

# MuCell® Process News

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## MuCell Process Cost Analysis

Trexel has developed, with the cooperation of industry consultants and licensed MuCell® molders, an Excel® worksheet, which provides a thorough cost analysis of MuCell products compared to solid processing. The worksheet has easy-to-input fields and allows molder specific machine rates, resin costs cycle times, product weight and all hardware, license and machine cost data. The spreadsheet provides a complete payback analysis over the term of the license and actual part cost comparison between Solid and MuCell with calculated piece part costs and savings. Both weight savings and cycle time benefits are individually analyzed and reported. Other useful reports are illustrated, including a machine hour utilization report and a checklist of additional savings opportunities. *Please contact your local Trexel sales manager to take advantage of this useful MuCell cost analysis tool.*

## Engel Supplies 600-ton Tiebarless Machine


Engel in York, PA has recently sold a MuCell capable 600-ton tiebarless machine to a major automotive supplier. This is the largest MuCell tiebarless machine sold to date with the MuCell process.

Typically, the applications projected to run on this press require a much larger tonnage machine; however, with the MuCell process and the ability to reduce cavity pressure, the end user

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## MuCell Process Extrusion Development Centers

Japan Steel Works, Ltd. (JSW) will be opening, this summer, two full-scale MuCell Extrusion process development facilities, available to customers in Japan and East Asia. Sanpho Group will continue to supply KHK-approved Trexel SCF systems and to administer Trexel's licenses in Japan.

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*Mold pictured, shown on a 600-ton press normally runs on an 800-ton press. Product requires 350-tons with MuCell.*

## More Automotive Suppliers Jump on Board with the MuCell Process

Trexel has entered into licensing agreements with three more major automotive suppliers, raising the total number to nine. Under the terms of these agreements, D&R Technologies LLC, Pixley Richards, Inc. and Thermotech, are all licensed to produce injection molded parts using MuCell technology.

As with the other automotive suppliers, Trexel will provide complete local, technical, process, equipment and licensing support to each of these new licensees in collaboration with the various equipment suppliers.

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 **MUCELL COST ANALYSIS**

 **MUCELL DEVELOPMENT CENTERS AT JSW**

 **ENGEL SUPPLIES 600-TON**

 **MORE AUTOMOTIVE SUPPLIERS ON BOARD**

 **MUCELL SAVING ENERGY**

 **TREXEL'S MUCELL LAB**

 **UPCOMING EVENTS**

## MuCell Process Saves Energy

When Dr. Nam Suh of MIT first conceived the MuCell® process, in the late 1980s, he envisioned it as a way to reduce the amount of polymer used in manufacturing plastic parts. Since 1993, Trexel, Inc. of Woburn, Massachusetts, has been commercializing the MuCell process, by licensing it to injection molders, extruders, blow molders, and equipment manufacturers. Trexel also provides engineering support, training and other services, supplying its licensees with equipment and components integral to the process. According to Dan Szczurko, Trexel Vice President Business Development, weight reduction has often become almost secondary to the other benefits of the MuCell process. "Many of our licensees are enamored with the improved cycle time, while others want the reduced warpage and improved dimensional stability."

Recently, with the rapidly escalating cost of electricity, customers have been looking at the process' ability to save energy. "We're always looking for ways to reduce our customers' energy use," explained Ron Johnston, of Western Massachusetts Electric Company (WMEC). "I heard about MuCell technology from my plastics customers, so I brought it to the attention of our company, which hired a consultant to evaluate it." The study, performed in 1999, by W.H. Fuller & Company of Glastonbury, CT, concluded that the MuCell process would generate substantial savings. Using a 400-ton injection molding machine as an example, Fuller calculated savings of 298,698 kWh per year, and reduced demand of 24.62 kWh. In WMEC's territory, that calculated to \$16,407 in annual savings. At today's energy prices, the number would approximate \$25,000.

Next, Trexel ran an actual test in March of 2001. Using an Arburg 420C machine, Trexel manufactured nylon tensile bars as both a solid and a MuCell part, hoping to compare the relative energy use. To record the data, a Hobo datalogger was attached to the Arburg machine and was programmed to record the amperage every 5 seconds. Each test lasted 30 minutes. During the first run, 63 solid tensile bars were produced. Then the system was "maximized" for MuCell: it was set to introduce a supercritical fluid (N<sub>2</sub>) into the polymer, the clamp tonnage was reduced from 40 to 3, the pack and hold from 3 seconds to 0.1, the cycle time from 28.9 seconds to 19, the weight from 45.2 grams to 31.2, and the MPP was increased from 30 bar to 70. During the second 30-minute run, 97 MuCell tensile bars were produced.

Once the runs were complete, the datalogger was removed and the data was transferred to a spreadsheet for detailed analysis. Since MuCell parts weigh less than solids, rather than comparing kilograms of output per unit of energy, one must compare parts produced per unit of energy. That is how the comparative efficiencies of the two processes were calculated.

Overall, the MuCell process produced a 2% reduction in running amps. However, since 97 MuCell tensile bars were produced versus 63 solid tensile bars in the same amount of time, a 36% reduction in energy use per tensile bar was measured. It was also noted that the MuCell parts had significantly less warpage than solids, and far more consistent dimensions.

ENERGY READINGS					
<b>Part:</b>	Tensile Bar				
<b>Material:</b>	Nylon				
	Solid	31% Weight Reduced MuCell Run			
Sample Readings			Sample Readings		
Date	Time	Amps	Date	Time	Amps
3/13/01	06:40:15.0	44.24	3/13/01	05:53:25.0	49.71
3/13/01	06:40:20.0	47.56	3/13/01	05:54:15.0	46.00
3/13/01	06:40:25.0	49.12	3/13/01	05:54:20.0	49.71
3/13/01	06:40:30.0	48.34	3/13/01	05:54:25.0	43.46
3/13/01	06:40:35.0	48.14	3/13/01	05:54:30.0	42.68
3/13/01	06:40:40.0	43.46	3/13/01	05:54:35.0	46.39
3/13/01	06:40:45.0	46.00	3/13/01	05:54:40.0	49.71
3/13/01	06:40:50.0	45.02	3/13/01	05:54:45.0	39.16
3/13/01	06:40:55.0	46.39	3/13/01	05:54:50.0	49.71
3/13/01	06:41:00.0	49.51	3/13/01	05:54:55.0	45.41
Average Amps	47.19		Average Amps	46.43	
Average kW	37.60		Average kW	36.99	
No. of Pieces	63		No. of Pieces	97	
kWh/Piece	0.60		kWh/Piece	0.38	
<b>Savings</b>					<b>36%</b>

...Automotive...continued from page 1

D&R Technology is a full service manufacturer & assembler of electromechanical components including switches, sensors, lamps and contact assemblies. Pixley Richards is a leader in the manufacturing of precision plastic components for the automotive industry. Thermotech is a state-of-the-art custom molding company.

The extensive research by each of these companies is what has made it increasingly clear that the processing advantages provided by MuCell technology are exactly what the automotive industry needs to lower component costs. It has also proven that the growing demand for the MuCell process within the automotive industry is exemplified by this rapid deployment of the technology and the number of other automotive suppliers who are developing products based on its processing advantages. According to Dan Szczurko, Trexel Vice President of Business Development "Customers are constantly remarking on the benefits they are realizing, like controlled weight reductions, improved dimensional stability, and reductions in warpage, cycle time, cavity pressure and tonnage. The MuCell process will be a win-win for molders and their customers." David B. Purdie, a former General Motors Executive and President of D&R Technologies, agrees with Trexel's process, "With the price of resins continually on the rise, and the pressure for cost reductions coming from the customer, we are turning to MuCell technology to give us and our customers a competitive edge going forward."



Richard LaViolette, Director of Sales and Marketing for Pixley Richards Inc. has been using the MuCell process for some time now with plans to launch it's first MuCell-based production components later this year. To date, Pixley has had great success



with this technology, and is now looking beyond MuCell merely for cost savings in materials alone. He feels that the real advantage of the MuCell process, is simply in providing a solution to many of the demanding and sometimes problematic applications faced on a routine basis. LaViolette says "Trexel has provided us with the opportunity to add MuCell technology to our long list of technical capabilities and we fully intend to further develop this process where applicable. Developing and passing these technical advantages onto our key customers is the most important factor of all, and frankly, it is what Pixley Richards does best !"

## UPCOMING EVENTS

Plastics Encounter, <i>Cleveland, OH</i> Van Dorn running the MuCell process! Booth #234	June 19-21
SME Paper/Presentation, <i>Dearborn, MI</i> "Advanced Injection Molding Processes"	Aug 21-22
Husky Open House, <i>Novi, MI</i> Running the MuCell process on a 750-ton machine!	Sept TBD
Plastics USA, <i>Chicago, IL</i> JSW Running the MuCell process!	Oct 2-4
K-Plast '01, Paper/Presentation, <i>Dusseldorf, Germany</i> "A New Cost-effective Modification to Retrofit Twin Screw Extruders for the Manufacture of Microcellular PVC Products"	Oct 24 9am
K Show, <i>Dusseldorf, Germany</i> Trexel: Hall 12 Stand 22 Arburg, Engel, Italtech, JSW running the MuCell process!	Oct 25-Nov 1

## THERMOTECH®

John Bonham, Vice President and General Manager of Thermotech, stated, "Thermotech has tested a variety of resins and products using MuCell technology," and "have found that in many applications, the MuCell process demonstrates the potential to reduce material costs and cycle time with improved dimensional predictability. This makes it an important weapon to add to our technology arsenal." Bonham says that they are particularly interested in the potential for using the MuCell process in combination with some of the technologies to which Thermotech has in development, creating truly unique product applications.

## Trexel's MuCell Process Product Development Lab in Full Operation

Trexel's 15,000 square-foot product development laboratory is complete with injection molding, extrusion, and extrusion blow molding apparatus, including dryers, downstream equipment, resin storage, and other auxiliary processing equipment. The laboratory is supplemented by a materials test facility for measuring the structure and performance of MuCell-processed materials.

Trexel operates a MuCell extrusion line in either single or tandem mode, at output rates up to 200 pounds/hour. A Uniloy Milacron blowmolder, modified to run the MuCell process, also operates in the laboratory, with manufacturing capabilities of up to 1/2 gallon size bottles. Installation of a conical twin ExtrusionTek machine is planned for this summer.

Injection molding equipment, modified for running the MuCell process, includes: a 55-ton vertical Arburg machine an 88-ton Arburg machine, a 150-ton Engel machine, a 200-ton Engel machine, and a 400-ton Milacron machine.

Additional injection molding equipment scheduled to be on line in the second quarter 2001 include: a 180-ton JSW machine, and a 170-ton Van Dorn Machine.

*...Engel..continued from page 1*

was able to purchase a much lower tonnage machine while meeting its requirements for a large platen area. This provided significant cost savings to the end user.

*...Extrusion Development Centers..continued from page 1*

According to David Bernstein, Trexel President and CEO, "This is a unique relationship whereby JSW will offer to its customers, all of Trexel's proprietary know-how in the patented MuCell Extrusion process. That, combined with the availability of the MuCell Extrusion Development Centers at JSW, will reduce the cost of entry and the time to market for Japanese and East Asia customers".

Alex Schroder, Trexel Marketing Director, stated, "One of the new development centers will focus on twin and single screw technology and the other on single screw. These will be the only such centers in the world outside of Trexel. Because of their availability, Trexel licensees will be able to do preliminary commercial development work on commercial-scale equipment that is already in place for MuCell processing."

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