NEW PLASTIC COMPONENTS HELP 'STREAMLINE' COAL CARRYING RAILCARS

Reengineering and replacing railcar manufacturers high-cost, heavy metal parts with innovative molded plastic parts reduces part costs, and lightens the load

As industries worldwide seek ways to become 'lean' through continuous improvement programs, certainly the rail transportation sector is no different. Their goal is to find new cost economies with improved fuel efficiency and load carrying capacities. Joining the railroad firms in this quest is FreightCar America, Inc., (FCA) of Chicago, IL, one of North America's premier manufacturers of freight carrying railcars. With the assistance of Molded Materials, Inc. (MMI) of Plymouth, MI in converting metal components to plastic parts, the latest railcar technologies from FCA are helping to move materials and freight more efficiently than ever before. FreightCar America and the plastics molding firm partnered recently to develop components for a coal car design that helped to lower costs and improve operations of the railcar.

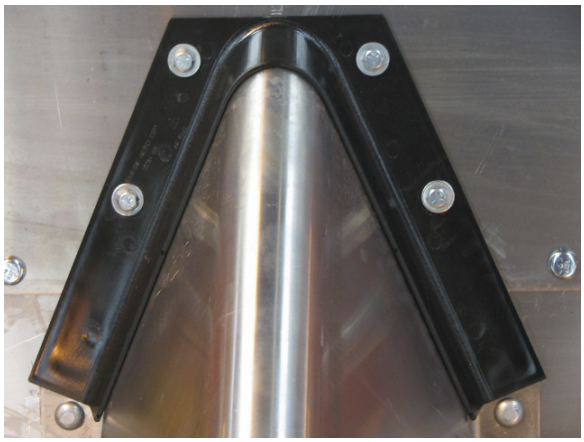
But building high quality products is nothing new to FreightCar America. The company's lineage dates back to 1852 as an iron works company, and the heritage of building coal cars can be traced back to their first mining cars produced in 1901. Today, in addition to coal carrying railcars, FCA's lineup of railcars includes ore and aggregate cars, flat cars, auto haulers, forest and lumber product haulers, steel coil, and slab cars.

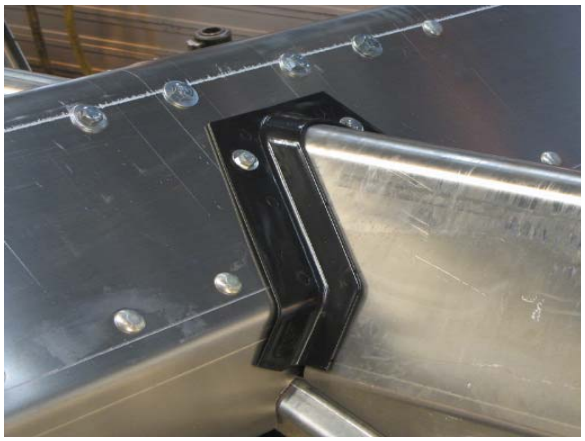
FCA introduced their first aluminum coal hauling railcar in 1986 and the push began to make the cars lighter and stronger, thus allowing trains to transport more coal. The evolution of the aluminum coal cars has continued to produce railcars of fuel efficient, aerodynamic design. Today, modern coal cars can carry coal loads that exceed 4,500 cubic feet and weigh in excess of 240,000 pounds (120 tons), though the car itself tips the scales at approximately 42,000 pounds.

One of the areas of the hopper cars that FCA examined was the connection of the longitudinal hoods that attached to the center sill and the floors. A different configuration was needed to make this connection and assure that coal would flow properly around the joint.

With that fact recognized, FreightCar America contacted MMI, specialists in the design, engineering and injection molding of protective dunnage trays and totes, ESD material handling units and low volume custom molding services, and in particular, metal to plastic conversions. MMI then began the process of analysis, design, material selection and fabrication of tooling and of the parts.

According to Tom Elkington, Vice President-Operations for MMI and coordinator for the hood collars molding project, these types of jobs entail more than might be expected. "Substituting an injection molded plastic part for the aluminum machined part, is more complicated than it may seem" says Mr. Elkington, "as each brings different characteristics to the equation. It's more than just duplicating dimensions. Strengths are different and wear has to be considered as well as resistance to climatic changes. As the coal cars could travel from sub-zero temperatures into blistering hot zones, the material has to handle both without becoming too brittle or too pliable in either extreme."





"In addition, the material specifications called for high-impact toughness and abrasion resistance. Plus, the finished collars had to offer enough flexibility to facilitate assembly with the hood during installation. There are a wide range of needs in both material requirements and design elements, yet we were able to come up with the right combination for FreightCar's application."

As the work began researching materials and tool designs, MMI first constructed a pattern to produce a cast urethane prototype of the hood collar. Some of the part geometry, including a slot on opposing sides of the collar to accommodate a slip fit for the hood and a wide span from the leg on one side of the 'V' hood to the other side's leg (see photos above), were design challenges to incorporate into the final parts. Also, there were two styles of collars required, as the two end collars were different from the two pieces required along the longitudinal beam at each cross beam junction. Another difficulty to overcome in the design was developing the correct angles of the corresponding cross beams' mounting surfaces.

The cast urethane prototype answered these questions and the approval was given to proceed with the production injection mold tooling. MMI selected and tested a polycarbonate-polyester (PC/PBT) alloy that has high-impact resistance, along with strength and flexibility. With the material tested and checked, and tooling approved, the production pieces were finished. Mr. Elkington points out that "the

final injection molded product came in at about one half the cost of the cast aluminum parts, and with twelve parts required per railcar, that can quickly add up."

These hood collars are just one example of FCA's commitment to investigating and implementing programs and processes for continuous improvement of their product lines to enhance quality and customer satisfaction. And, for MMI, a further example of the new and intriguing applications being developed that integrate advanced plastics, tool designs, and engineering know-how.

The molding and manufacturing resources of Molded Materials, Inc. includes complete in-house design and engineering services, encompassing finite element and mold flow analysis, in-house machining for mold and tool making, and in-house injection molding procedures and systems—providing direction and oversight to the entire process. For further information regarding Molded Materials, Inc, its products and services, visit www.moldedmaterials.com