FlowformingPlus™ Benefits

Delivering Precision and Accuracy to Keep Your Operations Competitive

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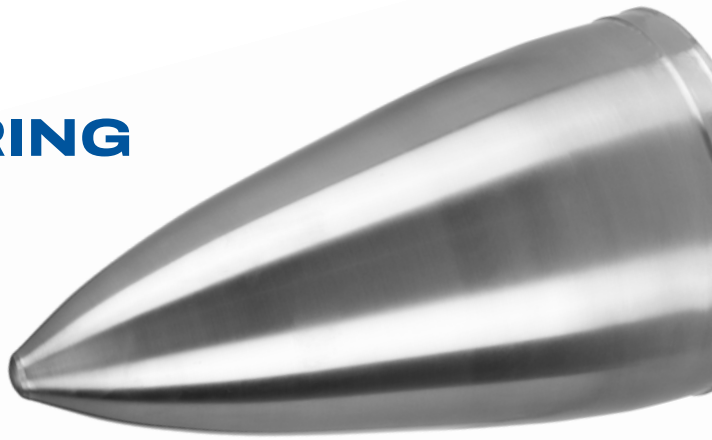
THE CHALLENGE IN MODERN MANUFACTURING



The Need for Efficiency

Manufacturing constantly evolves, demanding leaner and more efficient processes that deliver low costs and high repeatability. While advancements in nonmetallic materials are making strides, traditional metals dominate commercial and aerospace industries due to critical performance requirements.

KEY CHALLENGES

Complex multi-step manufacturing processes, particularly for aerospace components.

Up to 85% material waste in machining symmetrical parts from forged rings.

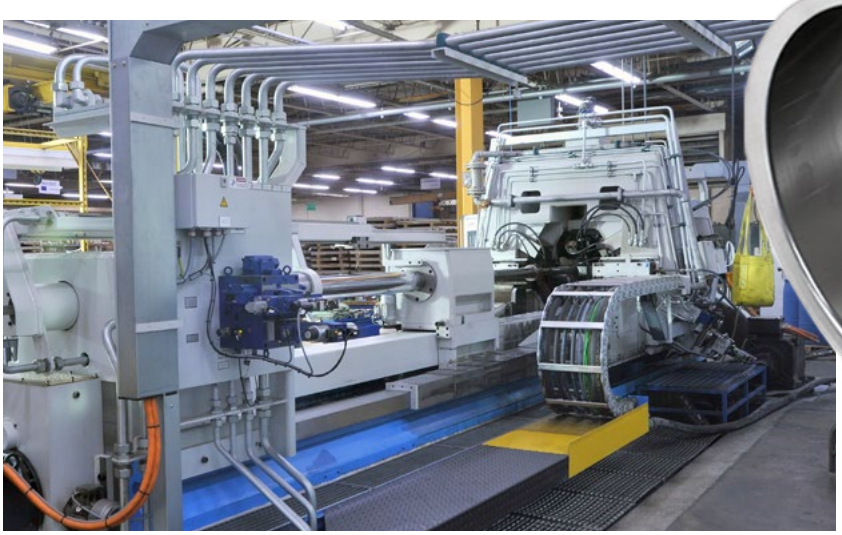
Distortion from welding in multi-piece assemblies.

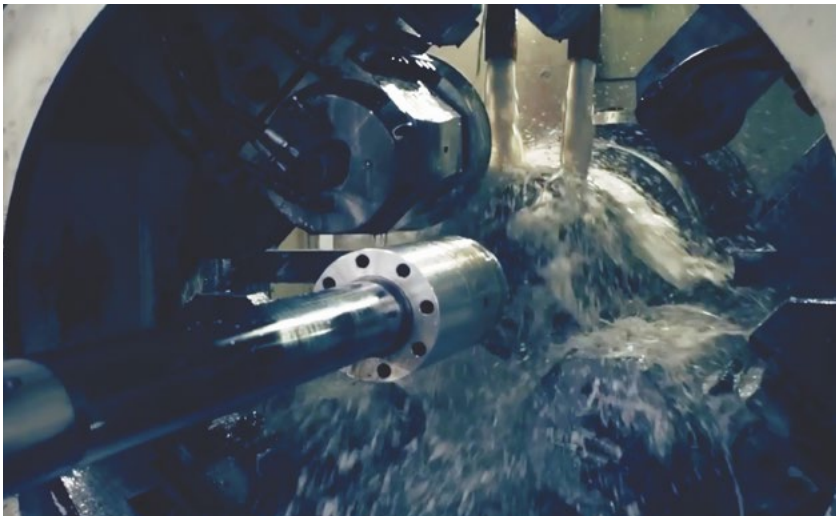
FlowformingPlus™ addresses these challenges by providing a cost-effective, precise, and efficient alternative to traditional methods.

WHAT IS FlowformingPlus™?

FlowformingPlus™ has been used for over 60 years, especially in the aerospace and defense industries. Recent technological advancements have made the process even more efficient and precise, further increasing its adoption.

FlowformingPlus™ is a controlled metal-forming process conducted at ambient temperatures. It creates hollow, thin-walled, symmetrical parts with high precision and minimal material waste.





How It Works

The process involves rotating a preform on a mandrel while compressing it with forming wheels. This enables precise wall thickness control and part geometry without requiring external heat or removing material.

WHY CHOOSE FlowformingPlus™?

Cost Efficiency

- Reduces material waste: Produces near-net shape components.
- Minimizes energy consumption: Requires less energy than traditional methods.
- Lowers testing requirements: Eliminates welds, reducing the need for non-destructive testing.

Material Versatility

- Compatible with metals like:
  - Stainless steels (austenitic, ferritic, and pH grades).
  - Inconel, Hastelloy, columbium.
  - Ideal for materials with at least 15% elongation.

Precision and Control

- Uses CNC technology and computer modeling to:
  - Achieve wall thickness tolerances within thousandths of an inch.
  - Ensure repeatable results without relying on external heating

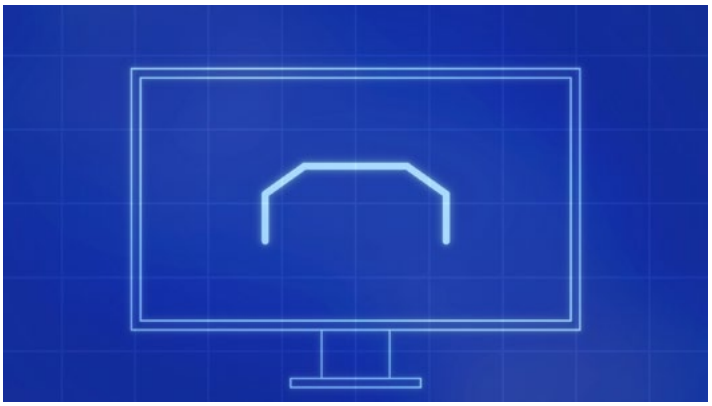
Comparison with Metal Spinning

- Metal Spinning:
  - Utilizes thinner starting materials and larger starting blanks.
  - Requires external heat to maintain malleability, leading to less control.
  - Produces inconsistent wall thickness and profiles.
- FlowformingPlus™:
  - Operates at ambient temperatures, ensuring greater control.
  - Achieves consistent wall thickness and predictable results.

FlowformingPlus™ enables precision manufacturing with unmatched material efficiency.

THE FlowformingPlus™ PROCESS

Step-by-Step Overview

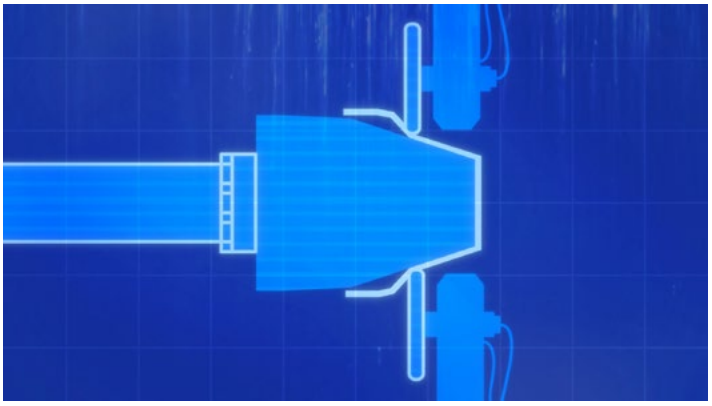


1. DESIGN THE PREFORM

- Reverse-engineer the final part.
- Optimize material volume and shape using advanced modeling tools.

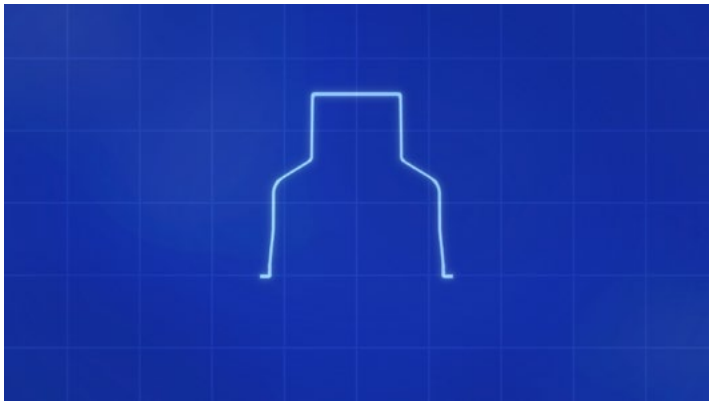
2. CREATE THE PREFORM

- Manufacturing methods include deep drawing, machining, or forging.



3. FORMING THE PART

- Rotate the preform on a hardened mandrel.
- Compress with 2-4 forming wheels.
- Adjust the gap between the wheels and mandrel to control wall thickness.



4. POST PROCESSING

- Apply finishing techniques like reforming or machining as needed.

IDEAL CANDIDATES FOR FlowformingPlus™

Material Considerations

- Good Fit: Metals with elongation of 15% or greater.
  - *Example:* Austenitic stainless steel doubles its strength through cold working. 304-grade stainless steel, for instance, has a tensile strength of 80 KSI in its annealed condition but can reach 160 KSI after FlowformingPlus™ with a 60% reduction in material thickness.
- Not Ideal: Certain titanium alloys or tempered aluminum.

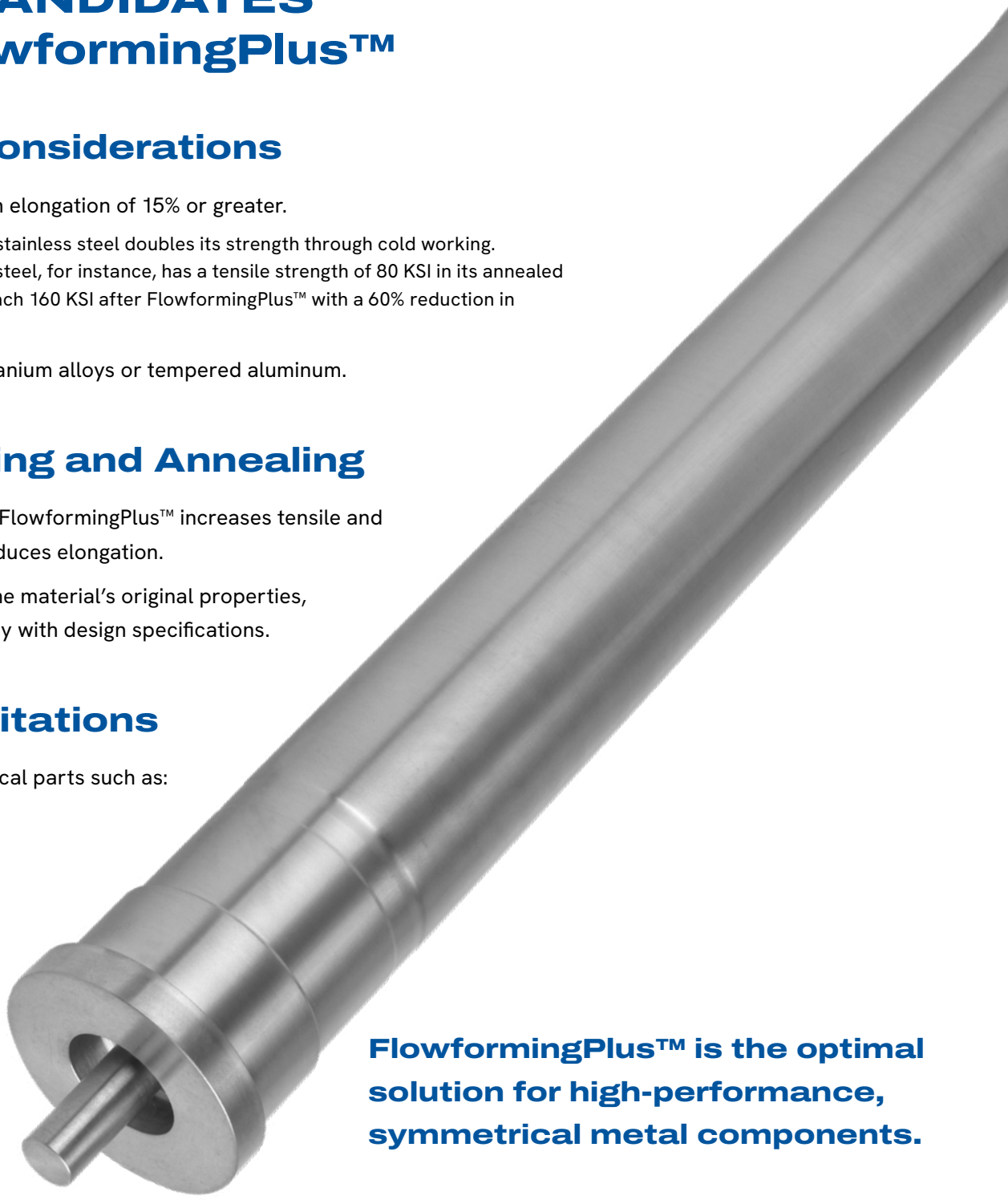
Cold Working and Annealing

- Cold working during FlowformingPlus™ increases tensile and yield strength but reduces elongation.
- Annealing restores the material's original properties, ensuring compatibility with design specifications.

Shape Limitations

Restricted to symmetrical parts such as:

- Tubular components
- Conical shapes



FlowformingPlus™ is the optimal solution for high-performance, symmetrical metal components.

WHY FlowformingPlus™ IS A VIABLE ALTERNATIVE

For Complex Designs

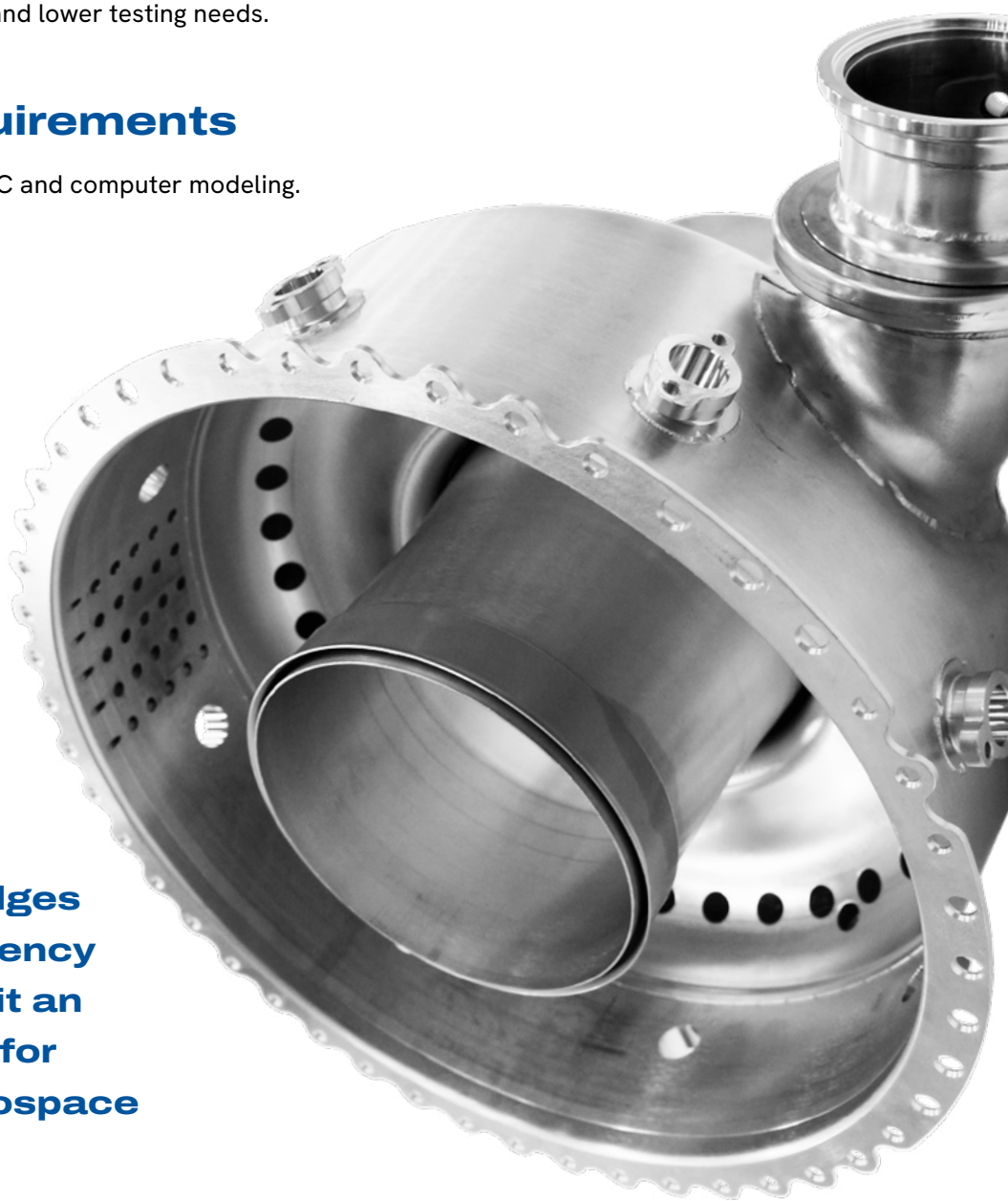
Seamless solutions for thin-walled, cyclical, contoured components.

For Cost-Conscious Operations

Minimal waste, reduced energy usage, and lower testing needs.

For Precision Requirements

Predictable, repeatable results with CNC and computer modeling.



FlowformingPlus™ bridges the gap between efficiency and precision, making it an indispensable method for industries such as aerospace and defense.

MORE THAN A MANUFACTURING PROCESS

With its ability to create seamless, high-performance components while minimizing waste, FlowformingPlus™ is a cornerstone technology for aerospace, defense, and beyond. By addressing traditional manufacturing inefficiencies and offering unparalleled control over material properties, FlowformingPlus™ ensures that operations remain competitive in an ever-evolving industry.

Learn more at PMFInd.com.