

# MuCell® Process News

October 2006

Volume XIII

## Trexel Speaks Many Languages, 24 Hours Per Day

Welcome to the latest issue of MuCell® Process News. Inside, you'll find articles about how MuCell technology continues to advance, where the MuCell process is integral to some dramatic new technology offerings in the market, and where Trexel is serving our customers around the globe. To our customers, first and foremost we thank you for your continuing business and support. We know that we need to earn your business each and every day, and that our business success is directly linked to yours.

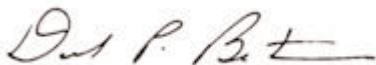
We're aware that it takes a lot to succeed in today's global marketplace. We have customers who design products in the USA, build their tools in Asia where they perform MuCell mold trials and pre-production, and then begin mass production in the USA and Mexico. One automotive Tier-one supplier we do business with designs products in Germany, build tools in Asia, perform MuCell mold trials there, and then does their mass production in Germany and France.

The point I wish to make is that Trexel, with support centers world-wide, is well positioned to provide local support anywhere around the globe anywhere our customers' business takes them. In North America and Europe we offer part & mold design consultancy as well as mass production support. In Asia we support mold design verification, mold trial optimization and pre-production trials. Trexel has built up a network of mold trial facilities in Asia, including Singapore, Malaysia, Thailand, Japan, Korea, China (both near Shanghai and the Shenzhen area), and we have experienced application engineers in Asia to help optimize the process.

With global communication among our engineering team as our normal operating mode for doing business, customers who work with the MuCell process both expect and get the support services they need transferred seamlessly from one continent to another, from one brand of molding machine to another, and from one company to another. Time and again, we've been able to demonstrate on these programs the kind of quality improvements, cycle time reductions and material savings our customers need to succeed.

So, whatever time it happens to be, we're on the job somewhere in the world helping our customers succeed. How may we be of service? Give us a call.

Best regards,



David P. Bernstein  
President & CEO

**Trexel Speaks Many Languages,  
24 Hours Per Day**

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## Keykert USA Opens the Door to Partner with Trexel for Support of Large Programs

A vehicle's door latches fulfill several important functions that are often taken for granted. The practical functions include the continued locking of a door in case of crash, along of course with protection against theft and secure closure of the door when driving.

At the same time however, acoustic characteristics such as the sound a closing door makes or the use of the central locking system contributes dramatically to the overall quality image of an automobile.

The company founded by Arnold Kiekert in 1857 has been specializing in locking systems from the very beginning. Today, with a network of R&D centers, sales offices, production sites and licensees located on five continents, Kiekert delivers systems which make cars more safe and comfortable. Globally, Kiekert is the market and innovation leader of these reliable and increasingly highly technological systems - a success acquired through permanently concentrating on the continuous improvement and further development of its products.

Across Europe, North America and Asia, Kiekert AG and its subsidiaries

have made a major commitment to Trexel and the MuCell process in support of their global production and supply chain strategies.

One example of Kiekert's global supply chain strategy has been their work for two major North American OEMs on door handle housing programs that involve literally millions of production parts. Keykert USA, as a major Tier One supplier, performed the original design of these products in the USA, and then used a global supply network to facilitate the building of the tools in China and Singapore, where pre-production runs were also conducted. Mass production for these parts was finally undertaken in the US and Mexico.

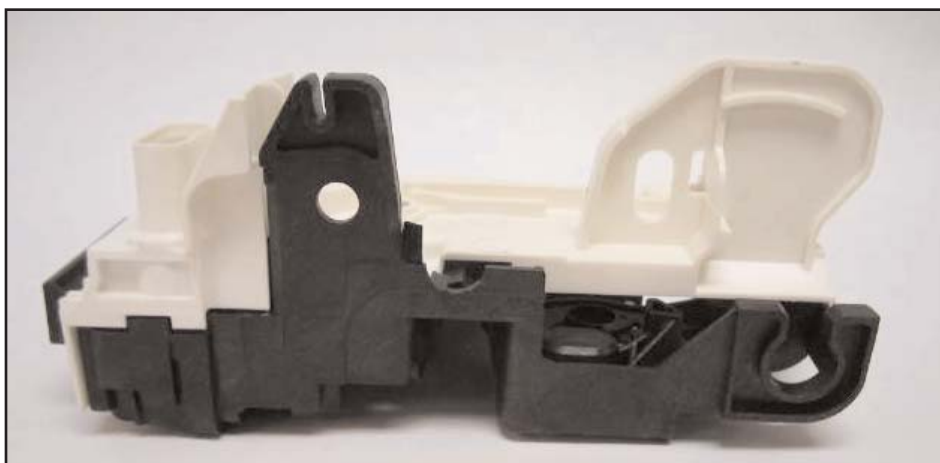
To keep these programs moving smoothly, Trexel, with its global network of experienced application engineers, support centers and licensee partners was able to support Keykert USA locally. Trexel provided mold design reviews, and process parameter optimization during mold trials in Asia by Trexel licensees Global Plastics PTE Ltd. and Avaplas Ltd. of Singapore, along with GEW Corp., Sirtec International Co. Ltd and Mitac

Precision Technology Ltd. in China. Trexel provided assistance in running pre-production parts, and finally provides a complete range of support services during mass production.

MuCell partners in Singapore and China were able to provide MuCell mold trial support on machines ranging from 150 ton to 650 ton in support of the Keykert USA/Kiekert AG programs. Trexel has also built up a network of mold trial facilities in Asia, including Malaysia, Thailand, Japan, Korea.

Patrick Tong, Trexel's General Manager - Asia commented, "With the global communication routines we've established among the various engineering teams involved with these programs, the MuCell process could be transferred seamlessly from one continent to another, from one brand of molding machine to another, and from one company to another.

"It's been a great experience to work on these programs, and as others of our customers seek to implement their own global supply chain strategies, we'll be ready to support them anywhere in the world," said Tong.



*Keykert lock housings were designed in the US, developed in Asia and are now produced using the MuCell Process in the US and Mexico.*

## Introducing Dolphin: Engel builds on its world leading expertise with the MuCell technology to get high levels of soft-touch quality in just one single process.

One of the future-oriented projects presented at the Engel Symposium in Germany this past May was the introduction of a radically new and innovative process to reduce what today is a multi-stage process for the production of soft-touch car interior components to a combined process of conventional injection molding and foam molding in just one machine. This innovative process, which in future will be marketed jointly under the name of "Dolphin", permits the low-cost, high-speed production of high-quality soft-touch sandwich components for the automotive industry, such as instrument panels, center consoles and glove compartments.

The new Dolphin process doesn't utilize thermosets, such as polyurethane, which is normally used in multi-stage production operations for foam-skinned instrument panels and other interior components, but instead utilizes the MuCell process to create a class A flexible skin with a soft foam backed layer.

The sample component produced on

the demonstration machine was a passenger car dashboard panel with a soft-touch surface. The body of the panel is injection molded in the first stage of the process in a glass fibre reinforced PBT/ASA blend (Ultradur S4090 IGX from BASF). It is then overmolded in the second stage with a special polyester (Pibiflex, a readily foamable thermoplastic polyester from P-Group) using the MuCell process. The close chemical affinity between the two materials ensures an optimum bond.

The machine used for the Dolphin process is a two-component large-capacity ENGEL DUO 11050/4550/1500 Combi M (15,000 kN clamping force). Its particular features are its two horizontally opposed injection units, a double-daylight mold with a rotating central block and a sensitive parallelism control integrated in the machine control system.

Compared with the conventional production of multilayer foam-molded parts, the new process is considerably faster and more economical, less com-

plex and, by reason of the single process, clearly advantageous from a logistical aspect. For instance, now all thermoplastic solutions can be easily utilized for just about any soft touch application in contrast to the traditional use of non recyclable thermosets. In addition, parts manufactured using the Dolphin process will be recyclable, and can be manufactured for the lowest possible transportation costs.

As one example, a dashboard panel for a top-range car can be efficiently produced in one single operation. The standard process is extremely time-consuming, comprising three separate stages and involving the processing of different types of plastic, the separate production of the body and the foamed soft-touch outer skin and the subsequent lamination of the body with the outer skin - all in different machines.

Going forward, the Dolphin process offers the potential for use in many other automotive interior applications, along with applications in different industries, like furniture and sporting goods.



*The Dolphin process can manufacture soft-touch automotive components like instrument panel housings in one operation, where normally three would be required.*

## Get SLIM® The MuCell® Way

"We're going to turn thin-wall packaging on its head," says Eric Chavent, Group Commercial Director for the Autobar Packaging Group. He's talking about Autobar's SLIM® technology. SLIM stands for Super Light Injection Molding being a combination of a MuCell process-driven microcellular foaming process in thin wall injection molding along with the use of extra thin labels for in-molding-line decoration.

In the past, reduced weight in packaging applications used to mean using larger molding machines. However, the SLIM program from Autobar uses MuCell technology in thin-wall packaging applications to save not only finished part weight, with reductions of up to 10% on some shapes, but also allows smaller machines to be used while maintaining key mechanical properties and improving throughput, including in-mold labeling. Parts molded using the SLIM® process will also feature excellent insulation properties due to the expansion process inherent in all parts molded using the MuCell process. According to Autobar, SLIM® should be considered as an alternative technology to all Injection molding/In-Mold Labeling existing processes.

Recent tests on one particular prototype packaging configuration (1/2 kilo margarine tub) for a customer showed

throughput improvements of up to 50%, with weight savings of 6% while running with less pressure and clamp tonnage than would be required for traditional injection molding.

"We see a tremendous number of benefits with the SLIM program using the MuCell process," says Chavent. We've developed a 12-cavity mold for this margarine tub application we're looking to win and we've achieved some amazing results on this application that will translate into significant benefits for our customer," he says. One Autobar area of expertise incorporated into the SLIM program is extra-thin labels which in turn complements the

"In addition," says Chavent, "while a 6-7% weight savings isn't really that dramatic on an individual margarine tub, when that number is spread over a planned two hundred million containers per year, the weight savings is impressive. There's an environmental tax on weight in Germany that we avoid. We are also able to make this application work on existing smaller machines, which in this target application results in \$8 million dollars in avoided investment in new machines. We're able to quote lower costs to our customers as a consequence and that's good business for everyone," says Chavent.



savings achieved elsewhere. "For instance," says Chavent, "we achieve better accuracy along the external dimensions which of course helps the in-mold labelling process. The 'friendly' injection molding conditions that come with the MuCell process, things like reduced pressures and improved flow rates both complement and facilitate the labeling technology."

first 500 ton machine has already been successfully upgraded at Autobar. Combined with Autobar's expertise in extra-thin labels for in-mold labeling, SLIM® is a unique offer now available on the market, and will provide the best benefits whenever a European user is looking for weight reduction and an associated environmental tax reduction.

In partnership with Trexel, the Autobar Packaging Group has developed the exclusive use of SLIM® technology across Europe. Trexel is working with Autobar and Netstal to upgrade state-of-the-art high speed Netstal packaging machines to the MuCell process. The

## Trexel-Rhodia Co-Marketing and Development Agreement Leads to MuCell Foamed Nylon Parts With Excellent Surface Finish

Officials from Trexel and Rhodia Polyamide's Engineering Plastics Business Unit present at NPE 2006 introduced new TECHNYL® XCell 6.6 and 6 polyamide grades of glass-filled nylon optimized for use with Trexel's MuCell® process. These new grades are the first technology deliverables from Rhodia as part of a newly signed global co-marketing and development agreement, where Rhodia will actively develop and commercialize new material technology optimized for the MuCell® process, and where Trexel will work exclusively with Rhodia for polyamide applications. These new resins are now fully commercial and available in industrial quantities.

The Rhodia/Trexel strategy is to work together to bring new value to applications in a variety of important polyamide markets. In automotive, for example, this new material/process combination brings new levels of value and performance to under-the-hood applications like rocker covers and air intake manifolds, and offers promise for the development of a new generation of thermoplastic polyamide front end modules.

One key facet of the Trexel-Rhodia development strategy has been to work with Weber GmbH of Dillenburg, Germany to conduct industrial trials using a Weber-designed series production tool originally designed to produce engine beauty covers for a major European OEM. The tool has been used without any modification, but has nonetheless produced parts that are characterized by excellent appearance.

The engine beauty cover, which was displayed at NPE for customer prospects and members of the global

trade press in attendance was molded in trials conducted in Braunau, Austria at EKB Elektro-und Kunststofftechnik GmbH on a 500 ton machine with a 90mm MuCell screw. EKB is a subsidiary of Dräxlmaier.

Rhodia has specifically adapted its Technyl Star™ technology to the MuCell® process to develop new Nylon 6 TECHNYL® XCell grades. Thanks to Technyl Star™ resin's flow behavior (spiral length +200% versus standard PA), these new grades offer enhanced processability and good property retention when used in the MuCell® process, while maintaining an excellent surface aspect.

Industrial trials with TECHNYL® XCell have proven that a 10% density savings is achievable with outstanding retention of rigidity, heat deflection



temperature (HDT) and notched impact performance. Additional advantages of these new materials when used with the MuCell® process include weight reduction, less warpage, faster injection molding, low injection pressure and lower molded-in stress.

"Users in numerous industries have long enjoyed the quality, performance and cost-effectiveness advantages that

accrue from manufacturing parts using the MuCell® process," said Philippe Guinot, General Manager of Strategic Marketing for Rhodia's Polyamide business. "These pre-production trials at EKB using Weber's engine beauty cover mold show that the new Technyl® XCell 6.6 and 6 grades developed by Rhodia and optimized for the MuCell® process result in outstanding mechanical property performance with no compromise in surface finish," he added.

"This agreement involves actual material reformulation by Rhodia to overcome the natural tendency of gas to come to the interface between the mold and the material as it is being injected into the mold and to create splay," said David Bernstein, President and CEO of Trexel. "For our part, Trexel has refined the parameters of the MuCell injection molding process, including injection profiles, gates sizes, injection speeds, mold and melt temperatures) to get a no-compromises surface. The key point is that this breakthrough begins with materials formulation and continues through process optimization," added Bernstein.

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## See the MuCell Process in Action With Technyl® XCell 6.6 resin at FAKUMA, October 17 - 21 in the Krauss-Maffei exhibit

Krauss-Maffei will demonstrate the effectiveness of the MuCell-Rhodia combination at its booth at the FAKUMA Conference, which will take place October 17 - 21 at Messe Friedrichshafen in Friedrichshafen,

Germany. Krauss-Maffei will mold a wire harness on a 200 ton machine using the MuCell process with a 60mm screw, and also using one of Rhodia's new Technyl XCell 6.6, 35% fiber filled polyamide grades. The part

will demonstrate the excellent appearance characteristics that can be achieved, combined with no warpage, no sink marks and excellent cycle time.

## Schefenacker Uses MuCell to Keep Things Stable on Frame Programs

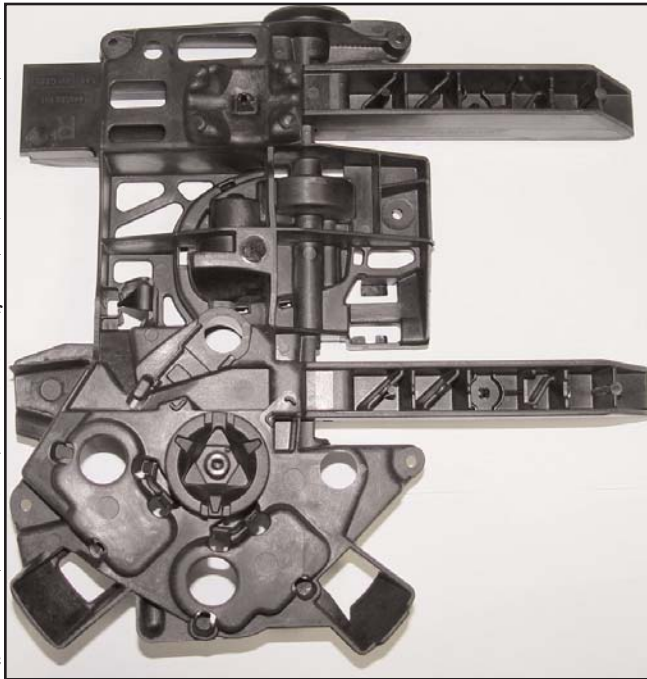
Schefenacker Vision Systems Australia Pty Ltd employs nearly 750 people at its Lonsdale site in South Australia. Its major products are interior and exterior mirrors and mirror actuators supplied to the four Australian automotive manufacturers, along with mirror exports to Ford in the USA, Mazda, Suzuki and Isuzu in Japan and mirror actuator sales to its sister companies in France, Spain, UK and the USA. Exports represent more than 80% of total business turnover and have been the key to the success of this Australian business unit of Schefenacker AG. In 2004, Schefenacker entered the automotive door handle segment, and today is beginning to enjoy the excellent business performance that it has already achieved in vision systems.

One key to success in Frame programs is the ability to avoid warpage and to achieve dimensional stability. Trexel has recently been involved in two innovative Frame programs with Schefenacker, one for Ford and another for Toyota. "The technical support we've achieved from Trexel has been outstanding. We have three MuCell-equipped machines in the plant, and have another on order. The Ford Case Frame will run at a level of about 350,000 vehicle sets per year,

and between one to two of the machines will be devoted full-time to the Ford program," says Joe Kennedy, one of Schefenacker's Molding Engineers. "Normally it's one of the most critical elements, but cycle time

but needs only 200T of clamp pressure to mold. According to Schefenacker, solid injection molded parts would have required a 650 Ton machine. "The part's final weight is 754 grams. We achieved a 10% weight reduction, and we saw a real reduction in part distortion," said Kennedy, "particularly in the legs."

The Toyota Door Handle Frame is also a structural component, molded 30% glass filled nylon, with a cycle time of 40 seconds, using a 4-cavity tool for this 85 gram final weight part. Again, reduction in distortion was the primary target. Nonetheless, the final molded part features a weight reduction of 10%, and requires only 100 tons of clamp pressure from the 350 Ton Engel machine. By way of comparison, solid injection molded parts would have required the full 350 ton rating.



**Ford Case Frame, molded in 50% glass fiber filled PBT**

on these two programs was not the main criteria for us. We did achieve a 10% cycle time reduction, but we were using MuCell for the reduced warpage," he said.

The Ford Case Frame is a structural component molded in 50% glass fiber filled PBT, with a cycle time of 46 seconds in a two cavity tool. The part is molded in a 420 Ton Arburg machine,

According to Kennedy, "The programs have been very successful. The dimensional stability we were after has been achieved and would not have been without MuCell.

"The MuCell process has enabled us to achieve warpage reductions, with weight and cycle time reductions as a bonus."

## Trexel Works in "Tandem" With Erwin Quarder on Large Door Lock Housing Program

If you can open your car doors, windows or lift gates at the touch of a button or adjust your seat and steering-wheel with ease, you'll quickly realize there's an impressive array of technologies involved in the production of door and interior systems.

When a major lock housing manufacturer was awarded a large order for door lock housings by a major North American-based OEM, they engaged the services of Erwin Quarder Systemtechnik GmbH in Espelkamp, Germany for design work, tooling and production of the plastic housing.

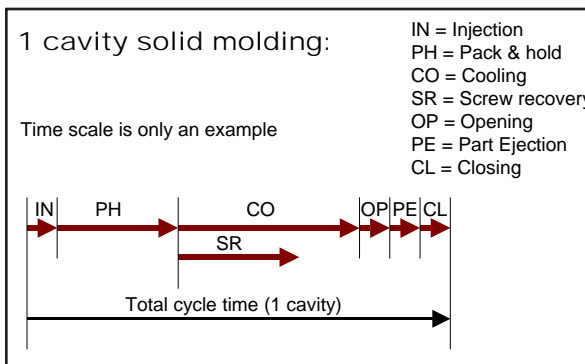
The innovative solution used by Erwin Quarder, called "Tandem Mold" technology, utilizes state of the art mold design technology along with the

MuCell process to help dramatically reduce cycle time on this application.

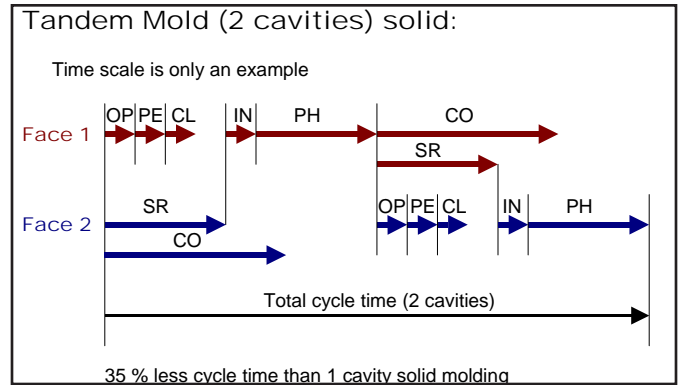
The idea of the Tandem Mold concept is to have a double daylight mold with each cavity being injected in turn, allowing one part to cool during the injection phase and part ejection process of the other. During injection and the pack & hold phase, the mold is closed under full clamp force. When the cooling phase begins, the cavity inner pressure goes down and a mechanical locking device secures alternate mold halves so that the other daylight may open for ejection when the machine opens.

The key benefit of the MuCell process when used in conjunction with

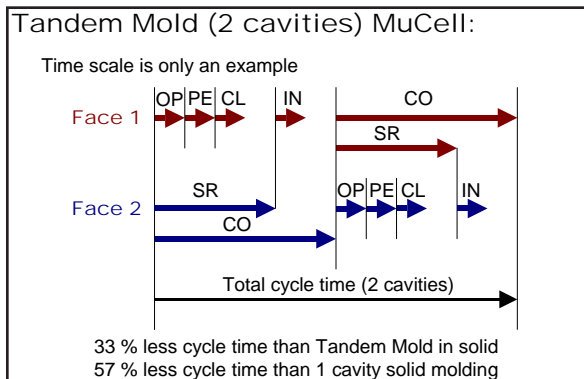
Quarder's Tandem Mold technology is that the MuCell process deletes the pack & hold time and the combination of the two technologies allows cycle time reductions of more than 50 % in comparison to the standard injection molding process using a conventional single face mold (see Figure 1). Industrial trials by Erwin Quarder using the Tandem Mold process showed a 33-35% cycle time reduction versus traditional solid injection molding using a single face mold (see Figure 2). However, when the MuCell process is used in conjunction with the Tandem Mold, Quarder will achieve cycle time reductions of more than 50 % when compared to traditional injection molding using a conventional single face mold, (see Figure 3).



**Figure 1.**  
*Traditional Injection Molding Process Using Single Face Mold*



**Figure 2.**  
*Tandem Mold Cycle Time As Compared To Traditional Injection Molding Process With A Single Face Mold.*



**Figure 3.**  
*Tandem Mold With MuCell Process Cycle Time Vs. Traditional Injection Molding Process Using Single Face Mold*

## Trexel and ExxonMobil Chemical Install a MuCell® TPV Extrusion Line in Japan

### *New Line will Speed Development of Automotive Weatherseals from Santoprene TPV in Japan and Asia*

Trexel and ExxonMobil Chemical have completed installation of a MuCell TPV Extrusion line at the Technology Center for Santoprene TPV's in Chidori, Japan.

The Technology Center for Santoprene TPVs will mainly support the regional TPV innovation projects for the development of MuCell TPV weatherseals for the Asian Automotive industry, with particular focus on Japan and Korea. In addition this application center will also develop new applications for other regions.

This installation represents the first time the MuCell Process has been implemented on a Berstorff extrusion line.

"Most leading Japanese and Korean automotive companies have announced strong mandates to convert from traditional non-recyclable EPDM rubber based weather seals, to TPV weather seals which are recyclable" said David Bernstein, President and CEO of Trexel. "It's also recognized that an all-TPV system offers weight reduction and coloring options" "The availability of an application development and demonstration center in the region will accelerate this effort," he added.


Berstorff machines have been installed by many of the leading-edge weatherseal producers in Europe and globally for solid profile and weatherseals applications. They have also been used to pro-

vide water foaming solutions. The ready availability of upgrade opportunities for the installed base of Berstorff machines may both facilitate and accelerate the transition to the MuCell Process by weatherseal producers around the world.

The installation of the MuCell line in Japan is also timely as it coincides with the introduction of the first new Santoprene TPV material specifically designed for the MuCell process. The new Santoprene TPV F150 grade addresses many of the shortcomings of more traditional TPV materials by offering improved elasticity, softness, foamability and surface appearance and is tailored specifically for the MuCell Process.

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## Trexel Works in "Tandem" With Erwin Quarder

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Trexel and Erwin Quarder supported common design and pre-production work and the results have been proven with the help of specially designed prototype molds. Based on the successful experience to date, Quarder is now constructing a 4 + 4 "Tandem

Mold" for the MuCell production of lock housings. These will be run on a 420 metric ton Krauss-Maffei machine and will be ramped up in Germany and then transferred to North America for mass production where Trexel will also provide a complete range of

support services. Erwin Quarder will manufacture the housings in Mexico and then ship the completed parts to their Tier One manufacturer for final assembly, which will also be done in Mexico.

## Hyundai's Avante/Elantra Model Features HVAC Module Housing Molded Using MuCell Process

Automotive heating/ventilation/air conditioning (HVAC) housings aren't commonly thought of as high performance parts, but these parts are situated under-the-hood in areas subject to extremes of hot and cold, and they require excellent dimensional stability to deliver excellent in-service performance.

The cooling fan module itself creates maximum air flow to dissipate the heat generated by the engine radiator and condenser. There is increasing demand for reduced noise from the HVAC system, a major source of noise under-the-hood, as consumers expect more

pleasant and comfortable driving conditions.

Today's Hyundai Avante/Elantra drivers and their passengers ride in comfort with a high-performance, yet light weight HVAC housing

molded using the MuCell process. As a relatively new technology in South Korea, the MuCell process was evaluated against conventional injection molding by a careful measurement of reject rates during



*The Hyundai Avante/Elantra's HVAC housing utilizes the MuCell process to improve manufacturability, reduce noise and save weight.*

pre-production industrial trials. The benefits of the MuCell process also allowed for a 9% reduction in weight.

Trexel assisted the two tooling producers, Kyung-IL and Daechang

with an array of services to support the mold design process and worked with Hyundai Motors and Halla Climate Control Corporation directly on manufacturing process optimization.

According to S.K. Lee, Marketing Director for PlusHUB, Trexel's partner in South Korea, "most car manufacturers are looking for cost reductions in every area. However, the most effective means of cost reduction is to reduce the weight of the car, and the waste that goes into its manufacture. The HVAC module for Hyundai is an excellent

example of the benefits the MuCell process can bring to a high performance part that is optimized for manufacturability, both low-noise and dimensionally stable in its performance and lighter weight as well."

## UPCOMING EVENTS

**FAKUMA 2006**

**Oct. 17 - 21, 2006**

**Messe Gelände Friedrichshafen**

**Krauss Maffei Exhibit**

**Hall A1, Stand 1202**