

Ideas



Changing From Metal To High Performance Plastics Improves Performance While Increasing Operating Life

Functional high performance plastic components (HPP) in vehicles are increasingly common versus metal components. Replacing metal designs with HPP materials improves performance and longevity while modernizing and lowering manufacturing costs. In

a 1/8-inch groove to hold the Quad-Ring® seal securely in position so that no twisting of the seal occurs during operation.

The seal separates the gas-charged portion of the bore from the oil portion, sliding up and down smoothly and

ideal for all types of vehicular hydraulic systems handling speeds up to 900 FPM (4.5 M/Sec) and maximum pressures of 750 psi (52 bar).

Both piston and seal are designed for automated, high volume manufacturing for cost savings in contrast to the previous, more labor-intensive, aluminum piston manufacturing cell. With no operator involvement, an automated part handling system moves the injection-molded pistons into position for assembly with the Quad-Ring® seals. During assembly, a small amount of silicone lubricant is automatically applied to the seal. Once assembled, a vision inspection system checks for dimensional accuracy and ensures that the seals are positioned correctly within the piston's groove. The automated production system operates 24/7 with output capacity in the millions per year.

Three-piece radiator sight gauge for skid loader: replaced with a single molded part of high performance PEI plastic. When in use these single-piece, molded sight gauges have significant operating advantages over punched metal assemblies.

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Changing thrust rings in vehicle transmissions from aluminum to high performance PEEK™ provides longer life, lighter weight and easier assembly.

today's fast-changing vehicle industries, economic, environmental and political factors are driving these new designs. As a result, OEM suppliers like Minnesota Rubber and Plastics are rising to meet the needs. The following examples show why.

Aluminum floating shock absorber piston: replaced with high performance plastic (HPP) component with integral Quad-Ring® seal. Molded of a glass filled, specially formulated, heat stabilized Nylon, these redesigned pistons provide improved sealing and overall hydraulic function.

The 1-3/4 inch diameter floating pistons feature a special Quad-Ring® seal that fits securely inside the shock absorber bore. The piston body is designed with

efficiently when in operation. The seal is precision molded from a specially formulated HNBR elastomer designed for high concentricity, low friction, and long operating life. This type of seal is



Floating shock absorber pistons changed from aluminum to specially formulated heat-stabilized nylon with Quad-Ring® HNBR seal.



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On the radiator, the molded sight gauges show coolant level without having to uncap and check the level or use a dipstick. With a threaded base, and sealant applied, the single component gauge locks tightly into position.

Precision molded of high performance Polyetherimide (PEI) by Minnesota Rubber and Plastics, the improved design is less costly than the three-piece device which required molding, stamping and assembly. With excellent mechanical properties, this new gauge has heat resistance up to 356° F for long periods of engine operation.



Radiator sight gauge molded as a single component from Polyetherimide (PEI) replaces a more complex three-piece molded and stamped assembly.

The new PEI molded gauge also has excellent hydrolytic and UV stability as well as radiation resistance. PEI is extremely well-suited for enclosed engines where there is repeated heat, moisture and cold exposure - everything from snowmobiles to jet skis or autos. PEI is inherently flame retardant so it is a great material choice for engine applications, and in this sight gauge application, has an operating life exceeding 20 years.

Transmission thrust rings converted from aluminum to a special PEEK™ formulation: provides longer operating life, lighter weight and easier assembly. These thrust rings act as rotating planetary carriers for helical shaped ring gears in transmission assemblies.

When precision molded by Minnesota Rubber and Plastics, rings incur less heat and surface abrasion resulting in longer operating life than the aluminum components they replace. Key to these benefits is the material formulation. It includes PEEK (Polyetheretherketone) which provides high temperature resistance (400°-450°F), a carbon fiber providing high wear resistance and PTFE (Teflon®) for reduced friction. In addition to more durability over time, the new design is 50 percent lighter and the cost is significantly less than the aluminum thrust rings. Important assembly benefits also were accomplished with this new design. The previous aluminum component had two locating holes requiring tedious riveting and assembly. Accurate alignment was required to avoid scrap components and potential performance issues. The new design eliminated the locating holes and added self-aligning features for easy and

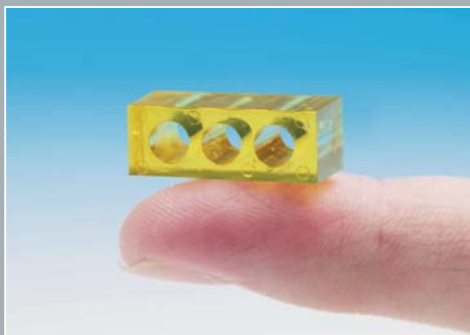


Transmission thrust rings converted from aluminum to PEEK™ costs less to make, assemble easier and provide longer operating life.

fast, press-fit assembly. Scrapped parts were eliminated.

Custom thrust rings of this type are often combined with other high performance plastic and elastomer components to form a completed assembly for an even more cost effectively designed assembly. These savings result in less material usage, reduced assembly time and consolidation of vendors resulting in less capital expense.

Vehicular electronics bantam jack spacers molded of PEI (Polyetherimide): provides high heat resistance and added strength over the previously used metal parts. These spacers enhance function in today's increasingly complex vehicular electronics.



PEI bantam jack spacers replace similar metal components and provide greater strength and heat resistance.

PEI bantam jack spacers have excellent hydrolytic, UV stability and radiation resistance. They are inherently flame retardant and can be used in confined electronic assemblies at continuous temperatures up to 375°F. They are well suited for applications where there is long term hot air exposure in engine compartments and to adjacent air conditioning or freezer systems.

Extra strength is added to these spacer designs using reinforced glass fibers.

Sport utility back-up light molded design: snap fit molded components eliminate all fasteners and welding operations. This is a great example of a complete product assembly designed for molding to minimize material requirements and a number of components while simplifying the assembly process.

This dual function back-up/utility light plugs directly into any 7-way standard 7 pin round RV/trailer receptacle. Producing 50 watts of very bright white light, it provides extra light behind a vehicle when needed – for loading the vehicle, plowing snow, setting up camp or hooking up a trailer.

MR&P designed a wear-resistant base, injection molded of nylon, which can be rotated manually into either of two operating modes – backup light when the vehicle is shifted into reverse and utility light mode when parked. The dual function design really adds value to the product and is regulated by a special micro switch mounted inside the light's base. When the base elements are turned, a small key inside actuates the micro switch, changing the selected operating mode. The two rotating base components have a special O-ring seal (EPDM-ethylene propylene diene monomer) that facilitates smooth rotation and also acts as a barrier to seal out moisture and dirt.



Back-up light molded assembly snap fits components together eliminating fasteners and welding operations.

The lens is molded of a polycarbonate material that effectively magnifies and disperses the 50 watt halogen light (1,000,000 measured candle power) over a wide area behind the vehicle. The lens is threaded around its circumference and screws tightly into the threaded base. This allows for easy bulb replacement when necessary. For added moisture and contaminant protection, a flat EPDM gasket seals the lens and base. Inside, a hard chrome plated reflector, stamped from cold rolled steel, holds a standard halogen bulb socket. This socket connects two glass insulated, high temperature resistant wires which lead to the vehicle's connecting receptacle.

Liquid Silicone Rubber Instrument Trays Organize And Protect Medical Tools

Organizing and protecting medical instruments are major challenges in healthcare. Custom molded Liquid Silicone Rubber (LSR) instrument trays from Minnesota Rubber and Plastics organize and protect high value tools.

These LSR trays make storage and autoclaving simple with easy-to-recognize molded compartments. Tools fit tray contours, cushioning and protecting the devices from damage that may occur in ordinary trays and drawers.

Compact and Stackable

Seamless and glove friendly, these stackable LSR trays can be designed to hold families of different size tools. Individual tool compartments can be designed with risers and drainage holes for drying while also providing extra separation and protection for individual tools that are heavy or have sharp edges. The trays can also be molded in a variety of colors for product differentiation as they fit inside standardized or customized metal sterilization trays.

LSR Tool Tray Attributes

Molded of medical grade silicone, these trays are rated for 10,000 hours continuous exposure to steam autoclave processing. They promote safe, effective sterilization, and are durable yet highly versatile. The LSR material is non-reactive, stable and resistant to extreme environments and temperatures from -55°C to +225°C while maintaining its useful properties.

Precision Molded

Additional advantages of custom LSR trays from Minnesota Rubber and Plastics include a very clean molding process with no material pre-processing. Depending on tray complexity,



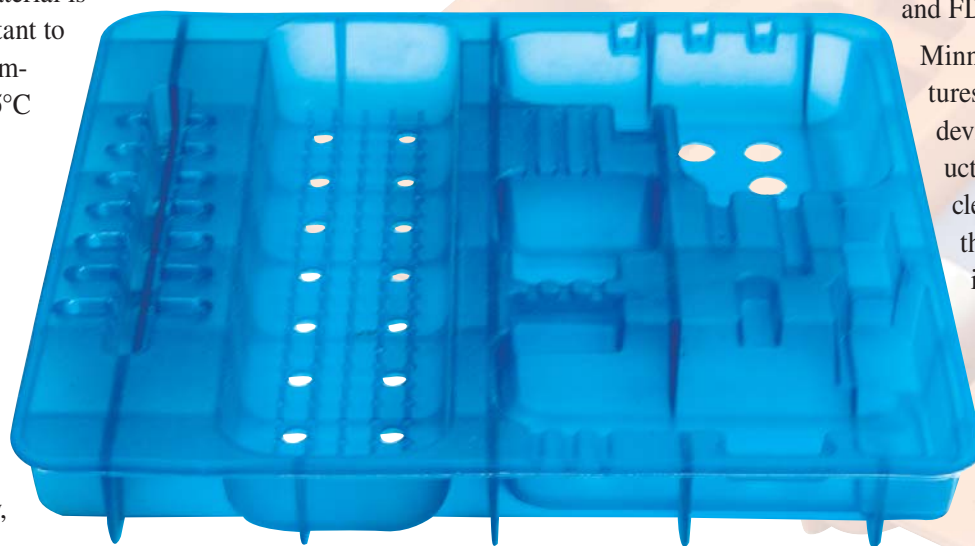
Autoclaving, tool protection and storage are simplified with LSR trays.

components can be molded with minimal flash. LSR material has repeatable, short cycle times, eliminating most secondary operations. Compared to other materials and processes, this means lower labor content due to reduced manufacturing steps.

Important Services Offered

Minnesota Rubber and Plastics provides assistance with design and materials engineering from a broad range of medical grade material options. In addition to LSR, other compounds are compliant with ISO 10993, USP Class VI, and FDA requirements.

Minnesota Rubber and Plastics manufactures a broad range of medical sealing devices, medical assemblies and products in Class 10,000 and Class 100,000 clean rooms. These capabilities include the manufacture of complete products involving complex automated assembly through final packaging.



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The unique design provides small “fingers” strategically positioned in the interior that locate, snap together and lock components tightly without the need for fasteners or welding. The micro switch is heat staked permanently into position so it does not require fasteners. For ease of use, the base has an external keyway for aligning and installing easily even in low-light conditions. A locking cleat provides positive retention.

Measuring just 6 inches long with 1-5/8 inch base receptacle and a 3 inch diameter lens, the light has no external connecting cords or wires,

weighs only 8 ounces and stores anywhere in a vehicle including a small glove box.

Qualified Sourcing Is A Necessity

Developing the right design and material in all of these material conversions is crucial to ensure the highest product performance while lowering cost. Equally important is the use of a full service source that provides in-house CAD design, mold building along with high-speed, automated, injection-molding and assembly for just-in-time delivery.

MR&P is a world leader for over 65 years supplying the transportation industry with quality products like these HPP components and assemblies. Our corporate-wide quality systems include: ISO 13485, ISO-TS 16949, and ISO 9000 in its North American, Asian and European facilities. These facilities operate under a corporate-wide Environmental Management System registered to the International Standards Organization series ISO-14001.

Providing Solutions For Plumbing Requirements

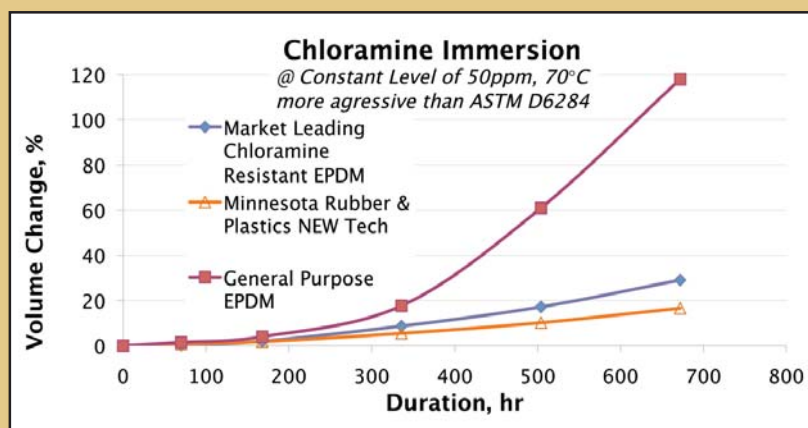
The Minnesota Rubber and Plastics Material Science Lab has developed a novel formulation technology which can enhance significantly the chloramine resistance of EPDM's. Test results showed these new EPDM compounds had no signs of degradation with minimal swell after 4 weeks of immersion. In addition, the volume swell was 50% less than the leading EPDM on the market.

"We've always looked for ways to further improve the chloramine resistance of our rubber compounds, while still maintaining their excellent resistance to chlorine and water," reports Minnesota Rubber and Plastics Chief Chemist, Haiying Zhou. "The extensive study involves advanced chemistry and new compounding trials. We discovered this technology after many tests. It can be applied to EPDM's of

various hardness, including self-lubed versions, and we expect the next generation of materials to pass NSF 61 requirements soon." Zhou says.

This new technology has been applied successfully in several recent product development projects.

It also provides the ideal solution for the stringent chloramine resistant requirements of the plumbing industry and is compatible with injection, compression and transfer molding processes.



Chloramine resistance of EPDM's.



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Upcoming Trade Shows

Minneapolis, MN Medical Design & Mfg November 2-3
Novi, MI AmCon November 8-9
Minneapolis, MN Life Science Alley December 7
San Jose, CA BIOMEDevice December 6-7
Anaheim, CA Medical Design & Mfg February 14-16
Dallas, TX Design 2 Part February 21-22
Stuttgart, Germany ... MEDTEC Europe March 13-14

Orlando, FL AmCon March 13-14
Santa Clara, CA Design 2 Part March 21-22
Beijing, China China MED March 23-25
Lyon, France MEDTEC France April 4-5
Seattle, WA AmCon April 10-11
Philadelphia, PA Medical Design & Mfg May 22-24
Chicago, IL Design & Medical Design June 19-21

