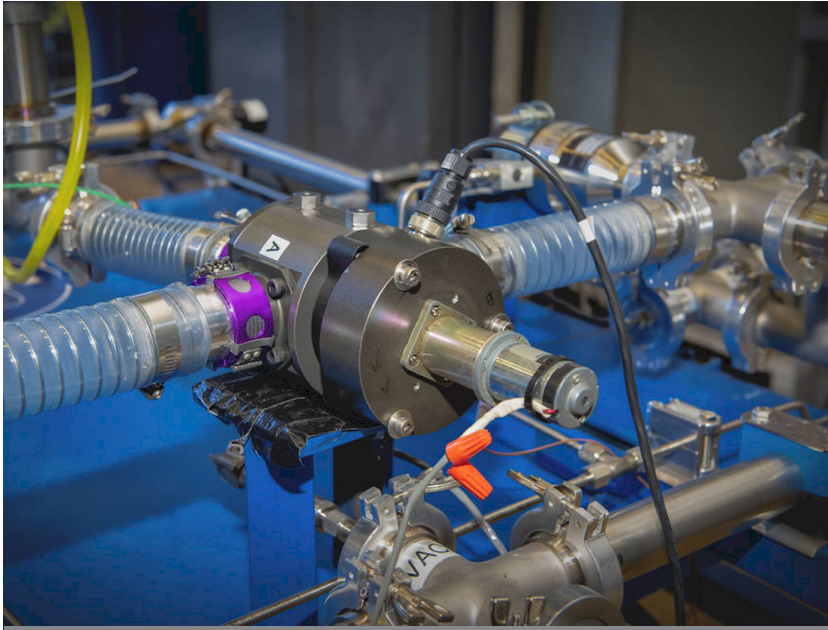


TECHNOLOGY SOLUTION

Mechanical and Fluid Systems



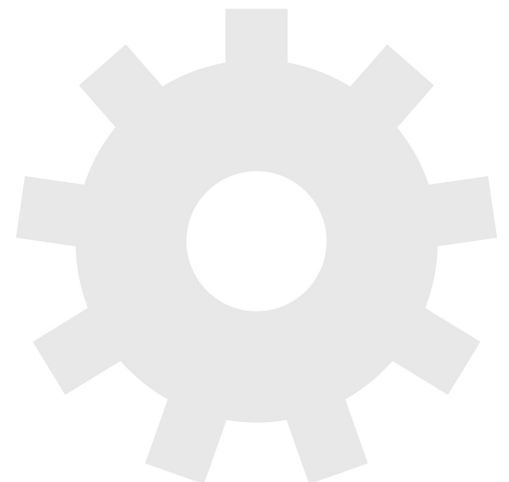
Debris-Tolerant Valve

For Use in Environments with Substantial Dust or other
Contaminants

Innovators at NASA's Marshall Space Flight Center (MSFC) have developed a Debris-Tolerant Valve designed for use in machines/environments with a large quantity of airborne dust or other contaminants. The invention was created for an atmospheric revitalization system on the International Space Station. On the ISS, the use of dried pelletized media in the system caused a problem with the collection of contaminants in the existing selector valve, requiring persistent valve maintenance and replacement. NASA's Debris-Tolerant Valve was offered as a solution and is currently being developed for use in future NASA missions. The new valve implements a novel design that has been extensively tested and offers substantial benefits including extended lifetime of internal valve parts, ease of maintenance, and low-cost manufacturability. Applications for the Debris-Tolerant Valve include use in aerospace or industrial processes.

BENEFITS

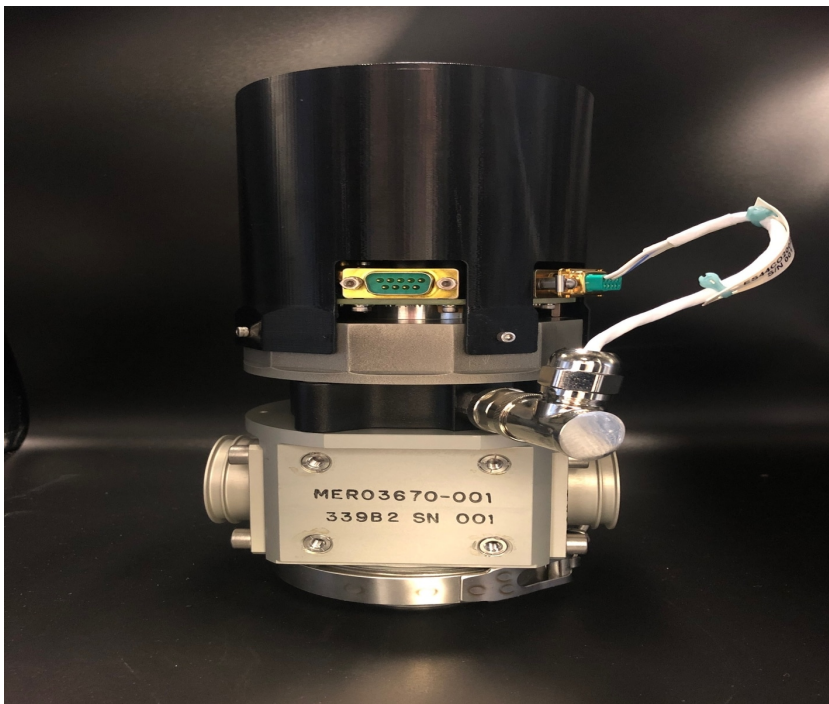
- Extended lifetime in dusty environments
- Easier to make and maintain
- Low-cost manufacturability



THE TECHNOLOGY

NASA's Debris-Tolerant Valve is designed for use in machines/environments with a large quantity of airborne dust or other contaminants. Valves subjected to airborne contaminants tend to have limited lifetime due to damaged seals, bearings, and other internal components. The Debris-Tolerant Valve design addresses this problem with four core improvements over existing commercial valves that are typically used in dusty or debris-laden processes: (1) a new cylinder design that substantially decreases dust collection within the valve; (2) a rotational valve design that minimizes grinding and packing experienced by the standard ball valve; (3) the use of elastomeric seals rather than the Teflon-based seals used in existing valves which are prone to scratching and subsequent leakage; and (4) a bleed port for fluid intake that allows pressure to build slowly in the valve and eliminates the stirring of dust commonly caused by rapid inflow of air in existing valves.

The operational lifetime of NASA's Debris-Tolerant Valve exceeds the lifetime of a standard commercial valve and the existing selector valve used on the ISS by 12X and 6X, respectively. NASA's valve design has fewer parts than existing valves and could be disassembled without tools, enabling easier servicing and maintenance. The Debris-Tolerant Valve is only about one-seventh (1/7) the cost of the existing ISS selector valve.



NASA's Debris-Tolerant Valve design

APPLICATIONS

The technology has several potential applications:

- Aerospace components
- Industrial processes
- Systems with desiccants, dryers, catalysts, dry pelletized media, or other dusty/powdery substances
- Swing dryer towers
- Slurry diverters
- Feed mill systems
- Portland cement equipment

PUBLICATIONS

Patent No: 11,226,045

"Marshall Advances Carbon Dioxide Filtration for Deep Space Exploration," October 24, 2018