

# MuCell® Process News

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## Nishikawa to Introduce MuCell TPV Sealing Systems to Japan

Nishikawa Rubber Company, the market share leader in Japan for the production of automotive weather-stripping products, has decided to proceed with commercial production of MuCell TPV weather strips. Operating for the past two years under a development license agreement with Trexel, Nishikawa recently informed Trexel about the positive results of its many tests and evaluations in which they compared MuCell TPV seals to standard sponge rubber seals and TPV seals produced through water foaming processes.

While the exact results are confiden-



tial, Nishikawa concluded that for the first time, it will be able to offer automotive seals with sufficient performance levels to replace sponge rubber in several product applications.

Dr. Toshinari Tenuh, Chief of R&D, explained, "Nishikawa has a long and successful history in the development of advanced designs and materials employing sponge rubber technolo-

gies. In order to meet the long-term requirements of our customers, we have been developing technologies that would allow us to substitute a thermoplastic for an EPDM product. The MuCell Process is the first technology we have used that allows us to meet the water absorption, compression set, and kink resistance criteria that are needed to enable this conversion for certain high-performance weather-strips."

Mr. Fumio Harada, Managing Director of Nishikawa's technical head office, stated, "It is very important that

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**NISHIKAWA TO INTRODUCE  
MUCELL TPV SYSTEMS**



**MODULAR UPGRADE SPEEDS  
IMPLEMENTATION**



**HARMAN BECKER SUPPLIES  
MUCELL AUTOMOTIVE SOUND  
ENCLOSURE**



**MOLDFLOW TECHNOLOGY  
FOR MUCELL DESIGN**



**TRICON INDUSTRIES BOOSTS  
PRODUCTIVITY**



**JCI PRODUCES MUCELL  
DOOR TRIM**



**SAMSUNG APPLIES MUCELL  
FOR DVD PRODUCT**

## Modular Upgrade Accelerates Implementation



The MuCell Modular Upgrade (MMU), one of Trexel's most significant engineering accomplishments to date, has met its goals in the field. Trexel has already successfully undertaken MMU installations for both hydraulic and electric injection molding machines from a long list of manufacturers that includes Nissei, Fanuc, Arburg, Engel, Kawaguchi, Meiki,

Milacron, Toshiba, Rochester, Van Dorn, and Sumitomo. Screw sizes range from 30 up to 100 mm. MMU installations have been implemented around the world including Singapore, Thailand, China, Japan, Germany, and the USA.

Trexel MMU Program Manager Jeffrey Ng noted that all Trexel engineering objectives have been met. "Despite major differences in machine design from manufacturer to manufacturer, the MMU has adapted to each machine with a minimum of engineering effort. We have proven beyond any doubt that the upgrade is indeed modular. On-site installations have been conducted in five days or less, and we expect to be able to improve on this time in the future."

## Harman Becker Supplies MuCell Automotive Sound Enclosure

Harman Becker is an innovator in automotive sound systems under the JBL and Infinity logos. Dr. Lou Mango, Principle Materials Engineer stated, "We see the MuCell Process as another innovative technology that can bring value and product improvement to our OEM customers. Development of MuCell technology for applications in sound enclosure systems represents a significant opportunity to reduce manufacturing costs and improve part quality."



The HD sound enclosure is in commercial production for the DaimlerChrysler Durango SUV. It was determined that the MuCell Process substantially reduced molded-in stress, thereby improving part flatness by 55%. This improvement resulted in significant weld process yield and

cycle throughput.

Process benefits included 10-15% cycle time reduction, 33% reduction in injection molding machine size, and 4% part weight savings.

The HD sound enclosures are being

supplied to Harman Becker by United Plastics Group in Bensenville, IL. UPG General Manager Patrick Madigen explained that several key factors had a big impact on the savings that were achieved.

"Attention to heat exchange details, such as amount and placement of cooling lines, thermal pins for mounting boss cores, and core-outs to achieve wall uniformity, helped optimize the cycle and direct material reduction opportunities. The direct sprue gate diameter needed for MuCell was reduced 25% vs. typical solid molding. Standard Polypropylene with optimized melt temperature was utilized to achieve desired surface finish."

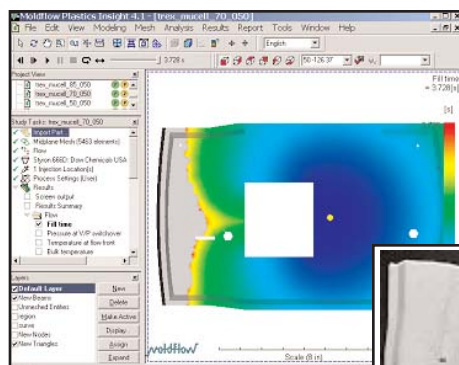
The use of MuCell resulted in plastic part cost savings of 15%.

## MoldFlow Technology for MuCell Design

In June, 2003, Moldflow Corporation announce the release of its Moldflow Plastics Insight (MPI) 4.1 simulation software. Included in this release is MPI/MuCell, a simulation package for the MuCell microcellular foam molding process. This new package is the result of a 2-year development effort between Trexel, Inc. and Moldflow Corporation and allows users interested in the MuCell Process to perform MuCell filling simulations prior to building molds.

One of the most significant aspects of this tool is the ability it gives users to predict the reduced viscosity, packing pressure, and cavity pressure to be achieved through the MuCell Process.

The package provides user with fill profiles based on MuCell processing conditions and predicts viscosity

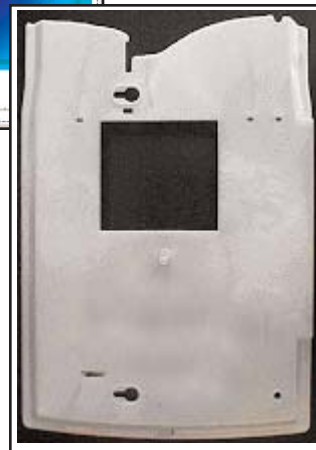


changes resulting from the addition of supercritical nitrogen or carbon dioxide to the polymer melt as well as profiles of pressure and temperature in the mold cavity. The user is then able to adjust the level of supercritical fluid (SCF) in the polymer melt as well as the desired weight reduction to determine cell structure. Adjustments to the shot volume can be made to

determine maximum weight reduction and last areas to fill.

By incorporating the MuCell filling module into the MPI 4.1 release, the results of the simulation can be used as

inputs for the MPI/Cool and MPI/Warp packages to evaluate cycle time and part warpage. The release of this software provides design engineers with a significant tool to be used in the design of parts for the MuCell process.



For more information, please contact Murali Anna-Reddy (Murali@moldflow.com) at (508) 358-5848.

## Tricon Industries Boosts Productivity and Design Capability

Committed to delivering to its customers continuous advancements in productivity, product quality, and design, Tricon Industries, a leading supplier of insert molded components to the worldwide automotive, mobile communications, and appliance industries, has commenced high volume production of an automotive lighting application using the MuCell process. The MuCell product, molded using a 33% glass fiber-reinforced nylon 66, appears on multiple domestic vehicle platforms.



the product to consistently feed through Tricon's automated assembly line.

Tricon Vice President Patricia L. Grandle stated, "Tricon Industries is devoted to meeting the needs of our customers for new cost and design-efficient product solutions, and to this end the MuCell injection molding process has been an essential enabling technology. MuCell implementation has resulted in a reliable, dimensionally stable, and robust part with a substantial productivity improvement."

The excellent dimensional stability afforded by the MuCell process allows

John Cieplak, Director of Manufacturing at Tricon noted, "MuCell process capability greater than 1.66 CpK has been established on critical product features. We are taking advantage of the reduced melt viscosity and lower and more evenly distributed cavity pressure of the MuCell process to provide our customers with more dimensionally conforming electrical and electronic components and unique thin-wall design opportunities". In production validation (PV) testing, the MuCell socket withstood

thermal exposure up to 85°C and vibration testing up to 1000 Hz.

"Vehicle manufacturers are recognizing the compelling opportunities and strategic benefits that Tricon Industries brings to precision electrical and electronic components, including insert-molded products, through the MuCell process," commented Trexel

<u>Reductions</u>	<u>MuCell</u>
<b>Cycle Time</b>	<b>37%</b>
<b>Part Weight</b>	<b>4%</b>
<b>Machine Size</b>	<b>&gt; 35%</b>
<b>Mold Temp</b>	<b>&gt;50 °F</b>

Business Director Lee J. Hyde. "With continued downsizing of automotive E/E component designs and the resulting challenges to meet dimensional and performance requirements such as those specified by USCAR, the MuCell process is providing companies such as Tricon Industries with the ability to reduce the time required to launch new programs."

## JCI Korea to produce First MuCell Door Trim Part for Kia Motors

In 2001, as part of a strategic decision to produce a lighter, pro-environment car, Kia Motors Co., Ltd., which holds more than a 30% market share in the Korean passenger car market, examined the MuCell Process along with a series of other enabling technologies

JCI Korea, one of Kia Motor's Tier One vendors specializing in interior parts, began studying the possibility of applying the MuCell technology to door trim parts after recognizing the weight-reduction limitations inherent to conventional solid molding processes.



JCI Korea began a formal evaluation process which included several successful mold trials performed at plusHUB Inc., the exclusive technical, sales, and marketing representative of Trexel in Korea. After gaining confidence that the MuCell Process would

result in lighter, lower cost parts, JCI specified MuCell parts and were successful in winning the order for the entire assembly of door trim parts.

As a result of this initial success, Kia Motors and JCI Korea have decided to apply the MuCell Process to the Front & Rear Upper Trims of the 2004 model. In addition to significant weight reduction and cost savings, it was the excellent dimensional stability, under extreme temperature ranges, of the MuCell Upper Trim parts that convinced JCI Korea to select the

## Samsung applies the MuCell® Process to Portable DVD Product

Since May, 2003, Samsung Electronics (SEC) has been employing the MuCell Process to manufacture LCD frames & housing bases for its new portable DVD player (model DVD L-200). This is the first time MuCell has been used for the mass production of home electronics parts that must meet a strict aesthetic standard for surface quality.



An increasing number of electronic home appliance products are using painting and coating processes to meet market tastes for high quality. The Samsung portable DVD player has demonstrated that the MuCell Process can be successfully combined with post molding painting processes to create acceptable surfaces while achieving the benefits of dimensional stability and cost savings.

Although the DVD player's outer parts were first introduced using a magnesium molding process, SEC was forced to consider substituting a thermoplastic material as it became diffi-

cult to outsource the production of the magnesium parts and achieve consistent high-quality production levels from their contractors. In the transition to thermoplastic, however, SEC found that it was unable to overcome the serious warping problem of the PC-ABS parts with thin wall structure through conventional solid molding processes. The warping phenomenon of the housing base went beyond aesthetics to the function of the product itself.

As the MuCell Process had already been applied successfully to the drum

washer pulley parts of another SEC division, SEC had access to the technology. In the first stage of development, SEC encountered technical obstacles such as gas swirls and bubbles that created defects on the painted surface of MuCell parts. As a result of intensive technical assistance of plusHUB., Trexel's marketing, sales and service representative in Korea, SEC finally succeeded in overcoming these issues by optimizing the mold air-venting structure. The use of injection profiling and a post baking process to expedite diffusion of the gas through the part overcame the initial obstacles.

The DVD L-200 model has been exported to European markets initially, and production has increased to address the North American market as well. Since external parts comprise over 70% of total injection molding parts in the electronics home appliances market, SEC is now in a position to consider expanded implementation plan for other product lines.

## JCI to Produce MuCell Door Trim for Kia



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MuCell Process for the parts. The outstanding straightness of MuCell parts has enabled JCI Korea to minimize the frictional resistance of the Upper Trims against the glass panels, assuring smooth up and down movement of the automatic windows.

In April 2003, JCI Korea selected Jintech, a Tier Two molder, to install a 550-ton MuCell machine made by Dongshin Hydraulics Co., Ltd., along with Trexel SCF equipment at the Jintech main factory located in Asan

City, Korea. Since then Jintech has successfully completed pilot production and will commence mass production of MuCell parts in October, 2003.

Jintech has achieved a 14% weight reduction and a 20% cycle time reduction as a result of using the MuCell Process. These economic benefits, along with the great dimensional stability and reduced thermally-induced warpage, have convinced Kia Motors and JCI Korea to plan broader applications of MuCell parts for the coming models.

## Nishikawa/MuCell



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Nishikawa be a technology leader in the development of 'green' solutions for our automotive customers."

"In the case of MuCell," he continued, "we expect to be able to convert a number of our weather strips to recyclable thermoplastics without sacrificing the high quality standards that the industry demands. We intend to be the leader in this effort and we expect the MuCell Process to be an important technology in achieving our goal."

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