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Optimizing for Manufacturability in Small Parts Sourcing

Ensuring Quality and Cost Effectiveness from Design Through Assembly

TABLE OF CONTENTS

What is optimizing for manufacturability? (And why should you care?)

In the world of manufacturing, the sourcing of small parts is an increasingly competitive and global endeavor. With improvements in transportation and communication making the planet "smaller," more and more suppliers have joined the marketplace.

This gives manufacturers an almost dizzying array of options for where to go for their small part needs.

Yet, no matter which supplier you choose to use, the quality of the end product depends on **optimizing for manufacturability** — the process of designing and specifying parts not only for fit and function, but also so they are easy to manufacture and assemble.

WHY OPTIMIZE FOR MANUFACTURABILITY?

The goals of optimized manufacturability are to:

- Streamline the production of new or improved products
- Maximize process efficiency
- Eliminate the need for changes that cause delays and increase costs
- Reduce waste in production processes
- Reduce the time and cost of product assembly
- Speed time to market
- Ensure product quality and reliability
- Improve profit margins while meeting end customer needs

START WITH PRODUCT DESIGN

In product design, there are two well-known methodologies known as Design for Manufacturing (DFM) and Design for Assembly (DFA). They are commonly used to make sure that parts:

- Are designed to be manufactured efficiently
- Are designed to be assembled easily and with minimum cost for time and labor

In general, the simpler the design, the easier the product will be to manufacture and assemble.

Traditionally, DFM and DFA have been separate processes, with engineers creating the designs and then passing their drawings along to other teams to decide how to accomplish production and assembly.

For example, DFM might focus on “designing out” expensive, complex, or unnecessary features that would make parts more difficult to manufacture. DFA might focus on combining parts to reduce the number of steps required to assemble the final product.

By bringing these processes together and including production and assembly considerations in the design stage, companies are better able to anticipate, detect, eliminate, or prevent waste and inefficiency in every step of manufacturing.

For instance, a more complex part might in theory reduce the total number of parts needed and, in turn, the time and cost of assembly. On the other hand, additional complexity might make the part:

- More difficult and/or expensive to manufacture
- More difficult to assemble because parts must be positioned precisely to mate correctly
- So heavy that additional setup is needed to support the part so that a worker can assemble the product

Therefore, a unified approach to design is a vital part of optimizing for manufacturability. In addition, it is far easier (and less costly) to make adjustments in the design phase than to stop and make changes to optimize after production has begun.

FIND EVERY OPPORTUNITY TO OPTIMIZE

Producing high-quality parts in the shortest possible time and at the lowest feasible cost requires a design that will allow for optimizing at every step of the manufacturing process:

- Quoting
- Material sourcing
- Fabrication
- Inspection
- Compliance
- Shipping

In the next section, we'll take a closer look at some of the areas in which optimizing for manufacturability can help you produce high-quality products while ensuring cost effectiveness.

What are key factors in optimizing for manufacturability?

Optimizing for manufacturability requires designing the parts of a product to meet the end use requirements while being conscious of all the factors that have an impact on time, quality, and cost throughout production.

SIMPLIFY, SIMPLIFY, SIMPLIFY!

Designing a complex part when a simpler design can do the job amounts to over-engineering, which in turn:

- Raises the cost
- Slows or can stop the quoting process
- May require a supplier to buy additional or special equipment to make the part — slowing the process AND raising the cost

On the other hand, reducing or eliminating any part features that are unnecessary or will be expensive to produce can help to simplify operations and optimize for manufacturability.

KEEP PART FEATURES AS SIMPLE AS POSSIBLE

Before finalizing any design, review it to see if you can eliminate any features that:

- Have no impact on product performance
- Call for extra steps or complex fixturing or tooling in the production process
- Require special adjustments or alignment during product assembly

For example, often tabs, slots, holes, and other features intended to make assembly of mated parts easier actually create an issue when they require very precise positioning of parts.

Instead, be sure any features that are added to aid in assembly are easily recognizable and, in fact, make assembly of parts simpler.

In addition, where possible, designing simple interchangeable or modular parts that can be used across different products or assemblies will make maintaining a parts inventory easier and more cost effective.

REDUCE THE NUMBER OF COMPONENTS TO ASSEMBLE

Reducing the number of components in a product also helps to optimize for manufacturability.

When designing a product, eliminating or combining parts wherever possible will minimize the quantity of parts required for assembly.

Once you have a preliminary design, make a list of all the components and hardware required in the design. Then consider if any parts can be eliminated or combined based on:

- Where the parts are positioned in relation to each other
- Whether the parts must move in the assembled product
- The impact on ease of production, including whether special processes or tooling would be required

Reducing the number of parts also reduces the amount of hardware and number of steps required for assembly, making that process faster and easier.

THINK ABOUT WAYS TO STREAMLINE PRODUCTION

Designing a part to reduce or eliminate expensive, complex, or unnecessary production steps also helps to optimize manufacturability.

For instance, to avoid added steps that will add to costs, use surface finish callouts only when they are required for part performance rather than an option chosen for aesthetic reasons.

Again, this is where a unified approach — including fabrication and quality control considerations in the design phase — can lead to small design changes that will:

- Reduce or eliminate unnecessary steps
- Take advantage of existing tools
- Eliminate the cost of special tooling or fixturing

- Optimize the results achieved by the chosen production method

CONSIDER THE TIME (AND COST) OF SETUP

When designing a part, don't just think about the process that will be used for material removal, whether it is **abrasive cutoff, double disk grinding, CNC machining, or other precision cutting capabilities**.

For a true picture of cost, you must also account for the time that will be needed to set up the equipment, including programming, fixturing, loading/unloading tools, loading/unloading parts, and other steps. Consider, for example:

- Do parts have a complex geometry that will require them to be flipped from side to side to machine all of the part features?
- Will multiple operations be needed to achieve the desired features, with each operation requiring its own setup?

While it may take only a few minutes to machine the feature of a part, it might take an hour to set up the equipment. Multiply that across several operations, and you've got a lot of added setup costs.

By minimizing the number of steps required, you can reduce the time and cost of setup. In addition, producing a high volume of parts per operation — rather than a small lot size — helps to "spread out" and minimize setup costs.

CHOOSING TOLERANCES WISELY

Geometric tolerances are a critical aspect of part design, determining how much variation can occur in a part feature while still enabling the part to fit and function as needed. That means part tolerances are critical to the quality of the part and the success of the end product.

Specifying tolerances and including them in an engineering drawing helps to ensure that your supplier will understand exactly what it is you need.

Tolerances are also a critical component of part cost — making them an important factor in optimizing for manufacturability. The tighter the tolerance, the more expensive the component will be to make.

RESERVE THE TIGHTEST TOLERANCES FOR THE MOST CRITICAL FEATURES

A tighter tolerance requires greater effort , both in the fabrication of the part itself and in inspection of the final parts, to ensure accuracy.

So, as a rule, it is important to avoid tight tolerances except where they are absolutely essential to part or product performance. For example, where a part has a surface that must meet and form a tight seal with the surface of another part, **you might need to specify a tight flatness tolerance**.

Or, for a part such as a small pin that must fit into a corresponding hole when the product is assembled, **you might need a tight circularity tolerance** for the pin's outside diameter (OD) along with the pin's length tolerance.

Whenever feasible, part dimensions should be in the center of the tolerance range. This allows for the greatest amount of variation while still meeting the requirements for fit and function.

PRIORITIZE FOR MULTIPLE TOLERANCES

It is not unusual for a single part to have multiple tolerance. In these instances, you can avoid over-engineering by determining which part feature is most critical to performance and reserving the tightest tolerance for that critical feature.

On occasion, **a part may have multiple tolerances that conflict with each other**. In this case, you may need to compromise on the tolerance of a secondary feature to achieve a tight tolerance on the part's most critical dimension.

KEEP TOLERANCE STACKING IN MIND

Keep the cumulative tolerance in mind whenever you have multiple tolerances.

When you have multiple parts that will make up a product, consider the interactions between the parts to avoid tolerance stacking issues. For instance, if you have a positional tolerance of ± 0.0010" (0.0254 mm) for two parts that must fit together, each part can only be ± 0.0005" (0.0127 mm) because the tolerances will "stack up."

When you have a part that will undergo multiple processes during its production, you need to consider the cumulative tolerance when you add up the tolerances from each process.

Here again, the feature that is most important to part performance can be assigned the tightest tolerance, and the other features can be looser to achieve the specified total tolerance.

CONSIDER THE MANUFACTURING PROCESS WHEN CHOOSING YOUR TOLERANCES

The tolerances of a part must also take into consideration the capabilities of the equipment that will be used to produce the part.

Specifying a tolerance that is beyond the capabilities of the machine will require additional processes to achieve the desired tolerance — and additional *anything* means more time and more money.

Depending on the production method to be used, there may be process improvements, controls, tools, or fixturing that will also be needed to achieve the proper tolerance.

OPTIMIZING RAW MATERIAL SOURCING

Raw material is not just a line item; it can have a huge impact on manufacturability. Optimizing material sourcing for small metal parts often requires striking a balance between ease of manufacture and achieving the required performance.

After all, choosing a soft metal for its ease of machinability does no good if it means the end product won't stand up to use. On the other hand, a harder, denser material such as steel or titanium will be more difficult and take more time to machine.

CONSIDER MATERIAL AVAILABILITY

Specifying a material that is readily available and that is compatible with the manufacturing process you plan to use will help to minimize production time while meeting your requirements for part fit and function.

Also consider whether multiple parts for your product can be manufactured using the same material. If so, you can realize cost savings by ordering a larger quantity from your material supplier.

In addition, reducing the number of shipments that need to be processed can save valuable time — allowing your manufacturing partner to receive material for multiple parts at once and to pass the resulting time/cost savings on to you.

OPT FOR STANDARD SIZES IN RAW MATERIAL SOURCING

When you are sourcing raw materials for parts — even when it is a small order for prototyping or product testing — you can also optimize for manufacturability by opting for a standard material size.

Any non-standard material size may be difficult to find or require a special order, both of which will add to the time and cost of production. But a readily available material size that is within the manufacturer's standard tolerance range will be easy to get and more cost effective.

Sometimes the standard material may require additional processing, such as grinding from a larger diameter. However, often the added processing cost is still less than the initial raw material cost for non-standard material.

BE CONSCIOUS OF DIFFERENCES ACROSS THE MARKETPLACE

There may be differences in the "same" material coming from different manufacturers or originating in different places around the world. Internationally, there is not yet a single standard for factors such as material size or chemical composition.

Therefore, you may need to be wary when acquiring raw materials from different sources and areas of the world.

BE EXACT WHEN THE MATERIAL NEEDS TO BE PRECISE

If the **quality and performance of parts depend on the precision of the metal** or other material (whatever its source), you need to be exact about what your requirements are.

For instance, perhaps the success of your application relies on starting with a raw material that offers very precise composition and performance, such as:

- Nickel titanium (NiTi) alloy used in medical device tubing requiring shape memory and super elasticity
- Tungsten used in high-performance welding electrodes requiring hardness and high levels of thermal and electrical conductivity

Therefore, if you were sourcing NiTi, you'd want to be aware that the material comes in a variety of different "recipes" that vary by manufacturer, usually indicated as the percentage of nickel by weight. If you were sourcing tungsten for spot welding electrodes, which benefit from using the purest material possible, you'd want to look for a source offering tungsten that is 99.99% pure.

CHOOSE A MATERIAL THAT WILL WITHSTAND THE END USE

For even the smallest parts, material selection must also be based on the application and the environment in which the parts will be used. After all, you don't want your product to fail because a component can't stand up to — or is not appropriate for – the end use.

For example, stainless steel is often used in medical device tubing applications that require a high degree of structure, high tensile modulus (stiffness), or high-pressure fluid flow. Stainless steel tubing is also used in many medical devices that require a material that can be precisely formed and machined.

However, **stainless steel comes in a variety of medical grades**. Which specific material you choose depends on the purpose and the properties that are required for the best performance, such as corrosion resistance, biocompatibility, hardness, flexibility, or durability.

CONSIDERING PART HANDLING IN PRODUCTION AND ASSEMBLY

Think about how parts will need to be handled and positioned during both production and later assembly. Otherwise, you can end up designing a product that adds to time and cost by:

- Forcing workers to put in a lot of extra steps or movements to accomplish tasks
- Requiring special fixturing or lifting devices to process or assemble parts

Worse, not considering ease of handling can create safety hazards for machine operators and assembly workers.

7 TIPS FOR OPTIMIZING PART HANDLING

- Simple parts are easier to pick up, handle, orient, and fixture, and less likely to be dropped or damaged.
- Parts that are symmetrical along both axes are easier to fabricate and assembly.
- When possible, use radii and chamfers on parts to avoid sharp edges, burrs, or points that could injure workers.
- Design parts with lead-in features and chamfers for easier insertion of pins or bolts.
- Avoid heavy or oversized parts that would require lifting devices or increase worker fatigue.

- Incorporate simple patterns of movement in fabrication and assembly processes, avoiding multiple setups and reorientation whenever possible.
- Make part differences very obvious so that assembly workers can distinguish between the parts at a glance.

THINK ABOUT THE ASSEMBLY WORKSPACE

The design should also take into consideration where the product will be assembled and the tools or equipment that will be available there.

If you have the opportunity to design the workspace, plan it in such a way to minimize the time and distance workers must move. Place hardware and tools within easy reach, and keep all components within a few steps from the point of assembly.

OPTIMIZING FOR INSPECTION

For purposes of both quality control and optimizing for manufacturability, don't forget to think about how the final parts will be inspected.

For instance, where possible, design parts so that their conformance to fit and function requirements can be verified with simple pass-fail (go/no-go) tools such as pin gages. In cases where parts will need to be measured, specify the dimension(s) that is critical to performance and the tool or method to be used for inspection.

The way in which you convey your inspection method and other manufacturing requirements to your supplier has a tremendous impact on quality and cost of the end product. That's why it is so critical to create a thorough request for quote (RFQ) — one that reflects every detail of what you want and need from your supplier.

In the next section, we'll discuss how to avoid some common RFQ issues that can derail your optimization efforts.

What causes issues with an RFQ? (And how can you avoid them?)

On top of everything you've already put into design — including the time and cost of research, prototyping, testing, and revising — the cost of manufacturing small metal parts includes:

- Materials
- Equipment
- Technicians
- Inspection
- Packaging
- The time and cost of quoting

If something has an impact on the manufacturing cost, quality, or timeline, it needs to be reflected in the project's RFQ. A supplier needs to know up front, not later, about any unusual parameters, non-standard materials, or other special needs a customer may have.

Unfortunately, that is not always the case — leading to:

- A delay in starting production while the RFQ is revised to include new or missing details
- Added time and cost for the supplier to requote the job
- Added time, labor, and cost for new or different requirements

What are some common issues that require a manufacturing project to be requoted — and what can you do to avoid them?

DISCREPANCIES BETWEEN THE RFQ AND PURCHASE ORDER

Placing an order for something that was not included in an RFQ is not uncommon. As a manufacturing partner, we at Metal Cutting often review purchase orders (POs) and find they do not agree with the jobs as originally quoted.

While it might not seem like a big deal, a simple after-thought can turn out to be a very important step in the supply chain. A last-minute change or addition to a project might require additional supplies, processes, and tools, as well as time and labor.

ACCIDENTAL OMISSIONS FROM RFQS

Of course, sometimes an RFQ omits a detail by accident. For example, a seemingly thorough RFQ might accidentally be **missing an important detail such as surface finish requirements**.

This type of omission might happen because different people are involved in completing the RFQ. Or it might be a simple oversight. Whatever the reason, the job must usually be requoted when the RFQ and PO are not in accord.

EXCEPTIONS NOT DULY NOTED

Sometimes a quote must include exceptions to the requirements that are spelled out in an RFQ.

For example, if Metal Cutting receives an RFQ asking for a length tolerance of ± 0.0005” (0.0127 mm) and we can’t hold that tolerance for the particular feature using the specified method, then we might quote the job with an exception of ± 0.001” (0.0254 mm).

If the customer’s PO later comes in with the originally requested tolerance rather than the exception that was quoted, we need to go back to the customer to make sure it was just an oversight.

If customers cannot accept a quote including an exception, they need to come back to us to discuss whether it is possible to make adjustments and requote as needed. When customers can accept a quote with exceptions, they need to be sure to change their internal description before submitting their PO, so that the RFQ and PO will be in agreement.

ENGINEERING DRAWING OMISSIONS

Creating a detailed engineering drawing that expresses all the features and requirements of a part is a vital element of product design.

Including that drawing in your RFQ is equally important. It goes a long way in helping your manufacturing partner understand and visualize exactly what it is you want and need.

Making sure your engineering drawing is clear and complete is necessary to optimizing for manufacturability and getting the quality results you want. It also helps to ensure that production stays on schedule and is not delayed by a lot of questions and revisions.

"THERE'S A DRAWING, BUT . . ."

Sometimes a drawing is provided later in the production process and includes additional requirements that were not called out in the original RFQ. That means requoting the project to include the time and cost of the additional requirements.

Other times, a drawing is provided and seems clear, but on closer look we find it is missing important details or the intent is not clear.

For example, a drawing may reference a previous part number, from when a part was manufactured by a different supplier. The old part (and/or its specifications) must then be tracked down so it can be referenced by the new supplier.

As the new supplier in this instance, we may find the old part has characteristics that were not accounted for in the RFQ or new drawing, which in turn will affect costs.

THE HIGH COST OF MISSING DETAILS

If an additional requirement that is missing from a drawing is not discovered until the final part is being inspected by the customer, the cost of that oversight could be significant.

While in some cases the parts can be reworked and additional steps can be applied to remedy the omission, the change in the scope of work means adding more time and cost to production.

In other cases, these is no remedy. The parts must be scrapped, and the entire process must begin anew.

RAW MATERIAL ISSUES

Tell your supplier up front, not later, about any unusual parameters or non-standard requirements you might have for your raw materials.

When Metal Cutting provides the raw material for a customer, we want to know every requirement up front — and especially if there are specific needs for characteristics such as:

- Ground surface
- Tensile strength
- ASTM chemistry

These vital and other details should be included in an RFQ to avoid added cost, delays, and other issues down the line. For example, a customer might request a mill certification, which is not always available — and if it is available, a mill certification increases lead time and cost.

MATERIAL AVAILABILITY ISSUES

Another RFQ issue that can lead to a long lead time and added cost is asking for a raw material that is not readily available.

For example, one Metal Cutting customer requested annealed tubing with a hardness of 350 HV (Vickers hardness) and an OD and ID tolerance that was half of the standard. The wait for the material? A whopping 52 weeks.

In another example, the raw material cost stated in the quote was based on a lead time of six weeks, but the customer's subsequent PO requested the material in just two weeks.

Sometimes an order such as this can be expedited — naturally, at an added cost. However, with materials that are not readily available, a rush order simply may not be possible, at any price.

CHANGES IN MATERIAL FROM PREVIOUS SPECIFICATIONS

Another potential issue is when the material for a part is changed from previous specifications.

This might be done for various good reasons. Perhaps the previously used material is no longer available. Or perhaps the customer wants to try a material with slightly different properties or a more affordable price.

The best advice for making this kind of change is to be sure to do it methodically. Before placing a large order for a new material, sample and test the material in a small quantity to make sure it will work.

BALANCING MATERIAL QUANTITY AND COST

While it is more cost effective to buy in a large quantity, here it makes financial sense to try before you commit, to minimize waste and unnecessary cost.

By running the new raw material through your formal validation processes, you can make other adjustments as needed to be sure the same results can be achieved with a different material.

Again, the sooner you can alert your supplier to a possible change in the raw material, the better. Remember this (or any) change in specification can impact the cost, since your supplier's quote is for the total order of raw material, in a large quantity.

CUSTOMER-SUPPLIED MATERIALS

Another manufacturability issue is when there are problems with customer-supplied material.

For example, a third-party provider might deliver raw material that is bent, bowed, rusted, dirty, or otherwise defective.

In these instances, the customer would incur the added cost of having the manufacturing partner put in time and labor to clean or correct the defective material so that it can be used.

When having material that is scratch free, undented, clean, and straight is important to your end product, your supplier relationship is crucial. Working together, you and your supplier can help to optimize the manufacturability of the raw material.

Often, suppliers can offer options or help to remedy a problem when they know what issue you are having. For example, when one of Metal Cutting's customers had difficulty getting material that was sufficiently straight, the customer sent us the material on a coil and we were responsible for both straightening and grinding.

SPECIAL DOCUMENTATION REQUIREMENTS

At Metal Cutting, sometimes a customer submits an RFQ with a long list of cross-referenced documents but does not provide the documents to us. This causes a delay in the quoting process while the customer goes back to try to locate and supply those documents.

Other times, customers surprise us with additional requirements for paperwork they want us to complete or provide, after the job has been quoted.

RAW MATERIAL DOCUMENTATION

If Metal Cutting is acquiring the raw material for a customer, upon request we will provide the customer with a signed Certificate of Compliance showing the material's chemical and, when applicable, mechanical properties as received from the mill.

In addition, our standard documentation describes the part that will be made, its tolerances, and its features. **This level of detail is part of our best practices and commitment to quality control (QC)**.

However, after a project is already underway, a customer may come back with a request for certification of the raw material's origin. Sometimes the customer also has very specific requirements — for example, that the material was sourced in the United States and not in another country.

Any country of origin certification is another documentation requirement that is critical to specify at the beginning of the process. In the current economy, there are severe limitations on availability of specialty metals, and not all countries make all metals.

CERTIFICATIONS AND OTHER DOCUMENTS SPECIFIC TO YOUR BUSINESS

Documentation that may be standard for your business or industry may not be standard for your manufacturing partner. For example, a customer might have a very specific supplier agreement with strict requirements regarding product quality and liability issues.

This kind of documentation requires careful review — and sometimes, negotiation — and can delay the start of production, especially if the request is made last-minute. This includes (but is not limited to):

- Supplier certifications
- Quality requirements
- Purchasing specifications
- Corporate documents
- Legal documents

Sometimes a customer's document requests are delayed because multiple people are involved at different stages of the process. For example, the purchasing manager and the QC manager are looking at different aspects of a project.

Whatever the reason, you need to let your supplier know sooner rather than later about all documentation and certification requirements you may have. Otherwise, valuable time may be lost — and cost, incurred.

UNIQUE INSPECTION CRITERIA

Part inspection and other QC measures are vital to optimizing the manufacture of small parts. That's why the schedule for inspections (when in the production process they will occur), along with the inspection method and tools to be used, should be agreed on ahead of time and put in writing.

At Metal Cutting, we establish a sampling plan for final part inspection at the very beginning of a project, along with the written method and other requirements.

INCLUDE INSPECTION BASICS

Putting your inspection requirements in your RFQ helps to ensure inspections are done in accordance with your needs. Ideally, your RFQ will include:

- How to inspect the finished parts, including which dimensions to examine
- When inspections will take place, including in-process checkpoints and final inspection
- The Acceptable Quality Level (AQL) and index values for your sampling plan

At Metal Cutting, we generally recommend and use AQL 1.0 c=0, a zero acceptance sampling plan, in which 100% inspection must be performed for a feature if one randomly selected part in a lot fails inspection.

(We derive lot and sampling size values from *Zero Acceptance Number Sampling Plans*, Fifth Edition, by Nicholas L. Squeglia. **Read more about sampling plans in quality control**.)

SPELL OUT ANY UNIQUE INSPECTION REQUIREMENTS

Optimizing for manufacturability depends on being able to calibrate, cross-calibrate, and agree on inspection methods. Therefore, If you have any unique or specific inspection criteria, it's critically important to let your supplier know as soon as possible.

It helps if your RFQ specifies details such as:

- If you want more parts to be inspected than what our standard sampling plan includes
- If only a specific feature requires an additional quantity of parts to be sampled

- Any testing method to be used, such as **eddy current testing (ECT)**
- Any requirements for specific equipment, devices, metrics, methods, or fixtures to be used for part inspection

For example, if your manufacturing partner makes a part and inspects it under an optical microscope at 10x magnification level but you plan to inspect the part at 100x, the results are going to be vastly different.

SPECIFY THE TOOLS TO USE

In addition, within the same inspection method, different tooling can give you different results. That's why it's important to be specific about what tools to use.

In fact, some customers specify the brand of tool they want us to use — such as a specific model of Mitutoyo, Starrett, or Fowler micrometer — for consistency with their own in-house quality inspection process.

This becomes more critical as the measurement resolution increases, as when making the leap:

- From hand micrometers to laser micrometers
- From contact surface finish metrology to non-contact optical interferometry
- From optical comparators to video edge detection instruments

In each case, the latter equipment should be cross-calibrated between vendor and customer — or even better, the same equipment should be properly calibrated and used by both companies.

SPECIFIC PACKAGING REQUIREMENTS

Imagine that after getting a quote for the production of 20,000 parts, a customer places an order with the manufacturing supplier. However, now the customer adds the requirement that the parts must be packaged in bags of 50 parts each.

This is probably a case where, after the quote had been done, the customer thought about how the parts needed to be handled once they were received post-production:

- Will the parts be easy to inspect?
- Does the lot size make sense for purposes of traceability?
- Does the lot size make sense for product assembly?
- Will the packaging maintain the necessary level of cleanliness?

Without a doubt, all of these things matter, and thinking about them can help to optimize manufacturability for the customer.

Those things also matter to your supplier.

For instance, with the very small parts we make here at Metal Cutting, we typically package all parts together in one box or bag. Of course, it would be a clean box or bag. But it would be a single lot unless a customer tells us they need something special, such as a specific lot size.

These end-of-production details matter because they have can have a big impact on cost, quality, and/or the timeline. Therefore, be sure to let your supplier know up front if you have any special packaging requirements.

Conclusion

Both the cost and quality of a product are closely aligned with its manufacturability. Optimizing for manufacturability requires taking a unified approach to product design.

That means considering not only the fit and function of all the product's component parts, but also the ease and efficiency with which the parts will be fabricated, inspected, delivered, and ultimately assembled into the end product.

With close collaboration and good communication between you as a product manufacturer and your suppliers and manufacturing partners, you can help to ensure the entire process runs smoothly and cost effectively.

In addition, providing a detailed and complete RFQ at the time a project is initiated will further optimize the manufacturing process — helping to produce a high-quality product on time and on budget.

For more tips on how to improve your quote request to optimize for manufacturability and produce the results you're looking for, **download our white paper *How to Fine-Tune Your Quote Request to Your Maximum Advantage: Frequently Asked Questions in Small Parts Sourcing***.

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