



Creating flexible solutions that last.



Hyspan Corporate Group



HYSPAN PRECISION PRODUCTS, INC.

HYSPAN de MEXICO



FLEXIAL CORPORATION



FLEXIBLE METAL, S.R.O., Prague

FLEXIBLE METAL, INC. Tucker GA

FLEXIBLE METAL, INC. Hamburg MI

FLEXIBLE METAL MEXICO



UNIVERSAL HOSE & BRAID



Global Footprint



North America

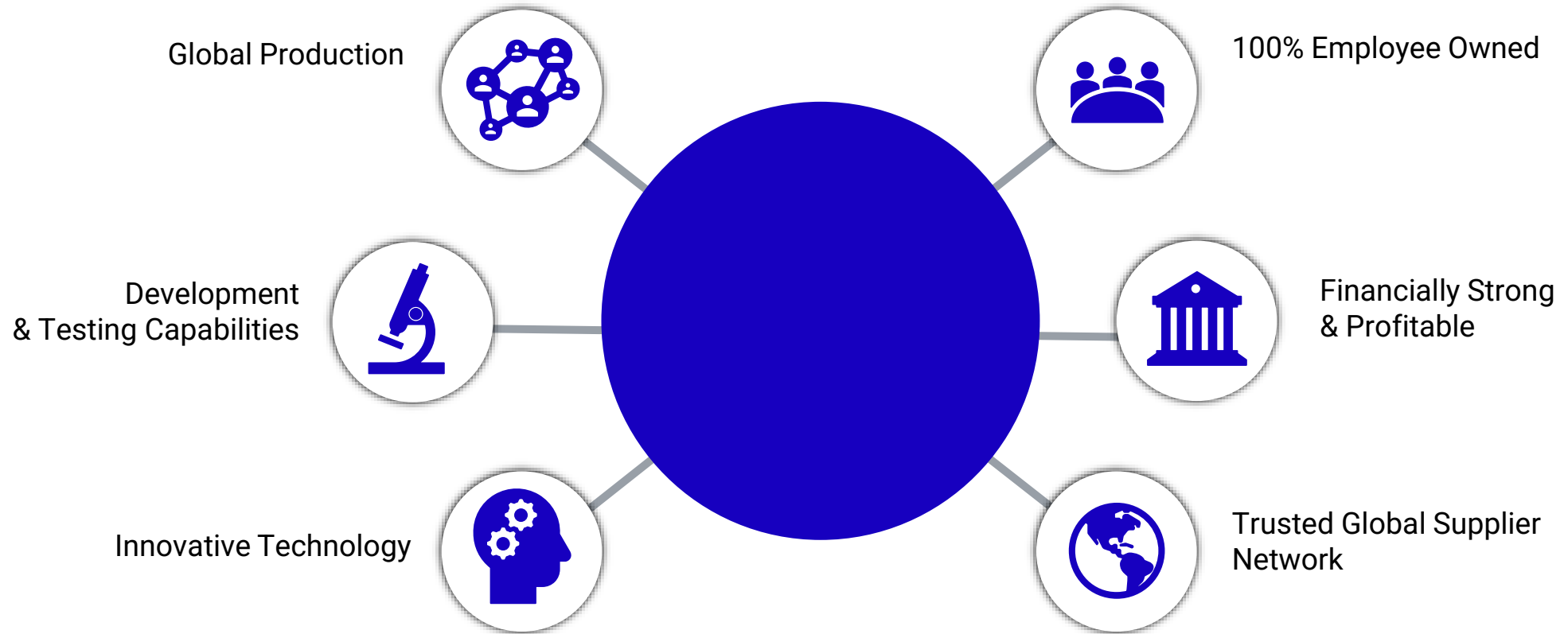


Europe



China

Overview of Flexible Metal



Employee Stock Ownership Plan

In 2017, an ESOP was established as an employee benefit plan that gives workers ownership interest in the company.

Because our employees have stake in our company's success, quality & customer service are our #1 priorities.

When our customers win, we win!

ESOP companies account for over half of Fortune Magazine's "100 Best Companies to Work for in America"*

*Source: www.esop.org

Flexible Metal Solutions

- Bellows
- EGR Tubes
- Oil Lines
- Exhaust Tubes
- Exhaust Manifolds
- EV Coolant Drop Tube



A Trusted Partner To Industry Leaders



Markets



Automotive



Power Generation



On-Highway



Off-Highway



Hydrogen



EV

Innovative Solutions Start Here

Co-developed source control specification and design for:

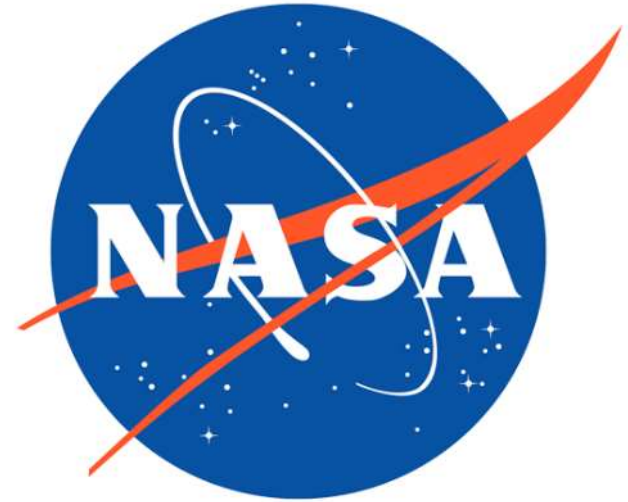
- NASA's Advanced Recycle Filter Tank Assembly
- Parker HSD A350 High Pressure Braking Accumulator
- Ratier Figeac C-Series High Pressure Accumulator

Technical contributor to NASA Marshall Space Flight Center
best practices & guidelines

A350 High Pressure Braking Accumulator compliance to fracture
critical hardware per NASA-STD-5019

First bellows vendor to supply and qualify all-titanium EHA for
Parker Irvine F-35 EHA program

Reviewer and technical contributor to SAE International



PROBLEM

Managing heat
within an
exhaust system.

SOLUTION

Created vacuum-sealed
insulation barrier on exhaust
manifold.



PROBLEM

Optimized design called for bellows at the bend.

SOLUTION

Engineered a high/low convolution bending solution.

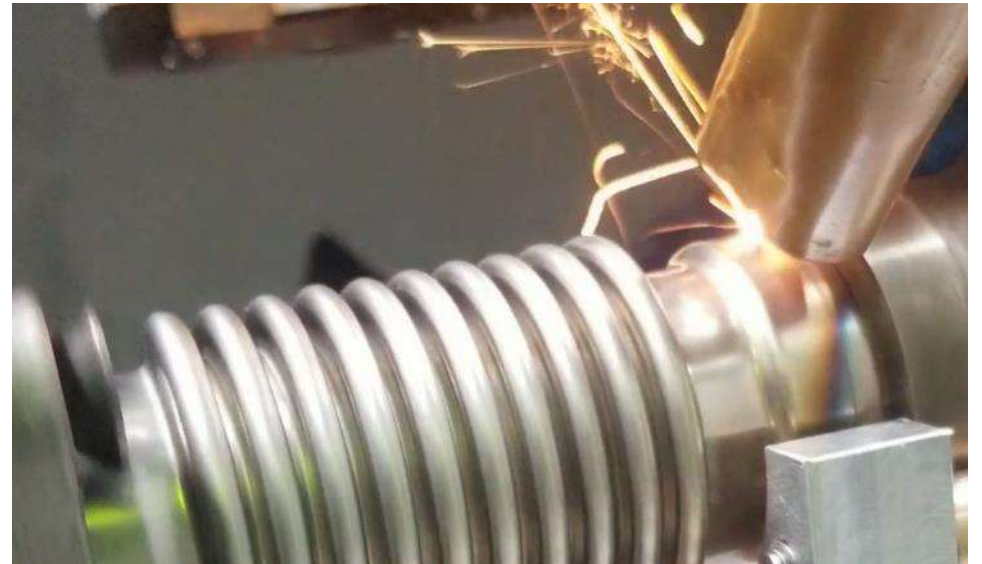


PROBLEM

Needed a strong,
economical
welding solution.

SOLUTION

Developed low-cost laser
welding manufacturing process.



PROBLEM

Wanted to have a better way divert more exhaust gas back into the system.

SOLUTION

Patented a “scoop” design that redirected a certain amount of exhaust back into the system.

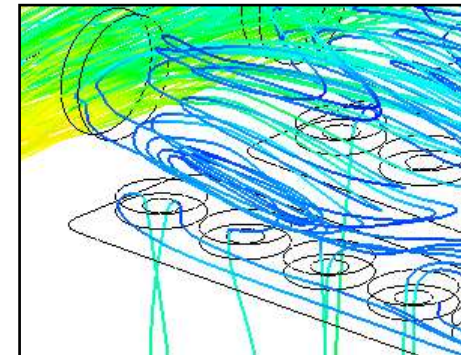


PROBLEM

Needed to improve flow distribution in manifold and tube configuration in fuel cell.

SOLUTION

Redesigned internal geometry to optimize flow and heat transfer performance.

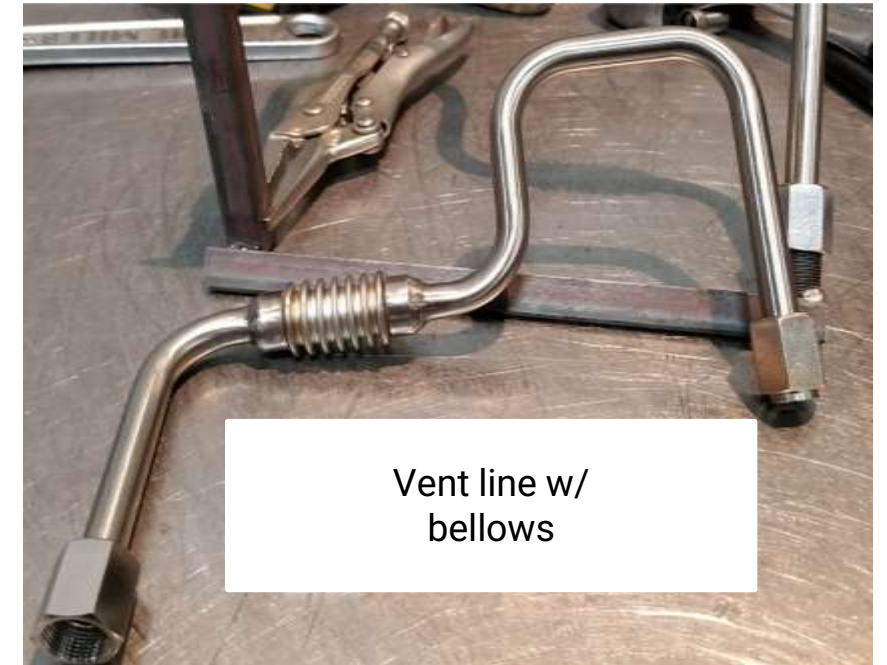


PROBLEM

Manufacturer needed to adjust a vent line for installation tolerance and working operation.

SOLUTION

A bellow compensator was fit into the vent line pipe to allow flexibility.



Vent line w/
bellows

PROBLEM

CONFIDENTIAL

SOLUTION

Needed a lightweight option for turbocharger housing.

Current turbocharger system was too loud.

Needed a way to insulate a tube with a bellows.

Wanted better efficiency for particular application.

Used a thin, dual-wall fabricated option with a lightweight material that could withstand the high heat.

Developed a design that could reduce noise at certain frequencies.

Co-created air gap insulation used in tubes for global truck manufacturer.

Developed proprietary sealing methodology to give more high-pressure cycle life to bellows.

PROBLEM

CONFIDENTIAL

SOLUTION

Needed mechanism to lock and seal drop tube in place at battery spigot.

Manufacturer needed to lower costs on Methanol reformer.

Developed patent-pending serviceable locking mechanism & seal.

New, more efficient design was engineered and validated through FEA by FMI.

Partnering With Flexible Metal

"We have no other supplier that can turn around data this fast, outstanding engineering support."

**Lead Engineer
MAN Trucks & Bus**

"Your technical competence and creative insights are most appreciated, respected, and recognized."

**Technical Engineer Expert
Ford Motor Company**

"I have let the purchasing team know how impressed my team is with FMI and I am really pushing them to bring you on board for all new RFQs."

**Supervisor - EGR Systems
Ford Motor Company**



Capabilities

Development & Engineering

Global Manufacturing

Program Management

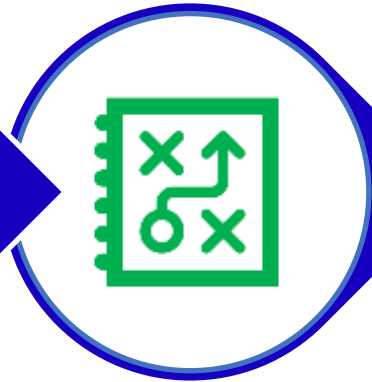
Quality Assurance

Flexible Metal's Design Process

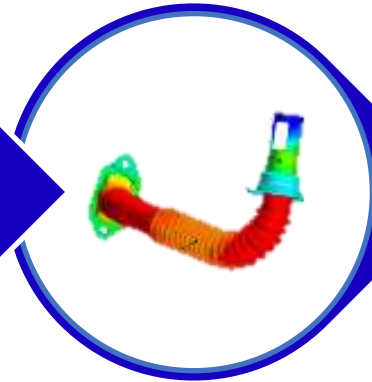
Discovery
Conversations



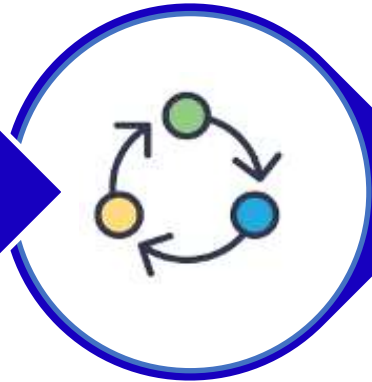
Problem
Identification



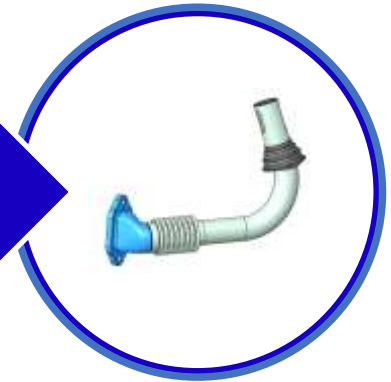
Initial
Concept



Design
Improvement



Design
Optimization



Capabilities

Development
& Engineering

Global Manufacturing

Program Management

Quality Assurance

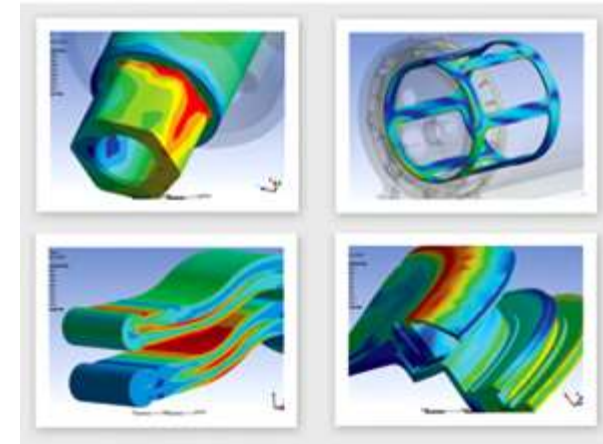
Testing & Analysis

With data-backed designs and concepts validated against real-world scenarios and applications, risks are minimized to protect against defects and other system failures.

Thermal & Modal
Analysis

Design Analysis
via CFD/FEA

Hot Vibration Testing



Capabilities

Development & Engineering

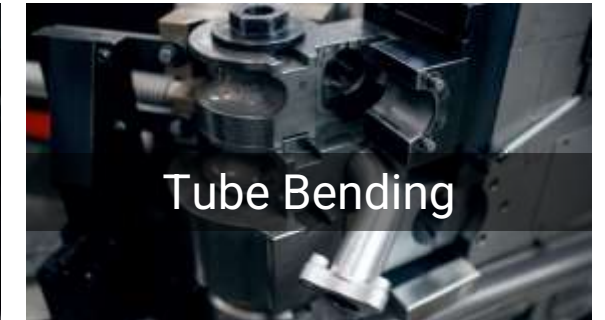
Global
Manufacturing

Program Management

Quality Assurance

Manufacturing is located in

- Tucker, Georgia, USA
- Hamburg, Michigan, USA
- Prague, Czech Republic
- Querétaro, Mexico



Capabilities

Development & Engineering

**Global
Manufacturing**

Program Management

Quality Assurance

Material Family	Ferritic			Austenitic					Inco Alloys			
Material Name	<u>409</u>	<u>439</u>	<u>18CrCb</u>	<u>304L</u>	<u>321</u>	<u>316L</u>	<u>309S</u>	<u>310S</u>	<u>864</u>	<u>601</u>	<u>625</u>	
Formability	B	C	D	A	A	A	A	B	B	B	C	
% Elong.	36	35	25	60	55	50	45	43	45	58	47	
YS (ksi) @ 1600F	2.4	2.6	4.2	10.0	10	16.0	16.6	16.1	18	20	36	
Max Oxid. Temp (F)	1600	1600	1650	1600	1600	1600	1900	2000	1800	2200	1900	
Max Oxid. Temp (C)	871	871	900	871	871	871	1038	1093	982	1204	1038	
TUBE												
Max Usage Temp (F)	1550	1600	1650	1600	1650	1650	1800	1900				
Max Usage Temp (C)	843	871	900	871	900	900	982	1038				
BELLOWS												
Max Usage Temp (F)	<i>Very application dependent - choose low cost material options 1st</i>			1470								2190
Max Usage Temp (C)				← 800 →								1200
Thermal Exp. Coef. @ 1600F in/in/Fx10 ⁻⁸	7.6	7.0	7.0	11	11.3	11.1	11	10.7	9.6	9.5	8.8	
% Ni	0.2	0.2	0.2	10	10	12	13	20	34	60	62	
% Cr	11	17	18	19	18	17	23	25	21	23	22	
Cost	Low	→										High

Capabilities

Development & Engineering

Global
Manufacturing

Program Management

Quality Assurance

TUCKER, GA USA

INDUSTRIES

- Heavy duty vehicles
- On-highway
- Gen-tech
- Agriculture vehicles

CAPABILITIES

- Hydroforming
- Tube bending
- Tube forming
- Tube milling
- MIG/TIG welding

CORE CUSTOMERS

- Volvo Group
- John Deere
- Caterpillar

PRODUCTS

- EGR
- Oil lines
- Exhaust tubes

VIDEO



Capabilities

Development & Engineering

Global
Manufacturing

Program Management

Quality Assurance

Hamburg, MI USA

INDUSTRIES

- Automotive
- Military
- Marine
- Railway
- EV

CAPABILITIES

- Tube bending
- Tube forming
- Hydraulic press forming
- MIG/TIG welding

CORE CUSTOMERS

- GM
- Stellantis
- Navistar
- Detroit Diesel
- Renk America

PRODUCTS

- EGR
- Oil lines
- Exhaust tubes
- Fabricated exhaust manifolds

VIDEO



Capabilities

Development & Engineering

Global
Manufacturing

Program Management

Quality Assurance

Prague, Czech Republic

INDUSTRIES

- On-highway
- Automotive

CORE CUSTOMERS

- Volvo Group
- Stellantis

CAPABILITIES

- Hydroforming
- Tube bending
- Tube forming
- Heat shield forming
- MIG/TIG welding
- Laser welding

PRODUCTS

- EGR
- Oil lines
- Exhaust tubes

VIDEO



Capabilities

Development & Engineering

Global Manufacturing

Program
Management

Quality Assurance

From design concept to production, our engineering experts collaborate with you through the most stringent requirements to design a system that lasts.

What you can expect from Flexible Metal:

- Fast, knowledgeable communication
- Data-backed designs for real-world application
- World-class engineering & customer support
- Collaborative workspace for instant updates
- Global manufacturing capabilities

Capabilities

Development & Engineering

Global Manufacturing

Program Management

Quality Assurance

Flexible Metal is
100% employee owned.

That means each member of our team is
committed to your success.

We adhere to the industry's most strict
regulations to provide you with
quality solutions you can trust.



Request a Sample



- 1 Scan QR code with cell phone
- 2 Enter name & shipping address
- 3 Enter email to receive tracking information



Thank you for
your attention.

FLEXIBLE
METAL

