# ADVANCING ELASTOMER SEAL SOLUTIONS FOR THE PRESSURISED METERED DOSE INHALER MARKET

**Nathan Sowder** of **Parker O-Ring & Engineered Seals Division** discusses the company's role and history in providing advanced elastomer seals and components to the drug delivery industry, with a particular emphasis on pressurised metered dose inhalers.

The pressurised metered dose inhaler (pMDI) market remains a vital segment of respiratory drug delivery, providing critical treatment to millions of patients worldwide with asthma, chronic obstructive pulmonary disease and other respiratory conditions. Parker has manufactured seals to support the pMDI market since 1956 (Figure 1), delivering reliable, high-performance solutions tailored to the stringent demands of pMDI applications, and has established a long-standing tradition of quality, innovation and customer commitment that continues to drive its leadership in the industry today.

Figure 1: Precision-cut seal and O-rings for use with pMDIs.

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## THE CRITICAL ROLE OF ELASTOMER SEALS IN pMDIs

Elastomer seals are fundamental to the performance and safety of pMDIs. Their key functions include:

- **Consistent Dose Delivery:** Elastomer seals prevent leakage of both medication and propellant, ensuring that each inhaled dose is accurate and effective
- **Device Integrity:** These seals withstand harsh chemical exposure from propellants and resist environmental stresses, such as temperature fluctuations and mechanical wear
- **Patient Safety:** The elastomers used in pMDIs must meet rigorous biocompatibility standards and comply with stringent regulatory requirements, safeguarding patient health.

## KEY CHALLENGES IN ELASTOMER APPLICATIONS FOR pMDIs

The evolving landscape of pMDI propellants and device designs presents several technical challenges for elastomer seals:

- **Chemical Compatibility:** Seals must be able to resist aggressive propellants such as hydrofluorocarbons (HFAs) and adapt to emerging low global-warming-potential (GWP) propellants, such as HFA-152a and HFO-1234ze. This requires advanced material formulations that maintain integrity without degradation or swelling over time.

- **Gas Permeability:** Minimising permeation of propellant gases through elastomer seals is crucial to preserving drug potency, ensuring dose accuracy and meeting environmental regulations aimed at reducing greenhouse gas emissions.

- **Compression Set Resistance Over Time:** Elastomers must maintain elasticity and sealing force over their entire product shelf life, resisting permanent deformation (compression set) that could compromise seal integrity during storage and use, leading to leakage or device failure.

## PARKER'S PROPRIETARY COMPOUNDS AND GLOBAL MANUFACTURING EXCELLENCE

Parker's leadership in pMDI sealing solutions stems from its deep expertise in material science and its ability to innovate, develop and mix proprietary elastomer compounds. The company's advantages enable it to offer:

- **Tailored Material Formulations:** Parker's in-house compound development capabilities enable it to customise elastomer properties for optimal chemical resistance, permeability and durability, meeting mechanical and regulatory requirements. Additionally, its materials are optimised for multiple manufacturing processes, enabling personalised designs that provide optimal component sealing solutions, including extrusion, splicing, injection or compression moulding.

"PARKER'S IN-HOUSE COMPOUND DEVELOPMENT CAPABILITIES ENABLE IT TO CUSTOMISE ELASTOMER PROPERTIES FOR OPTIMAL CHEMICAL RESISTANCE, PERMEABILITY AND DURABILITY, MEETING MECHANICAL AND REGULATORY REQUIREMENTS."

- **Consistent Quality Control:** By manufacturing proprietary compounds in its own facilities, Parker can ensure stringent quality controls and batch-to-batch consistency.

- **Innovation for Emerging Propellants:** Parker is actively developing next-generation compounds specifically designed for compatibility with new low-GWP propellants, such as HFA-152a and HFO-1234ze. These materials promise best-in-class performance in permeability, chemical resistance and compression set resistance, providing future-proof sealing solutions.

- **Global Manufacturing Footprint:** With strategically located production sites spanning North America, Europe and Asia, Parker provides supply chain resilience, rapid response to market demands and regional regulatory compliance.

## THE FUTURE OF pMDI SEALING TECHNOLOGY

As drug formulations and propellants evolve for pMDI delivery, sealing materials often require tailored modifications to maintain their compatibility and performance. By drawing on its sealing application engineering expertise, Parker can compress development timelines and deliver designs optimised for efficient manufacturing.

Furthermore, as the pharmaceutical industry accelerates its transition to environmentally sustainable pMDI propellants, the demand for advanced sealing materials that can meet evolving regulatory and performance requirements will only grow. Parker is committed to leading this innovation curve by delivering

elastomer seals that not only meet today's rigorous standards but also anticipate the challenges of tomorrow's drug delivery technologies.[1]

## PARKER'S 70-YEAR LEGACY OF EXCELLENCE

With a legacy spanning over 70 years, Parker combines material science expertise with manufacturing excellence to deliver elastomer seals that meet the highest standards of the pMDI market. The company's commitment to innovation and sustainability positions Parker as a trusted partner in advancing respiratory drug delivery solutions worldwide, delivering reliable and high-performance solutions tailored to the stringent demands of pMDI applications.

## REFERENCE

1. *Ewing D, "Next-Generation Propellants for pMDIs: Seal Material Challenges and Sustainable Alternatives to P-134a". Web page, Parker, accessed Oct 2025.*

**"FURTHERMORE, AS THE PHARMACEUTICAL INDUSTRY ACCELERATES ITS TRANSITION TO ENVIRONMENTALLY SUSTAINABLE pMDI PROPELLANTS, THE DEMAND FOR ADVANCED SEALING MATERIALS THAT CAN MEET EVOLVING REGULATORY AND PERFORMANCE REQUIREMENTS WILL ONLY GROW."**

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