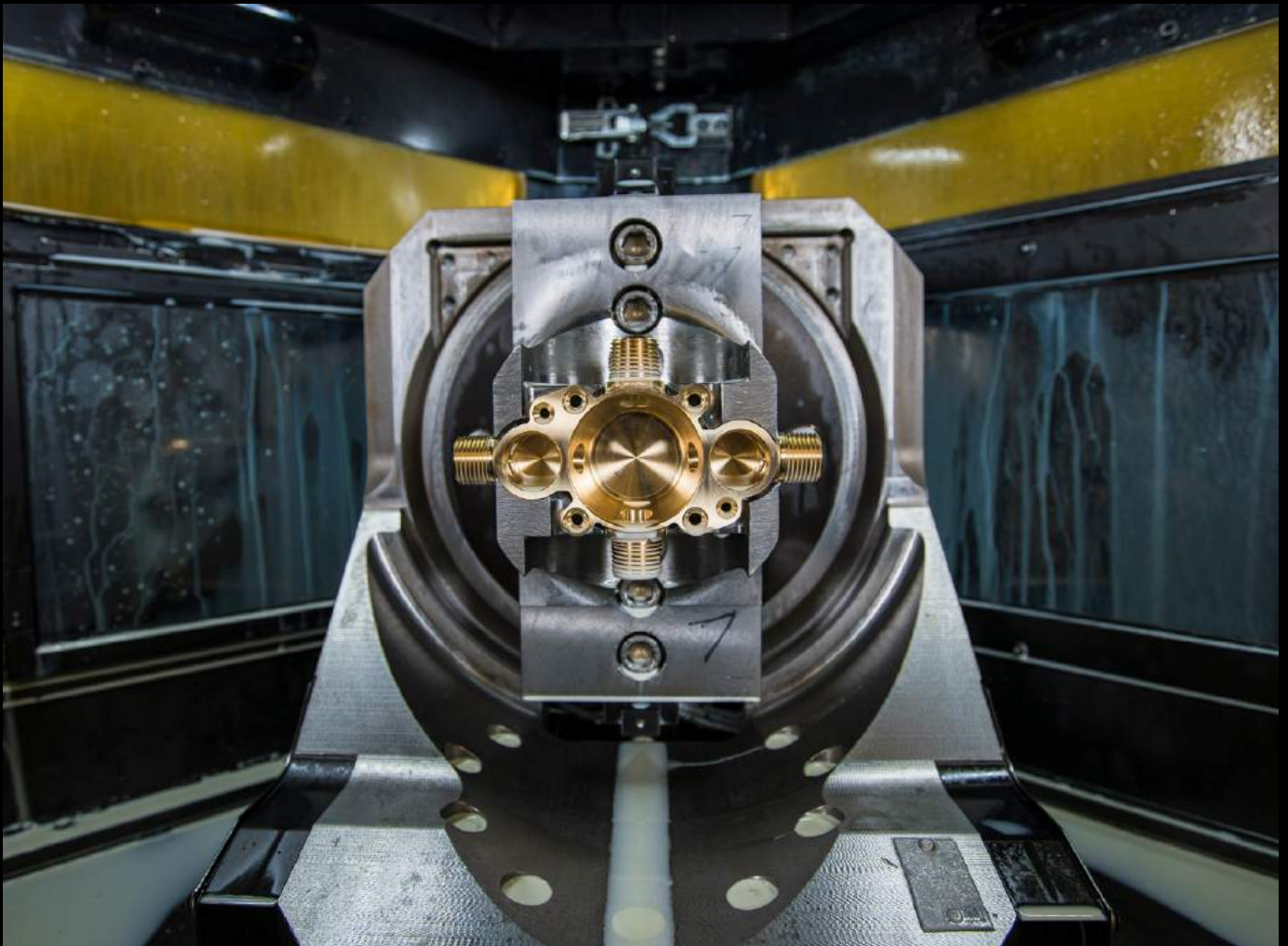


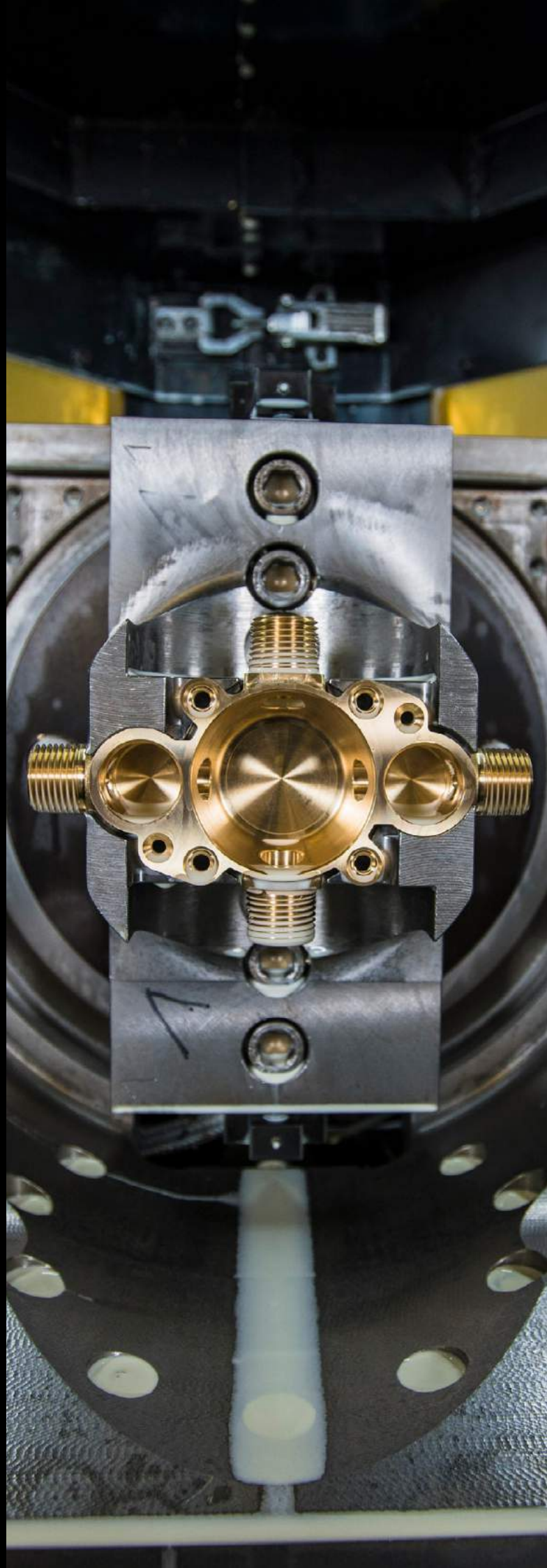


10 CRUCIAL COST DRIVERS FOR AUTOMOTIVE HOT FORGED PARTS



Quality control in the automotive industry is a vital, but challenging topic. As a buyer of non-ferrous serial automotive parts, you need to acquire the highest quality product at the lowest possible cost.

Which 10 cost-drivers will help deliver quality parts? Read on to find out how higher quality – in terms of materials and manufacturing processes – can actually reduce your total cost of ownership by maximizing efficiency and minimizing risk.



1 AUTOMOTIVE MANUFACTURING TRENDS

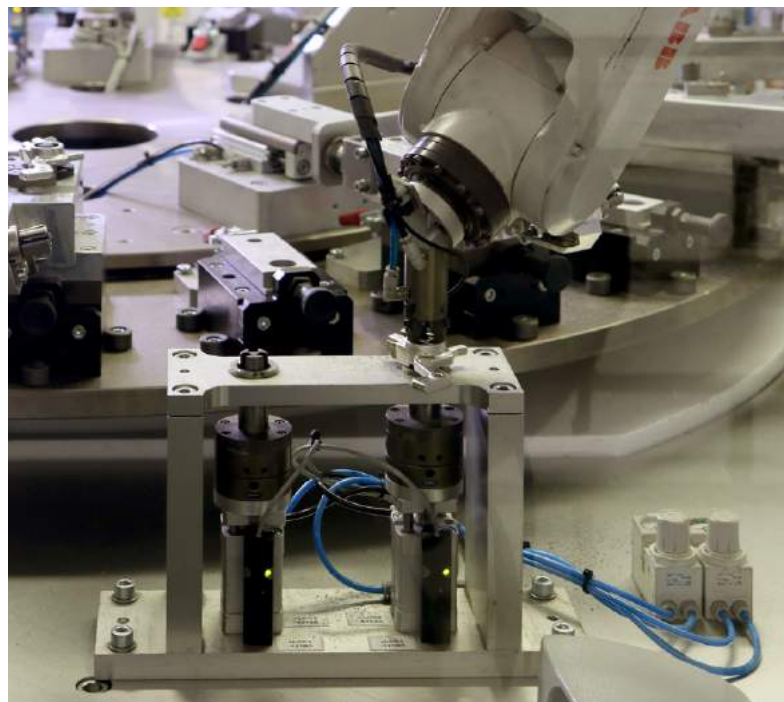
With the automotive industry's rapidly changing requirements, flexibility in meeting those requirements is crucial. At the same time, because of its safety-critical nature the industry demands zero defects as well as continuous improvement. To accomplish this, a potential supplier should have plans and processes in place for analyzing and correcting any non-conformances that might occur.

Propelled by more and more stringent emissions regulations, as well as new technologies and falling prices for electric batteries, the U.S., Europe, and China, have set goals for drastically reducing or eliminating new gasoline-powered passenger cars in the next 10 to 15 years.

This trend towards plug-in hybrids, battery electric, or even hydrogen-powered cars will mean a growing demand for automotive parts made from alloys with good electrical conductivity – such as copper and aluminum.

Meanwhile, prices for various raw materials are exploding. Automotive designers may consider converting a product from one material to another, which could also require substitutions in the manufacturing technology.

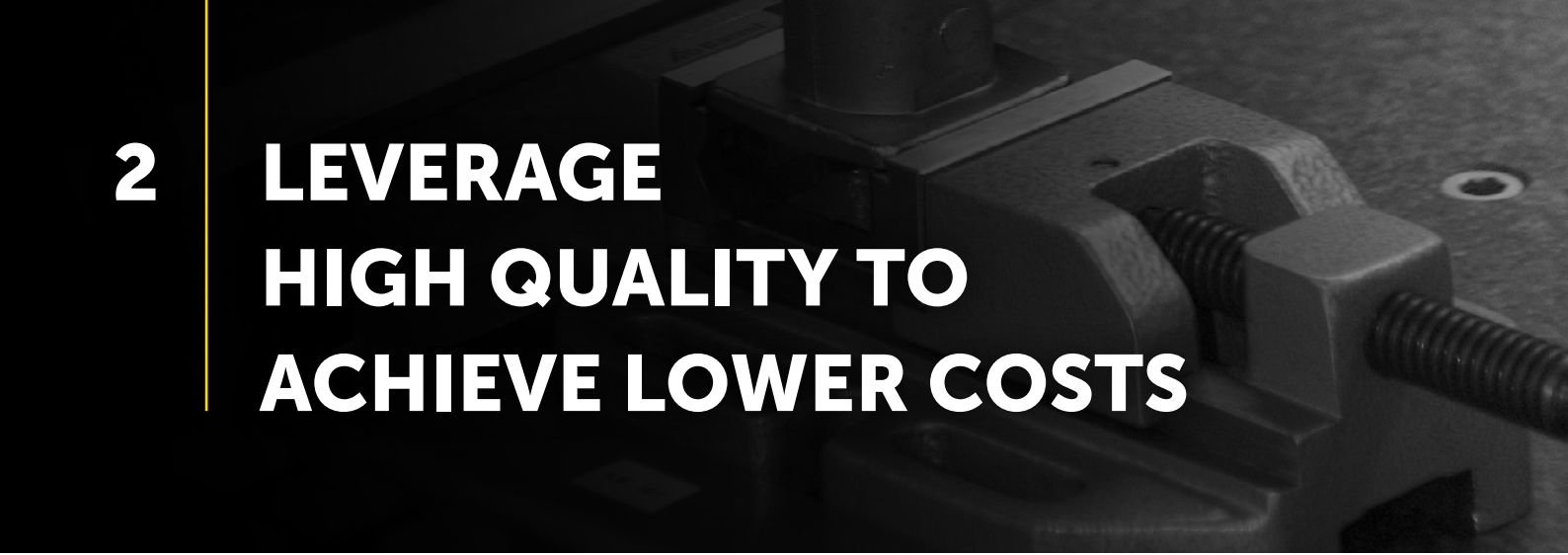
A parts supplier that is able to work with more than one type of alloy can make transitions of this type easier.



"BUILDING THE PUBLIC TRUST FOR USING AUTONOMOUS VEHICLES MEANS THAT SAFETY AND QUALITY ARE OF THE UTMOST IMPORTANCE."

A second huge automotive manufacturing trend is the move towards partially or fully autonomous vehicles that can interact with each other to, e.g., eliminate crashes and traffic jams. Building the public trust for using these vehicles means that safety and quality are of the utmost importance. You will need a supplier that can provide the experience and credentials for quality manufacturing processes that ensure zero defect parts.





2 LEVERAGE HIGH QUALITY TO ACHIEVE LOWER COSTS

For an automotive parts manufacturer, the potential consequences of a faulty production process could spell disaster. That's why quality management standards and continuous quality improvement have become an important mindset in the automotive industry. And contrary to the common way of thinking, higher quality does not necessarily have to mean higher cost. In fact, a zero-defect supplier should be able to keep costs down while producing high quality products.

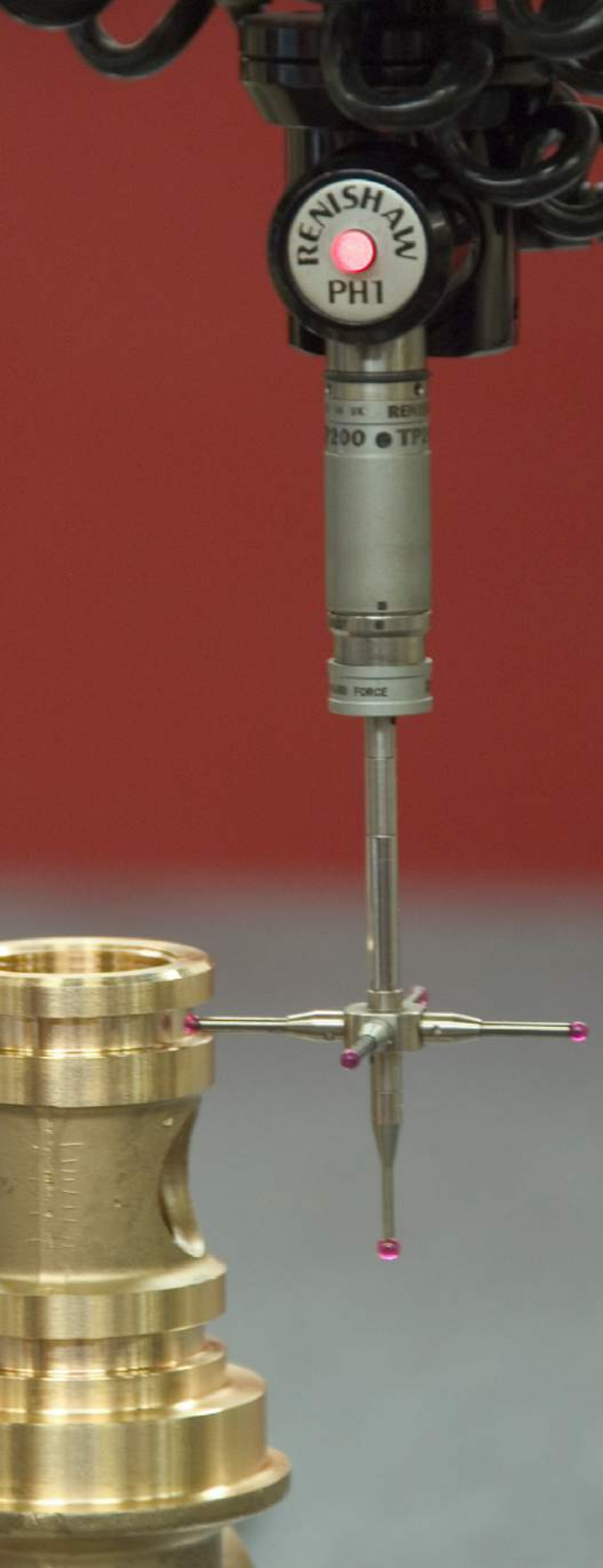
If you are a key supplier to automotive manufacturers, it is your job to deliver a reliable product at the lowest possible cost – and your subcontractor should be able to meet the exact same demands, as laid out in IATF 16949. This ISO technical specification replaces the ISO/TS 16949 standard for quality systems in the automotive industry.

The IATF quality certification requires suppliers to document their internal quality management processes and then submit to

third-party audits to verify and maintain a quality control plan. The standard contains requirements of a quality management system for the design, development, production, installation, and maintenance of automotive related products.

Don't hesitate to ask your subcontractor how they use IATF 16949 to guarantee reliable and repeatable processes with as little waste as possible. In addition to the certification itself, look for a supplier well-versed in the five automotive Quality Core tools that support the standard. These tools include:

- Advanced Product Quality Planning & Control Plan (APQP)
- Production Part Approval Process (PPAP)
- Failure Mode and Effects Analysis (FMEA)
- Statistical Process Control (SPC)
- Measurement System Analysis (MSA)



See Section 6. Increase Quality to Reduce Lifecycle Costs **on page 11.** for more on the Core Tools.

When awarding a specific part, you can request and approve a supplier's PPAP documents, spelling out which equipment specifications and process parameters they will use to meet your design requirements. The plan should also identify and eliminate any weak spots that might pose problems and establish a system for filtering out any remaining mistakes before they end up on your doorstep. In this way, you cut costs by reducing quality inspections and the need for reworking.

The need for quality extends all the way down the supply chain, so that at the end of the pipeline, your products reach the highest possible quality level. The IATF 16949 certification ensures that your supplier has quality management processes in place, and that they are maintained and regularly updated. Quality becomes a way to keep costs down by avoiding mistakes beforehand – instead of filtering out defaults afterwards.

3 SHEET METAL VS. HOT FORGED METAL IN AUTOMOTIVE

When choosing a manufacturing method for a serial automotive part, several factors must be balanced. What type of part is needed, and where will it be used in the car? Which alloy should be used? Above all, which method can maximize part quality, while minimizing cost and risk?

Alloys are selected for their mechanical and chemical properties, such as strength, corrosion resistance, hardness, and machinability. These qualities depend on the microstructure of the material, which partially depends on the method of manufacture.

Parts used in certain areas of the car, for example, those that connect the steering wheel with the steering column, must withstand a lot of torque as you turn the wheel. However, a part such as a battery clamp could be made either with hot forging or sheet metal methods.

Sheet metal parts are made by changing the shape of a workpiece with a cold or hot-forming operation on a blank piece of metal. The blank is typically stamped with a die, to create a three-dimensional shape. A sheet metal part is not as rigid as a forged part and often needs a lot of extra post-processing, including machining and surface treatments, which add to the total cost of ownership.



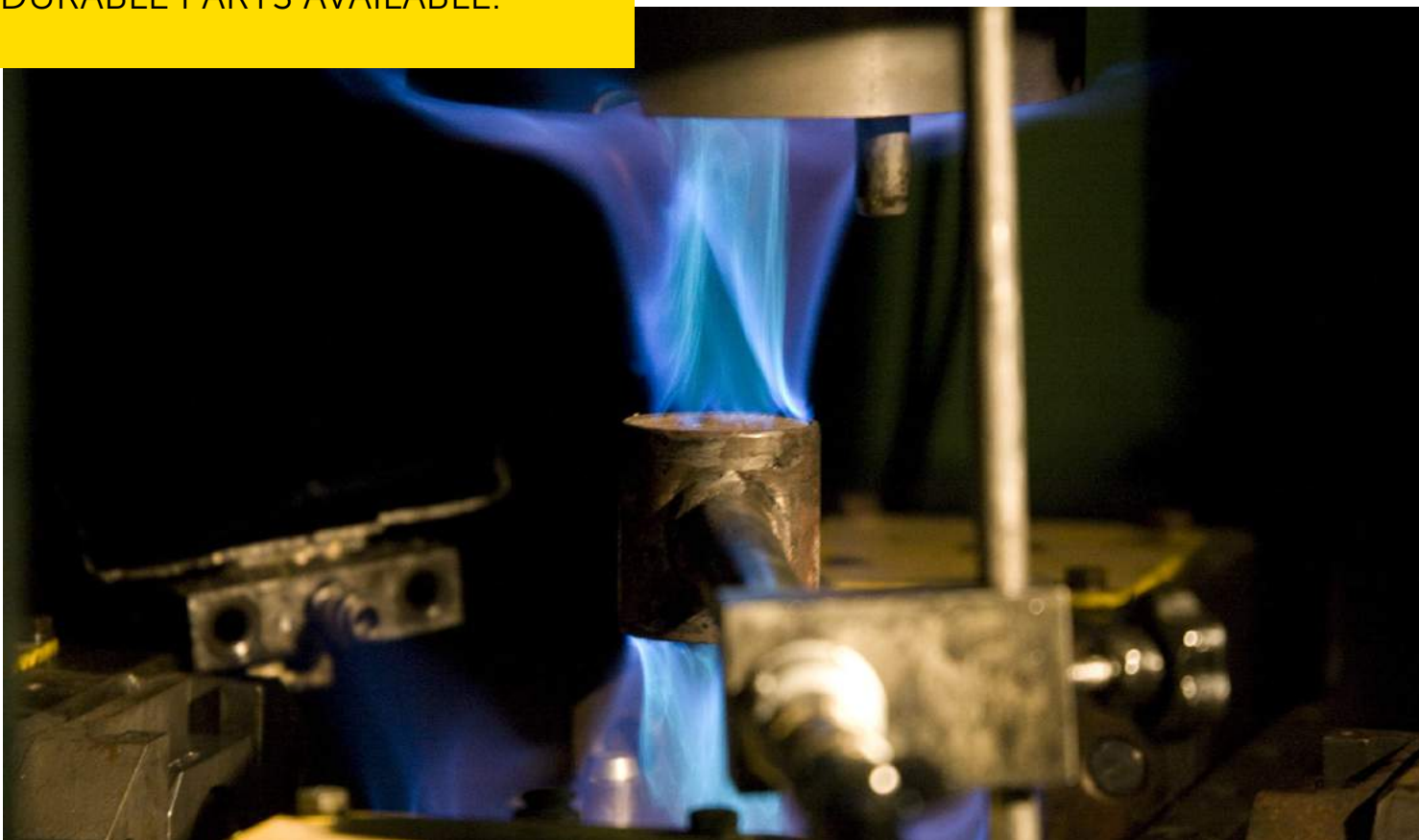
HOT-FORGING ADVANTAGES

In a fully-automated forging press, the billets are heated and the correct temperature is constantly monitored. With die forging, after the heated billet has been positioned in the die, the product is forged in one stroke. The forgings are then deburred using automated deburring equipment. This process removes any cracks or voids present in the metal and improves the microstructure, leaving a smooth finish.

As a result, forged parts are the strongest and most durable parts available.

In cases where durability and strength are not the highest criterion, the part designs allow for a cheaper processing method, which can be sheet metal or die casting for some automotive applications. However, when you need the best material strength and the most homogenous structure, forging is the manufacturing process of choice.

"FORGED PARTS ARE THE STRONGEST AND MOST DURABLE PARTS AVAILABLE."



4

A ONE STOP SHOP AUTOMOTIVE PARTNER

Delivering medium to high volumes of zero-defect serial parts, while keeping costs down partly depends on your subcontractor supplier. Building a network of trusted suppliers for automobile parts takes time. Look for a one stop shop automotive partner that can provide certified quality processes for multiple alloy solutions, production planning, and environmental controls.

Delivering high-quality components starts with choosing the right alloy. Preferred alloys for automotive parts are copper, brass, and aluminum. Depending on the

application, you will select a material based on characteristics such as (fatigue) strength, durability, surface treatability, corrosion resistance, and more. One way to keep costs down is to find an automotive supplier that is able to deliver multiple alloy solutions from under one roof. This way, you are free to switch alloy solutions when customer demands change without having to switch suppliers.

PREFERRED ALLOYS

- Copper
- Brass
- Aluminium

MAIN CHARACTERISTICS TO TAKE INTO CONSIDERATION WHEN SELECTING THE PREFERRED ALLOY

- (Fatigue) strength
- Durability
- Surface treatability
- Corrosion resistance
- Conductivity

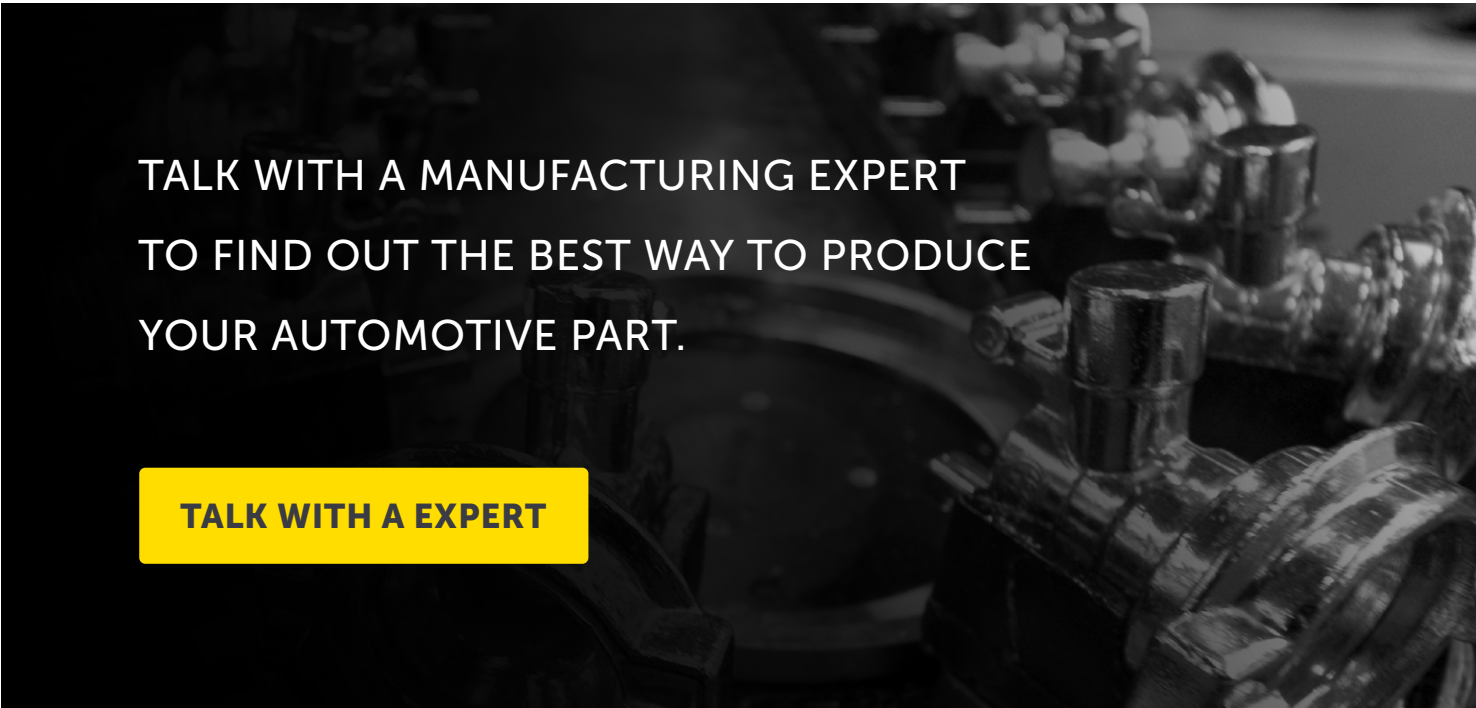
SIMPLIFY QUALITY APPROVALS

Ideally you could entrust a single supplier with the entire production process, from forging and machining to surface treatment and assembly. Every additional supplier you select for your alloy automotive part means extra invoices, higher handling costs, and longer lead times. Not to mention the paperwork to get an IATF approval for the release of any minor adjustment to your product.

For parts that need a machining operation to improve surface quality and add functionality to a forging, choose a partner with fully automated, CNC-monitored machining centers at its disposal.

To minimize shipping costs and related environmental concerns, choose a supplier with facilities close to your production plants. If not, are they willing to add future production facilities located in the heart of the automotive industry?

In the long run, a one-stop-shop automotive supplier will greatly increase your adaptability to a changing market, enable shorter lead times, and reduce your IATF paperwork.



**TALK WITH A MANUFACTURING EXPERT
TO FIND OUT THE BEST WAY TO PRODUCE
YOUR AUTOMOTIVE PART.**

TALK WITH A EXPERT

5 GLOBAL PRODUCTION FACILITIES WITH A LOCAL FOOTPRINT

Environmental issues drive many changes in the automotive industry, including localization of supply networks to reduce CO2 emissions from long-distance shipping. At the same time, the Asian market is expanding and more U.S. and European automakers are producing cars, or substantial parts of cars, in China. For quality, efficiency, and cost effectiveness, these manufacturers want to standardize the components used across their different platforms.

To better serve these customers, look for a corporate supplier with locations in strategic places around the world. This can create efficiencies in your supplier management as well as your quality control processes. A supplier with a local footprint can improve your logistics, reduce tariffs and import taxes, and minimize time zone differences, cultural



6 INCREASE QUALITY TO REDUCE LIFECYCLE COSTS

Continuous quality improvement is an important aspect in developing lifecycle costs for automotive parts. In choosing a serial part producer certified to IATF 16949, you ensure that they will manufacture your parts better, faster, and as efficiently as possible. And to stay in this highly competitive business, they typically pass these benefits on to you.

QUALITY PRODUCTION PROCESSES REDUCE COSTS

The IATF certification guarantees that a supplier already has the tools, systems, and processes in place that will enable them to take your part from design to development and into series production, while catching any failures before they become an issue.

Within the IATF 16949 manual, five core tools are used to make sure your supplier can (re)produce parts with the least amount of risk in their production which could lead to product defects.



The core tools include:

1 | APQP (ADVANCED PRODUCT QUALITY PLANNING)

APQP is a structured approach for designing and developing products with the help of the other four core tools. The focus is mainly on development because in the final stage this must provide a stable and controllable production process with an error-free product as output. During this process, the risks must be eliminated or controlled as much as possible. An important aspect is that the APQP process is supported by a multidisciplinary production team. In addition to the input of the team, it is of utmost importance to also involve the customer in the process since they have specific wishes (customer specific requirements). The customer must provide additional input that is crucial for the producer.

2 | FMEA (FAILURE MODE & EFFECT ANALYSES)

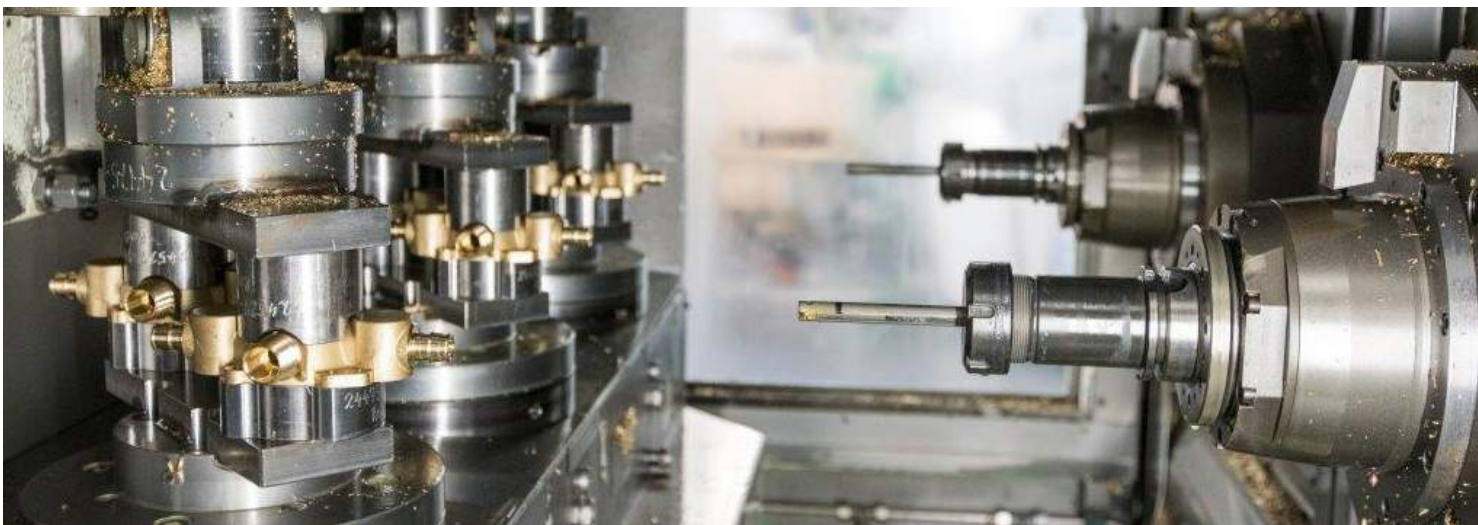
Within the FMEA, two different types can be distinguished. Following is a brief explanation of both:

Design FMEA

In the DFMEA process, all risks within the design are analyzed and where necessary split into different components. Among other things, the tool checks for cooperating systems or parts that also need attention. When the DFMEA is complete, the design is frozen.

Process FMEA

The various risks within the production process are analyzed within the PFMEA. This detects potential errors in the process and detects and eliminates them early.



3 | SPC (STATISTICAL PROCESS CONTROL)

The SPC looks at the critical aspects within the production processes and how they are controlled. Buyers demand certain tolerances and want to see how suppliers can control these in their process. A Process Control Plan is drawn up which indicates the critical factors that must be controlled. The plan describes how each factor will be checked, how often, by whom, and what to do if deviations occur.

4 | MSA (MEASUREMENT SYSTEM ANALYSIS)

The MSA is drawn up to ensure that what a supplier has described in their control plan (what will be measured and with which tools, etc.), will produce parts that meet the requirements. This MSA establishes that the equipment used is suitable and correct for the measurements in question. Because each piece of measuring equipment has its own tolerance, the MSA looks at the deviations of the tools themselves and what deviations this could cause in the parts. An MSA has the same function as determining whether a sample is valid. It answers the questions: Am I measuring what I want to measure, how reliable is that measurement and is the outcome reproducible, and how accurate and precise is the measurement?

5 | PPAP (PRODUCTION PART APPROVAL PROCESS)

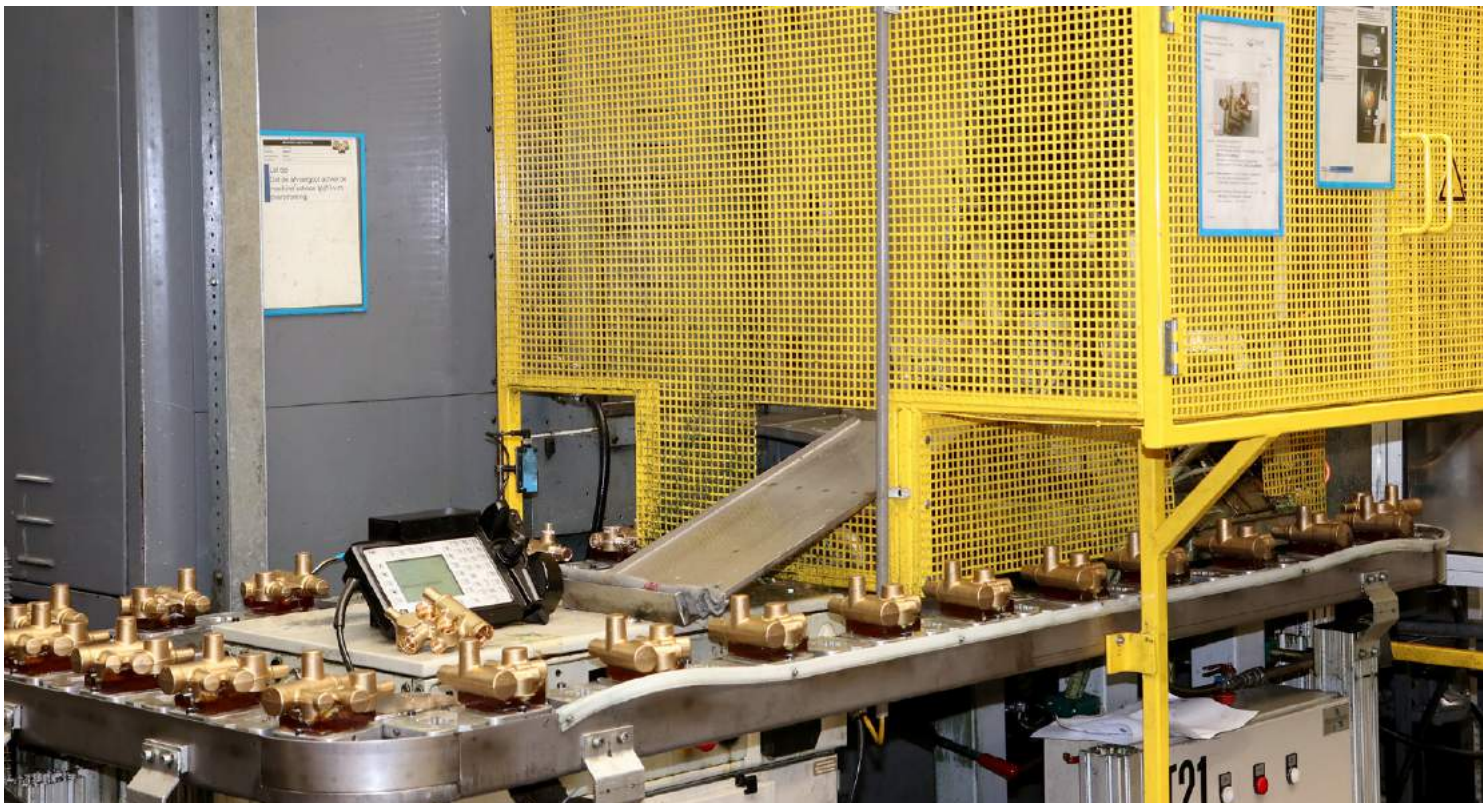
PPAP is the last phase of the development process. By sending the first parts a supplier produces along with PPAP documentation to the customer, the manufacturer indicates that they can control all facets of the production process. The parts, together with the documents, prove that the product meets the customer's requirements and that it can be produced with the least risk.



QUALITY AND THE TRUE COST OF OWNERSHIP

When calculating the lifecycle cost of your part, amortization of equipment must be addressed. Large pieces of equipment, such as forges or CNC machines, are amortized over many years, with the costs passed on to you in the form of an hourly rate. However, to maintain the highest part quality, the true cost of a part may actually vary later in the lifecycle as worn tooling or dies require reworking or replacement. By providing your supplier with accurate volume projections year over year, they can more precisely calculate the cost of servicing or replacing dies through the life of the contract.

Since the value of the alloy itself is subjected to market pricing, the material price component for your part varies. However, the added value costs of a part, including production, shipping, surface treatment, and profit margin, can be predicted more accurately. By following their Process Control Plan, your serial parts supplier will be able to improve their processes over time. As a result, parts suppliers typically offer rebates, or ratios, on the added value for the lifecycle of the contract. In this way, quality controls implemented by your supplier result in the highest quality products with zero defects at the lowest possible price.

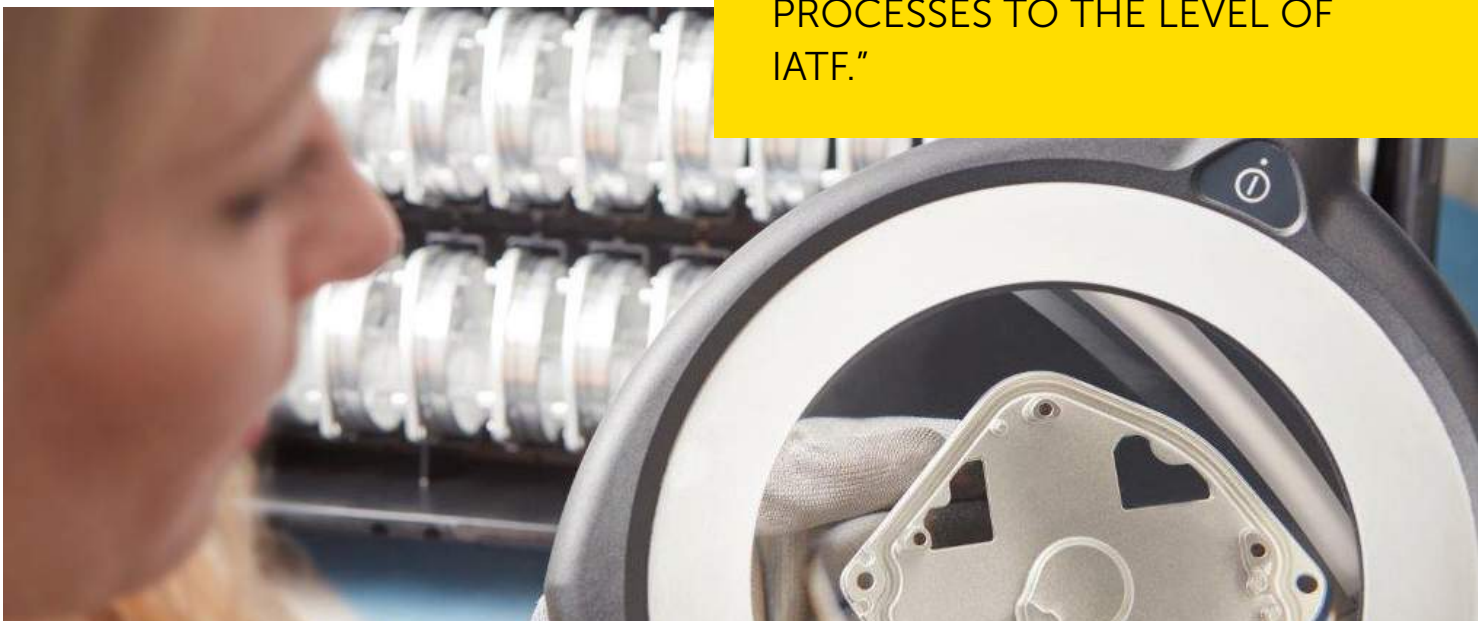


7 CERTIFICATES OF NOTIFIED BODIES

Before settling on a partner for producing serial automotive parts, you will need to determine whether the company has been certified to the IATF 16949 supplier requirements. The IATF certification is similar to the ISO 9001-2015 quality management certification but goes much further in detail specific to the automotive industry. In some cases, a supplier may be certified to both standards.

A supplier should also be able to work with its own subcontractors to help improve their quality processes to the level of IATF. In this context, they may perform regular audits at the supplier's facility to ensure that their quality management systems are consistently maintained to the standard.

"A SUPPLIER SHOULD ALSO BE ABLE TO WORK WITH ITS OWN SUBCONTRACTORS TO HELP IMPROVE THEIR QUALITY PROCESSES TO THE LEVEL OF IATF."



Another important certification for suppliers in the automotive industry is the environmental quality certification, ISO 14001-2015. Certification to this standard demonstrates that the company has put in place an environmental management system that follows regulations for CO2 emissions, toxic materials, etc., while continuously improving its use of resources and reducing waste.

A supplier may also be certified to the ISO-50001-16247 energy management system standard, which ensures that

the company tracks and controls its energy use -- another factor that helps in controlling costs.

Pursuing and maintaining these certifications demonstrate that a potential supplier is able to meet the environmental and quality management requirements necessary to ensure future viability, legality, and financial stability as a company.



8 FINANCIAL STABILITY

A FINANCIALLY STABLE PARTNER ENSURES QUALITY AND PROFITABILITY

In choosing a supplier for serial automotive parts, you need assurance that they will be around for the duration of the contract, and beyond. This is an important aspect of quality management. For companies that are not publicly listed, you can still make specific inquiries about their key figures to test potential partners for their financial stability, past and present.

By comparing past performance with current projections, you should be able to determine where the company is heading. Are they performing worse, year over year, with their situation becoming

“SELECT A SUPPLIER THAT WILL BE AROUND FOR THE LONG HAUL AND WON'T CUT CORNERS WITH QUALITY TO MAKE UP FOR LOSSES.”



critical from loss of business? Or are they growing and moving forward at a good pace?

Knowing the answers to these questions will help you select a supplier that will be around for the long haul and won't cut corners with quality to make up for losses. Performing due diligence here will prevent possible financial disasters that could result from recalls or a lack of qualified parts vital to your business.

9

EARLY SUPPLIER INVOLVEMENT

EARLY SUPPLIER INVOLVEMENT MAXIMIZES QUALITY, MINIMIZES COST

As a component manufacturer in the automotive industry, you are responsible for determining the design and requirements of your products. But in order to bring a serial product to market, reliable engineering is essential in the transition from design to production.

True success rests with the ability of your supplier's engineers to co-create the parts that you have designed. Working with you, they can find the best way to manufacture your parts, taking into account the boundaries on what they can accomplish with their equipment and

processes, as well as the functionality and performance requirements of your product.

Involving an experienced supplier early in the engineering process can greatly increase the quality of your product and mitigates avoidable costs. Their extensive knowledge of manufacturing could help spot and eliminate any weaknesses in the design phase before moving on to production, making sure that any problem that can't be avoided will be contained.

No matter the project phase they are involved in, a strategic partner will do their utmost to create high quality, zero defect automotive parts for an optimum cost level, by making changes that benefit both of you.

"INVOLVING AN EXPERIENCED SUPPLIER EARLY IN THE ENGINEERING PROCESS CAN GREATLY INCREASE THE QUALITY OF YOUR PRODUCT AND MITIGATES AVOIDABLE COSTS."

10

A WINNING TRACK RECORD IN AUTOMOTIVE

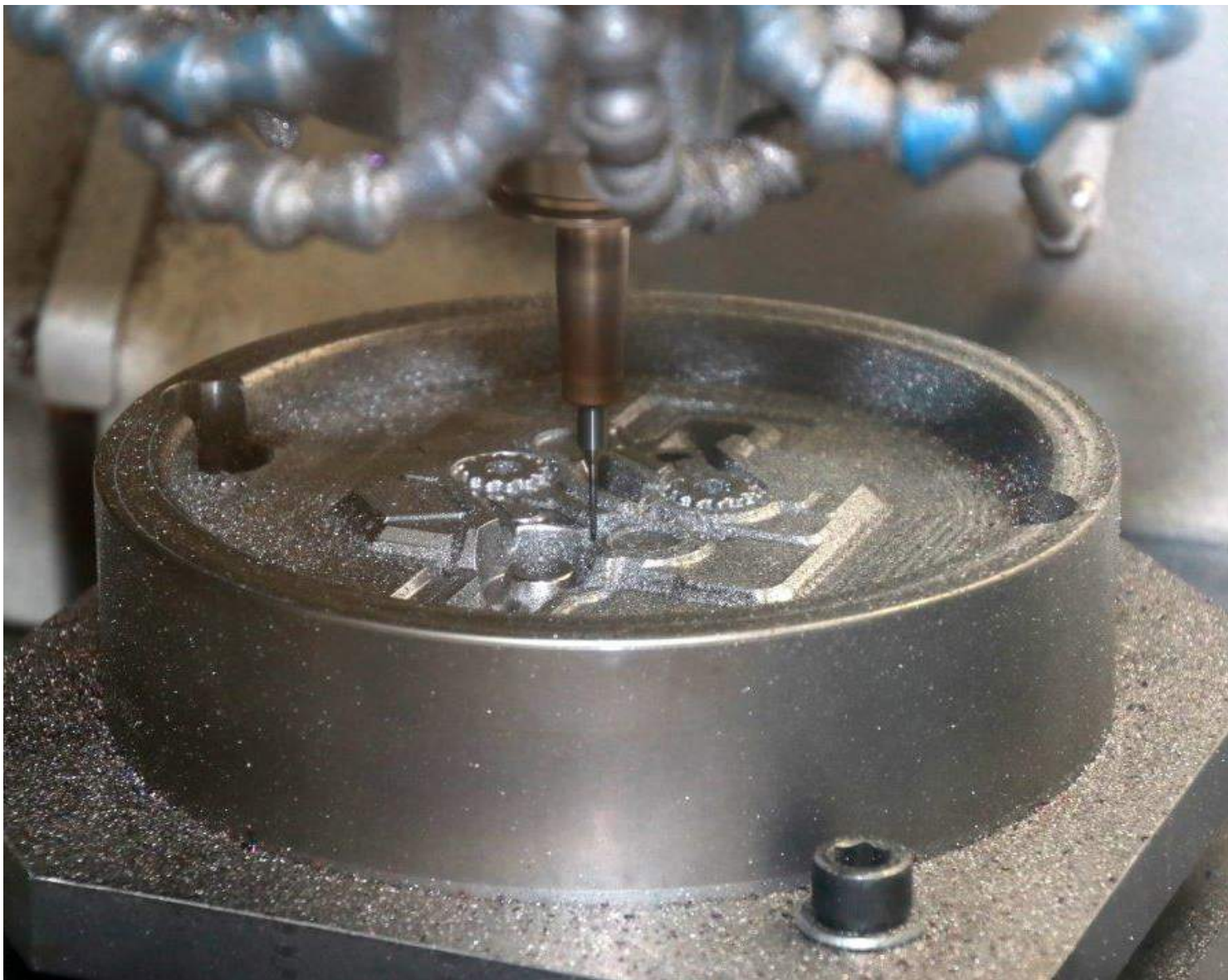
As an automotive buyer, you are painfully aware that your operations can be held hostage or suspended because of a supplier's failure to perform – leading to a potential disaster. Working in automotive, especially, you need assurance that your supplier understands the ins and outs of the industry. A future-proof alloy automotive partner should have a successful history of producing high quality parts for large-scale customers that meet all the requirements and fall within the budget.

How do potential partners and suppliers demonstrate that they know what's important to your operation? Most specifics of their existing contracts will be protected by non-disclosure agreements, making full transparency difficult. A supplier may be able to reveal only that they have manufactured large quantities of a generally similar product, for example, a battery clamp, for other customers.

"A SUPPLIER SHOULD BE ABLE TO SHOW YOU DOCUMENTATION, SUCH AS THEIR IATF CERTIFICATION AND THE RESULTS OF THIRD-PARTY AND INTERNAL QUALITY AUDITS."

The most important way to determine whether or not a supplier will be able to operate at the level you require is to ensure they are certified to the IATF quality management standard. A supplier should be able to show you documentation, such as their certification and the results of third-party and internal quality audits. (You can **check the validity** of a potential

supplier's IATF 16949 certificate online.) This certification guarantees that a supplier already has the systems and processes in place that will enable them to take your part from design to delivery with the lowest amount of risk, catching any failures in production before they become an issue.



ABOUT BONS & EVERS GROUP

QUALITY FROM DESIGN PHASE TO FINAL AUTOMOTIVE PART

At Bons and Evers, quality is a major part of our business philosophy. As the leading experts in the hot forging and machining of non-ferrous alloys, our specialists have extensive experience in high-quality manufacturing processes and are able to adapt to rapidly changing environments. With facilities in Germany, France, The Netherlands, Hungary, and China, we are a one-stop-shop for brass, aluminum, and copper forgings for the automotive industry.

Thanks to our extensive knowledge of product and process engineering, we can manufacture products more efficiently, in a reproducible way and for the lowest possible cost. Our experienced process designers and quality management specialists can work with you to develop and establish stable production processes that meet the requirements of IATF 16949. Our goal is to achieve high quality serial automotive parts with zero defects at the lowest possible cost.



We can provide a convenient one-stop shop for forging + machining + surface treatment + assembly:

- Manufacturing products that meet our clients' requirements in every respect starts with choosing the right alloy. We exclusively purchase raw materials from renowned suppliers that meet our quality standard.
- A machining operation is often required to add functionality to a forging. Our fully-automated CNC-monitored machining centers are used to precisely machine your parts to the required surface quality, and we are able to offer a flexible and comprehensive solution for the machining of small, medium and large batch sizes.
- Some clients are interested in purchasing hot forgings without the burden of having to do the assembly component themselves. On a project basis we offer tailor assembly opportunities for our clients.minimizing risk.

Our expertise has helped BE | Allbrass Industrial develop into a renowned supplier in the automotive industry. Do not hesitate to connect with our in-house experts in engineering, hot forging, machining, and assembly.

Schedule an appointment to discuss your project and the challenges you might face designing a part that requires strength and durability, and which can be manufactured with zero defects at the lowest cost.

SCHEDULE AN APPOINTMENT

