

Sealing Materials for Construction Equipment: Engineering Reliability in Harsh Environments

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Executive Summary

Hydraulic systems are the backbone of construction machinery, powering critical operations such as lifting, digging, and compacting. In these demanding environments, sealing components must perform flawlessly to ensure safety, efficiency, and uptime. This white paper explores how advanced sealing materials—such as **thermoplastic polyurethane, co-polyesters** and PTFE composites—address the unique challenges of construction applications, with insights into Hallite's engineering solutions.

Industry Overview

Construction sites expose equipment to abrasive contaminants, extreme temperatures, and high mechanical loads. Hydraulic systems must maintain integrity under high-pressure cycles, vibration, and exposure to dust, water, and chemicals. **Material selection is critical to ensuring seals perform reliably under these conditions, minimizing downtime and maximizing operational efficiency.**



Material Technologies & Performance Criteria

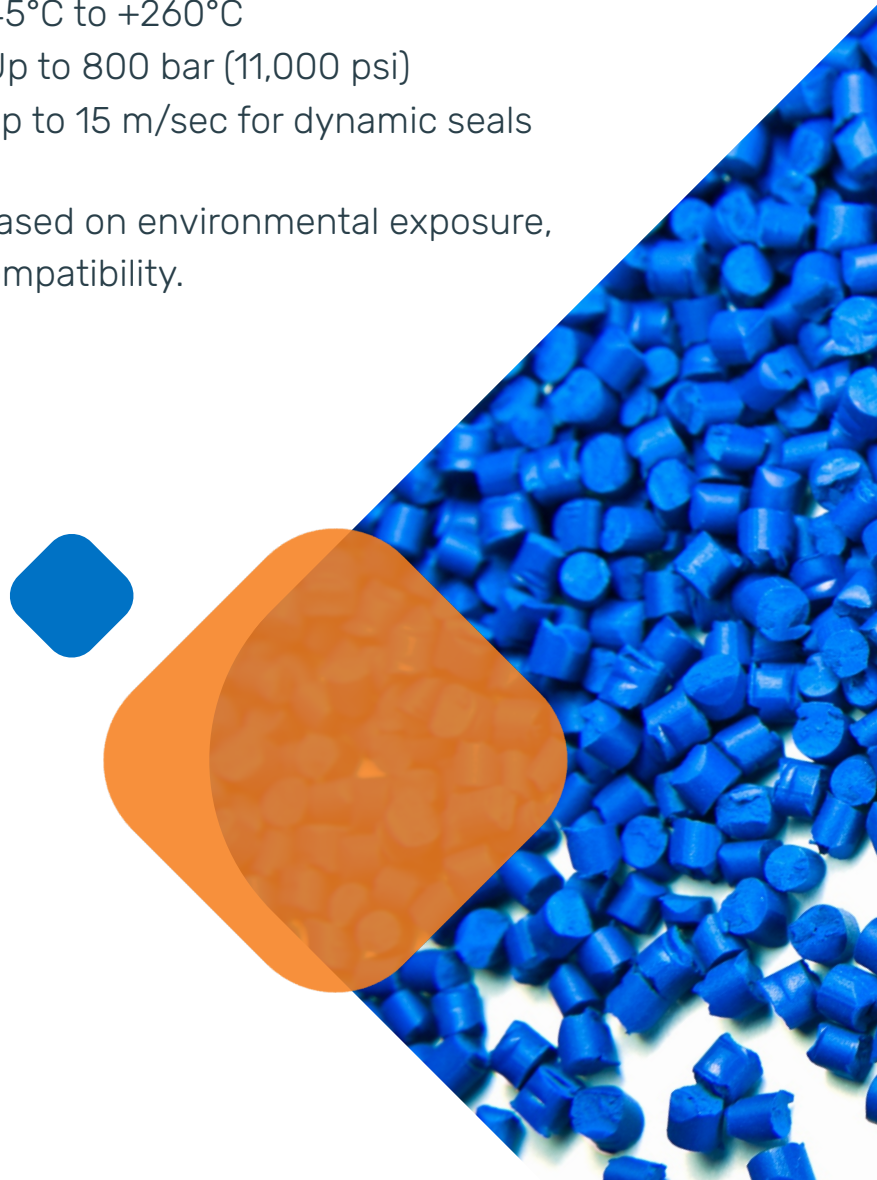
To meet the rigorous demands of construction, sealing components are engineered from high-performance materials such as:

- **Armorlene® PTFE:** Low friction, high wear resistance, and chemical compatibility
- **Hythane® TPU:** Tough, flexible, hydrolysis-resistant
- **Rubber-Fabric Composites:** Excellent extrusion resistance and shock absorption
- **Thermoplastic Elastomers (TPE):** Ideal for high-pressure, high-temperature sealing

Performance Characteristics:

- **Temperature Range:** -45°C to +260°C
- **Pressure Resistance:** Up to 800 bar (11,000 psi)
- **Speed Compatibility:** Up to 15 m/sec for dynamic seals

These materials are selected based on environmental exposure, mechanical stress, and fluid compatibility.



Applications Across Construction Equipment

Sealing materials are deployed across a wide range of equipment, including:

- Excavators and backhoes
- Cranes and telehandlers
- Dump trucks and tippers
- Skid steers and loaders
- Road pavers and compactors

Seal Types and Functions:

- **Rod Seals:** Prevent fluid leakage and contamination
- **Piston Seals:** Maintain pressure integrity
- **Wipers:** Protect systems from dirt and moisture
- **Bearings/Wear Rings:** Guide moving parts and absorb side loads



Case Study 1:

Hallite CT Seal in Crane Cylinders

The Hallite CT seal—engineered for high-pressure applications—is used in crane cylinders and mining equipment where holding position without drift is critical. Its robust design ensures pressure retention and minimises leakage, even under fluctuating loads and harsh environmental conditions.

Case Study 2:

Hallite 864 Wiper in Telehandlers

The Hallite 864 wiper, constructed from advanced polyurethane, is designed to prevent contamination in hydraulic systems. In telehandlers, it effectively removes dirt and moisture from the rod surface, maintaining system integrity during rapid directional changes and pressure spikes. Its durability and compatibility with various operating conditions make it ideal for construction environments.

Operational Benefits & Strategic Value

Optimizing sealing materials for constructed applications leads to:

- **Extended Service Life:** Reduced wear and maintenance
- **Improved Efficiency:** Lower friction and better fluid retention
- **Enhanced Safety:** Reliable sealing prevents system failures
- **OEM Compatibility:** Available in metric and inch sizes, fits ISO grooves

In construction, where equipment failure can halt entire operations, material selection for sealing components is a strategic decision. By aligning material properties with environmental and mechanical demands, engineers and procurement teams can ensure long-term reliability, safety, and cost-effectiveness.

Disclaimer: Performance characteristics such as temperature range, pressure resistance, and speed compatibility are indicative and may vary depending on specific product, application conditions, system design, and operating environment.

