

## Case Study

# Press Fitting Components for Gas Application

A Press Fitting Component for Water Applications is Transformed into a Robust Gas Press Fitting Design

## Challenge

*Design a rubber seal for gas press fittings that'll last 50 years and comply with stringent global regulations.*

A long-standing Minnesota Rubber & Plastics customer wanted to extend its current press fittings products with a new line for the gas market. We had previously designed a press fitting seal that provided a resistance force during assembly, which gives the plumber tactile feedback during the insertion process. This friction restricts the fitting from coming apart prior to pressing [Figure 1].

The customer now wanted these same features on a new line of natural gas and liquid petroleum gas fittings, which called for a new compound formulation. These new features make it easier to detect leaks and help techs properly check all system fittings. The unique design automatically rotates the seal for the plumber to prevent the sealing surface from coming into contact with the seal parting line.

The challenge was formulating a new compound in our advanced materials lab to resist chemical and physical degradation caused by a wide range of fuels and gases.

## Solution

*A custom HNBR formulation that withstands high pressures and temperatures.*

To develop and select the perfect compound for this application, Minnesota Rubber & Plastic's advanced materials lab researched the regulatory requirements and material performance targets. Based on these findings, we chose HNBR as the base compound.

During step two, we optimized the HNBR compound to withstand the client's rigorous compression set resistance requirement, as well as heat and chemical resistance. Additionally, to meet the customer's color requirement, we produced the compound in yellow, which signals to plumbers and inspectors that the correct fittings were installed [Figure 2].

With rubber seals manufactured using the new compound, compression set was tested and exposed at temperatures of 100°C and 150°C, and produced lower compression set test results than competitors. These higher values resulted in:

- Longer sealing force retention
- Longer seal life
- Enhanced safety

What's more, at low temperatures, the elastic modulus maintained its flexibility and sealing performance.

## Results

*A "bullet-proof" seal helped make a press-to-connect fitting the best on the market.*

Extensive customer and regulatory agency testing took place to certify the fittings and HNBR seals, which helped our customer go to market with a more cost-effective competitive offering.

Passed regulatory tests included CSA LC4, (1000°C sealing) and DIN EN 549. Based on client feedback, our customer's new product's ultimate success is due to close collaboration between both companies, an innovative fitting design, and a robust seal that'll last a half-century.

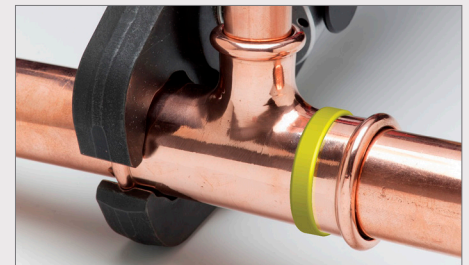


Figure 1. Copper Press Fitting being crimped.



Figure 2. Yellow HNBR and Black EPDM Press Fitting O-Rings of various sizes.

Physical properties	MRP's C2536YH	HNBR Competitor
Micro-Hardness Type M, IRHD	64.4	70.1
Compression Set Resistance, 22 hours @ 100°C, %	11.2	21.4
Compression Set Resistance, 22 hours @ 150°C, %	18.4	60.6
Elastic Modulus at 0°C (MPa)*	13.4	18.3
Elastic Modulus at -20°C (MPa)*	24.8	60.8
Elastic Modulus at -30°C (MPa)*	100.4	264.5
Tg per DMA (°C)*	-40.4	-34.9
Color	Yellow	Yellow

\* DMA Settings: 1.0°C/minute heating rate from -100°C to +100°C at 10Hz with 0.7% dynamic strain with a static/dynamic ratio of 1.5

## Quick Answers & Results

Minnesota Rubber & Plastics has extensive technical expertise for designing and manufacturing critical sealing components used in niche applications across multiple industries. Engineers like to work with us because they get quick answers and results.

## Areas of Expertise

- Rubber and LSR molding
- High-performance bonding and overmolding – plastic to metal or plastic, rubber to metal or plastic
- Custom material formulation
- Injection molding of engineered and high-performance plastics
- Ability to automate as volume requires
- Component and system assembly
- Custom designed seal geometry
- Metal to plastic conversions

## Comprehensive Engineering and Manufacturing Capabilities

Minnesota Rubber & Plastics specializes in formulating, designing, manufacturing and assembling rubber, silicone, and high-performance thermoplastics for discerning customers in gas, water, food and beverage markets.

Here are just a few of our comprehensive engineering and manufacturing capabilities:

- Preliminary engineering assistance and mechanical design review
- Materials engineering, including specialty compounds
- Extensive analytical and instrument laboratory for development and failure analysis
- Design for Manufacturability (DFM)
- Process engineering, including mold flow analysis, functional and leak testing
- Non-linear FEA

**Contact us to learn how we can help you solve your toughest technical challenges for your gas, water, food and beverage applications.**

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**For more than 70 years, Minnesota Rubber & Plastics has helped world-class organizations solve the most difficult sealing and component challenges.**

We develop highly engineered, critical-to-function custom molded solutions for the Medical, Transportation, Water, and Food & Beverage markets.

We can support our customers wherever they do business – and our global footprint spans North America, Europe and Asia.

