Minnesota Rubber & Plastics
Quadion LLC

Case Study

New material formulation for point-of-care diagnostics

Rapid response to urgent COVID-19 patient needs with a seal that meets strict chemical and mechanical requirements.

Challenge

Design a seal for a point-of-care (POC) test that tolerates extended chemical exposure.

POC tests are often used to rapidly diagnose infectious diseases like COVID-19. They provide results within minutes, enabling health care professionals to make quick decisions regarding patient care. The POC test uses a seal to control the release of reagent during operation, eliminating the need for complex fluid handling systems.

An existing Minnesota Rubber & Plastics customer was developing a new POC test device. The material they were using for their seal was breaking down when exposed to their proprietary chemical reagent and was unable to meet the product's long-term aging requirement. Not only that, but the seal was also failing to withstand the mechanical stresses placed upon it during operation.

The customer turned to our experts to redesign their seal geometry with a new compound formulation that would be compatible with their reagent and meet the mechanical needs of their testing cycle.

Solution

A custom formulation and seal geometry that withstands chemical and mechanical stress.

The Minnesota Rubber & Plastics Advanced Material Group (AMG) began work by finding an existing formulation that closely matched the requirements of the customer's application. With over 1,000 proprietary compounds in the AMG library, they were able to immediately accelerate the project by quickly finding a compound that closely met the customer's needs.

Using the library formulation as a base, a custom compound was developed that was highly resistant to the chemistry of the customer's proprietary reagent. The AMG team's experience with the unique challenges of diagnostic reagent chemistry helped ensure a smooth development process. The team's internal testing capabilities were put to work, subjecting the new compound to a battery of tests and failure analysis to help find the right formulation and durometer for the customer.

With the new compound in hand, the customer's seal geometry was redesigned to handle the mechanical stress of the device in operation. Taking it a step further, a second compound was developed by the AMG team to further optimize the seal performance. This second compound improved ease of assembly and long-term wear while reducing friction within the device's prefilled chamber.

Results

A seal that satisfied the customer's needs, improving patients' lives in the US and EU, and responds to the COVID-19 Pandemic.

Leveraging the AMG formulation library, along with the team's development and testing capabilities, Minnesota Rubber & Plastics was able to deliver a solution that delivered a solution that surpassed customer expectations on functionality, delivery, and financial value.

The new compound and seal geometry easily withstood the customer's reagent and the mechanical stresses placed on it during operation. The customer would go on to secure emergency use authorization (EUA) and later CE Mark approval for their device. The device is currently used as a diagnostic device for COVID-19 detection, and for other infectious disease applications.

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.

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 medical device challenges.

Minnesota Rubber & Plastics
1100 Xenium Lane N
Minneapolis, MN 55441

USA: 1 (800) 927-1422
Asia: +86-512 6273 2700
Europe: +33 (0)2 32 22 24 26
mnrubber.com
customerservice@mnrubber.com

@mnrubber
minnesota-rubber-and-plastics

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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.