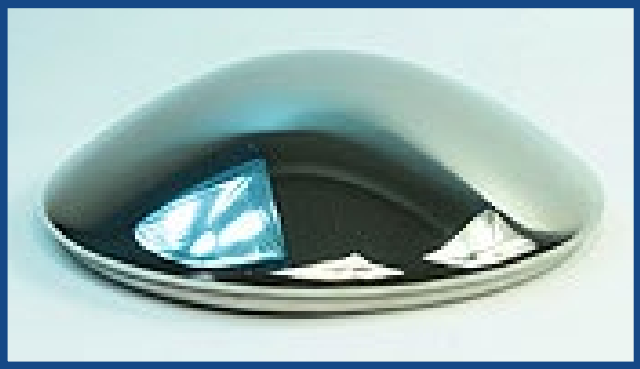

Helander Metal Spinning Company

All Spun Metal Products

An ISO 9001:2008 & AS9100 Rev C. Registered Company

Metal Spinning = Cost Effective Metal Forming

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An ISO 9001:2008 & AS9100 Rev C. Registered Company

Introduction

American companies are faced with doing more with less to effectively grow and succeed in today's competitive business environment. They must achieve higher productivity and be innovative with new strategies that will help them secure sustainable cost reductions and revenue growth. By focusing on the production and delivery of products that provide quality and value to their customers, companies can lay a solid foundation on which to adapt and thrive under ever changing economic conditions.

Planning for Success

As companies across all industries examine their current strategies to discover new approaches for improving their products and reducing expenditures, comprehensive planning efforts have become a necessary means of increasing the chances of successfully competing in the industrial marketplace. The availability of alternative process plans is an essential element towards integrating design, process planning, and scheduling functions.

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Explore Alternatives

Among the objectives of a good product development plan is the systematic selection of alternative manufacturing processes and materials for each component part. Design for manufacturability practices encourage designers to consider downstream assembly and manufacturing processes in addition to functional requirements and material selection.

Predictive modeling and simulation of process variables in advance of production can ensure the most appropriate and efficient manufacturing method is chosen. Engineering decisions about shape, size, configuration, material, and tolerances can be progressively adjusted and refined to take advantage of various manufacturing scenarios until the optimal final form of the product evolves. This methodical approach supports the efficient use of both production and financial resources.

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Discover the Benefits of Metal Spinning

As organizations strive to operate with maximum efficiency, they look for more agile and versatile means to support their business objectives. Metal spinning has taken on new relevance as a proven technology for simplifying, streamlining, and reducing the expense of producing axially symmetric parts. Development of new, automatic spinning machines using CNC controls and playback technology allows high volume production of tight tolerance parts with consistent repeatability.

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Discover the Benefits of Metal Spinning

The process of metal spinning, also referred to as spin forming, is a metal working process that is used for producing metal objects that are round, cylindrical, or spherical in shape. In addition to improved structural integrity, metal spinning offers numerous advantages over other forming processes and allows you to achieve substantial cost savings through low-cost tooling, increased material yields, reduction or elimination of secondary operations,. The spinning process can also accommodate any size and short lead times. Unmatched in terms of flexibility, metal spinning is well-suited for both prototyping and high volume production art — from small cylindrical caps to large diameter satellite dishes. All malleable metals can be used in this process. These include stainless steel (series 300 and 400), carbon steels, aluminum (2000 series, 3000 series, 5000 series and 6000 series), copper, bronze, brass, inconel, hastelloy, and titanium.

A Brief History of Metal Spinning

Metal spinning is an art form that can be traced back to the ancient Egyptians. Archeologists have uncovered evidence of simple hand operated spinning lathes constructed from wood that required two people to operate — one worker used a pole attached to a spindle to turn it, while the other used the chisel to carve the material. By the Middle Ages, a simple lathe-type machine was developed that allowed operators to continuously rotate spindles by means of a foot pedal, freeing their hands to control the speed of rotation and focus on accuracy. With the Industrial Revolution came the use of electric motors, which greatly increased the spinning speed, further improving accuracy and significantly boosting production volumes.

A Brief History of Metal Spinning

Fast forward to the 21st century, where modern metal spinning is conducted on rigidly constructed lathes that incorporate high velocity spindles and are operated either manually or through use of hydraulics or advanced computer controls. Robotically assisted, high-tech systems also include indexable toolholders that allow turning operations and edge detailing to be performed in easy, rapid succession, with no need for labor-intensive setup tasks in between. This increased level of automation has greatly contributed to the accuracy and economy of the metal spinning process.

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Metal Spinning Basics

Metal Spinning is a process by which a disc or tube of ductile metal is rotated on a spindle and formed into an axially symmetric part. By applying a levered force to a rotating disc of metal using rollers that spin at a very high speed, the metal begins to flow over a mandrel that is shaped to the interior geometry of the part. This rotational motion, combined with uniform forces applied to the metal blank, cause the material to flow evenly and create a smooth, even, and seamless surface. The compressive forces also realign and strengthen the grain structure, which significantly increases the tensile properties and fatigue resistance of the base material.

Metal Spun Parts

Stainless Steel

St15-8 Steel

Brass

Titanium

Aluminum

Copper

Metal Spinning Basics

Almost any ductile metal can be formed, including aluminum, stainless and carbon steels, as well as high performance alloys. Intricate curves, tight grooves, and other precise features of varying complexity can be executed in a single machining cycle.






Examples of metal spun parts can be found in a wide range of industries. Examples include:

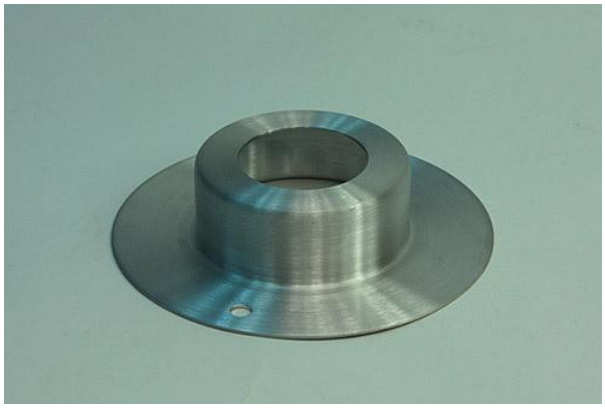
Commercial Food Equipment Pots, pans, bowls, kettles	Industrial Pump Components Cylinder housings, end caps
Parabolic Antennas/Satellite Dishes	Wheel Rims
Metal Furniture Components Table columns, chair bases	Aerospace & Defense Motor housings, inlet rings, missile parts
Waste Storage Industry Storage vessels, housings	Oil & Agriculture Industries Drilling and earthmoving equipment
Filtration & Separation Filter baskets, sleeves, venturis	Commercial Lighting/Architecture Lighting bases, reflectors, hardware
Green/Alternative Energy Burner tubes, vessels, battery housings	Medical & Laboratory Equipment Imaging equipment, housings
Streets & Sanitation Housings and equipment for sanitation vehicles	Hot Rod Components High performance components, retainers, vintage hub caps
HVAC Industry Inlet feeders	Bearing and windmill components

Cost Advantages

Tooling & Design Flexibility

Tooling for metal spinning is simple and economical to produce and includes only a roller spinning tool and mandrel. The initial tooling investment for metal spinning is usually 80% to 90% less when compared to the cost of tooling for alternative metal forming processes.

The roller spinning tools that force the flow of material over the mandrel are available commercially in a variety of materials and sizes to create job-specific profiles, edge treatments, and surface finishes. These tools spin on bearings at high speeds and are subject minimal friction and heating that can cause premature wear, giving them a long and useful service life.



Cost Advantages

Tooling & Design Flexibility

Mandrels are not subject to the excessive forces of other metalworking processes, and can be constructed of less expensive materials. Tooling can be tailored to the quantity of parts to be produced, so costs can be kept in line with part life expectancy. Other factors that help determine material of construction include the base metal, finish, and tolerancing requirements. Low-cost hardwood mandrels are often sufficient for prototype, low volume, or soft material applications. Soft tooling metals, such as aluminum or mild steels, are also appropriate for shorter run production.

Cost Advantages

Tooling & Design Flexibility

For more complex projects that involve more difficult-to-form alloys, longer production runs, or have critical tolerance requirements, hardened mandrels are preferred. However, since quality mandrels can be produced by simple turning and machining, the services of highly skilled tool and die makers are not required and both lead times and expense are significantly reduced.

Low cost tooling that is easily modifiable also allows for streamlined production of product variants, which enables businesses to easily add diversity to their product mix.

Cost Advantages

Tooling for Prototyping

The simplicity of the tooling requirements for metal spun products lends and elevated level of flexibility and versatility to the manufacturing process. Ongoing design modifications that are a natural part of the new product development process make the low start up costs associated with metal spinning the ideal choice for creating prototypes. Metal prototypes allow testing of the part in the actual production materials for verification of form, fit, and function before being manufactured in production quantities.

Cost Advantages

Tooling for Prototyping

Metal spinning allows forming parameters and part geometry to be altered quickly by using tool offsets and graphical manipulation, allowing design changes to be readily accommodated with minimal to no expense. Remodeled parts can be produced rapidly in prototype quantities, and since the tooling is not subject to excessive forces, various base metals can be tested without incurring additional tooling costs.

Reduced tooling requirements also facilitate and accelerate the ramp-up from prototype to full scale production, helping customers get their product to the market faster. If a customer decides not to proceed with the production run, the decision comes at a minimal cost.

Cost Advantages

Design & Process Flexibility

Metal spinning provides one of the largest and most dynamic work envelopes of any fabrication process. The diameter and depth of spun metal parts are limited only by the capacity of the equipment available. Metal spinning can be executed using various strategies, and the process applied is matched to the material of construction and required production volume.

Advanced CNC control brings high levels of speed, precision, and consistency to the metal spinning process. Complex geometries can be achieved rapidly, accurately, and repeatably in medium to high production quantities. Tolerances of ±0.030” are typical, and for specialty applications, tolerances ±0.005” or better are possible. Accelerated production can be achieved through use of robotic loading and unloading equipment, which allows spinning lathes to run with minimal operator intervention and reduces labor costs.

Cost Advantages

Design & Process Flexibility

Manual or hydraulic-assisted spinning requires a highly skilled operator to carefully pull the rollers and hand shape the metal, and these techniques make the most business sense for prototype and very low volume quantities.

By marrying the production volume to material selection and geometric complexity, we can select the process that delivers the most favorable unit cost. In all cases, set up costs remain minimal, which provides great economic advantage, especially when applied to lower volume production quantities.

Cost Advantages

Improved Material Yield

Metal spinning is a forming process that produces parts through mechanical deformation — the workpiece is reshaped without adding or removing material. With constantly rising material costs and the current focus on conservation of natural resources, metal spinning offers several significant cost advantages.

Increased material yield contributes substantially towards the economy of a spun metal part. Careful calculations enable appropriately sized blanks or pre-forms to be spun into their final shape with little to no material waste. In contrast to machining, which is a reductive process, no material is cut away, and in contrast to stamping, no burrs are generated.

Metal spinning permits the contour to be formed with little or no added machining, maximizing material usage, minimizing waste, and reducing the cost of production.

Cost Advantages

Reduced Material Requirements for Structurally Superior Parts

When the spinning roller contacts the workpiece, the highly localized pressure that deforms and cold-works the metal compresses and realigns the grain structure to harden the material. Tensile strength is improved, which allows thinner-walled components fabricated from lighter gauge materials which exhibit the same performance parameters as a heavier stamped or machined equivalent. The combination of less expensive raw materials and reduced material usage has a significant impact on component cost. In addition, metallurgic improvements eliminate the necessity of secondary work-hardening, which saves both time and expense.

Furthermore, spun parts have no seams that can crack or misalign over time. Seamless construction allows metal spun parts to withstand higher internal or external pressures, making spinning a superior and more economical solution for the production of products such as pressure vessels, scuba tanks, fire extinguishers, and CO2 cartridges.

Cost Advantages

Minimal Finish Requirements

Metal spinning lathes have the same basic characteristics as conventional turning centers, so all it takes is simple, automated tool changes to perform secondary operations. Processes associated with conventional finish machining, such as edge trimming, beading, flanging, and hole punching can all be achieved in one production cycle from a single setup, which reduces labor cost.

Metal spinning also produces parts with superior surface finishes. Roller selection can be easily adapted to the material and thickness to produce parts with consistent finishes of up to 32 micro-inch or better, eliminating the need for secondary polishing or machining in most applications.

By eliminating time and labor intensive movement of parts for secondary operations, production is streamlined, cycle times are shorter, and cost savings are realized.

Cost Advantages
Short Lead Times

Simplified tooling, fast cycle times, and elimination of many secondary finishing operations provide the cost benefit of short lead times. Inventory can be held at optimal levels for production needs, lowering its carrying costs and freeing up capital resources and optimizing cash flow.

Short lead times also help accelerate time to market, a strategic imperative for allowing you to realize revenues faster, increase market share, and enhance your company or brand image.

Cost Advantages

Low Investment Product Introductions

Metal spinning's low-cost startup costs give companies the opportunity to enter new markets without taking on burdensome financial risk. They can experiment with growth and expansion opportunities in existing markets or explore options for entering new markets without excessive drain of resources. Designers can also add unique customizations to existing products based on changes in consumer preferences to broaden the scope of their products and find new niche markets.

Sourcing Strategies for Quality with Economy

Choosing the Right Partner

Metal spinning is a competitive metal forming method and has succeeded in many applications because of its superior quality results and cost-saving attributes. When you are seeking a company that manufactures spun metal parts, it is essential that you undertake a thorough evaluation of their capabilities. Finding a vendor with relevant experience and capacity is important to realizing the maximum cost and quality benefits that metal spinning affords.

Some strategic questions for consideration:

- Does the manufacturer have the certifications that your industry requires?
- Do they have the proven ability to design and produce custom solutions for your product?
- Do they have experience with the appropriate materials, and what is their minimum and maximum part size?
- Can they handle your lead time and volume requirements on an ongoing basis?
- Do they have an established quality system and an established track record of on-time delivery?
- Have they invested in the latest equipment and technology?
- Do they produce goods for a good mix of industries?
- Can they provide the appropriate level of customer service?
- Are they financially stable?
- Are they focused on growth?
- Do they place value in their employees?

Sourcing Strategies for Quality with Economy

Collaborating on Design

Working closely with your spinning supplier during the design phase may significantly improve formability and reduce cost. If the manufacturer can provide an in-depth analysis of your component design, they can make recommendations that result in the most favorable balance between quality and cost.

Sourcing Strategies for Quality with Economy

Design Tips and Considerations

- Metal spinning thins and hardens materials, so consider the minimum wall thickness your part can tolerate.
- Changes to the diameter or depth of spun metal parts may lower material costs.
- Larger corner radii will be stronger and thin out the material less than tight corners, and they are more economical to produce.
- Inside dimensions are the easiest to hold.
- Metal spinning is both flexible and precise, and tolerance requirements directly impact the cost of a part.
- Identify critical points for tolerances. Sidewall thickness can vary. If you need a specific thickness or dimension on part of a sidewall, you do not need to specify it for the whole part.
- Geometric elements such as beads, groves, or flanges can add strength and rigidity.
- Symmetrical shapes are typical, but parts can be sectioned to achieve a wide variety of geometric forms.

In Conclusion

In today's dynamic business environment, it is essential to strategically use resources that give you the advantage of achieving and then sustaining a competitive edge in the marketplace. By examining fresh approaches to manufacturing, you will discover ways for improving products and reducing expenditures without sacrificing quality or the integrity of your brand and reputation.

When choosing a manufacturing process, careful consideration should be given to finding an economical balance of materials, quality, speed, flexibility, and cost.

In Conclusion

Every manufacturing process has strengths and weaknesses, so the one selected must be able to produce a quality product that is acceptable functionally and economically and provide measurable benefit over an alternative.

Metal spinning is the most economically advantageous forming methods available to industry today for the production of round, cylindrical, cone-shaped, elliptical, or other concave or convex parts. Advancements in technology have transformed this ancient craft into an increasingly relevant manufacturing strategy.

Summary of Cost Advantages

Low Cost Tooling -- Design simplicity and low cost materials of construction can save approximately 80-90% of startup costs.

Design Flexibility -- Modifications to part design can be made through minimal changes in tooling or through offsets or graphical manipulations done at little to no cost.

Process Flexibility -- Metal spinning has a large and dynamic work envelope. Advanced technology equipment allows for rapid production of high volumes, while traditional manual or hydraulic-assist spinning is a low-cost alternative for prototype or small volumes.

Improved Material Yield -- Creating geometry through mechanical deformation, not cutting, makes metal spinning is a zero-waste process.

Summary of Cost Advantages

Reduced Material Usage for Structurally Superior Parts -- Metal spinning improves tensile strength, allowing production of thinner walled and lighter gauge components to perform better than a heavier stamped or machined alternative.

Minimal Finish Requirements -- In-process secondary operations, intrinsic work hardening, and superior surface finishes eliminate the need additional work.

Short Lead Times -- Minimal setup and tooling requirements combined with fast cycle times reduces the cost of inventory and speeds time to market.

Low Investment Product Introductions -- The low start up costs associated with metal spinning make it advantageous for exploiting growth opportunities with minimal risk.

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Contact Us

Helander's engineers, manufacturing technologists, and material specialists can provide in-depth analysis of component design and advise you on the substantial cost advantages of using metal spinning to form your component part. Contact us today to learn how much you can save.

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Resources

http://www.thomasnet.com/articles/custom-manufacturing-fabricating/metal-spinning-history

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http://www.pma.org/divisions/metal-spinning/why-use-metal-spinning.asp