

Case Study

A New Material and Design for Umbrella and Bell Valves with Excellent Elongation to Break

Challenge

Redesign and manufacture umbrella and bell valves to operate longer without breaking and improve sealing performance.

Our client wanted us to create a custom elastomer material for umbrella and bell valves leading to a more robust version of existing critical pump sealing components. At the same time, we would develop the material and manufacture the valves from our design facility in China, close to our client's manufacturing operations.

The client was eager to have an alternate supplier located in Southern China in addition to its current local supplier. The new compound is an ideal candidate to manufacture using highly efficient vertical injection processes.

We also needed to improve the umbrella valve's sealing performance, which would require a refined design and a new mold.

Solution

Created a new advanced material and part design that significantly improves elongation to break performance.

Since our customer had manufacturing facilities near our China operations, we tapped our nearby advanced materials group to create the valves' new compound. Additionally, this group led the redesign of the part to improve sealing performance by enhancing surface topography.

Our tooling engineers improved demolding efficiency and reduced production costs. The new material also had to be more robust than previous parts.

Production molds for both the bell and umbrella valves were made up of several small groups, making it easy to replace molds and reduce mold costs. For high-volume part runs, low-cost replacement molds help to scale production efficiently and economically.

Finally, it's easy to control mold accuracy and provide a stable parts supply because of the parts' small size.



Results

Better valve sealing performance; elongation to break achieves 662%.

To meet the customer's requirements to improve the umbrella valve's sealing performance, MRP developed a processing technology to achieve surface topography that enhances sealing performance. Additionally, the mold design improved pump performance by increasing the umbrella valve's ability to seal onto the mating surface. Even the smallest efficiency gains with these valves have a substantial impact on overall pump performance. Elongation to break tests would later confirm the new material with 662% elongation, a critical improvement. Having the ability to develop and manufacture our customer's parts in China was critical for them as they expand their footprint in this part of the world. This proximity improved efficiencies, took less time and lowered costs.

Quick Answers and 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 to 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.

