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THE MAGAZINE FOR PRODUCTION ENGINEERS

JANUARY 2011

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WITH THIS ISSUE

The right materials

Paul Dawson, sales director of subcontractor Dawson Precision Components*, considers selection and use of different materials for metal parts manufacture and the pitfalls that can occur during the selection and procurement process

The right material is crucial to manufacturers, particularly in areas such as medicine or aerospace, where they can be safety-critical and industry standards are strict. Manufacturers need to know that materials are of suitable quality for the final product and also suited to the intended production process, with traceability ensured from start to finish. All this has to be achieved at the minimum cost to the business.

Dealing with materials inevitably relies on dealing with third parties, certainly for sourcing the material, but manufacturers also often subcontract the manufacture specific. This means ensuring traceability

of materials is more important, but, potentially, more challenging.

The first and most obvious decision is what material to use. When designing the product, the four main points to consider are the material's performance, how it will behave during manufacture, its cost and its appearance.

It is important to get the material decisions right at the start by investigating how different materials will respond to different conditions, through modelling or testing processes. An understanding of how different materials behave is key.

Aluminium, for example, is light, strong, durable and corrosion resistant, with good thermal and electrical conductivity. A wide range of alloys can be created to exploit these properties, so it is the most cost-effective solution for many applications. Bronze is tough and, unlike steel, does not spark on impact with a hard surface, so it is ideal for components such as bearings, electrical connectors and parts used in flammable environments.

COMMON MATERIALS

Steel is the most widely used metal. Stainless steel is corrosion and heat-resistant, whereas mild steel has a relatively low tensile strength and corrosion resistance is poor. But mild steel is cheap and malleable, while rusting can be avoided where painting or priming is an option. There are over 200 different grades of stainless steel alloy, although less than 50 are easy to come by. Understanding these different materials, grades and tensile strength is an important part of ensuring the final product meets its goal – whether it is



safety, quality or low cost.

This may sound intuitive, but it is not uncommon for companies like ours to receive requests for materials that are not commonly available or impractical to machine, and see us having to advise on a suitable alternative.

The final material decision will depend on the application, and for many products there will only be one option. This is often decided in-house or after consultation with people, like ourselves, that have materials experience. A good understanding of the main material types and their properties, combined with adequate modelling and testing, is critical to making this decision.

Once the material is decided, it is necessary to weigh up issues of quality against cost.

Reputable materials suppliers include certificates of conformity that confirm that the materials meet a particular size, tensile strength, and grade.

Many manufacturers can reduce costs by ordering from cheaper countries outside of Europe and North America. For large orders, where quality is not critical, countries such as China and India represent very good value. However, where materials have to meet strict standards, such countries are often not able to offer adequate guarantees. Many are perfectly capable of producing high quality materials, of course, but, for



Paul Dawson – offering material advice



companies required to meet EU standards or industry requirements, sourcing products from cheaper countries can cause problems when it comes to audit. We find many companies are willing to pay the little extra for the confidence of a European supplier.

Once you know the material you want, and whether you are looking abroad or at home, it is important to find the right supplier. Not all suppliers will offer the same quality of materials or service. Often decisions have to be made quickly and materials buyers go with the cheapest or closest, but taking a bit of time can pay off, in the long run.

Manufacturers should look for the same qualities in a materials supplier as they would in a subcontract manufacturer. Just because they offer you a product, not a skill, doesn't mean that service can be ignored. Find out if their staff are properly trained and whether they will allocate a personal representative, can answer questions quickly and knowledgeably, and offer after-hours support, when needed.

If you are regularly faced with having to source material at short notice, it is important to consider how much of the required material suppliers keep on site and how easy it is to acquire – something which is often overlooked until it is too late.

Many subcontractors, such as ourselves, will have stock of common grades and sizes of materials, and have a network of approved suppliers who can source any materials required. This is particularly valuable for smaller companies, for whom sourcing small quantities of materials at short notice can be difficult and expensive.

TRUSTING TRACEABILITY

Underpinning this whole process - from choosing the material, to transporting it, to manufacturing it into the final product and putting it through quality controls – is traceability. Full traceability throughout the production process, from material sourcing to finishing, can be assured by certificates of conformity, material test certification and bespoke inspection reports.

When outsourcing manufacture, it is important that the material continues to meet quality requirements in a traceable manner. Take AS9100, for example, the quality management standard for the aerospace industry. This requires product identification across the product's life cycle, high level inspection and testing procedures and documentation throughout, both in-house and for suppliers. Such expectations are common across manufacturing industry, in a variety of official and unofficial systems.

Manufacturers need to work with

suppliers who can help them meet these requirements. Having chosen the material, it is vital that all modifications made during the manufacturing process are recorded. Evidence of quality accreditations, such as ISO9001, are important, but, where quality is a real concern, there is no substitute for actually going to the factory, auditing the machinery and talking to engineers. Finally, ensure both yourselves and your subcontractors have procedures to document each stage of the production process, from receiving the materials, through processing, to inspection, so that, if anything is wrong with the finished product, it is easy to identify where the error occurred.

Decisions about materials need to be made throughout the manufacturing process and rushing these can result in anything from higher costs to product recalls. Understanding the properties of materials and how they will behave, and ensuring the whole process is traceable, is key to ensuring a streamlined, low-cost, high quality manufacturing operation. □

**Dawson Precision Components is a precision manufacturing subcontractor. It is a family-run business, offering a broad range of services, taking in metalworking, turning, milling and precision machining services, as well as production and design consultancy.*