DECEMBER 2023

Rubber World

135 years

THE TECHNICAL SERVICE MAGAZINE FOR THE RUBBER INDUSTRY VOLUME 269, No. 3

Molding of fluoroelastomers

Liquid silicone rubber molding:
Building confidence through simulation

Molecular Rebar with Aflas:
Improved physical properties for performance applications

Molding Suppliers Directory

www.rubberworld.com

@rubberworld


AirBoss®
Rubber Solutions
EVEN BETTER IN COLOR
Introducing: the new AirBoss dedicated color-compounding line for producing anything you need in colored rubber polymers. Faster. Cleaner. Smoother. With the same high-caliber expertise and service that set AirBoss apart.
AIRBOSS RUBBER SOLUTIONS
The Science of Rubber
WWW.AIRBOSSOFAMERICA.COM

Contents

Vol. 269, No. 3 December 2023

Features

Cover photo: Courtesy of Machinery + Planning (Maplan)

Departments

From the Editor

Jill Rohrer

Ten tire CEOs create TIP plan

CEOs of ten leading tire manufacturers gathered last month to confirm a two-year Tire Industry Project (TIP) work plan focused on research and action for sustainability in the tire lifecycle, including tire emission research and end-of-life tire management. TIP's work plan for 2024 and 2025 builds on its established program of scientific research with enhanced action and stakeholder engagement across projects relevant to environmental, social and governance (ESG) in the tire sector.

"Our new work plan underscores the commitment of our members to a tire value chain that has positive impact on people and planet," said TIP Executive Director Larisa Krychkova. "We are evolving and taking an increasingly collaborative and solution oriented approach to building the knowledge, engagement and action required to drive a sustainable tire life cycle.

CEOs of TIP member companies meet regularly to review project progress and approve work plans. The work plans are also reviewed by an assurance group of independent scientists who provide guidance on the scientific relevance and robustness of planned research.

TIP's members are Bridgestone, Continental, Goodyear, Hankook, Kumho, Michelin, Pirelli, Sumitomo Rubber Industries, Toyo Tires and Yokohama. TIP is co-chaired by Bridgestone, Continental, Goodyear and Michelin.

Components of the 2024-2025 work plan include tire emission research and mitigation; end-of-life tire management; and more effective sustainability assessments. TIP will initiate a global conference to bring the scientific community and other subject matter experts together to advance both scientific understanding and mitigation action on tire emissions, including tire and road wear particles. TIP will also organize open calls for projects to catalyze studies into other tire emissions.

TIP will contribute expertise to updating international guidelines that will drive more sustainable global movement and management of end-of-life tires (ELT). Complementing this, TIP will deliver workshops, tools and data to build stakeholder capacity for more circular ELT management.

TIP has also committed to developing tire specific sustainability definitions and methodologies to enable the tire industry to deliver more effective circularity and sustainability assessments. The definitions and methodologies are expected to improve tire sector alignment on sustainability reporting.

Jill Rohrer

RubberWorld

Editorial Staff

Jill Rohrer	editor
David Schultz	technical editor
Don R. Smith	contributing editor
Michele Caprez	electronic publishing director
Matthew M. Raymond	creative director

Editorial Offices

1741 Akron-Peninsula Rd.
Akron, Ohio 44313-5157
Phone: (330) 864-2122
Facsimile: (330) 864-5298
Internet: www.rubberworld.com

Circulation

Richard Jarrett (GCSCS8@gmail.com)
Manage or renew online:
www.rubberworld.com/subscribe

Business Staff

Chip Lippincott	publisher
Dennis Kennelly	senior vice president, associate publisher
Mike Dies	marketing representative
Pete McNeil	sales consultant
Laura Comstock	office manager

Lippincott & Peto

- Rubber World
- Blue Book: Materials, compounding ingredients, and services for rubber
- Blue Book on CD
- Blue Book Online
- Rubber Red Book
- Red Book on CD
- Rubber World Digital Edition

RUBBER WORLD, (ISSN-0035-9572), December, 2023, Vol. 269, No. 3, Copyright: Lippincott & Peto, Inc. 2023; all rights reserved. J.H. Lippincott, Chairman. Published monthly at 1741 Akron-Peninsula Rd., Akron, OH 44313-5157 by Lippincott & Peto, Inc. Editorial and Executive Offices at 1741 Akron-Peninsula Rd., Akron, OH 44313-5157. Periodicals postage paid at Akron, OH and at additional mailing offices. POSTMASTER: Please send changes of address to RUBBER WORLD, Circulation Dept., P.O. Box 16123, St. Louis, MO 63105. Publication Mail Agreement Number: 1488902. CPC Publication Agreement Number: 40032646; Canada return address: BleuChip International, P.O. Box 25542, London, ON N6C 6B2. Subscription rates: United States, 1 year $49; Canada, $59; International, $169 in U.S. currency by U.S. bank draft or international money order. Single copies $20.00. December, 2023. All rights reserved.

Alliance for Audited Media

TIRE

VMI REVOLUTE

REDEFINES THE PROCESS FOR BEAD APEX PRODUCTION.

The VMI Revolute automatic bead apex assembly system, designed to complement VMI's existing bead apexing solution, speeds production time per item (almost double that of the next best performing VMI system) and reaches new levels of performance in other ways (higher apex than any other on the market, greater variety of compounds), but its main advantage is the level of automation.

Change-over times are shortened, with much less operator intervention and greater use of recipe driven methods. Waste is reduced, quality is more consistent and processes are made more efficient. Resulting in increased productivity and flexibility as well as improved competitiveness.

- Optimized automation
- Improved bead apex quality
- Increased flexibility
- Enhanced sustainability performance

vmi-group.com

VMI GROUP

Business Briefs

VMI opens service center in Thailand

VMI (www.vmi-group.com), Epe, The Netherlands, opened its Southeast Asian service center recently in Chonburi, Thailand. The move from smaller premises to the high-tech facility is said to reflect VMI's commitment to support the industry in this increasingly important region. The facility of almost 1,500 square meters is said to be suited for delivering the full range of service that VMI offers with a state-of-the-art workshop, office space for support staff and engineering, and training facilities.

Acquisitions, expansions

Arlanxeo (www.arlanxeo.com), Maastricht, The Netherlands, is strengthening its position as a leading global producer of synthetic rubber by debottlenecking its production processes at its hydrogenated nitrile butadiene rubber (HNBR) plants in Orance, TX, and Leverkusen, Germany.

Orion S.A. (www.orioncarbons.com), Luxembourg, completed its first greenfield project: a carbon black plant in eastern China that will supply the fast growing demand in Asia. The facility in the city of Huaibei in Anhui Province will produce carbon black for a variety of applications, including rubber, polymers and inks. The site's two production lines have a total capacity of 70 kilotons per year.

Ecore International (www.ecoreintl.com), Lancaster, PA, announced its strategic acquisition of **Ameritread Remanufactured Tires**, a Pennsylvania based company specializing in the remanufacturing of certified reconstructed tires.

Quality registrations

ARP Materials (www.arpmaterials.com), Amherst, NY, earned gold certification from the **Ecovadis Platform**. This recognition marks ARP's inaugural year within the EcoVadis framework, and is said to reflect ARP's unwavering commitment to environmental, social and economic sustainability.

Covestro (www.covestro.com), Pittsburgh, PA, announced that its Newark, OH, polycarbonate compounding facility has achieved **International Sustainability and Carbon Certification** (ISCC) Plus certification, increasing availability of the company's mass balanced polycarbonate products in the U.S.

Hexpol Compounding Americas (www.hexpol.com), Burton, OH, has achieved ISCC Plus certification as a rubber compounding processing unit with mass balance chain of custody at its Middlefield, OH, site.

Hexpol TPE (www.hexpoltpe.com), Manchester, U.K., has added ISCC Plus credentials to its site in Lichtenfels, Germany.

Orion S.A. (www.orioncarbons.com), Luxembourg, a specialty chemicals producer, announced that a fourth plant has earned ISCC Plus certification. Orion's facility in Cologne, Germany, was the company's latest carbon black production plant to pass extensive audits confirming the site's compliance for producing circular and bio-circular raw materials.

Business Briefs

Synthos partners with OMV on raw materials

CONTRACTS, LICENSES

Synthos (www.synthos.com), Oświęcim, Poland, a global producer of synthetic rubber, announced the signing of a memorandum of understanding (MOU) with **OMV**, an Austrian multinational integrated oil, gas and petrochemicals company. Under the MOU, the two companies will cooperate on the long term supply of sustainable raw materials, with a focus on sustainable butadiene for synthetic rubber used in tire manufacturing.

Synthos has signed an MOU with **Kumho Tire**, a South Korean tire manufacturer, for the joint development of sustainable tire raw materials. The two companies will conduct a joint research and development project for neodymium-butadiene rubber using bio-butadiene, and expand the use of environmentally friendly synthetic rubber in tire manufacturing.

Qualitest (www.worldoftest.com), Fairfield, CT, a North American provider of advanced polymer testing technologies, and **Gibitre**, a European manufacturer of high quality testing equipment for the rubber industry, are extending their collaboration that will introduce a range of sophisticated durometers and Shore/IRHD hardness testers tailored specifically for the North American market.

Nynas AB (www.nynas.com), Stockholm, Sweden, has partnered with **Leader Rubber** to address challenges related to developing high performance retreaded tires for the endurance off-road market. Nynas ReSolution is a collection of products and solutions said to help clients achieve sustainable performance in different ways.

Continental (www.continental-tires.com), Hanover, Germany, announced that **BMW** is equipping its 5 Series from the factory with Continental tires.

Continental announced that the Italian manufacturer of commercial vehicles **Iveco** is equipping its eDaily 42S all-electric van with Continental's VanContact Ultra, Eco and Winter tires.

Bridgestone (www.bridgestone.com), Tokyo, Japan, has been named by the **Fédération Internationale de l'Automobile** (FIA) at the **World Motor Sport Council** in Baku, Azerbaijan, as sole future tire supplier for the ABB FIA Formula E World Championship.

Business Briefs

Molecular Rebar Design earns SBIR EPA grant

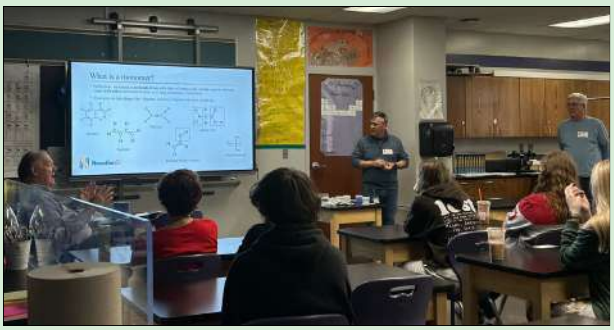
CORPORATE, FINANCIAL NEWS

Molecular Rebar Design, LLC (www.molecularrebar.com), Austin, TX, was awarded a Small Business Innovation Research (SBIR) Phase I award from the **U.S. Environmental Protection Agency** (EPA) to use Molecular Rebar (MR) carbon nanotubes to reduce or replace 6PPD in tire compounds, targeting a similar or better lifetime of tires with less environmental impact.

United Steelworkers (www.usw.org), Pittsburgh, PA, released the following statement in response to the **International Trade Commission**'s (ITC) affirmative preliminary determination on dumped truck and bus tires from Thailand: "USW members take immense pride in making high quality truck and bus tires, but the recent spike in imports from Thailand, underwritten by Chinese investments, put both their jobs and the communities they support at risk. We are gratified that the ITC in its preliminary determination affirmed our position and provided a path forward to protecting U.S. tiremakers from illegally dumped products."

High school students explore polymers with NovationSi

NovationSi (www.novationsi), Barberton, OH, along with **R.D. Abbott** and **FocusCFO**, collaborating as the **Greater Akron Polymer Industry Cluster**, a cross-sector collaboration between polymer related companies and institutions in Northeast Ohio, recently provided an Exploring Polymers Workshop to high school students in Barberton, OH. Representatives from RDAbbott, a materials science and distribution company; NovationSi, RDAbbott's manufacturing subsidiary; and FocusCFO, a provider of fractional CFO services, presented the two-part series to honors chemistry students at Barberton High School. Barberton is the home of NovationSi and the site of RDAbbott's materials science and logistics hub for the northeastern U.S. NovationSi President Bob Bradley and Brian Swanton, director of process engineering at Novation Si, participated as workshop presenters.



Conductive silicone rubber market to grow

The global conductive silicone rubber market is anticipated to attain a compound annual growth rate (CAGR) of approximately 8% over the forecast period, i.e., 2023-2035, according to a report published by Research Nester. The market is segmented on the basis of product type into thermal conductive, electricity conductive and others, out of which the electricity conductive segment is projected to occupy the largest share over the forecast period, as this property of silicone rubber is beneficial in making parts for electric appliances.

The growing application of electricity conductive silicone rubber in making wires is estimated to boost the segment growth.

The global conductive silicone rubber market is estimated to witness growth on the back of the higher flexibility, better elasticity, resistance to corrosion, longer life and electromagnetic shielding properties of silicone rubber. These are conductors of heat and electricity, but unlike metal conductors, they are highly flexible, making them optimal for making wires and small machinery parts. The growing adoption of conductive silicone rubber in the automotive industry for making parts for vehicle engines is estimated to boost the market growth. Moreover, the growing production in automotive, backed by rising sales of vehicles, is estimated to boost the market growth. According to a report by the International Energy Agency (IEA), the global sale of cars surpassed 73 million in 2020.

On the basis of geographical analysis, the global conductive silicone rubber market is segmented into five major regions, including North America, Europe, Asia Pacific, Latin America, and the Middle East and Africa region. The market in the North America region is anticipated to hold the largest share over the forecast period, on account of the presence of major automobile manufacturers in developed countries such as the U.S., along with the rising production of automobiles in the region. More than 3 million cars were sold in the U.S. in 2020. The high disposable income of people is another major factor estimated to promote the market growth.

The research report is global in nature and covers detailed analysis on the market in North America (U.S. and Canada), Europe (U.K., Germany, France, Italy, Spain, Hungary, Belgium, Netherlands and Luxembourg, Finland, Sweden, Norway and Denmark, Poland, Turkey, Russia and the rest of Europe), Latin America (Brazil, Mexico, Argentina, rest of Latin America), Asia-Pacific (China, India, Japan, South Korea, Indonesia, Singapore, Malaysia, Australia, New Zealand and rest of Asia-Pacific), Middle East and Africa (Israel, Saudi Arabia, UAE, Bahrain, Kuwait, Qatar, Oman, North Africa, South Africa and rest of Middle East and Africa).

The various properties of conductive silicone rubber, such as high elasticity, resistance to corrosion, flexibility and electromagnetic shielding, are said to make it the most optimum material for making wires and parts for electric machines. These properties make silicone rubber excellent for electronics, as they reduce the chances of damage and improve life of the devices. This is estimated to boost the market growth.

However, the higher cost of conductive silicone rubber is expected to operate as a key restraint to the growth of the global conductive silicone rubber market over the forecast period.

Passenger tire segment only bright spot in USTMA tire shipments forecast

The U.S. Tire Manufacturers Association (USTMA) projects total U.S. tire shipments of 327.7 million units in 2023. This is a 1.3% decrease compared to the 332 million units shipped in 2022. Pre-pandemic, the USTMA says 332.7 million units were shipped in 2019.

Compared with 2022, only the passenger tire segments posted gains. Original equipment (OE) shipments for passenger tires increased almost 8% to 44.9 million units, while replacement passenger tires rose 0.2% to 214.2 million units shipped. OE light truck and truck tires are expected to change by -4.0% and -1.3%, respectively. Replacement light truck and truck tire shipments are projected to change by -5.6 and -21.3%, respectively.

USTMA November 2023 tire shipments forecast

	2023 forecast	2022	% change	Units +/-	2019	% change versus 2019
Original equipment tires						
Passenger	44.9	41.6	7.9	3.3	46.3	-2.9
Light truck	6.0	6.3	-4.0	-0.2	5.9	2.6
Truck	6.4	6.5	-1.3	-0.1	6.5	-1.8
Replacement tires						
Passenger	214.2	213.7	0.2	0.5	222.6	-3.8
Light truck	35.2	37.2	-5.6	-2.1	32.5	8.1
Truck	21.0	26.6	-21.3	-5.7	18.9	10.7
Total	327.7	332.0	-1.3	-4.3	332.7	-1.5

All shipments in millions. Figures are rounded.

Challenges facing hydrogen production

Hydrogen and its potential as a clean fuel got a boost, as countries representing over half of the global gross domestic product (GDP) announced a 12 month plan at the recent COP27 climate talks that will deploy at least 100 hydrogen valleys: locally integrated hydrogen ecosystems that cluster several industrial and research initiatives to carry out pilot projects across the complete hydrogen value chain. Additionally, the target to deploy "50 large scale net zero emission industrial plants" is likely to create demand for hydrogen production. Investments in hydrogen production are set to exceed billions of dollars, according to Greene Tweed.

Greene Tweed has been manufacturing high performance elastomers, thermoplastics, composites and engineered components that can withstand harsh industrial conditions, and has a wide range of material solutions that solve challenges in hydrogen production, specifically with valves, compressors and electrolyzers.

Valves are safety-critical components when producing or handling hazardous fluids. And hydrogen poses a few unique challenges. It is an extremely light and low density gas. This means that it can penetrate any type of polymer or metal, causing leakage. "Permeation is a huge problem with hydrogen, and that is why it is critical to select products made of materials with minimal permeability to reduce leakage. For instance, crosslinking a material like PEEK could help to lower diffusion coefficient and enhance performance in a hydrogen environment by reducing permeation," says Kerry Drake, technology manager at Greene Tweed. Arlon 3000XT crosslinked PEEK may, therefore, be an excellent solution for valve seats in hydrogen service. Low lubricity of hydrogen molecules can generate valve seats wear and friction issues. For these non-lubricated environments, Greene Tweed offers WR 600, a PFA composite with unique dry running properties; and Arlon 3000XT, the only crosslinked PEEK available in the market.

When combined with high pressure, hydrogen permeation can generate rapid gas decompression (RGD) issues. Greene Tweed recommends RGD resistant Fusion 938 o-rings, or MSE spring energized lip seals for extreme temperatures and pressures. Permeation issues can also occur at low temperatures, and Fusion 665 o-rings are best suited to overcome such problems.

Compressors are critical to storing and transporting hydrogen safely and cost-effectively. Compressors are one of the most critical types of equipment in transporting the increasing amount of hydrogen that will be required to properly support the expected rise in hydrogen demand, the company says. But designing new compressors and upgrading current compressors for hydrogen services often present technical challenges not typically seen with other gases.

For any type of hydrogen compressor, Greene Tweed recommends Fusion 938 o-rings for RGD resistance, and Fusion 665 o-rings for low temperature services. In reciprocating compressors, Arlon 3000XT crosslinked PEEK, WR 600 composites and Avalon 56 modified PTFE are said to be a great choice in piston rings and rider bands, as well as valve plates.

While designing a centrifugal compressor for hydrogen service, engineers need to ensure a high operating speed for the impeller. The maximum achievable impeller tip speed depends on the material used to construct it. Greene Tweed recommends Xycomp carbon fiber reinforced thermoplastic composite with a high strength-to-weight ratio. For sealing elements, RGD-resistant Fusion 938 o-rings and MSE spring energized lip seals for extreme temperatures and pressures are said to be best suited.

Green hydrogen, a potentially carbon-free fuel, is critical to decarbonizing the global economy. What makes green hydrogen possible are electrolyzers that split water into hydrogen and oxygen using electricity that comes from sources like wind and solar. To produce emission-free hydrogen, electrolyzers need material solutions that can withstand challenges, such as material outgassing, chemical compatibility or degradation of mechanical properties at increased temperatures. Greene Tweed has developed a portfolio that includes materials to enhance the performance of fuel cells and electrolyzers. These include Arlon 3000XT that provides chemical resistance better than standard PEEK, while retaining the mechanical properties of standard PEEK at a higher temperature. Moreover, it offers permeability 200 times lower than standard PEEK. Greene Tweed's Chemraz seals are said to be ideal for their exceptional chemical compatibility, low outgassing properties and high temperature capabilities.

The company actively tests its materials extensively at several independent laboratories to ensure that its solutions can withstand the challenges associated with hydrogen. So far, results from tests, including high pressure cyclic exposure tests and permeation tests, show the materials and solutions are ready to support and empower hydrogen infrastructure.

Oil, Gas & Energy sponsored by AGC Chemicals Americas, inc.


AGC
Fluon®
Fluon+™
AFLAS®
FLUOROELASTOMERS
High-Performance Fluoropolymers for the Oil & Gas Industry
When failure is not an option.

by Samuel Saldiarriaga,
Simtec Silicone Parts

Liquid silicone rubber ophthalmological part and in-line slitting

Simtec Silicone Parts was approached by a large medical OEM customer seeking a solution for their new medical device in the design development stage. A solution was needed for all project phases, including prototyping and high volume production, along with secondary slitting. The product was a handheld surgical device that included a liquid silicone rubber one-way slit valve serving a critical function. The valve required high volume, cleanroom production and packaging.

Background

Ophthalmology is the study of eye-related medical conditions. In this field, ophthalmologists deliver medical treatments and surgeries to relieve afflictions ranging from infections to cataracts to optical nerve issues. These doctors perform surgical procedures using various ophthalmologic instruments that are crucial to operational success. These tools must perform reliably due to the precision and delicate nature of their use, navigating the intricate and fragile inner workings of the eye anatomy with high-stakes consequences.

Liquid silicone rubber (LSR) has proven to be a valuable material for ophthalmological and other surgical instruments, providing the biocompatibility required for contact with human fluids, and the vital sealing properties needed for one-way valves. The precision, accuracy, consistency and hygienic environment offered by automated cleanroom injection molding and inline slitting deliver the quality and reliability needed to ensure exact performance of critical functions and patient safety.

Challenges

Critical function

Simtec's customer, a manufacturer and global leader in medical devices, designed a new handheld ophthalmological surgical instrument used to facilitate the safe removal of the eye's natu-

Tech Service

ral lens during cataract surgery. This small surgical device utilizes a one-way valve that serves a critical function to ensure patient safety. The purpose of the check valve is to allow fluid to pass in one direction and then seal to maintain pressure, preventing backflow and depressurizing the patient's eye, which can lead to serious complications during surgery.

In cataract surgery, maintaining ocular pressure is critical for patient safety. By sealing against the device's end piece, the check valve closes when detecting any change in the end piece pressure.

Valve slitting

Given the critical nature of the valve's function, the accuracy of the slit length, orientation and positioning is extremely important.

Typically, a molded-in slit is not a viable option, as it leaves a gap of a minimum 0.010" (0.25 mm). This gap is undesirable, as it can allow for some fluid to backflow. Therefore, a secondary cutting or slitting operation is required and performed after the valve is molded. Traditionally, when a slitting operation is performed as an independent secondary operation, a standard bowl feeder or other automation equipment is used. However, performing the secondary operation in this manner adds costs and time to a project, and poses orientation, alignment and quality challenges.

Simtec's solution

Early support

Simtec offers its support in the early stages of customer projects, providing valuable material guidance, design recommendations to optimize manufacturing (DFM), and a quality assurance plan to help ensure a successful project.

Self-healing LSR

A known characteristic and benefit of LSR materials is its self-healing characteristic; in fact, this feature is why LSRs are widely chosen and preferred for sealing applications. However, for components such as check valves, one-way valves and other applications using a slitting concept, these self-healing characteristics can present challenges. Simtec has decades of experience and expertise in LSR injection molding, and with this knowledge combined with an understanding of its customers' requirements, Simtec is able to offer a solution. Simtec recommended a reduced self-healing LSR grade that met the customer's requirements. Additives and other methods are also available options for reducing healing.

Pilot and production parts manufacturing

To meet the need for a limited quantity of molded LSR parts for clinical trials, Simtec built a four-cavity insert package that would run in a Simtec mold base. The pilot production was automated, and within an environmentally controlled enclosure, accurately representing the manufactured product.

Tech Service

An eight-cavity high capacity production mold went into production following pilot production. Research findings from the pilot production were applied to the production process, thereby streamlining and minimizing debugging time.

Inline slitting process

Simtec designed a customized inline process to perform the slitting operation immediately following the molding step. The components are robotically removed and securely placed and aligned in the custom fixture for slitting. Once the precision slitting function is completed, the parts are conveyed within the hygienic enclosure into a Class 8 cleanroom for inspection and packaging.

Inline value-added benefits

Performing the slitting operation within the same process added great value for the client. Simtec shortened its client's supply chain by serving as a single source for both the molding and the slitting operations, saving time and costs, and enhancing quality. Alternatively, secondary equipment such as automated bowl feeding equipment, traditionally used for secondary slitting operations, can result in higher defects due to inconsistent alignment that can damage the components, increase downtime, and ultimately result in higher operational and maintenance costs.

Simtec's customized, automated inline slitting offered the customer a better solution. With a value-added inline process, Simtec can provide higher output, and the precision needed for consistent and accurate slit length, orientation and positioning over the 10-year project lifetime.

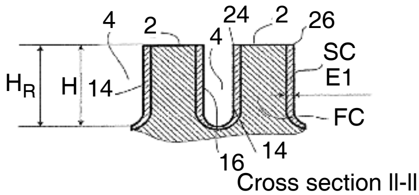
Simtec Silicone Parts

Simtec has been providing innovative, value-added custom liquid silicone rubber component solutions for over two decades. Simtec partners with its Fortune 100 and other top OEM customers, providing support through all phases of the project, from early design and prototype support through high volume fully automated precision LSR, LSR two-shot, LSR overmolding and LSR multi-shot injection molding, and post-molding value-added secondary processes performed within the same molding cell.

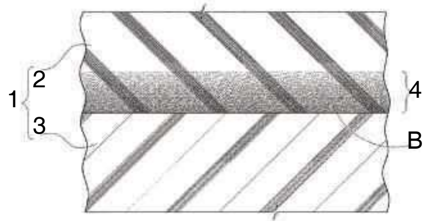
Patent News

Phthalic anhydride modified polymer rubbers of ethylene-glycidyl-methacrylate-vinyl acetate and epoxy resins comprising the same
U.S. patent: 11,725,101
Issued: August 15, 2023
Inventors: Martin Hoch, Susanna Lieber, Piming Ma, Qianqian Wang and Pengwu Xu
Assigned: Arlanxeo
Key statement: The present disclosure relates to rubber polymers of ethylene-glycidylmethacrylate-vinyl acetate polymer as modifiers in epoxy resins. In particular ethylene-glycidylmethacrylate-vinyl acetate rubber polymers comprising phthalic anhydride modified glycidyl methacrylate monomer units.

Tire comprising a rubber composition
U.S. patent: 11,724,542
Issued: August 15, 2023
Inventor: Masahiko Moriyama
Assigned: Michelin
Key statement: A tire comprises a fluorescent rubber composition based on at least an elastomer matrix, a reinforcing filler comprising between 0 and 50 phr of carbon black and between 2.5 and 15 phr of a fluorescent pigment.

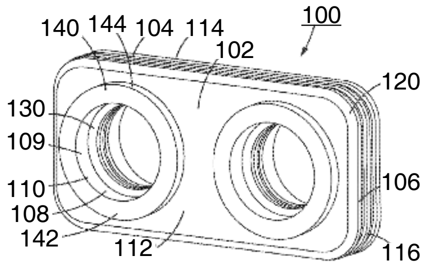


Laminate body, manufacturing method therefor, and airless tire
U.S. patent: 11,731,402
Issued: August 22, 2023
Inventors: Ai Takeda and Jun Okamoto
Assigned: Sumitomo Rubber
Key statement: A laminate body of a rubber layer and a resin layer made of a resin, wherein the rubber layer includes a surface-treated superficial layer (4) directly united with the resin layer without any intervening adhesive layer.



Elastomer seal spring
U.S. patent: 11,735,858
Issued: August 22, 2023
Inventor: David Demaratos

Assigned: J.S.T.
Key statement: The seal spring of the present invention has a dual functionality. The seal spring provides both a sealing property and spring function in use within an electrical connector system, which is accomplished by its elastomeric qualities. The seal spring is preferably comprised of silicone, EPDM rubber or materials and compositions that provide similar performance during use, or the like. The seal spring of the present invention is not limited or defined into a spring section or a seal section by its geometry. Shown is an implementation of the seal spring within a conductive female housing and connector assembly. The seal spring compresses and provides adequate spring force against a disk ferrule assembly, pressing the disk ferrule assembly, with a wire shield, against a conductive female outer housing, providing a grounding scheme for the connector assembly. The seal spring also seals against the female outer housing and a wire.

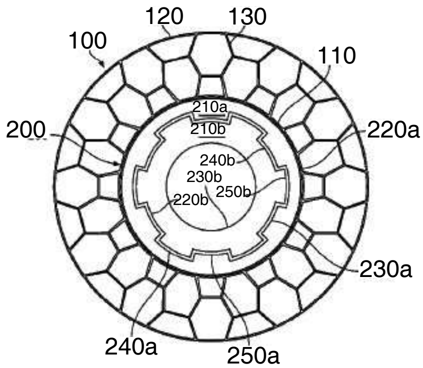


Tire comprising a tread
U.S. patent: 11,724,545
Issued: August 15, 2023
Inventors: Tomoya Sakurada and Tomotake Uchida
Assigned: Michelin
Key statement: A tire having a tread comprising at least two radially superposed portions which comprise a radially external portion being made of a first rubber composition (FC) and a radially internal portion being made of a second rubber composition (SC); the tread comprising a plurality of tread pattern elements (1) delimited by cutouts (3, 4); the tread pattern elements (1) respectively comprising at least one lateral face (13, 14, 15, 16) and a contact surface (2) intended to come into contact with the ground during rolling; the external portion of the tread pattern elements (1) being at least partially covered on at least one of the lateral face(s) (13, 14, 15, 16) with a layer of a third rubber composition (TC).

Elastomer laminate
U.S. patent: 11,731,401

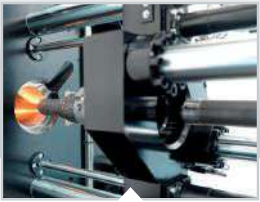
Issued: August 22, 2023
Inventors: Jose-Carlos Araujo Da Silva and Frederic Lemerle
Assigned: Michelin
Key statement: An elastomeric laminate comprises at least two adjacent cohesive layers, the first layer consisting of a composition based on 10 to 100 phr of a copolymer of ethylene and of a 1,3-diene of formula $CH_2{=}CR{-}CH{=}CH_2$, the ethylene units in the copolymer representing more than 50 mol % of the monomer units of the copolymer, the symbol R representing a hydrocarbon chain having 3 to 20 carbon atoms, from 0 to 90 phr of a diene elastomer having a content by weight of diene unit of greater than 50% and a crosslinking system; the second layer consisting of a composition based on a diene elastomer having a content by weight of diene unit of greater than 50% and a crosslinking system. Also disclosed is a tire, in particular a tire provided with a sidewall, comprising this composition.

Tire rim assembly having inner and outer rim components
U.S. patent: 11,724,539
Issued: August 15, 2023
Inventor: David G. Abdallah, Jr.
Assigned: Bridgestone
Key statement: A rim assembly for a tire includes an outer rim having an outer annular surface and an inner surface. The rim assembly also has an inner rim with an outer surface, wherein the inner surface of the outer rim has a first plurality of axial grooves that define a first plurality of axial ridges. The outer surface of the inner rim has a second plurality of axial grooves that define a second plurality of axial ridges. The second plurality of axial grooves have a cross-sectional geometry corresponding to a cross-sectional geometry of the first plurality of axial ridges and the second plurality of axial ridges have a cross-sectional geometry corresponding to a cross-sectional geometry of the first plurality of axial grooves.



MAPLAN INJECTION INTELLIGENCE

Contact us!



FIFO Duale

MAP.cooldrive

Brush & Demolding Systems

Advanced for **TOMORROW.**

MAPLAN RAPID Series offers unparalleled efficiency

- Generously dimensioned clamping unit
- Optimised for the processing of difficult technical elastomer
- Various demoulding devices and brush systems available
- Large daylight and closing stroke
- Post-processing-free production of sealing elements and moulded articles possible
- Cold runner ready
- Comes with all MAPLAN+ benefits

MAPLAN

MAchinery + PLANning Inc.
1655 North Lancaster Road, South Elgin
IL 60177 - USA | **+1 630 924 0100**
sales@maplan-usa.com | www.maplan.at/en

Molding of fluoroelastomers

by William Stahl, WMS Technologies, LLC

Fluoroelastomers are high performance polymers that have been around for over 65 years. They were first introduced for the aerospace industry, but have since found use in automotive, oil and gas production, chemical and utility industries, green applications, and other applications where their chemical resistance, thermal resistance and mechanical properties provide longer term durability compared to hydrocarbon based elastomers. Various types of fluoroelastomer parts, including grommets and seals, are shown in figure 1.

When designing or working with fluoroelastomer parts, there are three things to consider:

- What is the application (automotive; oil and gas; chemical and utilities industry)?
- What is the environment (temperature range [high/low/cycling]; fluids resistance; environment exposure)?
- What is the part profile (dimension; thin walled or thick cross-section; convolutes or undercuts in the part)?

These questions will help determine the polymer selection, cure system and other compound ingredients needed to formulate a part. They will also help determine the best way to mold a part: compression, transfer or injection molding. Each molding method has its own operational parameters based on the formulation, part dimensions and mold design.

Figure 1 - various types of fluoroelastomer parts

General fluoroelastomer compounding

A general fluoroelastomer formulation consists of the following:

- Polymer: 100 phr
- Metal oxides: 0-10 phr
- Fillers: 2-70 phr
- Process aids: 0.5-3 phr
- Cure system: 2-5 phr

Polymer

The polymer can be divided into types and grades.

The type of fluoroelastomer determines the basic properties, such as low temperature flexibility and fluid resistance, and is based on fluorine content and monomer composition (table 1).

The grade of fluoroelastomer used determines the processing characteristics of the raw polymer and is based on its viscosity (ML 1+10, 121°C). Supplier technical data sheets or product information guides can recommend polymers to be used for each molding operation.

Cure system

The two main cure systems for fluoroelastomers are bisphenol and peroxide.

A bisphenol cure system consists of an accelerator which controls the rate of cure (or how fast the compound will cure), while the curative controls the state of cure (crosslink development) the compound will have. The accelerator is a phosonium based salt (BTPPC+), while the curative is bisphenol BpAF. Both materials are available as dispersions in an FKM binder or in a pellet form in a set ratio of accelerator to curative.

A peroxide cure system consists of a coagent which controls the state of cure (curative), while the peroxide controls the rate of cure (accelerator). The main coagent is triallyl isocyanurate (TAIC). It is available as a liquid or a dispersion. Usually, the peroxide used is 2,5-dimethyl 2,5-di-(t-butylperoxy) hexane.

The cure system depends on a ratio of accelerator to curative.

Table 1 - types of FKM elastomers

ASTM D1418 classifies fluoroelastomers as FKM polymers. This specification lists five different types of fluoroelastomers.

FKM type 1:	*FKM type 2:*	*FKM type 3:*	*FKM type 4:*	*FKM type 5.*
Composition of vinylidene fluoride (VF2) and hexafluoropropylene ((HFP) Fluorine content ~66%.	Composition of vinylidene fluoride (VF2), hexafluoropropylene (HFP) and tetrafluoroethylene (TFE) Fluorine content ~68% to 70%	Low temperature FKM Composition of vinylidene fluoride (VF2), tetrafluoroethylene (TFE) and perfluoromethylvinylether (PMVE). Fluorine content ~64 to 67%	Base resistant FEPM. Composition of tetrafluoroethylene (TFE) and propylene. Fluorine content ~54% (may also contain VF2 and different fluorine content).	Base resistant FEPM. Composition of ethylene (E), tetrafluoroethylene (TFE) perfluoromethylvinylether (PMVE). Fluorine content ~67% (may also contain VF2 and HFP)

By varying this ratio, one can improve flow time, scorch safety and cure time of a compound.

Process aids

Process aids can improve mill release, provide smooth preforms and help with mold release. The following are recommended process aids for fluoroelastomer compounding:

- VPA No. 1
- VPA No. 2*
- VPA No. 3
- Struktol WS280
- Struktol HT 290*
- Tecnoflon FPA
- Carnauba wax*
- PAT 777
- Armeen 18D*

Products with an asterisk (*) are recommended for peroxide cured compounds.

The following factors should be considered when selecting a process aid:

- Process aids such as carnauba wax have a high melting point (~84°C). It may be too high to melt into a mill mixed compound, which may cause dispersion during molding. It is recommended to use a lower melting point wax or a powdered process aid.
- Process aid levels may depend on filler level amounts and types (higher loaded compounds and mineral fillers may need more process aids).
- High shear molding processes such as transfer and injection molding may cause process aids to migrate to the surface easier, causing molding problems.
- A combination of process aids at low levels may work better.

Metal oxides

High activity magnesium oxide (3 phr) and calcium hydroxide (6 phr) are used in bisphenol cured compounds to help create a cure site and act as acid acceptors. Varying these levels can either give faster or slower cure times. Higher levels of these metal oxides will promote mold sticking and fouling.

Zinc oxide may or may not be needed in peroxide cure formulations, depending on the cure site technology of the polymer itself. It can be used, along with magnesium oxide, to help improve heat resistance.

Fillers

Fillers are used to reinforce or enhance the mechanical and physical properties of the compound. They may either be carbon black, mineral fillers or other specialty type materials

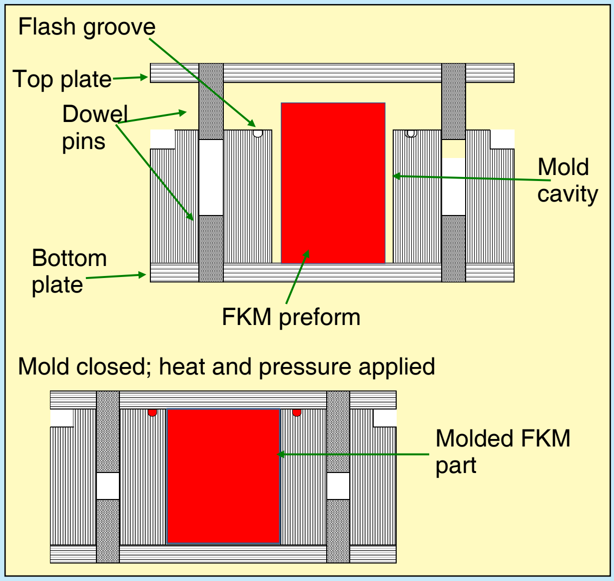
Before molding begins

Once a formulation is determined, one must mix the compound. The objective of mixing, either by a two-roll mill or internal mixer, is to deliver a compound with each ingredient uniformly dispersed and distributed throughout the batch:

- To reduce variability, use quality materials.
- All materials must be properly stored. Be careful of hydroscopic materials such as metal oxides.
- Weigh ingredients accurately.

Once mixed, the compound should be cooled as soon as possible to reduce the heat history of the batch. Variations in the heat history could cause variations in compound viscosity, cure rate and state of cure.

Figure 2 - compression molding



Testing of mixed compound

There are several tests that can be run on a mixed compound to determine its flow and cure properties:

- ASTM D1646 Mooney viscosity determines viscosity of a compound.
- ASTM D2084 vulcanization (oscillating disk rheometer) helps determine the processing time, onset of cure, curing time and state of cure.
- ASTM D5289 vulcanization (moving disk rheometer) is the same as above.
- ASTM D5099 capillary rheometer measures flow rates and shear properties.

Mooney viscosity will help with compound flow. The oscillating disk rheometer and moving disk rheometer will help with scorch safety and cure properties The capillary rheometer measures the change in viscosity through a change of different shear rates and temperatures. These data can help predict how the compound will behave in the different molding operations.

Compression molding

Compression molding is the oldest and simplest method for molding fluoroelastomer parts (figure 2). A compound of specific weight and shape is placed in a heated mold cavity. The mold is held under heat and pressure until the part is cured. The mold is opened and the part is removed for final finishing.

Cure times and temperatures will depend of the size and shape of the part being molded. Typical cure temperatures range from 162°C to 177°C. Cure times range from 5 to 25 minutes

Table 2 - typical recipe/properties for compression molded compound

Viton A601C	100	-
Viton A401C	-	100
High activity magnesium oxide	3	3
Calcium hydroxide	6	6
N990 carbon black	30	30
Carnauba wax	1	1
Mooney scorch (MS at 121°C)		
Minimum (MU)	49.5	41.5
2 point rise (minutes)	22.1	23.7
5 point rise (minutes)	>30	>30
ODR, 177°C, 3°arc, 12 minute clock		
ML (dNm)	18.1	14.2
Ts2 (minutes)	1.3	1.5
Tc90 (minutes)	2.9	2.9
Mc90 (dNm)	134.6	130.7
MH (dNm)	147.7	143.6

(very thick cross-section parts may take up to several hours to cure).

Formulating for compression molding depends on the type of part being molded. Compression molding allows for the use of moderate to high viscosity polymers. Compound viscosity depends on the part dimensions and flow into the mold cavity before the onset of cure.

Preparation of preforms is essential for good molded parts. Preforms should have a slightly higher weight (about 5%) than the finished part to ensure proper fill of the mold cavity. They should also be in the general shape of the cavity to help with flow. They need to be free from porosity.

If a part has convoluted shapes or undercuts, one may have to formulate to improve hot tear resistance to help with demolding. This can be accomplished by lowering the state of cure of the compound and using different fillers to increase the tear resistance or lower the curing temperature.

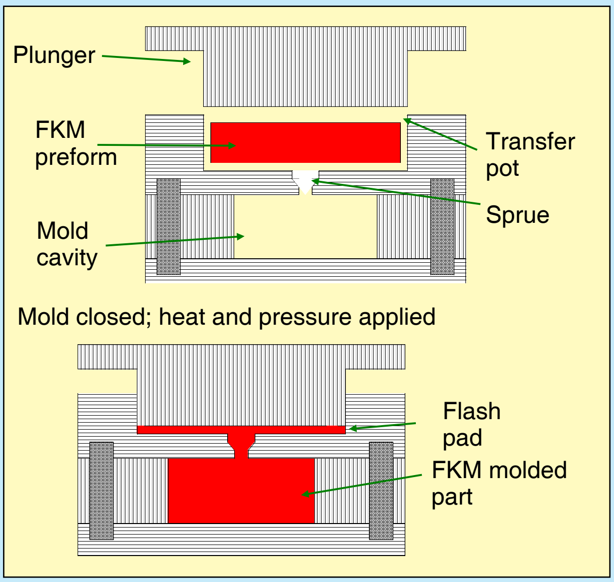
Two factors to monitor during compression molding include the temperature of the mold and pressure use to closed the mold.

Compression molding is a labor intensive operation, including the preform preparation, loading of the preforms and unloading of the cured parts. Temperature of the mold could vary, depending on the length of time the mold is opened, affecting the rate and state of cure of the part.

It is necessary to make sure constant pressure is applied to the closed mold during the entire curing cycle. At the start of the cycle, a cold preform is pressed into a hot mold. As the rubber softens and flows into the cavity, there may be a drift in the pressure applied to the closed mold.

Both factors could affect part dimensions and properties, and cause batch-to-batch variations (table 2).

Figure 3 - transfer molding



Transfer molding

Transfer molding (figure 3) is a little more involved than compression molding. Transfer molding consists of a mold body, mold plate and a plunger. A preweighed sample of compound is placed in the transfer pot. As pressure is applied to the plunger, the compound is pushed through a sprue into the closed mold, filling the cavity. Once cured, the mold is opened and the part is removed for final finishing. The cured sprue material and the remaining cured transfer pad are discarded.

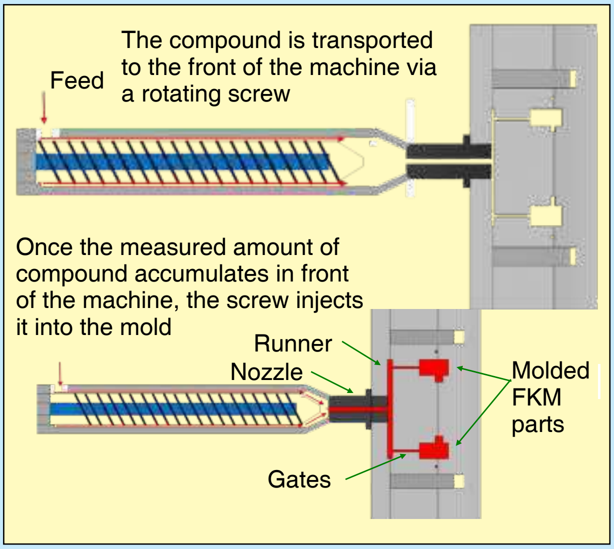
Formulating for transfer molding is more dependent on a balance of compound viscosity (flow) and scorch safety (longer ts1, ts2 from the ODR/MDR). Frictional heat (shear heat) is generated as the compound flows through the sprue and gates into the mold cavity. While the generated shear heat contributes to shorter cure times and lower cure temperatures, care must be taken to prevent premature scorching.

The shot sample should be of uniform shape and density to prevent any problems during transfer. Cycle time for transfer molding depends on the amount of material to be transferred, viscosity of the compound, sprue sizes, pressure applied to the

Table 3 - typical recipe/properties for transfer molded compound

Viton A-200	65
Viton A-500	35
High activity magnesium oxide	3
Calcium hydroxide	4
N762 carbon black	15
Carnauba wax	1
Viton curative 50	1.3
Mooney scorch (MS at 121°C)	
Minimum (MU)	9.7
2 point rise (minutes)	>30
ODR, 177°C, 3°arc, 12 minute clock	
ML (dNm)	5.1
Ts2 (minutes)	1.7
Tc90 (minutes)	4.1
Mc90 (dNm)	50.6
MH (dNm)	55.7

Figure 4 - reciprocating screw



plunger and the number of cavities in the mold.

Even though transfer molding offers better control of part dimensions and consistency than compression molding, constant pressure needs to be maintained during the cycle time to prevent problems. Table 3 provides a typical recipe and properties.

Injection molding

Injection molding is a process where a measured amount of heated compound is injected under controlled conditions into a closed and heated mold for curing.

There are two types of injection molding machines, including reciprocating screw and a screw/ram combination.

In the reciprocating screw (figure 4), the compound is fed into a heated barrel like an extruder. Its viscosity is lowered as it is transported forward. After a measured amount accumulates in the front of the barrel, the screw, acting as a ram, injects the rubber into the mold.

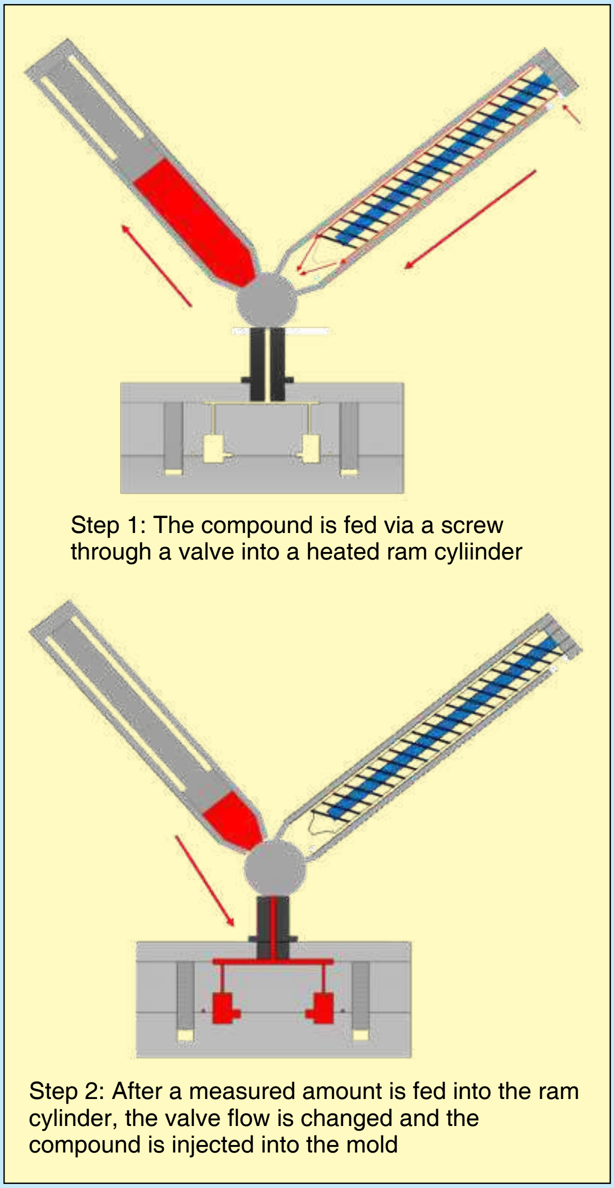
In the screw/ram (figure 5), the compound is fed into a heated barrel where a screw moves it forward. At the tip of the machine is a valve that feeds the rubber into a heated ram barrel. After a measured amount accumulates in the ram cylinder, the valve flow is changed and the rubber is injected into the mold.

Like transfer molding, the main areas of concern for injection molding are compound viscosity (flow) and scorch safety. More shear force (heat) is generated as the compound flows through the injection barrels, into the injection nozzles, the flow runners in the mold, and finally the gates leading into the mold cavity.

General operating conditions to monitor for injection molding FKM compounds include:

- Injection barrel temperature: 60°C to 80°C
- Screw rpm: 25 to 50
- Injection pressure: 3,000 to 15,000 psi
- Injection rate: up to 10 seconds, depending on part dimension and volume
- Mold temperature: 177°C to 200°C

Figure 5 - screw/ram



- Cure time: 15 seconds to several minutes, depending on part dimensions

Figures 6 and 7 show the mold and the parts made from a

Figure 6 - 16-cavity symmetrical o-ring mold

Figure 7 - parts made from a 16-cavity symmetrical o-ring mold

16-cavity symmetrical o-ring mold. In this design, the injected material from the nozzle, runners and sprues all cured. This made for manual removal the of parts (one quadrant of the mold is not completely filled due to a short shot size).

Systems have been designed to allow the compound in the nozzle, runners and sprue to have high enough heat for good flow properties, but below the onset of prevulcanization.

Injection molding allows for more intricate design of parts when compared to compression and transfer molding. The compound is entering a closed mold at close to cure temperature. This, along with the clamping force from the press, allows for tighter part tolerances and less flash on the parts. Table 4 provides a typical recipe and properties.

Table 4 - typical recipe/properties for injection molded compound

Viton A-200	85
Viton A-500	15
High activity magnesium oxide	3
Calcium hydroxide	4
N762 carbon black	15
Carnauba wax	1
Viton curative 50	1.3
Mooney scorch, (MS at 121°C)	
Minimum (MU)	57.2
2 point rise (minutes)	12.6
5 point rise (minutes)	>30
ODR, 177°C, 3°arc, 12 minute clock	
ML (dNm)	16.6
Ts2 (minutes)	2.3
Tc90 (minutes)	4.7
Mc90 (dNm)	112.4
MH (dNm)	123.1

Post-curing of parts

Fluoroelastomer parts may need a secondary curing step to optimize their physical properties. This secondary step is called post-curing and is accomplished in an air circulating oven. Post-curing should be done on deflashed parts.

Post-curing times and temperatures may depend on compound formulation, cure system and application. Some of the new technology peroxide cure fluoroelastomers need little or no post-curing.

Post-cure cycle times can range from 2 to 24 hours. Temperatures range from 162°C to 260°C.

Thick cross-section parts need to be step post-cured. Start at 90°C for 2 to 4 hours, then increase by 25°C an hour until the final post-cure temperature is reached. Use of calcium oxide is recommended for the formulation.

It is recommended that bonded metal parts not be post-cured above 200°C to maintain the bond.

Troubleshooting

Listed below are areas that describe issues that could occur when molding fluoroelastomer compounds, with the molding defect followed by the correction:

- Trapped air: Poor quality or underweight preform. Improper mold lock up. Mold should be "bumped" before closing.
- Trapped air (injection molding): Vent mold, pull vacuum in runner system.
- Non-fills: Underweight preform. Increase preform weight. Poor mold flow due to scorchy compound. Decrease mold temperature, increase scorch safety. Not enough pressure to fill mold.
- Non fills (injection molding): Short shot size. Increase shot size. Poor flow due to scorchy compound. Not enough injection pressure.
- Knit lines: Excessive external mold release. Use lighter application, clean mold. Excessive internal process aid. Decrease level of process aid or use different process aid if possible. Marginal flow due to scorch safety. Lower mold temperature or increase scorch safety.
- Blisters: Poor dispersion of ingredients. Refine mixed compound. Under cure. Increase mold temperature or cure rate of compound. Contamination. Check weigh-up mixing and milling procedures.
- Tear on demolding: Poor hot tear resistance. Decrease mold temperature or state of cure of compound. Use a higher molecular weight polymer if possible, or different filler to improve tear resistance.
- Back grinding: Gouge observed at mold line on part when mold is opened. Poor mold flow. Decrease mold temperature or increase compound scorch safety. Use lower viscosity polymer.
- Excessive mold flash: Over weight preform. Check mold alignment, increase closure pressure on mold.
- Long cure cycles (for transfer/injection): Increase compound rate of cure. Increase temperature of stock entering mold (increase compound viscosity; increase barrel temperature; increase injection pressure; reduce

nozzle or gate size).

- Mold shrinkage: Low durometer compound >3%; 75 durometer compound ~3%; high durometer compound <3%.

Molding fluoroelastomer parts: Review

When planning to mold a fluoroelastomer part, one needs to understand its application, environment and part dimensions. This will help to determine polymer selection, cure system, and other compounding ingredients and processing properties needed for either compression, transfer or injection molding.

References

1. Albert L. Moore, Fluoroelastomers Handbook: The Definitive User's Guide and Databook, William Andrew Publishing (2006).

2. Peter S. Johnson, Rubber Processing: An Introduction, Hanser Publishers (2001).

3. W.M. Stahl, "Compounding fluoroelastomers," presented at the International Elastomer Conference and Expo, October 16-19, 2023, Cleveland, Ohio.

4. Technical product information guides, data sheets and processing guides from various fluoroelastomer suppliers.

Building confidence in liquid silicone rubber molding through simulation

by Harshal Bhogesra, Moldex3D Northern America, and Robert Jovingo and Kevin Barbee, Shin Etsu Silicones of America

The effective development of components is becoming more reliant on simulations. Allocating resources to precise, early stage design simulations can result in substantial savings by reducing the need for iterative loops in the prototype phase, streamlining the validation process for overall mold design. This study aims to demonstrate how Moldex3D simulations can be utilized to preemptively address these challenges during the product development phase.

Moldex3D recently decided that it could further promote its capabilities to help the molding industry, and joined with Shin Etsu Silicones of America and partner M.R. Mold & Engineering, and determined they could lead the efforts in understanding molding issues. Shin-Etsu provided an optical liquid silicone rubber (LSR) grade that was utilized for looking into tooling, filling and curing defects. It was determined that it would be best to use a showcase mold that was built to highlight most of the molding issues that could occur, including air traps, jetting, imbalances, short shots, flashes and uneven curing that could typically be seen in day-to-day LSR molding operations, and how they could be solved through Moldex3D simulations. A four-cavity tool in a horizontal press was utilized, where two cavities are facing towards the sky and the other two are facing towards the ground. Since LSR has lower viscosity, the influence of gravity during molding was highlighted. This tool was already built, so the focus was on how these molding challenges could be solved through Moldex3D simulations. If this problem been known earlier during the development phase, a different direction would have been taken.

The partners then set out to run a number of simulations that would help them focus on issues that do occur, and how the simulations would aid them early on to prevent these issues. During the first simulation, air was observed being trapped in the middle of the part, as shown in figure 1. Even though there was enough venting in the parting line, sometimes because of the gate location, air is entrapped in the middle of the cavity and does not make it to the vents to escape. Even with vacuum, these late fills can create issues as gas is released from heating the LSR, and these volatiles leave residue on the surface of the mold. This could also lead to potential knit lines in some designs, so it is important to review gate locations, size, melt viscosity, fill time, etc., earlier during the product development phase through simulation, and find a way to eliminate these issues. In this case, if the fill pattern and air entrapment had been known through simulation, before building the tool, there is a good possibility it could have been gated differently along the circumference of the part

Figure 1 - air trap comparison between actual part and simulation

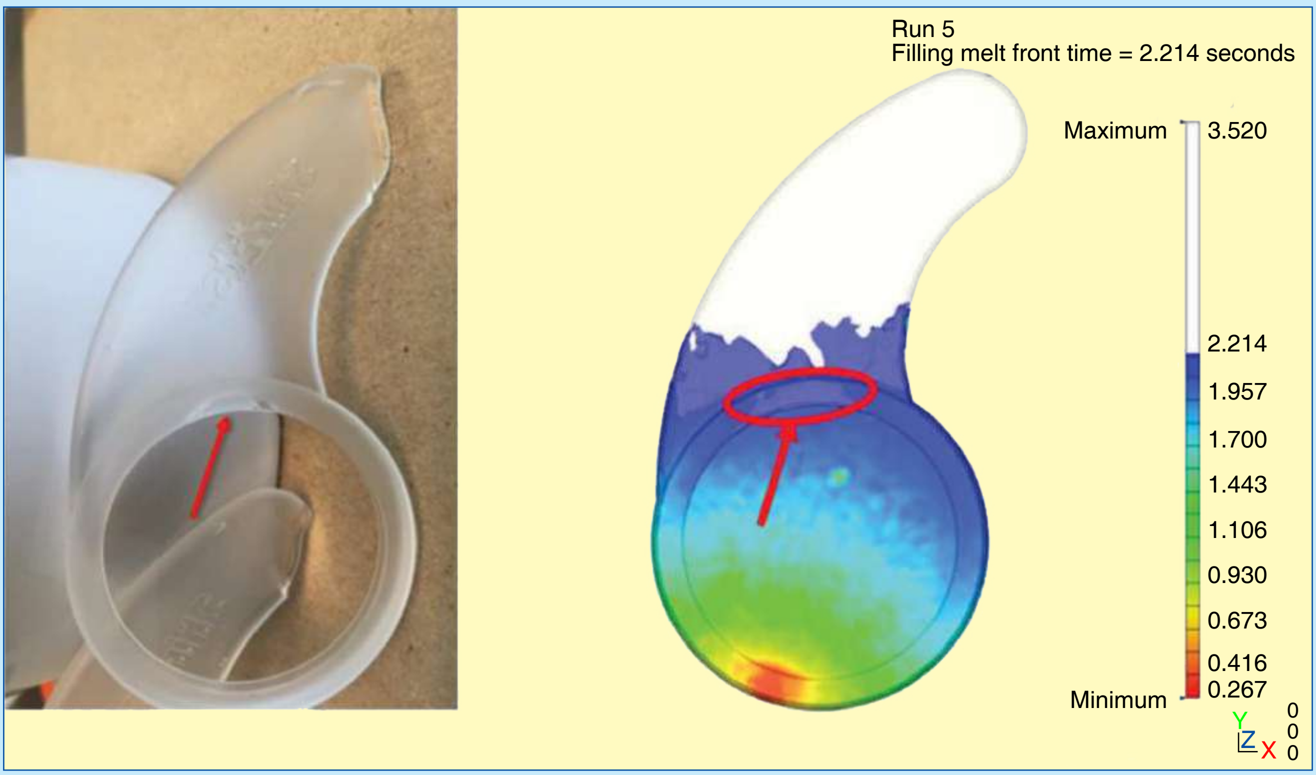


Figure 2 - inconsistent jetting comparison between actual part and simulation

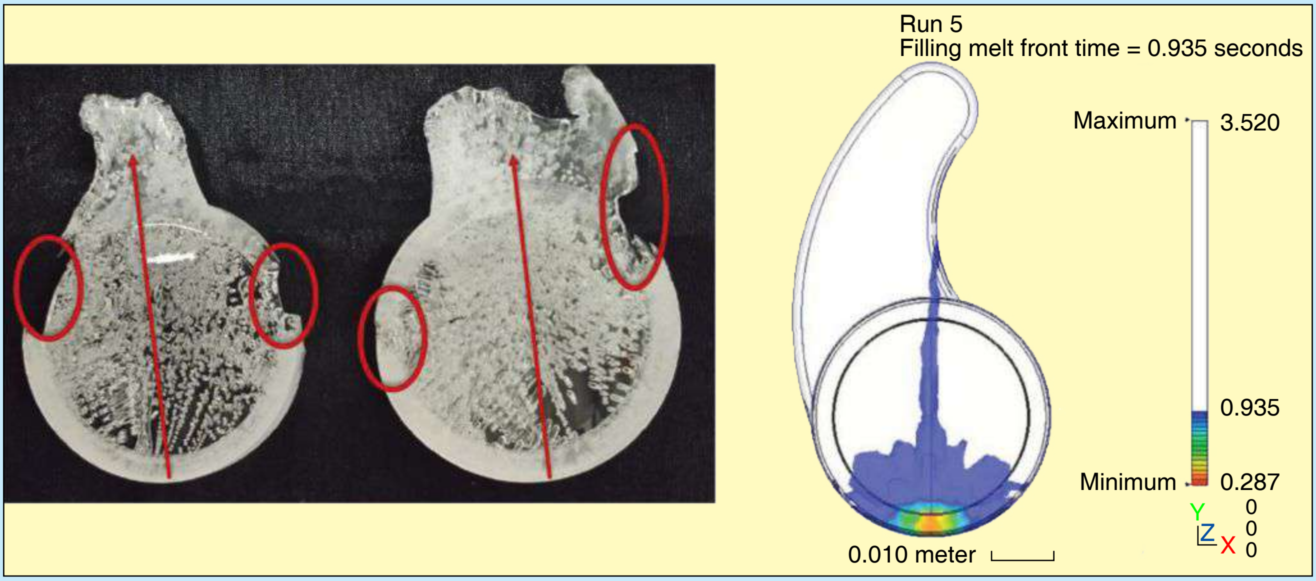


Figure 3 - imbalances during filling because of gravity and lower viscosity of liquid silicone rubber

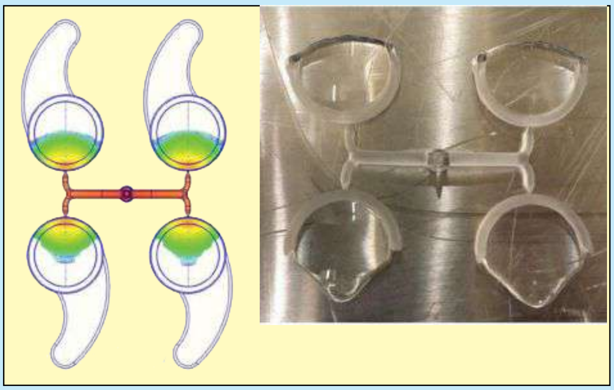


Figure 4 - imbalances could lead to flashing in the bottom cavities and non-fills in the top cavities

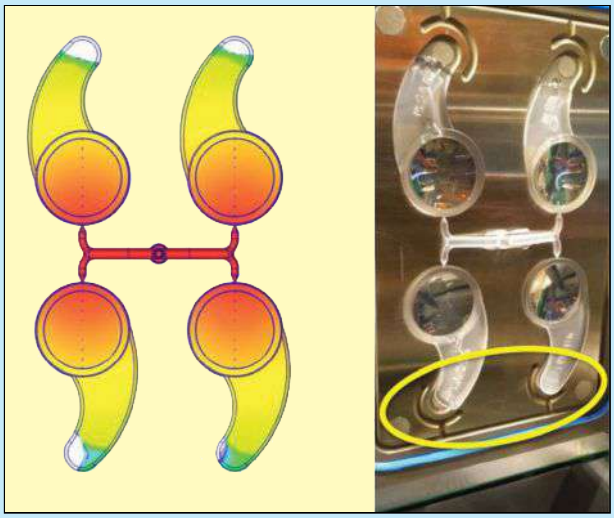
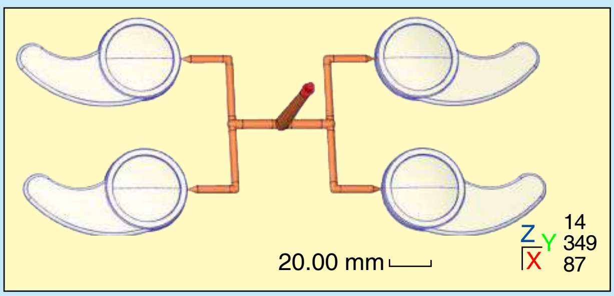


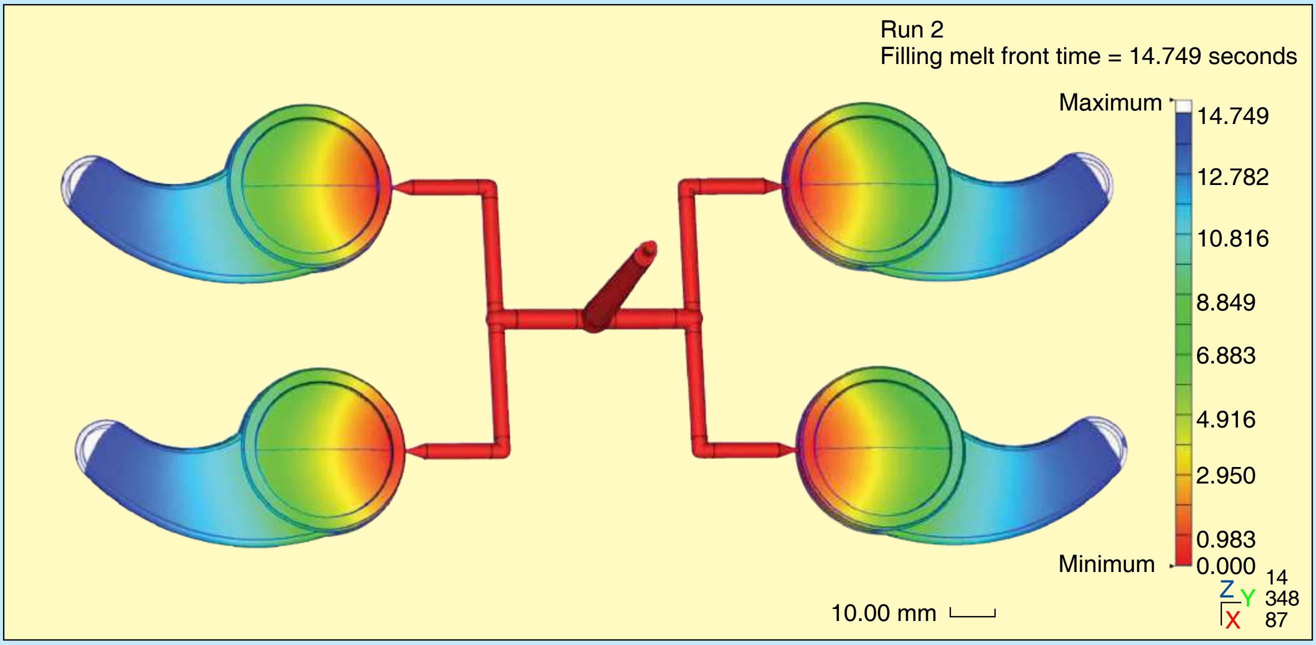
Figure 5 - part orientation idea for equal gravity influence on all cavities



to see if it would help air to escape through the vents and not be built up in the middle of the cavity. Through design of experiments (DOE) and optimization at Moldex3D, objectives and variables can be assigned, and Moldex3D technology can provide the answer. For example, testing personnel can mark specific areas in a simulation and request the software to eliminate any regions where air may be entrapped. Variables could include plans for location of 20-30 gating ideas and determine which one is the most optimum. Simulation will run all those gating designs automatically, ingeniously learn from previous iterations and funnel the team towards the final solution. In this case, it would have found the optimized gate to eliminate air traps, before cutting the tool steel.

It was then decided that, based on the previous issue of air entrapment, operators might try to fill this part faster. The fill time of 3 seconds resulted in jetting. This occurs when the viscosity is low, and velocity is high. The material flows from a

Figure 6 - balanced filling in all cavities with horizontal molding machine



small gate towards the larger wall thickness. The melt front is unstable during this time, and the material jets into the open space towards the opposite wall, as shown in figure 2. It can also lead to inconsistent air bubbles and entrapment inside the parts, which would be hard to eliminate.

Jetting can be reduced or eliminated by slowing down filling, which will lead to lower shear, or by changing the gate location/style, which will change the flow pattern. It is important to run simulations before cutting the steel to optimize gating and eliminate this jetting issue in production. It might, at this juncture, be best to provide a gate that would allow the melt front to impinge the wall at angle, so it hits the wall rather than have the material flowing into an open space. In this case, it was too late, since the mold was already built, so the only option was to slow down the filling. The fill time was increased to 15 seconds, which reduced the jetting, but led to another issue: imbalanced filling. Due to gravity, the top two cavities facing the sky filled evenly, while the bottom two cavities facing the ground developed a sagging issue due to the influence of gravity and low viscosity of the LSR. Gravitational influence increases with the

Figure 7 - balanced filling progression in all cavities with vertical molding machine

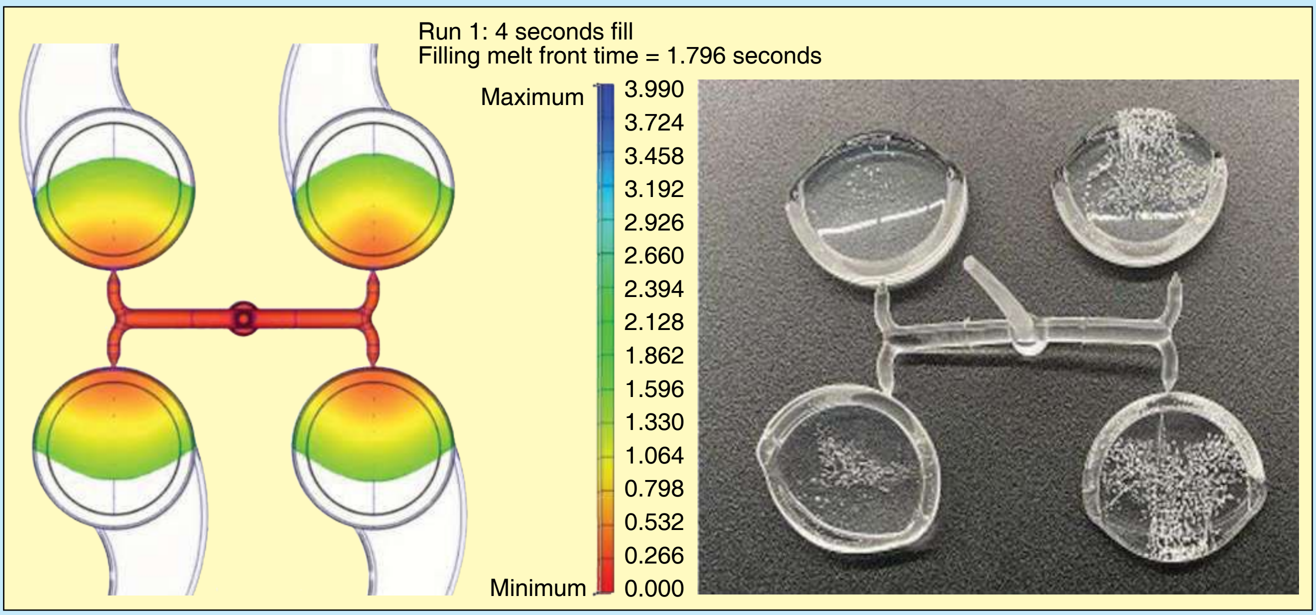


Figure 8 - balanced filling further progression in all cavities with vertical molding machine; actual production

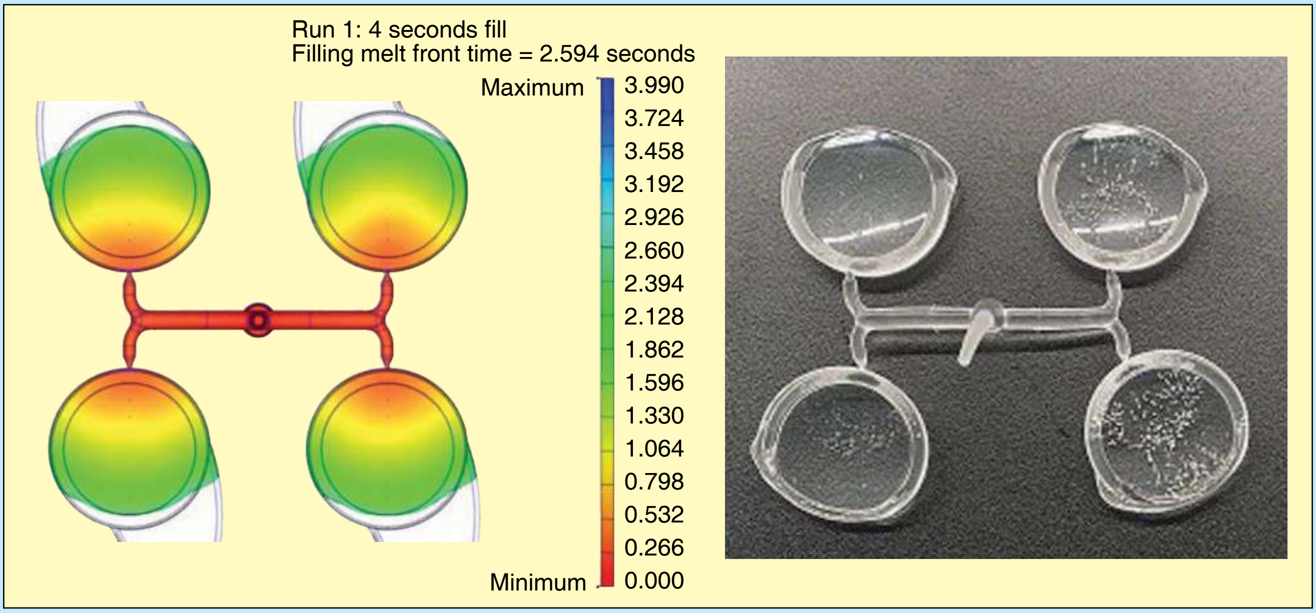
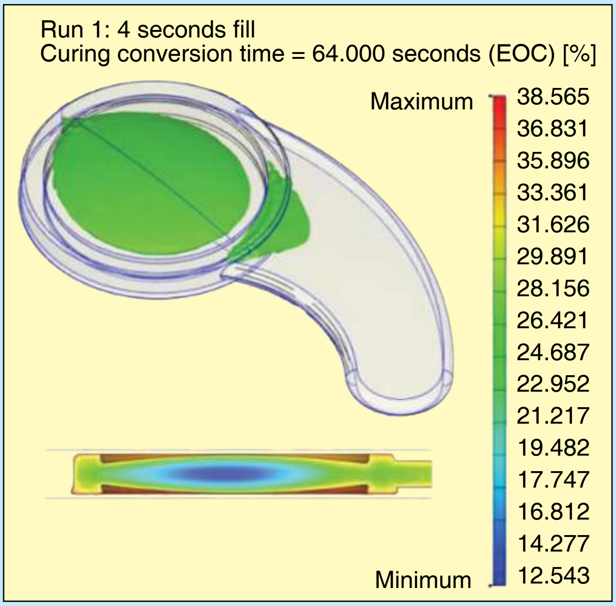


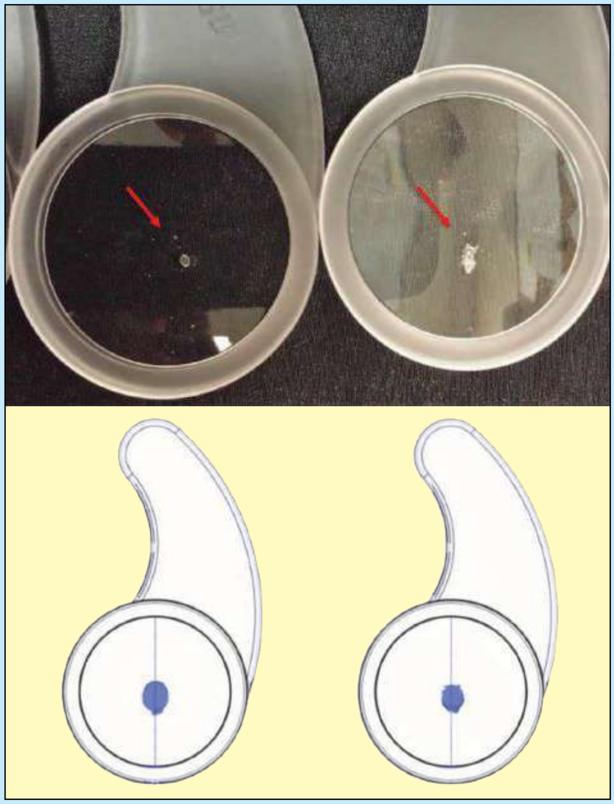
Figure 9 - curing conversion at the end of 60 seconds cycle; simulation



longer fill time (slower filling), and this effect is more visible with the lower viscosity materials which are accurately captured inside the simulation, as shown in figure 3. This figure illustrates the imbalances between production and simulation, where the gravitational influence is captured by the software.

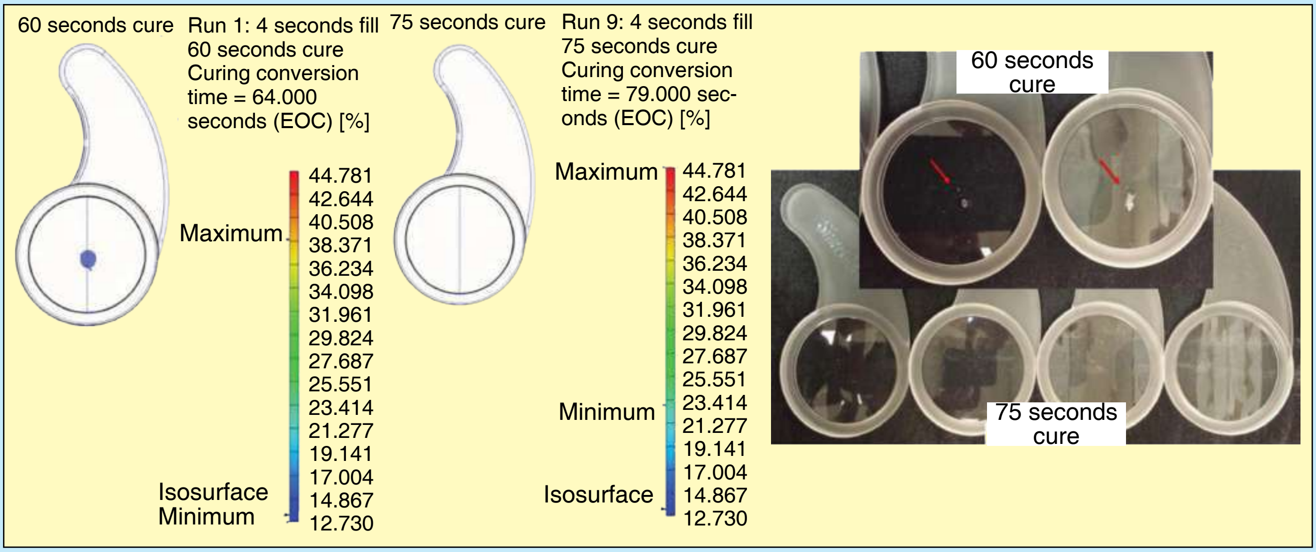
Sagging continues and leads to imbalanced filling, where the bottom two cavities fill faster due to gravity and slower filling/lower viscosity, as shown in figure 4. This then leads to high pressure and increases the potential for flashing in those cavities.

Figure 10 - voids comparison between actual and simulated parts



This will also accelerate melt velocity to other unfilled cavities, and could lead to non-fills/short shots in the top cavities. This kind of imbalance between cavities or within cavities (in some

Figure 11 - voids comparison between actual and simulated parts; 60 seconds versus 75 seconds cure times



molds) could reduce the processing window. It is also important to evaluate mold temperature, as it would affect polymer viscosity/temperature and flow pattern. With longer fill time, this effect worsens the imbalances.

If the simulation had been run before this tool was built, testing personnel would have decided to orient the parts differently, as shown in figure 5, so the gravity influence is the same for all four cavities. It was too late at this point. Testing personnel did, however, check this by running the simulation to check if the theory was correct, and it was confirmed it was correct. This allowed a balanced filling in all cavities utilizing a horizontal molding machine, as can be seen in figure 6.

Since the tool in this showcase study was already built, the only option to avoid imbalances and jetting was to run it in a vertical press with the slower filling time. When the mold was run in the vertical molding machine, gravity influence or sagging were not seen, and there was a more balanced filling compared to the horizontal molding machine, as illustrated in figures 7 and 8, where the filling progression between actual production and simulation is shown.

Initially, the cycle time for this mold was 60 seconds. This resulted in late curing areas in the center of the part. Wall thickness is greater in that region, so a majority of the part cures at the end of the cycle, except the core of this thick section, as shown in figure 9. The longer filling time results then end up in two distinct regions of the fast cure: transparent and the much slower cure (green shaded).

It was then decided to evaluate if there may be enough residual heat in the part to fully cure outside the mold. In this case, there was not sufficient heat generated to effect an adequate cure. Since it is a clear LSR part, void related defects in the actual parts certainly could be seen, and were compared to the simulation, as shown in figure 10. If the simulation had been run before, testing personnel could have predicted it, and optimized the heater locations and power to facilitate curing in these thick sections.

At this point, the only option would be to increase the cycle time. It was then determined that if 15 seconds were added to the original cycle time of 60 seconds, it would lead to full cure within the parts, including the thicker section, and would as well eliminate the void related issues, as can be seen in figure 11.

Conclusion

In a collaborative endeavor involving Shin Etsu Silicones of America, M.R. Mold & Engineering and Moldex3D, this project explored the intricate challenges of molding optical liquid silicone rubber (LSR), and proposed innovative solutions. A key focus was a showcase mold featuring four cavities, strategically positioned to highlight the nuanced impact of gravity on LSR molding: two facing upward and two downward. Simulations revealed that altering part orientation can equalize gravity's impact, offering a preventive measure against imbalances. The study concluded by underscoring the paramount importance of conducting simulations before tool construction to proactively anticipate and effectively tackle molding challenges.

QUIMIPOL®

Dear Customers and Friends:

We are pleased to inform you that our represented INDUSTRIAS NEGROMEX S.A. DE C.V (GRUPO DYNASOL), has decided to name us exclusive distributor as of December 1st of this year, for Leon, Guanajuato; Guadalajara, Jalisco; Monterrey, Nuevo Leon, and the rest of the states of the Mexican Republic, for their product brands PARACRIL®, EMULPRENE®, ARLATEX®, and INSAGUM®, whereby, we thank to INDUSTRIAS NEGROMEX for the trust placed in our company and we ratify that we are determined not only to meet, but to exceed your expectations in this new project.

We would also like to thank to: our customers for their preference during these First 23 years, our suppliers for their trust and our team of collaborators, for their effort and dedication that together have allowed us to reach the position that we currently have in the market.

With this new scope, we confirm our commitment to improve and expand our product portfolio, putting at your disposition our work team integrated by more than 100 collaborators, including a team of technical specialists at the service of our industry, as well as our own delivery fleet, together with four branches that we have located in the most important industrial zones of the country, and a storage capacity that allows us to cover the demand of products in a timely.

All of the above with the aim of maintaining and growing as number one supplier to the industries served in Mexico, as well as to continue climbing our position in international markets.

Finally, we ratify our gratitude and commitment to INDUSTRIAS NEGROMEX and GRUPO DYNASOL for the trust placed in our company; we are sure that this alliance will allow us, our customers and collaborators, grow continuously with our participation in the industry.

Best Regards.

Atte.
QUÍMICOS Y POLÍMEROS CORPORATION S.A. DE C.V.

www.quimicosypolimeros.com
Tel.: (+52) 55 8283 45 70 al 75

MATRIZ
Carlos B. Zetina No. 2,
Col. Parque Industrial Xalostoc,
Ecatepec, Edo. de México.

LEÓN
Blvd. Juan José Torres Landa
No. 5020, Bodega 6
Col. Arroyo Hondo, León, Gto.

GUADALAJARA
Av. Gobernador Luis G. Curiel
No. 2780, Col. Zona Industrial,
Guadalajara, Jalisco.

MONTERREY
Avenida de la Industria No. 122,
Fraccionamiento Industrial Legacy
Business Park, Apodaca, Nuevo León.

Molecular Rebar with Aflas: Improved physical properties for high performance applications

by August Krupp and Shelby Swanson, Molecular Rebar Design, LLC

The addition of Molecular Rebar (MR) carbon nanotubes yields impressive performance improvements for resistance to DIN abrasion (30%+), tear (15%+), cut and chip (30%+) and cyclical fatigue lifetime in traditional polymers like NR, SBR, BR, NBR, HNBR, IIR and CR. These results have been previously published by Molecular Rebar Design, LLC in a multitude of formats focusing on different applications, such as an OTR tire tread compound article in *Rubber World* (ref. 1). Others, such as Akron Rubber Development Laboratory (ARDL), have also independently published results using Molecular Rebar nanotubes, demonstrating similar improvements in abrasion resistance (ref. 2). The common thread among the majority of these publications, and MR's use in these polymer systems, is that the MR is delivered to the compounding process using a plasticizing oil carrier agent, typically in a 50:50 ratio of nanotubes to oil. This commercially sold product has the trade name Molecular Rebar in Oil (MRO) for obvious reasons, and two primary grades exist: MRO Gen I for more polar polymers, like NBR/HNBR; and MRO Gen II for less polar polymers and blends thereof, like natural, styrene butadiene, polyisoprene and natural rubber-polybutadiene blends.

Fluoropolymers, their compounds and their applications are unique in the rubber industry. Fluoropolymers, and in this article's case, fluoroelastomers, are primarily used when applications demand resistance to high temperatures, corrosive environments or chemically aggressive lubricants. Some examples include oil and gas seals/gaskets and automotive fuel system components, with many of these applications being referred to as high pressure, high temperature (HPHT). Fluoroelastomers are generally divided into three main categories: FEPM (TFE/P) (tetrafluoroethylene propylene copolymer), FKM- fluoroelastomer and FFKM (perfluoroelastomer) (ref. 3). These fluoroelastomer compound recipes are substantially different than mechanical rubber goods or tire rubber compounds. The fluoroelastomer recipes use lower quantities of filler, typically carbon black at 20-30 phr, almost no processing aids and with crosslinking packages utilizing diamines, bisphenols or peroxides with coagents.

While fluoroelastomers are well noted for their resistance to high temperatures and degradative chemical environments, detrimental fluoropolymer qualities usually center on two topics: the relatively high cost of the polymer, and reduced physical properties, especially at high temperature (185°C+). The physical characteristic deficiencies of fluoroelastomers are commonly noted, with special emphasis given to poor tear strength in comparison to typical elastomers (ref. 4).

This article focuses on the use of MR carbon nanotubes in AGC Chemicals' Aflas 100H grade of FEPM, reinforcing a modified formula derived from AGG Chemicals' Aflas Technical Brochure (ref. 5). The base, or control, formulation used in this project is shown in table 1; it is an 85 durometer compound simulating a formulation used for HPHT applications. Aflas 100H is the base polymer used, and it is a high molecular weight FEPM that has superb physicals, in addition to better steam and base resistance as compared to FKM. It should be noted that there is not any processing oil or plasticizer present in the formulation. To impart Molecular Rebar's typical performance improvements in traditional polymers to fluoropolymers, Aflas FEPM, FKM, FFKM, etc., a new delivery method needed to be developed. The delivery method should also minimize environmental, health and safety concerns, encapsulating the carbon nanotubes and insuring sufficient dispersion for property enhancements.

Molecular Rebar is a registered trademark of Molecular Rebar Design, LLC. Aflas is a registered trademark of AGC Chemicals Americas, Inc.

Product development

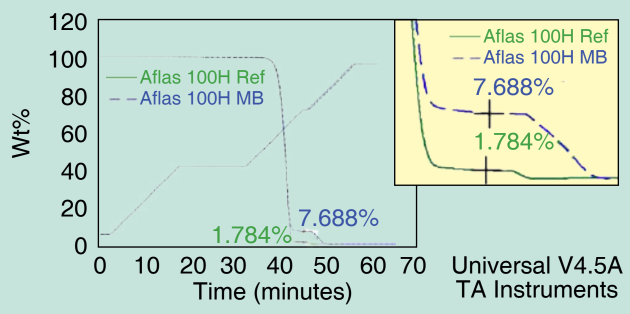
The Molecular Rebar material is typically dispersed in an aqueous solution. For the oil delivered Molecular Rebar in Oil (MRO) products, the MR is phase transferred from the aqueous solution to the oil carrier, with subsequent dewatering and drying occurring, resulting in a dry 50:50 ratio of MR:oil. The lack of processing oil in fluoroelastomer formulations necessitates a phase transfer of MR from the aqueous phase to the polymer phase itself, resulting in a masterbatch of MR in Aflas 100H.

The MR chosen after an initial dispersion study is an essentially non-polar multi-wall carbon nanotube (MWCNT) that is well dispersed into water, resulting in a plurality of discrete MWCNTs. The phase transfer from water to FEPM occurred at laboratory scale in a Haake Rheomix laboratory mixer, which is a ~75 cm^3 volumetric tangential mixer with internal mixer style rotors equipped. The MR was added to the mixing FEPM in a wet cake form of roughly ~8 wt% MWCNT in water. The majority of water is extruded during this mixing process, and the temperature of the batch oscillates between ~95°C and ~110°C as the MR wet cake is added, water extrudes, water evaporates

Table 1 - control formulation for this project, to be modified with the addition of Molecular Rebar

Ingredient	*Mix step*	*Specific gravity*	*Base/control formulation (phr)*
Aflas 100H FEPM	1	1.55	100
N330 carbon black	1	1.83	20
Sodium stearate	1	1.02	1
Triallyl isocyanurate (TAIC), 100% active	2	1.11	5
VC-40K dialkyl peroxide, 40% active	2	1.62	2.5

Figure 1 - TGA results of polymer decomposition resulting in confirmation of 6 wt% MR in Aflas 100H



and more MR wet cake is added. This procedure was then scaled up to a 1.6 L internal mixer, where multiple kilograms of material were produced for testing and sampling. It is envisioned that this procedure could be accomplished at a larger scale using a heated two-roll mill or a devolatilizing extrusion system.

The maximum concentration of Molecular Rebar discrete MWCNTs in Aflas 100H is found to be 6 wt%. Higher loadings of the MR cause the composition to “powder out,” and it is suspected that the surface of the nanotubes can no longer be wetted by the polymer. This is likely a function of the well dispersed nature of these nanotubes combined with the high molecular weight of the Aflas 100H FEPM.

Upon completion of the masterbatch production, targeting 6 wt% MR in Aflas 100H FEPM, the material composition was checked by thermogravimetric analysis (TGA) and the dispersion was checked via transmission electron microscopy (TEM). The TGA data are shown in figure 1, where the inherent decomposition residue of a pure 100H reference sample at ~575°C is subtracted from the decomposition residue of the masterbatch (MB) sample, resulting in confirmation of ~6 wt% MR masterbatch in Aflas 100H FEPM.

Figure 2 shows the dispersion of the Molecular Rebar in the Aflas 100H polymer, qualifying that the MR has remained in a discrete state from phase transfer from water to FEPM.

After confirmation of good masterbatch dispersion through TEM imaging, the masterbatch was diluted with additional pure 100H FEPM on a two-roll mill, resulting in a dilute composition of ~1 wt% MR in Aflas 100H. A small slice of the dilute let-down composition was then imaged using a microscope with a backlight. A comparison in figure 3 shows a homogenously black elastomer slice on the left, demonstrating a good let-down with good MR dispersion from the masterbatch. On the right in figure 3, a prior experimental MR that had an excessive quantity of polar groups resulting in a bad let-down is shown for comparison. The veins of undispersed masterbatch on the right are clearly visible, as compared to the homogenous let-down on the left.

The process and subsequent quality control steps demonstrate that the 6 wt% Molecular Rebar in Aflas 100H masterbatch is of good quality, having a near 6 wt% loading of MR, with dispersed CNTs in both the masterbatch itself and a subsequent dilute let-down compound. The 6 wt% MR-100H masterbatch is qualified for use in performance testing alongside other typical compounding ingredients for Aflas FEPM compounds.

Performance characteristics

The Molecular Rebar masterbatch was used to modify the control formula shown in table 1. The authors performed three iterative experiments ahead of the results published here to determine that a replacement ratio of 3 phr MR to 6 phr N330 carbon black results in a near equivalent 100% modulus. Keeping comparative systems in an iso-modulus format reduces variables that may affect the outcome of certain tests, such as tear, compression set and modulus decrease at temperature. The ex-

Figure 2 - TEM images showing the dispersion of MR in 100H: 3 kx magnification (left) and 20 kx magnification (right)

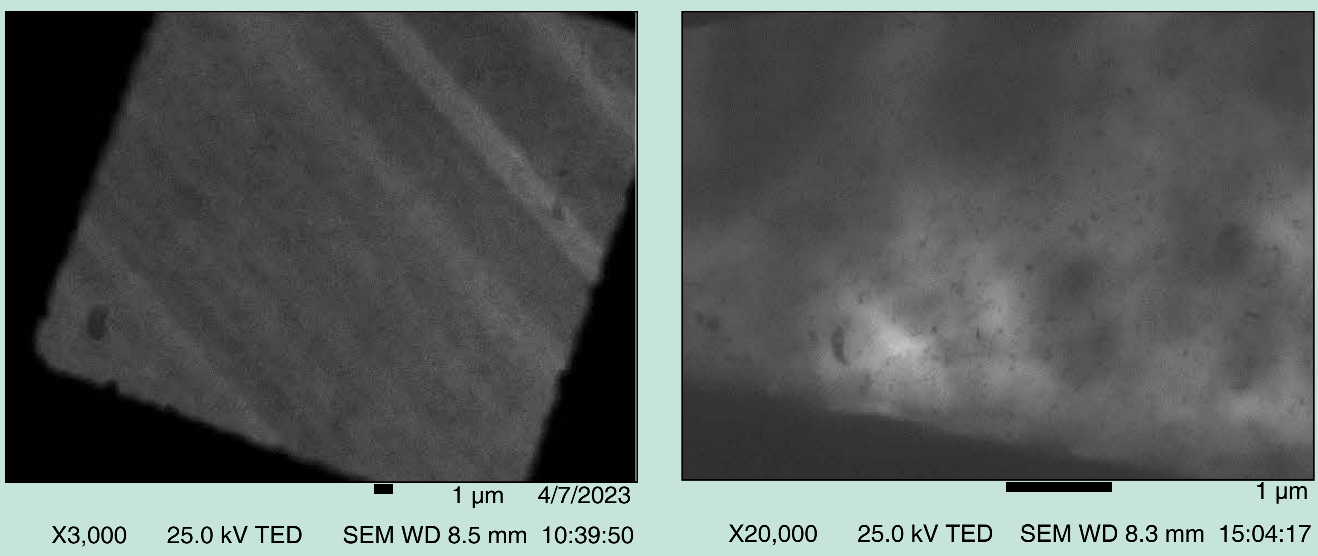


Table 2 - experimental formulations for this project

Ingredient	*Mix step*	*Specific gravity*	*20 phr N330*	*14 phr N330 3 phr MR*	*20 phr N330 3 phr MR*	*6 phr MR*
Aflas 100H FEPM	1	1.55	100	50	50	0
MR-Aflas 100H masterbatch (6 wt% MR)	1	1.56	-	50	50	100
N330 carbon black	1	1.83	20	14	20	0
Sodium stearate	1	1.02	1	1	1	1
Triallyl isocyanurate (TAIC), 100% active	2	1.11	5	5	5	5
VC-40K dialkyl peroxide, 40% active	2	1.62	2.5	2.5	2.5	2.5

Table 3 - procedure for mixing the experimental Aflas FEPM compounds

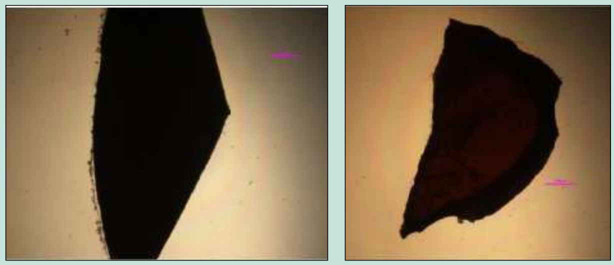
General procedure for mixing Aflas in an internal mixer

1) Make sure the mixer is completely clean by running a cleanout batch using raw gum of EPDM or other material with no cure additives or fillers prior to mixing.
2) Premix all ingredients except the peroxide.
3) Use full cooling water on all rotors and chamber. Rotor speed should be between 30 and 40 rpm and the ram pressure generally between 60 and 80 psi. Add the Aflas to the chamber and lower the ram. Break up the polymer for about one minute. The temperature should reach approximately 120°F to 130°F (49°C to 54°C).
4) Add 1/2 the premixed ingredients. Lower the ram and continue mixing until the temperature reaches between 150°F and 180°F (66°C to 82°C). Add the remaining additives (except the peroxide) and mix until the temperature reaches 200°F to 220°F (93°C to 105°C). Raise the ram and sweep. Lower the ram and continue until a temperature of 220°F to 250°F (105°C to 121°C) is reached.
5) Dump the batch onto a mill (which should also use full water cooling). Adjust the mill gap to get a uniform bank rolling. Add the peroxide and make cuts and folds until the peroxide is fully dispersed.
6) Alternatively, if the peroxide is added into the mixer, it should be done on a second pass; i.e., remove the first mix and allow it to cool. Once cool, add it back to the mixer and mix one minute to once again break up and then add the peroxide. Continue to mix until the temperature has reached 190°F to 220°F (88°C to 105°C). Remove the batch and use the mill to get a uniform sheet. Allow it to cool.

perimental formulas used to determine performance characteristic shifts with the MR for Aflas are shown in table 2. One formula focuses on equivalent modulus (14N330-3MR); one is to determine solely the effects of the MR added on top of the formula (20N330-3MR); and one replaces the N330 carbon black in its entirety (6MR).

The formulas were compounded using the recommended mixing procedure from AGC Chemicals (ref. 6), shown in table 3. Specifically, the compounds were mixed in an internal mixer following the methodology described in step 6 of table 3. The MR-Aflas masterbatch was incorporated with the pure gum Aflas 100H in pass #1. After mixing, compounds were milled to produce a uniform sheet.

Figure 3 - microscope images of a ~1 wt% dilute let-down of MR-100H masterbatch in pure 100H; homogeneous (left), undispersed (right)



The compounds were cured into both 2 mm thick plaques for tensile, tear and DMA testing, as well as buttons for compression set testing. Compounds were cured at 170°C for 20 minutes, and then post-cured in an oven at 200°C for four hours in accordance with AGC recommendations (ref. 5). Hardness values are shown in table 4 for each experimental formula after post-curing.

Tensile testing of the compounds took place in accordance with DIN 53504, where the dumbbell specimen is of the S2 variety. Tensile test results are shown in figure 4: ultimate tensile strength and 100% modulus on the left, and maximum elongation on the right.

A version of a single-edge notched tear test, which the authors have previously used and called a constrained tear test (ref. 1), was performed. The tear toughness was calculated from the area under the stress-strain curve of the constrained tear test, which equates to the work performed on the specimen to propa-

Table 4 - durometer A hardness values for the experimental compounds after post-curing

2 mm thick plaques	*Aflas 100H: 20 phr N330*	*Aflas 100H: 14 phr N330 3 phr MR*	*Aflas 100H: 20 phr N330 3 phr MR*	*Aflas 100H: 20 phr 6 phr MR*
Durometer A hardness (ASTM D2240)	85	84	87	83

Figure 4 - tensile test results for the four experimental compounds

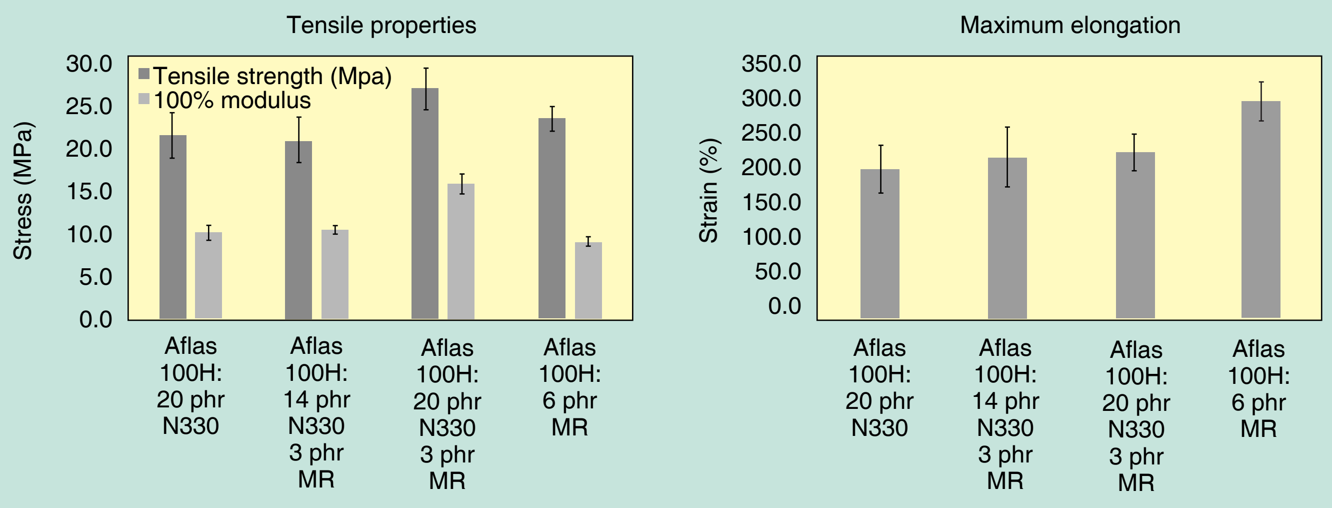
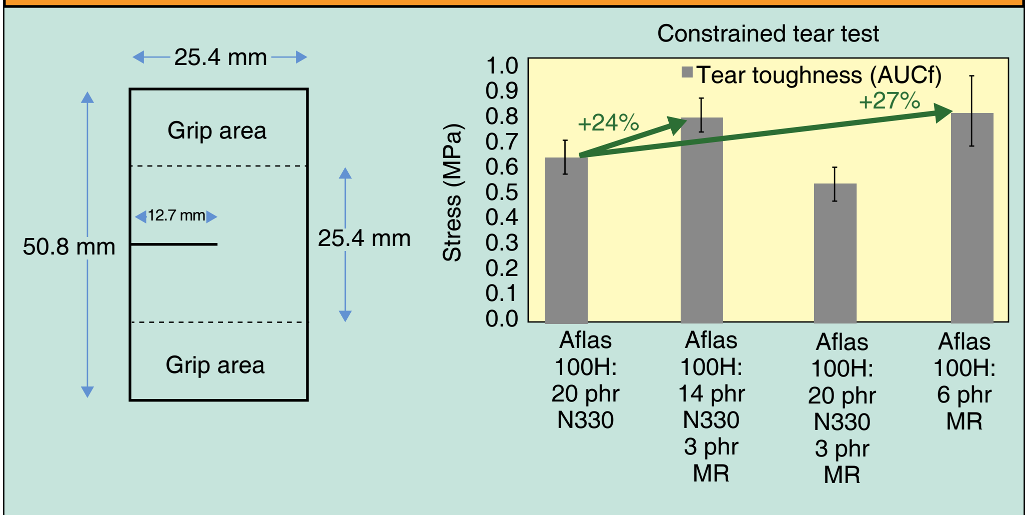


Figure 5 - constrained tear test specimen (left) and results for near equivalent modulus experimental compounds (right)



gate the crack or tear to specimen failure. A diagram of the test specimen is shown in figure 5 (left), while the results of the constrained tear test for the experimental compounds are shown on the right.

Failure analysis scanning electron microscope (SEM) images of a tear test specimen from sample 14 phr N330 3 phr MR are shown in figure 6. In the left image, an area of fast crack growth is outlined in red, while the slow crack growth area is outlined in green. In the right image, an edge of the slow crack growth zone is shown at higher magnification, with nanotubes on the crack surface pointed out with red arrows, providing credence to the hypothesis that the individualized nanotubes are creating improved tear toughness through a crack bridging effect.

Compression set testing in accordance with ASTM D395 Method B (constant deflection) was performed on the experimental samples. Two conditions were tested: 20 hours at 200°C and 70 hours at 200°C, both of which are standard times and temperatures, according to AGC Chemicals' literature (ref. 5). Compression set testing results are shown in figure 7.

After testing, the compression set buttons were used to manufacture abrasion test specimens, which were tested in accordance with ASTM D5963, Method B. All of the samples were within the range of error of one another, and the test results indicated almost no material loss during testing.

The experimental compounds were tested for modulus shifts during temperature changes. Using a dynamic mechanical analyzer (DMA), strain cycles from 0% to 30% were performed on three test specimens per compound during a temperature sweep from room temperature (25°C) up to ~177°C (350°F). Results were collected after an initial sweep at room temperature to negate initial inelastic, or hysteretic, energy loss. A modulus measuring point of 10% strain was chosen, and the 10% modulus was plotted for each sample at left in figure 8 during the temperature sweep. At right in figure 8, a magnified and analyzed plot of the near modulus matched compounds is shown from 100°C to ~177°C, with linear fit lines, resultant slopes and the coefficients of determination.

The tests performed during this experimental study are not exhaustive, but are intended to address key concerns in the oil and gas or energy sector.

Critical compound performance characteristics like tensile strength, modulus, elongation, tear toughness, compression set and high temperature modulus changes are known to have drastic effects on the performance of oilfield mechanical rubber goods.

Figure 6 - SEM images of 14 phr N330 3 phr MR crack surface from a tear test specimen

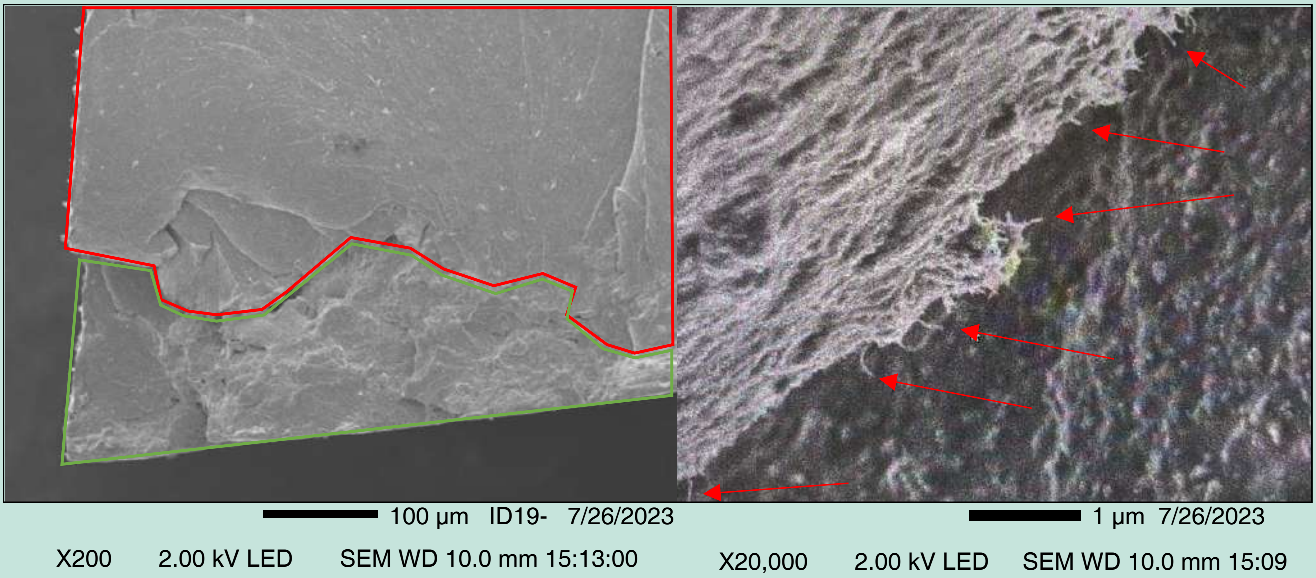
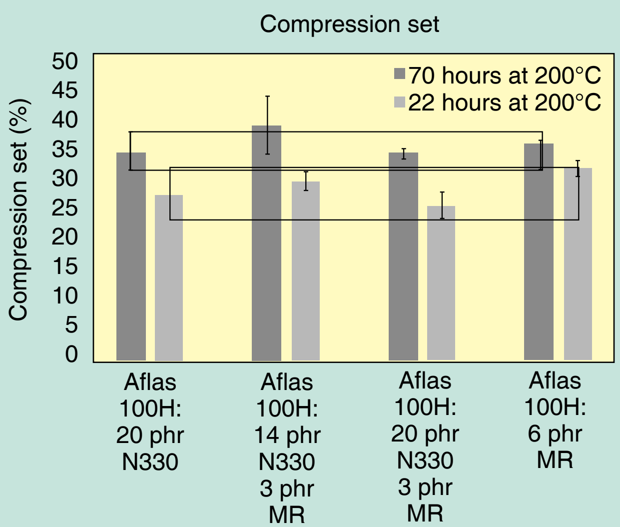


Figure 7 - compression set testing results of the experimental Aflas FEPM compounds



Discussion and conclusions

The use of Molecular Rebar from the MR-Aflas masterbatch to replace carbon black is demonstrated to give a number of benefits to the physical characteristics of the compound, without other detrimental property effects. By replacing 6 phr of N330 carbon black with 3 phr of MR, the 100% modulus of the experimental compound (14 phr N330 3 phr MR) is nearly equivalent to the control's 100% modulus (20 phr N330), while maintaining tensile strength and overall elongation. The total replacement of the 20 phr of N330 carbon black with 6 phr MR decreases 100% modulus slightly (~10%), while greatly improving elongation (+45%), with no detrimental effect on ultimate tensile strength. The use of MR on top of the control formulation causes a large increase in 100% modulus of ~50%, while maintaining overall elongation and tensile strength. The changes in tensile properties align with previous studies of MR in other polymer systems, demonstrating the near universal use cases of MR in elastomers.

Tear toughness increases with MR when replacing carbon black, and keeping modulus nearly identical, are expected and demonstrated to be statistically significant in these Aflas 100H FEPM compounds, with the 14 phr N330 3 phr MR and the 6 phr MR (0 phr N330) compounds having improved constrained tear toughness of roughly 25% over the control compound. The slightly detrimental effect on tear toughness with the 20 phr N330 3 phr MR sample is likely explained by the significantly higher modulus value of that MR on top sample. The increased stress at equivalent strain overcomes the crack bridging effects of the MR, causing more fast crack growth areas with catastrophic energy buildup, as compared to the near equivalent modulus systems. This hypothesis is strengthened when observing the median constrained tear curves plotted in figure 9, where the MR on top sample has a higher maximum stress value, coupled with a steeper potential energy buildup prior to crack initiation, but is shorter in overall elongation; likely correlating to shorter, more abrupt fracturing at higher potential energy levels.

The compression test results demonstrate that the above improvements with MR in tensile properties and tear toughness can be achieved without a detrimental effect on the set properties of the elastomer compound. This is particularly interesting, since when replacing the carbon black with a lower level of Molecular Rebar, there is technically a higher volume of elastomer in the compound, which is typically associated with worse compression set. In this study, the replacement of a higher loading of carbon black with a lower loading of MR resulted in no statistically significant change (in either direction) of compression set. The directional change in compression set with the MR

Figure 8 - 10% modulus values of each sample during a temperature sweep using a DMA

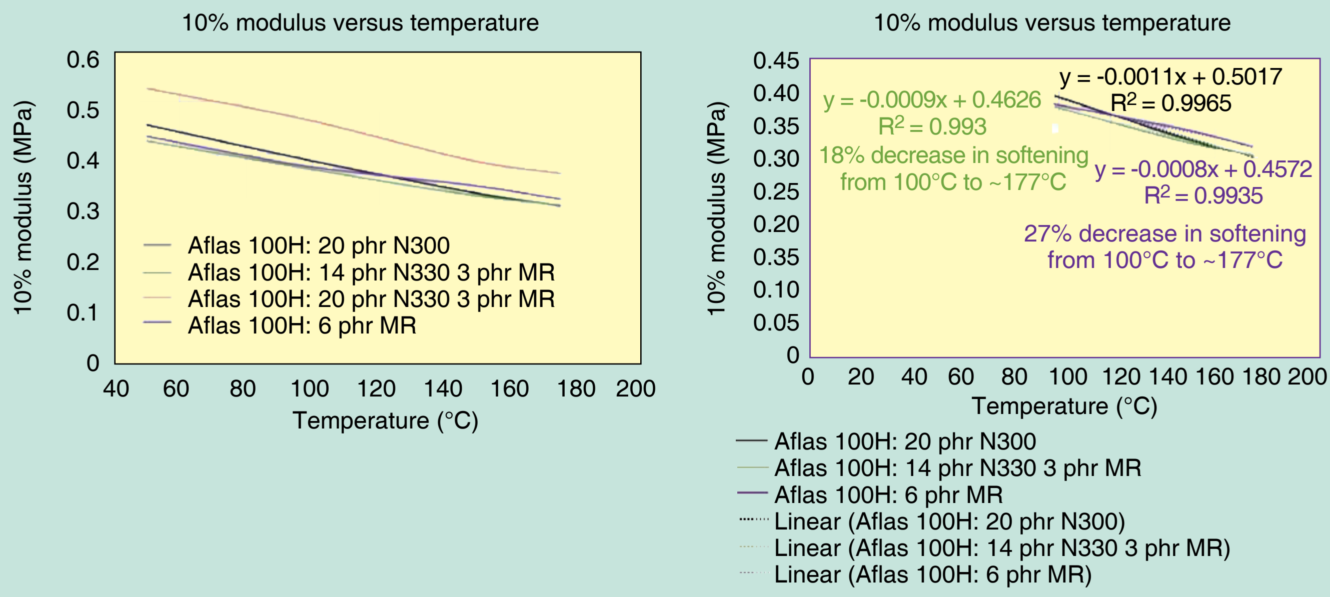


Figure 9 - median stress-strain constrained tear curve of each experimental compound

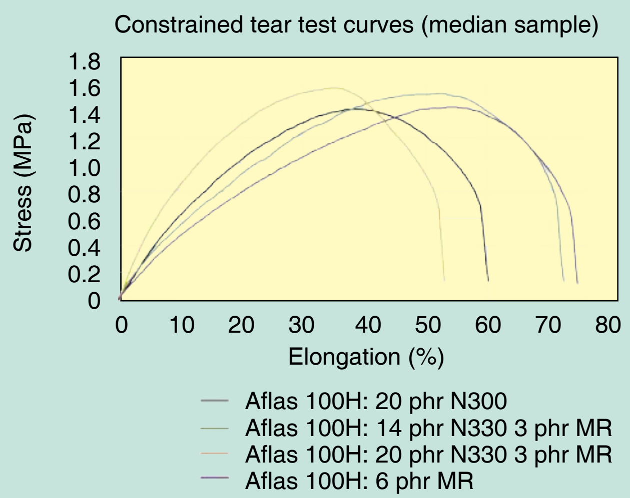
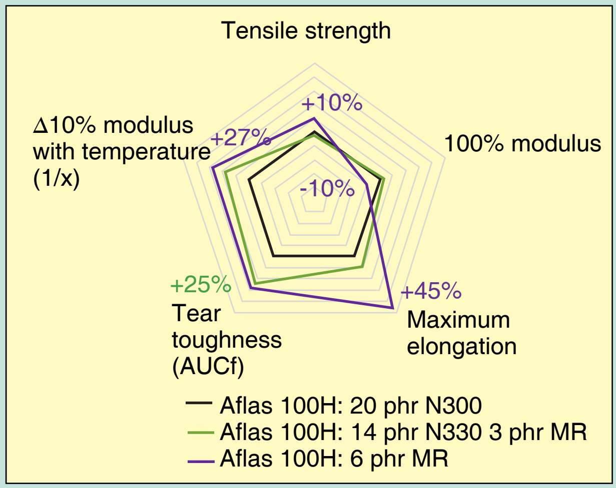


Figure 10 - radar plot of benefits when replacing N330 carbon black with MR in experimental Aflas FEPM compounds



on the top formulation (20 phr N330 3 phr MR) indicates there are likely some very minor shifts in compression set taking place, but within the range of error. It is hypothesized that the MR is of such high surface area, and has such a high degree of interaction with the Aflas 100H FEPM, that the overall bound rubber within the compound is nearly equivalent when MR is replacing the carbon black, minimizing the expected detrimental effects of a higher polymer content.

Although very stable to high temperatures, fluoroelastomers typically have decreasing modulus as temperatures increase; even more so than other elastomers. This effect is primarily driven by the slippage of fluorine groups at temperature, but is mitigated by increasing filler loading or increased crosslinking density. The experimental compounds in this study, with MR replacing carbon black, have less change in modulus as temperature increases, as measured by change (Δ) in 10% modulus using a DMA. In the left portion of figure 8, it is observed that both MR compounds with a replaced carbon black portion begin at room temperature with slightly lower 10% modulus values; but at ~177°C end with higher 10% modulus values. This is magnified in the right-hand portion of figure 8, and quantified by the change in slope of the linear fit curves between the three samples: the control, 14 phr N330 3 phr MR and 6 phr MR (0 phr N330). Figure 10 summarizes the benefits of using Molecular Rebar to replace existing carbon black content in an Aflas 100H FEPM compound.

A new masterbatch of 6 wt% Molecular Rebar in Aflas FEPM has been developed; and when used to replace a portion or all of the existing carbon black in a typical model Aflas compound formulation, it results in a variety of benefits. The experimental compounds using MR in lieu of some or all carbon black demonstrate improved tensile elongation, similar modulus, similar tensile strength, improved tear toughness (25%+) and improved high temperature modulus retention (18% to 27%), without adversely affecting compression set. These improvements in fluoroelastomer compound properties are useful for reduced part failure rates during hot demolding, improved cyclical fatigue and tear resistance for oil and gas packer elements, or improved tear resistance for roller cover compounds.

References

1. Krupp and Peddini, "Improved cut, chip and chunk resistance with no sacrifice in rolling resistance or heat buildup in tire compounds," Rubber World, Vol. 261, No. 5, pp. 24-28, February 2020.

2. Paul Pavka, "Effect of nanotube type and loading level on the abrasion resistance of a model tire tread compound, part 1," Rubber World, Vol. 267, No. 4, pp. 27-33, January 2023.

3. Daniel L. Hertz, III, "A fluoroelastomer compendium for the non-metallic practitioner," EPG Educational Symposium, September 19-20, 2017.

4. Ebnesajjad and Morgan, "10 - fluorinated additives for rubber," Fluoropolymer Additives in Plastics Design Library, pp. 175-192 (2012).

5. AGC Inc., Aflas Technical Brochure, AGC Chemicals Americas, website accessed October 30, 2023.

6. AGC Inc., Aflas Technical Bulletin, Aflas Processing Recommendations, AGC Chemicals Americas, website accessed October 30, 2023.


AGC
Fluon®
Fluon+™
AFLAS®
FLUOROELASTOMERS
High-Performance Fluoropolymers for the Oil & Gas Industry
When failure is not an option.

Molding suppliers directory

The following is a directory of suppliers who offer molding equipment, materials and expertise to the rubber industry. The directory is followed by a cross-reference section listing the companies that offer each of these items.

2BA North America
24 Joseph St.
Parry Sound, Ontario, Canada
P2A 2G2 .... (705) 746-1162
Fax: (705) 746-1164
Email: gary.2BANA@baueradventures.com
Gary Bauer, managing director

Abrasive Supply Company, Inc.
25240 State Route 172
Minerva, OH 44657 ..... (330) 894-2818
Fax: (330) 894-2626
Website: www.polyblast.com
Email: sales@polyblast.com
Rob Miller, president; Rob Rouse, sales manager

Accumold
1711 S.E. Ora Labor Rd.
Ankeny, IA 50021 .... (515) 964-5741
Fax: (515) 964-5782
Website: www.accu-mold.com
Email: ajohnson@accu-mold.com
Aaron Johnson, vice president marketing and customer strategy

Ace Equipment Co.
5350 Evergreen Pkwy.
Sheffield, OH 44054...... (440) 934-2180
Website: www.armaturecoil.com
Email: sheran@armaturecoil.com
Scott Heran, owner

Acme-Hardesty Co.
450 Sentry Pkwy. W., Ste. 104
Blue Bell, PA 19422..... (215) 591-3610
(800) 223-7054
Fax: (215) 591-3620
Website: www.acme-hardesty.com
Email: sales@acme-hardesty.com
Bryan Huston, national sales manager

Acrolab Ltd.
7475 Tranby Ave.
Windsor, Ontario, Canada N8S 2B7
.... (800) 265-9542
Fax: (800) 465-9674
Website: www.acrolab.com
Email: info@acrolab.com
John Hodgins, chief executive officer; Joseph Ouellette, president; Shawn McAiney, purchasing director; Eugene Ryzer, technical director; Dan Higgins, vice president; Cory Beemer, sales and marketing manager

AES Rubber Equipment, LLC
2134 Primo Rd., Ste. 101
Highlands Ranch, CO 80129
.... (269) 598-3322
Website: www.usedrubberequip.com
Email: aes_54@hotmail.com
Brad Scott, president

Akrochem Corporation
3770 Embassy Pkwy.
Akron, OH 44333......... (330) 535-2122
(800) 321-2260
Fax: (330) 535-8947
Website: www.akrochem.com
Email: info@akrochem.com
Renee Horvatich, technical service
(See our ad on the 4th cover)

Akromold (Goderich), Ltd.
510 Mooney St.
Goderich, Ontario, Canada N7A 3Y6
.... (519) 524-8751
Fax: (519) 524-5822
Website: www.akromold.com
Email: sales@akromold.com
Terry Pellar, owner; Rick Haas, owner; Derek Langtry, owner

All Well Ind. Co., Ltd.
No. 75, Liuchiao W. Rd.
Chingkou Village, Puhsin Hsiang
Changhua Hsien, Taiwan 51346
.... (886) 4-8346006
Fax: (886) 4-8350823
Website: www.all-well.com.tw
Email: sales@all-well.com.tw
Bor Po Chen, president

Altman Manufacturing Co.
1990 Ohio St.
Lisle, IL 60532 .... (630) 963-0031
Fax: (630) 963-0089
Website: www.altmanmfg.com
Email: brian@altmanmfg.com
Paul Altman, president; Brian A. Altman, vice president sales

Amstat Industries, Inc.
25685 Hillview Ct.
Mundelein, IL 60060 .... (847) 998-6210
(800) 783-9999
Fax: (847) 998-6218
Website: www.amstat.com
Email: info@amstat.com
A. Cohen, president

APV Engineered Coatings
1390 Firestone Pkwy.
Akron,OH 44301.......... (330) 773-8911
(800) 772-3452
Website: www.apvcoatings.com
Email: sales@apvcoatings.com
David Hanna, marketing manager
(See our ad on page 78)

Arburg GmbH + Co KG
Arthur-Hehl-St.
72290 Lossburg, Germany 72290
....49 7446-33-0
Fax: 49 7446-33-3365
Website: www.arburg.com
Email: contact@arburg.com
Christoph Schumacher, marketing and corporate communications

ARP Materials
200 Creekside Dr.
Amherst, NY 14228
.... (716) 691-2141
Fax: (716) 691-5664
Website: www.arpmaterials.com
Email: nfasolino@arpmaterials.com
Nick Fasolino, president
(See our ad on page 18)

ASB Industries/Hannecard Roller Coatings
1031 Lambert St.
Barberton, OH 44203
.... (330) 753-8458
Fax: (330) 753-7550
Website: www.asbindustries.com
Email: ohio@hannecard.com
Scott Whitten, sales

Asbury Graphite Mills
156 Asbury-West Portal Rd.
Asbury, NJ 08802
.... (908) 537-2157
Fax: (908) 537-2908
Website: www.asbury.com
Email: asburyinfo@asbury.com
Nicholas Mares, vice president of marketing

Axel Plastics Research Laboratories, Inc.
50 Cambridge Dr.
Monroe, CT 06468....... (203) 590-2000
Fax: (203) 590-2000
Website: www.axelplastics.com
Email: info@axelplast.com
Scott Waterman, director of sales

Bartell Machinery Systems Corp.
6321 Elmer Hill Rd.
Rome, NY 13440......... (315) 336-7600
Fax: (315) 336-0947
Website: www.bartellmachinery.com
Email: sales@bartellmachinery.com

Barwell Global Ltd., Corporate Headquarters
Unit 1, 9 Burrel Rd.
Stirling Way
St. Ives, Cambridge, U.K. PE27 3LE
.... 44-1480-832-850
Fax: 44-1480-832-851

Molding suppliers directory

Website: www.barwell.com
Email: sales@barwell.com
Ian Turner, sales and service director

Barwell Global USA - Spare Parts & Service
2868 Westway Dr., Unit E
Brunswick, OH 44212-5661
.... (330) 225-9557
Fax: (330) 225-9555
Website: www.barwell.com/usa
Email: tammy@barwellusa.com
Tammy Kidd, operations manager

Barwell Global USA - USA Machine Sales
2868 Westway Dr., Unit E
Brunswick, OH 44212-5661
.... (330) 441-8630
Fax: (330) 225-9555
Website: www.barwell.com/usa
Email: ian@barwellusa.com
Ian Turner, vice president, sales and service

Batson Inc.
1 Club Rd.
P.O. Box 3978
Greenville, SC 29608.... (864) 242-5262
Fax: (864) 271-4535
Website: www.lpbatson.com
Email: batson@lpbatson.com
Glenn Batson, vice president; Steve Ouimette, product manager; Ben Rushing, Jr., area sales manager; Chuck Hays, area sales manager

Berran Industrial Group, Inc.
570 Wolf Ledges Pkwy.
Akron, OH 44311......... (330) 253-5800
Fax: (330) 253-5805
Website: www.berranindustrialgroup.com
Email: sales@berran.com
Randy P. Adair, president; Paul Zuzik, general manager

Blue Wave Ultrasonics
209 West 76th St.
Davenport, IA 52806... (563) 322-0144
Fax: (563) 322-7180
Website: www.bluewaveinc.com
Email: sales@bluewaveinc.com
Kalvin Frank, director of sales and service

Boy Machines Inc.
199 Philips Rd.
Exton, PA 19341.......... (610) 363-9121
Fax: (610) 363-0163
Website: www.boymachines.com
Email: spelna@boymachines.com
Sonya Pelna

Brenntag Specialties, Inc.
1 Cragwood Rd.
South Plainfield, NJ 07080
.... (908) 561-6100
(800) 732-0562
Fax: (800) 833-8139
Website: www.brenntagspecialties.com
Email: specialties@brenntag.com
Michael Strausser

Burton Press Co., Inc.
2156 Avon Industrial Dr.
Rochester Hills, MI 48309-3610
.... (248) 853-0212
Fax: (248) 853-2102
Website: www.burtonpress.com
Email: info@burtonpress.com
Edward LaPierre, president

Buzuluk a.s.
Buzulucka 108
Komarov 267 62
Komarov u Horovic, Czech Republic
.... 420 311 575 111
Fax: 420 316 572-234
Website: www.buzuluk.cz
Email: info@buzuluk.cz
Ondrej Soukup, assistant marketing manager; Frantisek Devera, CEO; Pavel Charvat, marketing manager; Vaclav Jelinek, strategic business unit manager; Jaroslav Spot, sales manager; Frantisek Kubalek, customer service manager

Canadian Feed Screws Mfg. Ltd.
80 Venture Dr.
Scarborough, Ontario, Canada M1B 3L6
.... (416) 284-8880
Fax: (416) 284-8169
Website: www.canadianFeedscrews.com
Email: cfsafs@aol.com
John Vasilev, president; Brigitte Girardo, director of sales

Carver, Inc.
1569 Morris St.
P.O. Box 298
Wabash, IN 46992-0298
.... (260) 563-7577
Fax: (206) 563-7625
Website: www.carverpress.com
Email: carverpress@corpemail.com
Gary Herring, regional sales manager; David Singer, sales and marketing manager
(See our ads on pages 57 and 74)

Chemours
1007 Market St.
P.O. Box 2047
Wilmington, DE 19899
.... (302) 773-1000
Website: www.chemours.com

Chem-Trend, Inc.
1445 W. McPherson Park Dr.
Howell, MI 48843......... (517) 545-7980
Fax: (517) 546-1199
Website: www.chemtrend.com
Email: nasales@chemtrend.com
Alison Deming

CCS Instruments Inc.
1868 Akron Peninsula Rd.
Akron, OH 44313......... (330) 376-3600
(800) 742-8535
Fax: (330) 376-8500
Website: www.ccsi-inc.com
Email: info@ccsi-inc.com
David Warner, president; Michael Kent Warner, executive vice president

CF Extrusion Technologies
2748 2nd St.
Cuyahoga Falls, OH 44221
.... (330) 807-5956
Website: www.cfextrusion.com
Email: info@cfextrusion.com
Terrance Hendershot, president and owner; Shannon Davidson, vice president of sales and operations; Larry Schlabaugh, senior engineer; Chance Hendershot, sales engineer; Madison Hendershot-Dubay, business development

Cincinnati Industrial Machinery Co.
Division of Armor Group
4600 N. Mason-Montgomery Rd.
Mason, OH 45040 .... (513) 923-5601
Fax: (513) 923-5694
Website: www.cinind.com
Email: sales@cinind.com
Joshua Donay, president

Circle Mold & Machine Inc.
83 S. Thomas Rd.
Tallmadge, OH 44278-0513
.... (330) 633-7017
Fax: (330) 633-7025
Website: www.circlemold.com
Email: info@circlemold.com
Edward A. Siciliano, CEO; Edward T. Siciliano, president

Coi Rubber Products, Inc.
19255 San Jose Ave. D-1
City of Industry, CA 91748
.... (626) 965-9966
Fax: (626) 581-2335
Website: www.coirubber.com
Email: sales@coirubber.com
David Chao, president


DESMA
North American Manufacturing Center
NAMC
MACHINERY AND TOOLING
FOR THE RUBBER AND
SILICONE INDUSTRY
TOOLING BUILT IN HEBRON, KY | USA
D968.400
DESMA
ENGINE SEALING
ELECTRICAL
MEDICAL DEVICE
INFASTRUCTURE
RUBBER TO METAL
DESMA USA, Inc. | 2195 Arbor Tech Drive Hebron, KY 41048 | sales.us@desma.biz | www.desma-usa.com | 859 525 6610

Molding suppliers directory

Cold Jet LLC - Dry Ice Cleaning Equipment
455 Wards Corner Rd.
Loveland, OH 45140.... (800) 337-9423
Fax: (513) 831-3211
Website: www.coldjet.com
Email: swilson@coldjet.com
Ellen Heini, marketing communications

Computer Age Engineering
867 E. 38th St.
Marion, IN 46953......... (765) 674-8551
Fax: (765) 674-3964
Website: www.caeweb.com
Email: info@caeweb.com
Tim Anger, sales engineer

Creative Coatings Corporation
7 Crescent St.
Nashua, NH 03064...... (603) 791-0137
Fax: (603) 791-0209
Website: www.mk-kubitza.com
Email: flocking@aol.com
Robert P. Borowski, president

Cryogenic Deflashing Systems Inc.
1701 E. Edinger Ave., Bldg G-2
Santa Ana, CA 92705... (714) 564-1020
Fax: (714) 564-1025
Website: www.cryogenicdeflashingsys-tems.com
Email: cryogenicdeflashingsystem-sinc@msn.com
Ruben Mendez, president

Custom Engineering Co.
2800 McClelland Ave.
Erie, PA 16510 .... (814) 898-2800
Fax: (814) 898-2825
Website: www.platens.com
Email: andyt@customeng.com
Andy Tompkins, sales manager

Dabsco Equipment Inc.
3007 Trenton Rd.
Clarksville, TN 37040
.... (931) 553-0242
Fax: (931) 647-1914
Website: www.dabsco.com
Email: info@dabsco.com
Jerome Buie, vice president; David Buie, president

Dake - a Laguna Tools Company
1809 Industrial Park Dr.
Grand Haven, MI 49417
.... (800) 937-3253
Website: www.dakecorp.com
Email: customerservice@dakecorp.com
Juan Palacios, sales manager

Danieli Corporation
800 Cranberry Woods Dr.
Cranberry Township, PA 16066
.... (724) 778-5400
Fax: (724) 778-5401
Website: www.danieli-usa.com
Email: sales@danieli-usa.com
Losso Paolo, president

David Wolfe Design, Inc.
829 Moe Dr.
Akron, OH 44310......... (330) 633-6124
Fax: (330) 633-9926
Website: www.davidwolfedesign.com
Email: info@davidwolfedesign.com
Doug Pryor, design manager

Deguma-Schütz GmbH
Industriestraße 4–8
36419 Geisa, Germany 36419
.... +49 (0) 36967 761-0
Fax: +49 (0) 36967 761-22
Website: www.deguma.com
Email: deguma@deguma.com
Viktoria Schütz, CEO

Desenco, Inc.
1938 S. Arlington St.
Akron, OH 44306
.... (330) 724-1200
Fax: (330) 724-1443
Website: www.desenco.com
Email: info@desenco.com
Robert Bates, president

Deshors Tire Mold Inc.
825 Third Ave., Second Floor
New York, NY 10022... (212) 520-8265
Fax: (212) 520 8501
Website: www.deshorstiremold.com
Email: philippeboe@aol.com
Philippe Boe, executive vice president

Desma USA, Inc.
2195 Arbor Tech Dr.
Hebron, KY 41048-7509
.... (859) 525-6610
Website: www.desma-usa.com
Email: sales.us@desma.biz
L. Scott Early, president and CEO
(See our ad on page 45)

Dinamec Systems LLC
4285 McEver Industrial Dr. NW
Acworth, GA 30101 ..... (770) 421-1181
Fax: (770) 421-8611
Website: www.dinamecsystems.com
Email: samantha.paulson@dinamec-systems.com
Luc Ceyssens, director; Drew Jones, general sales manager; Samantha Paulson, marketing

Dow Chemical
P.O. Box 1206
Midland, MI 48642-1206
...... (800) 447-1206 (U.S. and Canada)
(989) 832-1560
Fax: (989) 832-1465
Website: www.dow.com
Email: dowcig@dow.com

DRP Mold Corp.
70 James Baldwin Dr.
Martinsville, IN 46151-8080
.... (765) 349-3355
Fax: (765) 349-3366
Website: www.drpmold.com
Email: pparker@drpmold.com
Paul Parker, president and CEO; Linda Parker, owner

E&D Engineering Systems LLC
895 Industrial Dr.
Gladwin, MI 48624....... (989) 246-0770
Fax: (989) 246-0774
Website: www.edengsys.com
Email: ed@edengsys.com
John Shurlow, shop supervisor; Ed Wark, president

Eagle Polymer Equipment, Inc.
P.O. Box 1271
Akron, OH 44309......... (330) 706-0552
Fax: (330) 706-0546
Website: www.polymerequipment.com
Email: info@polymerequipment.com
Tim Samples, president

Edge-Sweets Co.
2887 Three Mile Rd., N.W.
Grand Rapids, MI 49544
.... (616) 453-5458
Fax: (616) 453-6227
Website: www.edge-sweets.com
Email: info@edge-sweets.com
Adam Firer, marketing manager

Electronic Development Labs, Inc.
244 Oakland Dr.
Danville, VA 24540...... (434) 799-0807
(800) 342-5335
Fax: (434) 799-0847
Website: www.edl-inc.com
Email: sales@edl-inc.com
Danielle Smith, sales manager; Stephanie King, service manager; Gabbi White, marketing director

Emerson
41 Eagle Rd.
Danbury, CT 06813-1961
.... (203) 796-0400
Fax: (203) 796-9838
Website: www.emerson.com/en-us
Email: info@Emerson.com

Encore Systems, Inc.
8501 Savage Rd.

Molding suppliers directory

Angora, MN 55703 ...... (218) 666-5455
Website: www.tirebaler.com
Email: info@tirebaler.com
Keith Ojanen

Engel
3740 Board Rd.
York, PA 17406 .... (717) 764-6818
Website: www.engelglobal.com
Email: contact.us@engelglobal.com
Chad Zediker, account manager, Elastomers/LSR

Epco LLC, Brown Machine
330 North Ross St.
Beaverton, MI 48612 ... (800) 989-3726
(989) 435-7741
Fax: (989) 435-2821
Website: www.epcollc.com
Email: epco-sales@brown-machine.com
Sam DeBartolo, national sales manager

Erie Mill & Press Co. Inc.
P.O. Box 6349
953 East 12th St.
Erie, PA 16512 .... (814) 454-1581
Fax: (814) 454-7913
Website: www.empco-inc.com
Email: jan@empco-inc.com
John Nowak, president; Greg Maus, vice president; Bradley Nowak, sales engineer

Erie Press Systems
1253 West 12th St.
P.O. Box 4061
Erie, PA 16512 .... (814) 455-3941
Fax: (814) 456-4819
Website: www.eriepress.com
Email: bhirsh@eriepress.com
Bob Hirsh, sales

Estee Mold & Die
1467 Stanley Ave.
Dayton, OH 45404....... (937) 224-7853
Website: www.firsttoolcorp.com
Email: sales@firsttoolcorp.com
Dan Rinehart, president

Feedscrews.com
2511 N. Friday Rd.
Cocoa, FL 32926......... (321) 631-2050
Fax: (321) 636-3508
Website: www.feedscrews.com
Ron Anderson, CEO/president

Ferry Industries, Inc.
4445 Allen Rd.
Stow, OH 44224-1058
.... (330) 920-9200
Fax: (330) 920-4200
Website: www.ferryindustries.com
Email: sales@ferryindustries.com

Ann Rowland, international sales manager; Adam Covington, president

Fisa North America Inc.
260 Stanley St.
Elk Grove Village, IL 60007
.... (847) 299-8400
Fax: (847) 299-8440
Website: www.fisa.com
Email: fisa-na@fisa.com
Fabio Leon, regional sales

Flexfab, LLC
1699 W. M-43 Highway
Hastings, MI 49058...... (269) 945-3533
Fax: (269) 945-4802
Email: sales@flexfab.com
Website: www.flexfab.com
Matthew DeCamp, president/CEO

Fluid Kinetics, Inc.
251 Thorn Ave.
Orchard Park, NY 14127
.... (716) 662-7900
Fax: (716) 662-7982
Website: www.fluidkinetics.net
Email: dhayes@fluidkinetics.net
Douglas J. Hayes; Robert Glace, Jr.

Fort Wayne Mold and Engineering
4501 Earth Dr.
Fort Wayne, IN 46809... (260) 747-9168
Fax: (260) 747-3601
Website: www.fortwaynemold.com
Email: rmarley@fortwaynemold.com
Darrell Beverly, chief operations officer; Brad Fiedler, chief engineering officer; Roger Marley, chief sales officer

Freeman Schwabe Machinery
4064 Clough Woods Dr.
Cincinnati, OH 45103.... (513) 947-2888
Fax: (513) 947-2887
Website: www.freemanschwabe.com
Email: sales@freemanschwabe.com
Greg DeFisher, CEO

French Oil Mill Machinery Co.
Polymer Machinery Group; Hydraulic Machinery Group
1035 W. Greene St.
Piqua, OH 45356-0920.... (937) 773-3420
Fax: (937) 773-3424
Website: www.frenchoil.com
Email: sales@frenchoil.com
Tayte French Lutz, chairman and CEO; Jason McDaniel, COO and president; Doug Smith, hydraulic sales; Dave Sledz, hydraulic sales; Mary Quinlan, hydraulic sales; Jeff Rudy, aftermarket sales; Alex Lee, polymer sales; Brian Greever, polymer sales

Friess Equipment
2222 Akron-Peninsula Rd.
Akron, OH 44313......... (330) 945-9440
Fax: (330) 923-5833
Website: www.friessequipment.com
Email: info@friessequipment.com
Jim Friess, president
(See our ad on page 70)

Fusion
422 Mesa Loop
San Antonio, TX 78258....(210) 712-7803
Website: www.fusion.net
Email: ayovanovich@fusoni.us
Adrian Yovanovich
(See our ad on page 42)

Gearhart Machine Co.
1145 Highbrook Ave.
Akron, OH 44301......... (330) 253-1880
Fax: (330) 253-1886
Email: jamie@erlbachergear.com
Patrick Casto, president/owner

Glacier Machinery Sales Corp.
P.O. Box 130486
St. Paul, MN 55113 ..... (651) 786-9700
Website: www.glaciermachinery.com
Email: sales@glaciermachinery.com
Marvin Cleveland, president

Gluco, Inc.
794 Chicago Dr.
Jenison, MI 49428....... (616) 457-1212
Fax: (616) 457-3620
Website: www.gluco.com
Email: gluco@gluco.com
Doug Grotenrath, vice president of sales

Gomaplast Machinery, Inc.
2424 Long Rd.
Wooster, OH 44691..... (330) 263-7845
Fax: (330) 263-7846
Website: www.gomaplast.com
Email: sales@gomaplast.com
Marcelo S. Hildebrandt, president
(See our ad on page 20)

Greene Rubber Company
20 Cross St.
Woburn, MA 01801...... (781) 937-9909
Fax: (781) 937-9739
Website: www.greenerubber.com
Email:marketing@greenerubber.com
Stephanie Agulas, marketing manager

Greenerd
41 Crown St.
P.O. Box 886
Nashua, NH 03061...... (603) 889-4101
(800) 877-9110
Fax: (603) 889-7601
Website: www.greenerd.com

LATEST INNOVATIONS

SMARTmix TOP 7000 Pro

DOSING TECHNOLOGY

THE PERFECT MIX

- Material utilization up to 99.6%
- Fully automatic drum change
- Automatic follower plates and drum recognition
- Easy exchange of 5 and 55 gal follower plates
- Smallest footprint (55 gal system) 1,150 x 790 x 1,950 mm (L/W/H)

Molding suppliers directory

Grimco Presses Inc.
65 First Ave.
Paterson, NJ 07514..... (973) 345-0660
Fax: (973) 345-0686
Website: www.grimcopresses.com
Email: sales@grimcopresses.com
David Grimaldi, Jr., president; David Grimaldi, sales and marketing manager; Robert Szydlowski, technical director

Gusmer-Admiral, Inc.
12104-1/2 E. Park St.
Cerritos, CA 90703...... (866) 397-8677
Fax: (562) 404-0687
Website: www.urethaneservice.com
Email: steve.hille@empirewestcorp.com
Mark S. Prichard, director/sales engineer, RIM Division

Guyson Corp.
13 Grande Blvd.
Saratoga Springs, NY 12866-9090
.... (800) 228-7894
(518) 587-7897
Fax: (518) 587-7840
Website: www.guyson.com
Email: info@guyson.com
Caitlin Lewis, business development manager; Steve Donohue, vice president, sales
(See our ad on page 51)

Harwick Standard
60 South Seiberling St.
P.O. Box 9360
Akron, OH 44305-0360
....(330) 798-9300
(800) 899-4412
Website: www.harwick.com
Email: info@harwick.com
Bill Knezevich, director of marketing; Rodney Crowell, director of sales
(See our ads on pages 11 and 72)

Haysite Reinforced Plastics
5599 New Perry Hwy.
Erie, PA 16509 .... (814) 868-3691
Fax: (814) 864-7803
Website: www.haysite.com
Email: info@haysite.com
Mark Anderson, president; Anthony Lignetta, director of sales

HB Chemical
1665 Enterprise Pkwy.
Twinsburg OH 44087... (330) 920-8023
(800) 991-2436
Fax: (330) 920-0971
Website: www.hbchemical.com
Email: orderdesk@hbchemical.com
Jeffrey L. Rand, president
(See our ads on pages 7, 8 and 9)

Herbert Machine Works Inc.
850 Moe Dr.
Akron, OH 44310......... (330) 929-4297
Website: www.herbert.eu/herbert-maschinenbau
Email: matthias.walter@herbert.eu

HF Rubber Machinery, Inc.
1701 N. Topeka
P.O. Box 8250
Topeka, KS 66608....... (785) 235-2336
Fax: (785) 235-1331
Website: www.hfrmusa.com
Email: info@us.hf-group.com
Paul White, executive vice president, Topeka operations

Hilma Div. of Carr Lane Roemheld
927 Horan Dr.
Fenton, MO 63026....... (800) 827-2526
Fax: (636) 386-8034
Website: www.roemheld-usa.com
Email: info@clrh.com
Hilma engineer

Hix Corporation
1201 E. 27th Terrace
Pittsburg, KS 66762..... (800) 835-0606
Fax: (620) 231-1598
Website: www.ovens-dryers.com
Email: Info@ovens-dryers.com
Kara Charbonneau, customer service manager

Hull Industries, Inc.
59 Industrial Dr.
New Britain, PA 18901 ... (215) 230-4260
Fax: (215) 230-4261
Website: www.hullindustries.com
Email: info@hullindustries.com
Patrick Shire, vice president of sales

Hunter Hydraulics, Inc.
2512 Columbus Rd. N.E.
P.O. Box 7117
Canton, OH 44705....... (330) 455-3983
Fax: (330) 455-6534
Larry R. Hunter, president

Husky Injection Molding Systems, Inc.
8845 West 192nd St.
Mokena, IL 60448........ (708) 479-9049
Fax: (708) 479-9054
Website: www.husky.co
John Galt, president and CEO

Hydratecs Injection Equipment Co.
430 Morgan Ave.
Akron, OH 44311......... (330) 773-0491
Fax: (330) 773-3800
Website: www.hydratecsinjectionequip.com
Email: hiekarl@ameritech.net
Karl Barkey, president

Icon Industries, Inc.
1522 Madison Ave., S.E.
Grand Rapids, MI 49507
.... (616) 241-1877
Fax: (616) 241-5578
Website: www.iconindustries.com
Email: sales@iconindustries.com
Thomas D. Jacques, president; Robert Zieger, vice president; Pete Spiering, sales manager

IMS Co.
10373 Stafford Rd.
Chagrin Falls, OH 44023-5296
.... (440) 543-1615
Fax: (440) 543-1069
Website: www.imscompany.com
Email: sales@imscompany.com
Dianna Barnes, sales manager

Indusco
120B Spence Ln.
Nashville, TN 37210 .... (615) 833-0666
Fax: (615) 834-8722
Website: www.induscousa.com
Email: sales@indusco.com
Tony Hoffman, president

Industrial Rubber Machinery Inc.
3784 Brant Dr.
Akron, OH 44319......... (330) 645-0020
Fax: (330) 645-0070
Website: www.rubbermachinery.com
Email: info@rubbermachinery.com
Larry Weber, president

International Baler Corporation
5400 Rio Grande Ave.
P.O. Box 61025
Jacksonville, FL 32254... (904) 358-3812
(800) 231-9286
Fax: (904) 358-7013
Website: www.intl-baler.com
Email: sales@intl-baler.com
Roger Griffin, president and CEO

International Mold Steel
1155 Victory Pl.
Hebron, KY 41048....... (800) 625-6653
(859) 342-6000
Fax: (859) 342-6006
Website: www.imsteel.com
Email: salesdesk@imsteel.com
Paul Britton, national sales manager

Jaco Products
15060 Madison Rd.
Middlefield, OH 44062-9407
.... (440) 632-7096
Fax: (440) 632-0012

Website: www.jacoproducts.com
Email: sales@jacoproducts.com
Bill Carter, general manager

Jemco Corp.
59 Old Turnpike Rd.
Beacon Falls, CT 06403
.... (203) 881-0488
Fax: (203) 881-0178
Website: www.jemcocorp.com
Email: joe@Jemco.comcastbiz.net
Joseph Norton; George Norton; Priscilla Weiss

Jing Day Machinery Industrial Co., Ltd.
No. 57, Houjue, Danei Dist., Tainan
City 74255, Tainan City, Taiwan
.... (886) 6-576-1168
(576) 3289, 576-3648
Fax: (886) 6-576-3369
Website: www.jingday.com
Robert K.M. Yang, general manager

JJB Engineering Co.
2695 North Haven Blvd., Ste. 10
Cuyahoga Falls, OH 44223
.... (330) 807-0671
Fax: (330) 926-1134
Email: sales@jjbengineering.com
Edward Sheehan, president

JM Machinery Inc.
P.O. Box 378
Wadsworth, OH 44282... (330) 825-2400
Fax: (330) 825-0569
Website: www.jmmachinery.com
Email: enquiry@jmmachinery.com
Michael Dyer, president and CEO; Jacqueline McCaman, vice president; Jason Breth, sales manager; Harish Nene, India office director

Kay Zee, Inc.
P.O. Box 95
New Philadelphia, OH 44663
.... (330) 339-1268
Fax: (330) 339-4324
Website: www.kayzeeinc.net
Email: kayzee11@aol.com

Kempler Industries Inc.
2323 Touhy Ave.
Elk Grove Village, IL 60007
.... (847) 640-8600
Fax: (847) 640-0431
Website: www.kempler.com
Email: sales@kempler.com
Charles Kempler, president; Douglas Kempler, sales and marketing manager

Kendon Corporation
3904 S. Hoyt Ave.
Muncie, IN 47302 .... (765) 282-1515
Fax: (765) 282-9359
Dick Elias, safety, human resources manager

Kendy Mold Industrial Ltd.
Building 5, Juhui Mold Industrial Park,
Tianliao Com, Yutang St.
Guangming District, ShenZhen City
518105, China 86-755-2328 4987
Website: www.kendymold.com
Email: info@kendymold.com
Judy Zhu, sales manager

Kent Mold & Mfg. Co.
1190 W. Main St.

Molding suppliers directory

Kent, OH 44240........... (330) 673-3469
Fax: (330) 673-9699
Website: www.kentmold.com
Email: pj@kentmold.com
Paul J. Ferder, president; Paul M. Ferder, general manager

Kipe Molds, Inc.
340 E. Crowther Ave.
Placentia, CA 92870.... (714) 572-9576
Fax: (714) 572-9579
Website: www.kipemolds.com
Email: dana.king@kipemolds.com
Becky Kipe, sales

Kobelco Stewart Bolling Inc.
1600 Terex Rd.
Hudson, OH 44236...... (330) 655-3111
Fax: (330) 655-2982
Website: www.ksbiusa.com
Email: information@ksbi.com
Hisashi Mitamura, president

KraussMaffei Corporation
7095 Industrial Rd.
Florence, KY 40122..... (859) 283-0200
Website: www.kraussmaffei.com
Email: info@kraussmaffei.com, salesnam@kraussmaffei.com
Alexandra Coffey, corporate communication and marketing

Lamac Systems Inc.
412 Honeysuckle Dr.
Dayton, OH 45429....... (937) 439-4131
Fax: (937) 439-5408
Website: www.lamac.com
Email: sales@lamac.com
James K. Hoffman, president; Bob Allen, vice president

Laselec Inc.
2605 N. Forum Dr.
Grand Prairie, TX 75052
......................................(817) 460 7830
Website: www.laselec.com
Frederick Viaut, sales manager

Long Chang Mechanical Co. Ltd.
No. 9 Lane 220
Chung Chen South Rd.
Young Kang City, Taiwan
.... (886) 6-2531251-2
Fax: (886) 6-2535271
Website: www.longchang.com.tw
Email: taiwan-lcmi@umail.hinet.net
Chin-Huo Huang, CEO/president; Ping-Shun Huang, vice president/purchase director; Chin-Yin Chang, technical director

Lotréc AB
Box 3023
181 03 Lidingö
Stockholm, Sweden
.... +46 (8) 544 80 900
Fax: +46 (8) 544 80 909
Website: www.lubkorelease.com
Email: release@lotrec.se
Brandon Hurrie, Lubko division manager

LWB Machinery N.A. LP
8865 Norwin Ave., Ste. 27 #362
North Huntingdon, PA 15642
.... (724) 733-1942
Fax: (724) 733-1962
Website: www.lwb.us.com
Email: info@lwb-steinl.us
Tim Crites, president; John Fleming, national sales manager; Seth Sheets, service liaison manager

M.R. Mold and Engineering Corp.
1150 Beacon St.
Brea, CA 92821........... (714) 996-5511
Fax: (714) 996-6029
Website: www.mrmold.com
Email: info@mrmold.com
Rick Finnie, president; Brian Giesel, operations manager

Machinery Exchange Corp.
34501 Aurora Rd., #106
Solon, OH 44139......... (330) 896-0585
Fax: (330) 896-0147
Website: www.mecakron.com
Email: bthompson@mecakron.com
Bob Thompson

Machinery + Planning, Inc.
1655 North Lancaster Rd.
South Elgin, IL 60177
.... (630) 924-0100
Fax: (630) 924-1675
Website: www.maplan.at/en
Email: sales@maplan-usa.com
Deven Lokagariwar, president; John “JR” Mohl III, national sales director; Ben Puffer, technical sales director; Russ Burgert, service manager; Jessica Louzensky, operations manager
(See our ads on pages 23 and 75)

Macrodyne Technologies Inc.
311 Connie Cres.
Concord, Ontario, Canada L4K 5R2
.... (905) 669-2253
Fax: (905) 669-0936
Website: www.macrodynepress.com
Email: sales@macrodynepress.com
Dennis Colyer, sales manager; Andrew Kirk, vice president

Maren Engineering Corp.
111 W. Taft Dr.
South Holland, IL 60473
.... (708) 333-6250
Fax: (708) 333-7507
Website: www.marenengineering.com
Email: sales@marenengineering.com
Terry Stengel, sales; Mike Blais, sales; Michel Hartung, sales

Maverix Solutions, Inc.
1633 E. 4th St., Ste. 220
Santa Ana, CA 92701 ... (714) 794-5950
Website: www.mavcoatmoldrelease.com
Email: info@maverixsolutions.com
Mark Danzo, president

Maxi-Blast Inc.
3650 North Olive Rd.
South Bend, IN 46628... (574) 233-1161
(800) 535-3874
Fax: (574) 234-0792
Website: www.maxiblast.com
Email: info@maxiblast.com
Michael Golubski, vice president sales

McLube Division
9 Crozerville Rd.
P.O. Box 2425
Aston, PA 19014..........(800) 2-McLube
(610) 459-1890
Fax: (610) 459-9538
Website: www.mclube.com
Email: sales@mclube.com
Evan J. Silo, technical representative

McNeil & NRM, Inc.
96 E. Crosier St.
Akron, OH 44311......... (330) 253-2525
Fax: (330) 253-5714
Website: www.mcneilnrm.com
Email: sales@mcneilnrm.com
Donald R. Spear, P.E., executive vice president, sales

Melrose Mold & Machining Co.
10085 Pacific Ave.
Franklin Park, IL 60131-1830
.... (847) 233-9970
Fax: (847) 233-9975
Website: www.melrosemold.com
Email: melrosemold@sbcglobal.net
Mark Kawczynski, president

Menzel LP
P.O. Drawer 3308
Spartanburg, SC 29304
.... (864) 576-5690
Fax: (864) 574-4570
Website: www.menzelus.com
Email: menzel@menzelus.com
Kent Bolick, general manager

Mesnac Americas Co. Ltd.
2620 Ridgewood Rd
Akron, OH 44313......... (865) 591-3655
(865) 856-2317

Website: www.mesnac.com
Email: americas@mesnac.com
David Jones, president; Jerry Gu, CEO; Gilberto Gonzalez, sales manager; Bill Kulmacz, technical service manager

Mid-American Machine & Equipment, Inc.
815 E. 6th St.
LeRoy, KS 66857 .... (620) 964-2156
Fax: (620) 964-2157
Website: www.mid-americanmachine.com
Email: midam@kans.com
Shane Sutherland, CEO

Mid-States Tool & Machine, Inc.
2220 Patterson St.
Decatur, IN 46733 .... (260) 728-9797
Fax: (206) 728-9795
Website: www.midstatestool.com
Email: jasons@midstatestool.com
Jason Scheumann, president

Miller-Stephenson Chemical Co.
55 Backus Ave.
Danbury, CT 06810 ..... (203) 743-4447
Fax: (203) 791-8702
Website: www.miller-stephenson.com
Email: ctsales@mschem.com
Lynn Bobenhausen, sales manager

Mitsubishi Heavy Industries America, Inc.
Tire Machinery Division
600 Cherry Fork Ave.
Leetonia, OH 44431
.... (330) 427-8900
Fax: (330) 427-8909
Website: www.mitsubishitoday.com
Email: chuck_coristin@mhiahq.com
Katsuhide Aikawa, general manager; Robert Focht, plant manager; Chuck Coristin, business manager

Mix Head Repair & Sales
78 Veterans Dr.
Holland, MI 49423
.... (616) 394-0191
Fax: (616) 394-9711
Website: www.mhr-inc.com
Email: info@mhr-inc.com
Jeffrey Hunter, global sales manager; James Gohlke, vice president sales

Moldex3D North America Inc.
27725 Stansbury Blvd., Ste. 190
Farmington Hills, MI 48334
.... (248) 946-4570
Fax: (248) 928-2270
Website: www.moldex3d.com
Email: wendytsai@moldex3d.com
Wenny Tsai, marketing specialist

MonTech USA
1280 S. Williams Dr.
P.O. Box 169
Columbia City, IN 46725-0169
.... (800) 552-5115
(260) 244-5115
Fax: (206) 244-4158
Website: www.montechusa.com
Email: info@montechusa.com
Richard J. Bagan, president

Morris Bean & Co.
777 E. Hyde Rd.
P.O. Box 108
Yellow Springs, OH 45387
.... (937) 767-7301
Fax: (937) 767-7306
Website: www.morrisbean.com
Email: sales@morrisbean.com
G. Michael McWilliams, general manager, tire molds

Multiplas Enginery Co., Ltd.
65 Technology 7th Rd.
Hwa-Ya Technology Park
Gueishan, Taoyuan, Taiwan
.... +886-3-318-0090
Website: www.multiplas-tw.com
Email: multiplas@multiplas.com.tw

Natrochem, Inc.
1 Exley St.
Savannah, GA 31415.... (912) 236-4464
Fax: (912) 236-1919
Website: www.natrochem.com
Email: agrady@natrochem.com
Ann Grady

Nerpco USA, LLC
43 Russell Rd.
Bethany, CT 06524...... (203) 393-9050
Fax: (203) 393-9051
Website: www.nerpcousa.com
Email: nerpcousa@att.net
Steven R. Barnes, vice president; Richard B. Barnes, president

NFM Iddon Limited
Units 125, 126 Brookfield Pl., Walton Summit Centre, Preston PR5 8BF, U.K.
....1772-421258
Fax: 1772-431114
Website: www.nfmiddon.co.uk
Email: sales@nfmiddon.co.uk
Michael I. Iddon, sales director; Peter Rowe, sales manager

NFM Welding Engineers, Inc.
577 Oberlin Rd., S.W.
Massillon, OH 44647
.... (330) 837-3868
Fax: (330) 837-2230
Website: www.nfm.net
Email: sales@nfm.net
Paul R. Roberson, president

OEM Press Systems
311 S. Highland Ave.
Fullerton, CA 92832..... (714) 449-7500
Fax: (714) 449-7510
Website: www.oempresssystems.com
Email: sales@oempresssystems.com
Sean Field, CEO; Mary Quinlan, sales manager; Bill Puscas, service manager

Oil States Industries, Inc.
7701 S. Cooper
P.O. Box 670
Arlington, TX 76004-0670
.... (817) 548-4200
Fax: (817) 548-4250
Website: www.oilstates.com
Email: houstonsales@oilstates.com
Howard Hughes, president

Oxco, Inc.
547-H Kings Ridge Dr.
Fort Mill, SC 29708...... (704) 333-7514
Fax: (704) 333-7517
Website: www.oxco.com
Email: emeier@oxco.com
Erich Meier, president

Pacific Press Technologies, L.P.
714 Walnut St.
Mt. Carmel, IL 62863... (618) 262-8666
Fax: (618) 262-7000
Website: www.pacific-press.com
Email: sales@pacific-press.com
Gordan Baker, vice president, director of sales and product development

Park Thermal International
62 Todd Rd.
Georgetown, Ontario, Canada L7G 4R7
.... (905) 877-5254
(877) 834-4328
Fax: (905) 877-6205
Website: www.parkthermal.com
Email: jmistry@parkthermal.com
Jay Mistry, CEO

Passaic Rubber Co.
45 Demarest Dr.
Wayne, NJ 07470........ (973) 696-9500
Fax: (973) 696-0686
Website: www.passaic.com
Email: answers@passaic.com
Jeff Leach, chairman/COO; J.D. Mathey, president; James Leach, vice president, operations

Pfaff Molds L.P.
11825 Westhall Dr.
Charlotte, NC 28278.... (704) 423-9484
Fax: (704) 423-9487

Molding suppliers directory

Website: www.pfaff-mold.com
Email: info@pfaff-mold.com
Troy DeVlieger, president; Raimund Kusserow, vice president and project manager

PHI
14955 E. Salt Lake Ave.
City of Industry, CA 91746-3133
.... (626) 968-9680
Fax: (626) 333-3610
Website: www.phi-tulip.com
Email: sales@phi-tulip.com
Russ Hanson, sales manager

Polymer Machinery Co., Inc.
154B Potomac Ave.
Tallmadge, OH 44278-2715
.... (330) 633-5734
Fax: (330) 633-6367
Website: www.polymermachineryco.com
Email: sales@polymermachineryco.com
Kendall Ashby, president; Jim Chiofolo, sales; Matt Turlik, sales
(See our ad on page 14)

Polymer Solutions Group
12819 Coit Rd.
Cleveland, OH 44108...... (229) 435-8394
Fax: (330) 633-6367
Website: www.polymersolutionsgroup.com
Rikki Lamba, managing director, additives

Pyropel Inc.
20 Howard Ave.
New Bedford, MA 02745
.... (508) 273-2628
(888) 797-6735
Website: www.pyropel.com
Email: pyropel@pyropelinc.com
Gordon Varney, president
(See our ads on pages 62 and 79)

Rahco Rubber Inc.
1633 Birchwood Ave.
Des Plaines, IL 60018... (847) 298-4200
Fax: (847) 298-4201
Website: www.rahco-rubber.com
Email: jackanton@rahco-rubber.com
Jack Anton, vice president of sales and marketing

RAK Machine, Inc.
5814 Walworth Ave.
Cleveland, OH 44102.... (216) 631-7750
Fax: (216) 631-7790
Website: www.rakmachine.com
Email: info@rakmachine.com
Timothy Bragg, president and CEO

Raydar Rubber
1734 Wall Rd., Ste. B
Wadsworth, OH 44281... (330) 334-6111
Email: asavakis@raydarrubber.com
Angelo Savakis, co-owner

Regloplas Corporation
4063 Tabor Rd.
Sodus, MI 49126 .... (888) 799-4110
Fax: (269) 428-1155
Website: www.regloplasusa.com
Email: kpetrykowski@regloplasusa.com
Kip Petrykowski, director of sales

Release Coatings of New York, Inc.
125 South Brooklyn Ave.
Wellsville, NY 14895
.... (585) 593-2335
Fax: (585) 593-4912
Website: www.rcony.com
Email: rnaples@rcony.com
Ralph Naples, president
(See our ads on pages 55, 75 and 78)

Reliable Rubber and Plastic Machinery Co.
2008-14 Union Tpke.
North Bergen, NJ 07047
.... (201) 865-1073
Fax: (201) 865-6878
Website: www.reliable-machinery.com
Email: info@reliable-machinery.com
Thomas Liccardo, vice president/sales manager; Helga Liccardo, president; Joseph Liccardo III, vice president, engineering; Doug James, purchasing director; Zsolt Racz, engineering
(See our ad on page 16)

Rep Corp.
310 Katom Dr.
Kodak, TN 37764......... (847) 697-7210
Fax: (847) 697-6829
Website: www.repinjection.com
Email: jwirtz@repcorp.com
Bruno Tabar, chief executive officer

Reuther Mold & Mfg. Co.
1225 Munroe Falls Ave.
Cuyahoga Falls, OH 44221
.... (330) 923-5266
Fax: (330) 923-9930
Website: www.reuthermold.com
Email: JoeF@reuthermold.com
Joe Flach, president

RICO Elastomere Projecting GmbH
A-4600 Thalheim/Wels
Am Thalbach 8
.... +43(0)7242-76460
Fax: +43(0)7242-76470
Website: www.rico.at
Email: office@rico.at

RIF Molds Inc.
9901 Colbert, Ville d'Anjou
Montreal, Quebec, Canada H1J 1Z9
.... (514) 352-6021
Fax: (514) 352-7528
Website: www.rifmolds.com
Email: info@rifmolds.com
Rene Mellerin, president

RJS Corp.
3400 Massillon Rd.
Akron, OH 44312......... (330) 896-2387
Fax: (330) 896-3282
Website: www.rjscorp.com
Email: sales@rjscorp.com
C. Hamilton, president

Roemheld North America
927 Horan Dr.
Fenton, MO 63026....... (800) 827-2526
(636) 386-8022
Fax: (636) 386-8034
Website: www.roemheld-usa.com
Email: Info@roemheld-usa.com
Hilma engineer

Rogers Industrial Products Inc.
532 S. Main St.
Akron, OH 44311......... (330) 535-3331
Fax: (330) 535-4408
Website: www.rogersusa.com
Email: sales@rogersusa.com
Rob Cole, general manager; John R. Cole, president and CEO; Brady Stalmaker, manager, engineering

Root, G.M. Inc.
160 Ridge Rd.
Buffalo, NY 14218 .... (716) 825-4342
Fax: (716) 821-0565
Website: www.gmroot.com
Email: gmroot@gmroot.com
Rory Root, president; Richard Root, CEO; Glenn Root, managing director

H.M. Royal, Inc.
689 Pennington Ave.
P.O. Box 28
Trenton, NJ 08601
.... (609) 396-9176
Fax: (609) 396-3185
Website: www.hmroyal.com
Email: joe_royal@hmroyal.com
Joseph E. Royal, president

Rubber City Machinery Corp.
1000 Sweitzer Ave.
P.O. Box 2043
Akron, OH 44309......... (330) 434-3500
Fax: (330) 434-2244
Website: www.rcmc.com
Email: info@rcmc.com
Robert Westfall, executive vice president; Daniel Abraham, general manager, sales, certified appraiser

Molding suppliers directory

Sanyu USA, Inc.
1720 Indian Wood Cir., Suite A
Maumee, OH 43537 .... (419) 897-9595
Fax: (419) 897-9262
Website: www.sanyu-group.com
Email: info@sanyusa.com
Mark Beaver, vice president

Schold Machine Co., Midwest Facility
7201 W. 64th Pl.
Chicago, IL 60638-4692
.... (708) 458-3793
(708) 458-3788
Website: www.schold.com
Email: schold@schold.com
Christopher Spatz, president; John Duong, vice president; Mike Barr, principal engineer

Shaw Almex Industries
P.O. Box 430
Parry Sound, Ontario, Canada P2A 2X4
.... (800) 461-4351
(705) 746-5884
Fax: (705) 746-5884
Website: www.almex.com
Email: sail@almex.com
James Shaw, president; Susan Moir, production manager; Terry Ideson, sales manager

Shaw Almex Presses
5051 Snapfinger Woods Dr.
Decatur, GA 30031...... (404) 294-0574
Fax: (404) 294-4407
Website: www.almex-online.com
Email: bob_shaw@almex.com
Bob Shaw, vice president, operations

Sherdil Precision Inc.
447 Silver Creek Industrial Dr.
Tecumseh, Ontario, Canada N8N 4W2
.... (519) 727-4010
Fax: (519) 727-4011
Website: www.sherdil.com
Email: sales@sherdil.com
Jason Adams, process engineer

Shibaura Machine Company, America
755 Greenleaf
Elk Grove, IL 60007
.... (888) 593-1616
Website: www.shibaura-machine.com
Email: sma-info@shibaura-machine.com
Hiroshi Azuma, president

Siempelkamp LP
200 Cobb Pkwy. N.
Suite 302
Marietta, GA 30062 ..... (770) 424-4141
Fax: (770) 424-4998
Website: www.siempelkamp-usa.com
Email: info@siempelkamp-usa.com
Juergen Maibohm, sales engineer

Sinoarp Tires Equipment Technology
No. 18 Pingsheng Rd.
Suzhou Industrial Park
Suzhou, China .... +86-0512-62812532
Fax: +86-0512-62812552
Website: www.sinoarp.com
Email: sinoarp@sinoarp.com
Chen Qiang, president

Sivon Manufacturing Co.
3131 Perry Pk. Rd.

Molding suppliers directory

Perry, OH 44081.......... (440) 259-5505
Fax: (440) 259-4602
Website: www.sivonmfg.com
Email: smaco38@hotmail.com
Charlotte E. Kieffer, president; Bonnie Judd, treasurer; Kathleen Ritts, secretary

Soberay & Sons Ltd.
5500 Walworth Ave.
Cleveland, OH 44102
.... (216) 334-2003
Fax: (216) 334-2005
Website: www.soberayandsons.com
Email: sales@soberayandsons.com
Ron Soberay, president and CEO; Ryan Soberay, vice president

Sovereign Chemical Co.
4040 Embassy Pkwy.
Akron, OH 44333......... (330) 542-8400
Fax: (330) 542-8884
Website: www.sovchem.net
Email: cs@sovchem.net
Debra DiPaola

Stoner Inc.
1070 Robert Fulton Hwy.
Quarryville, PA 17566
.... (717) 786-7355
Outside PA: (800) 227-5538
Fax: (717) 786-9088
Website: www.stonersolutions.com
Email: jressler@stonersolutions.com
Jim Ressler, product manager

Struktol Company of America
P.O. Box 1649
201 E. Steels Corners Rd.
Stow, OH 44224-0649.... (330) 928-5188
(800) 327-8649
Fax: (330) 928-0013
Website: www.struktol.com
Email: customerservice@struktol.com
(See our ad on page 1)

Sumitomo (SHI) Demag Plastics Machinery North America, Inc.
17909 Cleveland Parkway Dr., Ste. 100
Cleveland, OH 44135
.... (440) 876-8960
Fax: (440) 876-2785
Website: www.vandorndemag.com
Email: sdna.info-dc@shi-g.com
John F. Martich, vice president and COO

Superior Mold & Die Co.
449 N. Main St.
Munroe Falls, OH 44262
.... (330) 688-8251
Fax: (330) 688-8253
Website: www.s-m-d.us
Email: dave@s-m-d.us
Richard Yamokoski, president; David Yamokoski, operations manager

Taber Inc.
286 County Rd.
P.O. Box 208
Barrington, RI 02806
.... (401) 245-2800
Fax: (401) 245-6010
Website: www.taberincorporated.com
Email: greg@taberincorp.com
Greg D. Taber, product manager

Taricco Corp.
1520 W. 16th St.
Long Beach, CA 90813
.... (562) 437-5433
(800) 4-CLAVES
Fax: (562) 901-3932
Website: www.taricco.com
Email: carolyn@taricco.org
Todd Taricco, president

Taylor-Winfield Technologies
3200 Innovation Place
P.O. Box 779
Youngstown, OH 44509
.... (330) 259-8500
(800) 523-4899
Fax: (330) 259-8538
Website: www.taylor-winfield.com
Email: sales@taylor-winfield.com
Donnie Wells, president

Tekcast Industries, Inc.
124 Maple St.
Warwick, RI 02888
.... (800) 445-7900
Website: www.tekcast.com
Email: info@tekcast.com
Tom Francis, president

Testing Machines Inc.
40 McCullough Dr.
New Castle, DE 19720
.... (302) 613-5600
(800) 678-3221
Fax: (302) 613-5619
Website: www.testingmachines.com
Email: info@testingmachines.com
Sean Kohl, director of global sales

TMP, A Division of French
1035 W. Greene St.
P.O. Box 920
Piqua, OH 45356......... (937) 773-3420
Fax: (937) 773-3424
Website: www.frenchoil.com/tmp-products
Email: sales@frenchoil.com
Tayte French Lutz, chairman and CEO; Jason McDaniel, COO and president; Doug Smith, hydraulic sales; Dave Sledz, hydraulic sales; Mary Quinlan, hydraulic sales; Jeff Rudy, aftermarket sales; Alex Lee, polymer sales; Brian Greever, polymer sales

TMP Asian
1035 W. Greene St.
P.O. Box 920
Piqua, OH 45356
.... (937) 773-3420
Fax: (937) 773-3424
Website: www.tmpasian.com
Email: hydraulicsales@frenchoil.com
Kyle Kadrovach, sales engineer

Tung Yu Hydraulic Machinery Co., Ltd.
No 12, Yongsing Rd., Nan Kung Industrial Zone
Nantou City, Taiwan 540
.... +886-49-2253588
Fax: +886-49-2252998
Website: www.tungyu.com
Email: tungyu@tungyu.com
Hua-Ling, Lin, general manager; Steven Yen, vice general manager; Frank Cheng, sales and marketing manager; Chen-Pin, Yang, president and CEO

U.S. Molding Machinery, Co.
38294 Pelton Rd.
Willoughby, OH 44094
.... (440) 918-1701
Fax: (440) 918-1720
Website: www.usmolding.com
Email: usmolding@usmolding.com
Zachariha Cohen, president

United Feed Screws Ltd.
487 Wellington Ave.
P.O. Box 9433
Akron, OH 44305......... (330) 798-5532
Fax: (330) 798-5548
Website: www.unitedfeedscrews.com
Email: jpaulnorton@unitedfeedscrews.com
J.P. Norton, president; Jim Norton, vice president, operations; Joseph P. Norton, Sr., technical director; Becky Jackson, office manager

Vanderbilt Chemicals, LLC
30 Winfield St.
Norwalk, CT 06856-5150
.... (203) 853-1400
Fax: (203) 853-1452
Website: www.rtvanderbilt.com
Susan Flores, sales specialist; Matt Messina, technical sales manager, Americas, rubber and plastics; Chris Nola, global business manager, rubber and plastics
(See our ad on page 2)

Molding suppliers directory

Venango Machine Co., Inc.
14118 Rte. 8-89
P.O. Box 239
Wattsburg, PA 16442 .. (814) 739-2211
Fax: (814) 739-2024
Website: www.venangomachine.com
Email: nvogel@venangomachine.com
Nyla J. Vogel, sales manager
(See our ad on page 61)

Wabash MPI
1569 Morris St.
P.O. Box 298
Wabash, IN 46992-0298
.... (260) 563-1184
Fax: (206) 563-1396
Website: www.wabashmpi.com
Email: wabashmpi@corpemail.com
David Singer, marketing manager; Joel Kline, regional sales manager
(See our ads on pages 57 and 74)

West Coast Rubber Machinery, Inc.
7180 Scout Ave.
Bell Gardens, CA 90201
.... (562) 927-2546
Fax: (562) 806-4628
Website: www.wcrubbermach.com
Email: sales@wcacc.com
George Schofhauser, president; Bruce Reichenfeld, vice president

Western Reserve Chemicals
60 S. Seiberling St.
Akron, OH 44305......... (330) 798-9300
Fax: (330) 798-0214
Website: www.wrchem.com
Email: support@wrchem.com
Marc Pignataro, sales and marketing

Williams, White & Co.
600 River Dr.
Moline, IL 61265.......... (877) 797-7650
Fax: (309) 797-7655
Website: www.williamswhite.com
Email: sales@williamswhite.com
David Nesbitt

Wyko Tire Technology
6435 Hwy. 411 S.
P.O. Box 130
Greenback, TN 37742... (865) 856-2317
Fax: (865) 856-2092
Website: www.wyko.com
Email: sales@wyko.com
Kenny McCleery, general manager; Bill Jones, general manager, U.K. office

Yizumi Rubber Machinery Co., Ltd.
No. 22, Ke Yuan 3 Rd.
Hi-Tech Industrial Zone,
Ronggui, Shunde
Foshan City, Guangdong Province,
China 528306 .... +86-757-2926 5156
+86-757-2926 5320
Fax: +86-757-2926 2195
Website: www.yizumi-group.com.hk
Email: rim@yizumi-group.com
Nancy Liu, international sales manager

Zenith Pumps
1710 Airport Rd.
Monroe, NC 28110...... (704) 289-6511
Fax: (704) 289-9273
Website: www.zenithpumps.com
Email: cc@circor.com
Keith Schafer, business manager

Classified List

Auxiliary Equipment
2BA North America Inc.
International Bailer Corp.
Rahco Rubber Inc.

Mold cleaners
Ace Equipment Co.
Amstat Industries, Inc.
Blue Wave Ultrasonics
CCS Instruments Inc.
Cincinnati Industrial Machinery Co.
Cold Jet
Emerson
Fisa North America Inc.
Friess Equipment
Glo-Mold Inc.
Guyson Corp.
IMS Co.
Kay Zee, Inc.
Maxi-Blast Inc.
Mitsubishi Heavy Industries America
Raydar Rubber
Tekcast Industries, Inc.

Mold cleaning equipment
Abrasive Supply Company, Inc.
Ace Equipment Co.
Acrolab Ltd.
Blue Wave Ultrasonics
CCS Instruments Inc.
Cold Jet
Dinamec Systems LLC
Emerson

Molding suppliers directory

Fisa North America Inc.
Friess Equipment
Guyson Corp.
Laselec Inc.
Maxi-Blast Inc.
Oxco, Inc.
Regloplas Corporation
Root, G.M. Inc.

Mold inserts
CCS Instruments Inc.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
Fort Wayne Mold and Engineering
Melrose Mold & Machining Co.
Rahco Rubber Inc.
Roembke Mfg. & Design, Inc.

Platens
Acrolab Ltd.
Akromold (Goderich), Ltd.
Carver, Inc.
Circle Mold & Machine Inc.
Coi Rubber Products, Inc.
Computer Age Engineering
Custom Engineering Co.
Dake - a Laguna Tools Company
Erie Mill & Press Co. Inc.
French Oil Mill Machinery Co.
Gomaplast Machinery, Inc.
Grimco Presses Inc.
Hix Corporation
Icon Industries, Inc.
Industrial Rubber Machinery Inc.
JJB Engineering Co.
JM Machinery Inc.
McNeil & NRM, Inc.
Nerpco USA, LLC
OEM Press Systems
Pebsco, LLC
PHI
Polymer Machinery Co., Inc.
Rahco Rubber Inc.
Reliable Rubber and Plastic Machinery Co.
Reuther Mold & Mfg. Co.
Roemheld North America
Rogers Industrial Products Inc.
Rubber City Machinery Corp.
Siempelkamp LP
Sivon Manufacturing Co.
Soberay & Sons Ltd.
TMP, A Division of French
Venango Machine Co., Inc.
Wabash MPI
West Coast Rubber Machinery, Inc.
Williams, White & Co.

Presses
AES Rubber Equipment, LLC
All Well Ind. Co., Ltd.
Altman Manufacturing Co.
Arburg GmbH + Co KG
ASB Industries/Hannecard Roller Coatings
Barwell Global Ltd., Corporate Headquarters
Barwell Global USA - Spare Parts & Service
Barwell Global USA - USA Machine Sales
Batson Inc.
Berran Industrial Group, Inc.
Boy Machines Inc.
Brown Machine Group
Burton Press Co., Inc.
Buzuluk a.s.
Canadian Feed Screws Mfg. Ltd.
Carver, Inc.
CCS Instruments Inc.
CF Extrusion Technologies
Coi Rubber Products, Inc.
Cryogenic Deflashing Systems Inc.
Custom Engineering Co.
Dabsco Equipment Inc.
Dake - a Laguna Tools Company
Danieli Corporation
Deguma-Schuetz GmbH
Desma USA, Inc.
Eagle Polymer Equipment, Inc.
Edge-Sweets Co.
Encore Systems, Inc.
Engel
Erie Mill & Press Co. Inc.
Erie Press Systems
Feedscrews.com
Fluid Kinetics, Inc.
Freeman Schwabe Machinery
French Oil Mill Machinery Co.
Glacier Machinery Sales Corp.
Gluco, Inc.
Gomaplast Machinery, Inc.
Greenerd
Grimco Presses Inc.
Herbert Machine Works Inc.
HF Rubber Machinery, Inc.
Hull Industries, Inc.
Hunter Hydraulics, Inc.
Hydratecs Injection Equipment Co.
Icon Industries, Inc.
Indusco
Industrial Rubber Machinery Inc.
International Baler Corporation
JJB Engineering Co.
JM Machinery Inc.
Kempler Industries Inc.
Kendy Mold Industrial Ltd.
Kipe Molds, Inc.
KraussMaffei Berstorff
Lamac Systems Inc.
Long Chang Mechanical Co. Ltd.
LWB Machinery N.A. LP
M.R. Mold and Engineering Corp.
Machinery Exchange Corp.
Macrodyne Technologies Inc.
Maren Engineering Corp.
McNeil & NRM, Inc.
Menzel LP
Mesnac Americas Co. Ltd.
Mid-American Machine & Equipment, Inc.
Mitsubishi Heavy Industries America, Inc.
MonTech USA
Multiplas Enginery Co., Ltd.
Nerpco USA, LLC
NFM Iddon Limited
NFM Welding Engineers, Inc.
OEM Press Systems
Pacific Press Technologies, L.P.
Park Thermal International
Passaic Rubber Co.
PHI
Polymer Machinery Co., Inc.
Rahco Rubber Inc.
RAK Machine, Inc.
Reliable Rubber and Plastic Machinery Co.
Rep Corp.
RJS Corp.
Roembke Mfg. & Design, Inc.
Rogers Industrial Products Inc.
Rubber City Machinery Corp.
Sanyu USA, Inc.
Schold Machine Co., Midwest Facility
Shaw Almex Industries
Shaw Almex Presses
Sherdil Precision Inc.
Shibaura Machine Company, America
Siempelkamp LP
Sinoarp Tires Equipment Technology
Sivon Manufacturing Co.
Soberay & Sons Ltd.
Sumitomo (SHI) Demag Plastics Machinery North America, Inc.
Taricco Corp.
Taylor-Winfield Technologies
Tekcast Industries, Inc.
Testing Machines Inc.
TMP, A Division of French
Tung Yu Hydraulic Machinery Co., Ltd.
U.S. Molding Machinery, Co.
United Feed Screws Ltd.
Venango Machine Co., Inc.
Wabash MPI
West Coast Rubber Machinery, Inc.
Williams, White & Co.
Wyko Tire Technology
Yizumi Rubber Machinery Co., Ltd.

Rotational molding equipment
Acrolab Ltd.
Buzuluk a.s.
Coi Rubber Products, Inc.
Computer Age Engineering
Ferry Industries, Inc.
LWB Machinery N.A. LP
Rahco Rubber Inc.
Tung Yu Hydraulic Machinery Co., Ltd.
Zenith Pumps

Molding suppliers directory

Molds
Accumold
Acme-Hardesty Co.
Akromold (Goderich), Ltd.
Asbury Graphite Mills
Axel Plastics Research Laboratories, Inc.
Bartell Machinery Systems Corp.
Brenntag Specialties, Inc.
CCS Instruments Inc.
CF Extrusion Technologies
Circle Mold & Machine Inc.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
Desenco, Inc.
Desma USA, Inc.
DRP Mold Corp.
Estee Mold & Die
Feedscrews.com
Fort Wayne Mold and Engineering
Freeman Schwabe Machinery
French Oil Mill Machinery Co.
Gearhart Machine Co.
Glacier Machinery Sales Corp.
Herbert Machine Works Inc.
Hull Industries, Inc.
Husky Injection Molding Systems, Inc.
Jaco Products
Jemco Corp.
Kendy Mold Industrial Ltd.
Kent Mold & Mfg. Co.
Kipe Molds, Inc.
M.R. Mold and Engineering Corp.
Melrose Mold & Machining Co.
Mesnac Americas Co. Ltd.
Mid-States Tool & Machine, Inc.
Mix Head Repair & Sales
MonTech USA
Morris Bean & Co.
Passaic Rubber Co.
Pfaff Molds L.P.
Polymer Machinery Co., Inc.
Rahco Rubber Inc.
Reuther Mold & Mfg. Co.
RICO Elastomere Projecting GmbH
RIF Molds Inc.
Roembke Mfg. & Design, Inc.
Root, G.M. Inc.
Sivon Manufacturing Co.
Testing Machines Inc.
U.S. Molding Machinery, Co.
Wyko Tire Technology

Molds - Airbag
Coi Rubber Products, Inc.
Freeman Schwabe Machinery

Molds - Cold runner
Akromold (Goderich), Ltd.
Coi Rubber Products, Inc.
Desenco, Inc.
Desma USA, Inc.
DRP Mold Corp.
Fort Wayne Mold and Engineering
Hamilton Mold & Machine, Inc.
M.R. Mold and Engineering Corp.
Melrose Mold & Machining Co.
Pfaff Molds L.P.
Rahco Rubber Inc.
Reuther Mold & Mfg. Co.
Roembke Mfg. & Design, Inc.
Superior Mold & Die Co.
U.S. Molding Machinery, Co.

Molds - Compression
AES Rubber Equipment, LLC
Akromold (Goderich), Ltd.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
Desenco, Inc.
Desma USA, Inc.
DRP Mold Corp.
Fort Wayne Mold and Engineering
Freeman Schwabe Machinery
French Oil Mill Machinery Co.
Greene Rubber Company
Greenerd
Hull Industries, Inc.
Jemco Corp.
Melrose Mold & Machining Co.
Pebsco, LLC
Polymer Machinery Co., Inc.
Rahco Rubber Inc.
Raydar Rubber
Reuther Mold & Mfg. Co.
Roembke Mfg. & Design, Inc.
Sivon Manufacturing Co.
Superior Mold & Die Co.
U.S. Molding Machinery, Co.

Molds - Drug sundries
Coi Rubber Products, Inc.
Desenco, Inc.
Desma USA, Inc.
Fort Wayne Mold and Engineering
Jemco Corp.
Kent Mold & Mfg. Co.
Polymer Machinery Co., Inc.

Molds - Elastomeric keypads
Coi Rubber Products, Inc.
Desenco, Inc.
Fort Wayne Mold and Engineering

Molds - Fan belt
Akromold (Goderich), Ltd.
Coi Rubber Products, Inc.
Kent Mold & Mfg. Co.

Molds - Fiberglass
Coi Rubber Products, Inc.
Reuther Mold & Mfg. Co.

Molds - Heel and sole
Circle Mold & Machine Inc.
Coi Rubber Products, Inc.
Kent Mold & Mfg. Co.
Melrose Mold & Machining Co.
Polymer Machinery Co., Inc.

Molds - Injection
AES Rubber Equipment, LLC
Akromold (Goderich), Ltd.
Batson Inc.
Circle Mold & Machine Inc.
Coi Rubber Products, Inc.
Cryogenic Deflashing Systems Inc.
David Wolfe Design, Inc.
Desenco, Inc.
Desma USA, Inc.
DRP Mold Corp.
Electronic Development Labs, Inc.
Estee Mold & Die
Feedscrews.com
Fort Wayne Mold and Engineering
Greene Rubber Company
Hull Industries, Inc.
Jemco Corp.
Jing Day Machinery Industrial Co., Ltd.
Kent Mold & Mfg. Co.
Kipe Molds, Inc.
M.R. Mold and Engineering Corp.
Melrose Mold & Machining Co.
Oil States Industries, Inc.
Pfaff Molds L.P.
Polymer Machinery Co., Inc.
Rahco Rubber Inc.
Reuther Mold & Mfg. Co.
Roembke Mfg. & Design, Inc.
Sanyu USA, Inc.
Sivon Manufacturing Co.
Superior Mold & Die Co.
U.S. Molding Machinery, Co.

Molds - LIM
Akromold (Goderich), Ltd.
CCS Instruments Inc.
Coi Rubber Products, Inc.
Cryogenic Deflashing Systems Inc.
Desenco, Inc.
Desma USA, Inc.
Fort Wayne Mold and Engineering
Greene Rubber Company
M.R. Mold and Engineering Corp.
Reuther Mold & Mfg. Co.
Roembke Mfg. & Design, Inc.

Molds - Mechanical goods
Akromold (Goderich), Ltd.
CCS Instruments Inc.
Circle Mold & Machine Inc.
Coi Rubber Products, Inc.
Desenco, Inc.
Desma USA, Inc.
DRP Mold Corp.
Feedscrews.com
Fort Wayne Mold and Engineering
Jemco Corp.
Kent Mold & Mfg. Co.

Molding suppliers directory

Melrose Mold & Machining Co.
Oil States Industries, Inc.
Polymer Machinery Co., Inc.
Rahco Rubber Inc.
Reuther Mold & Mfg. Co.
Superior Mold & Die Co.

Molds - Plastic
CCS Instruments Inc.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
E&D Engineering Systems LLC
Feedscrews.com
Freeman Schwabe Machinery
M.R. Mold and Engineering Corp.
Pfaff Molds L.P.
Rahco Rubber Inc.
Reuther Mold & Mfg. Co.
Roembke Mfg. & Design, Inc.
Superior Mold & Die Co.
U.S. Molding Machinery, Co.

Mold Releases
Acme-Hardesty Co.
Akrochem Corp.
APV Engineered Coatings
Asbury Graphite Mills
Axel Plastics
Brenntag Specialties, Inc.
Chem Trend, Inc.
Dow Chemical
Flow Polymers, Inc.
Harwick Standard Distribution Corp.
Haysite Reinforced Plastics
HB Chemical
Lotréc AB
McLube
Miller-Stephenson Chemical Co., Inc.
Natrochem
H.M. Royal, Inc.
Sovereign Chemical Co.
Stoner Inc.
Struktol Company of America
Taber Inc.
Vanderbilt Chemicals, LLC
Western Reserve Chemical

Molds - Rubber
Akromold (Goderich), Ltd.
CCS Instruments Inc.
Circle Mold & Machine Inc.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
Desenco, Inc.
Desma USA, Inc.
DRP Mold Corp.
E&D Engineering Systems LLC
Feedscrews.com
Fort Wayne Mold and Engineering
Freeman Schwabe Machinery
French Oil Mill Machinery Co.
Jemco Corp.
Kendy Mold Industrial Ltd.
Kent Mold & Mfg. Co.
M.R. Mold and Engineering Corp.
Melrose Mold & Machining Co.
MonTech USA
Passaic Rubber Co.
Pfaff Molds L.P.
Polymer Machinery Co., Inc.
Rahco Rubber Inc.
Reuther Mold & Mfg. Co.
Roembke Mfg. & Design, Inc.
Sivon Manufacturing Co.
Superior Mold & Die Co.
Tekcast Industries, Inc.
U.S. Molding Machinery, Co.

Molds - Sponge and foam
CCS Instruments Inc.
Circle Mold & Machine Inc.
Coi Rubber Products, Inc.
Freeman Schwabe Machinery
Jemco Corp.
Kent Mold & Mfg. Co.
Melrose Mold & Machining Co.
Superior Mold & Die Co.

Molds - Structural foam
CCS Instruments Inc.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
Melrose Mold & Machining Co.

Molds - Tire
Bartell Machinery Systems Corp.
Desenco, Inc.
Mesnac Americas Co. Ltd.
Superior Mold & Die Co.
Wyko Tire Technology

Molds - Tire bead
Coi Rubber Products, Inc.
Superior Mold & Die Co.

Molds - Transfer
CCS Instruments Inc.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
Desenco, Inc.
Desma USA, Inc.
DRP Mold Corp.
E&D Engineering Systems LLC
Fort Wayne Mold and Engineering
French Oil Mill Machinery Co.
Greene Rubber Company
Hull Industries, Inc.
Jemco Corp.
Melrose Mold & Machining Co.
Rahco Rubber Inc.
Raydar Rubber
Reuther Mold & Mfg. Co.
Sivon Manufacturing Co.
Superior Mold & Die Co.
U.S. Molding Machinery, Co.

Molds - Tube
Bartell Machinery Systems Corp.
Coi Rubber Products, Inc.

Molds - Urethane
Batson Inc.
Coi Rubber Products, Inc.
David Wolfe Design, Inc.
DRP Mold Corp.
Fort Wayne Mold and Engineering
Jemco Corp.
Melrose Mold & Machining Co.
Reuther Mold & Mfg. Co.
Superior Mold & Die Co.

ARPM launches virtual training academy

The Association for Rubber Products Manufacturers (ARPM) announced the launch of a Virtual Training Academy. This online training portal provides rubber industry professionals with the core information needed for anyone new to the industry, and a refresher for industry veterans.

The 23 training courses were created by industry subject matter experts and provide learners with the introductory information they need to understand the basics of each primary discipline of the rubber industry, and what it takes to make a part. The courses are divided into several modules, including Non-Molding Operations, Quality in Rubber Manufacturing and Job Setup and Production Flow.

Greg Vassmer, an ARPM Training Academy committee member and industry veteran, shared, “ARPM has used its broad base of rubber manufacturers and their expertise to create the industry’s best collection of virtual training modules. There simply is no longer a reason for rubber companies to neglect rubber-specific formal training, or have to rely on on-the-job training. ARPM’s expert learning system can now be plugged directly into any employee’s development program.”

The Virtual Training Academy is available to any ARPM member at no additional cost to their annual membership dues, and cannot be found anywhere else in the industry, according to ARPM. Once a learner has completed a course in the ARPM Training Academy, they will receive a certificate of completion. For more information or to view the course catalog, contact info@arpminc.org.

For more information on ARPM and upcoming events, visit www.arpminc.com.

Established in 2010, the Association for Rubber Products Manufacturers is managed by rubber business leaders and has over 100 members. The association works to provide manufacturers with bottom line impacting programs, networking and additional beneficial services.

The ARPM Training Academy is a dynamic technical training resource that teaches fundamentals and advanced topics for the rubber industry. The ARPM Training Academy is said to provide training for the entire workforce, from the entry level machine operator to the highly skilled engineering professional.

Registration opens for DKT 2024 trade fair

The German Rubber Society (DKG) announced the upcoming German Rubber Conference and the associated international trade fair DKT 2024. This major industry event will be held in Nuremberg,

Meetings

Germany from July 1-4, and promises to bring together experts and companies from around the world to showcase their latest developments and products, according to organizers.

From July 1-4, Nuremberg will once again become the hub of the international rubber industry. The registration status for the exhibition, a good month before the exhibit stand registration deadline on October 16, was already showing promising signs, according to organizers, indicating that the highest point of 2018 will be attained.

Dr. H.-Martin Issel, chairman of the DKG, emphasized the importance of this event: “DKT 2024 will not only provide a platform for the latest innovations and products in the rubber industry, but will also be a meeting point for highly topical industry issues. Under the motto, ‘Networking for a Sustainable Future,’ this gathering of industry experts and key players is an event not to be missed.”

DKT 2024 will take place in the state-of-the-art Halls 8 and 9 in the heart of the Nuremberg Exhibition Center. The close proximity of the international conference to the industrial exhibition will allow for short distances and an intensive exchange between the participants, according to the Deutsche Kautschuk-Gesellschaft e.V. (DKG). The timing in mid-2024 is said to promise a spirit of optimism and an economic upturn, with innovative solutions for an industry in transition.

Companies, experts and all interested parties are invited to participate in DKT 2024 and help shape the future of the rubber industry. For more information on registration and the event program, visit www.dkt2024.de.

The DKG is a non-profit network supported by nearly 1,000 personal members and over 100 member companies in the rubber and elastomer industry, founded in 1926. The DKG is said to be a leading organization in the rubber industry, and is dedicated to promoting research, innovation and exchange in the industry. DKG regularly organizes events and conferences to bring together experts and companies to shape the future of the rubber industry.

Middle East Rubber and Tire Expo held

TechnoBiz is hosting Middle East Rubber and Tire Expo 2024 in the Sharjah Expo Center in the United Arab Emirates January 8-9. Exhibitors will include manufacturers and suppliers of natural and synthetic rubber, TPE and TPV, rubber chemicals and compounds, rubber reclaim, tire testing services, and more.

For further information, email peram.technobiz@gmail.com, or visit https://expo.technobiz.org.

Rubber Group News

The **Ohio Rubber Group** will hold its Winter Technical Meeting January 23 at the Hilton Garden Inn in Twinsburg, OH. Details are available at www.ohiorubbergroup.org.

Calendar

Rubber Division, ACS, Career Catalyst Webinar: Know Your Worth; Negotiating Salary and Benefits in a Job, www.rubber.org/training/ - December 14.

University of Akron, Akron Polymer Training Services, Essentials of Rubber Science and Technology online course, www.uakron.edu/apts/ - December 19.

January

TechnoBiz, Middle East Rubber & Tire Expo 2024, Sharjah Expo Center, Sharjah, United Arab Emirates, https://expo.technobiz.org - January 8-9.

University of Akron, Akron Polymer Training Services, Adhesion Science (Interfacial Phenomena in Soft Materials) online course, www.uakron.edu/apts/ - January 8-9.

University of Akron, Akron Polymer Training Services, Color Theory and Applications online course, www.uakron.edu/apts/ - January 10-12.

Rubber Division, ACS, Utilizing Laboratory Equipment for Efficient Development and Problem Solving online course, www.rubber.org/training/ - January 16.

Active Communications International, Future of Polyolefins 2024 conference, Antwerp, Belgium, https://www.wplgroup.com/aci/event/polyolefins-conference - January 17-18.

Rubber Division, ACS, How to Create and Deliver Scientific Presentations course, www.rubber.org/training/ - January 18.

Ohio Rubber Group, winter technical meeting, Hilton Garden Inn, Twinsburg, OH, www.ohiorubbergroup.org - January 23.

Rubber Division, ACS, Strength and Endurance in Rubber online course, www.rubber.org/training/ - January 24.

Rubber Division, ACS, Introduction to Compounding, Mixing and Testing online course, www.rubber.org/training/ - January 30.

TechnoBiz, Latex Conference 2024 (Latex Science, Technology, Processing and Markets), Prince Songkla University, Pattani, Thailand, https://conference.technobiz.org - January 30-31.

ACI Events, Future of Chemical Recycling Europe 2024, Rotterdam, Netherlands, https://www.wplgroup.com/aci/event/future-of-chemical-recycling - January 31 - February 1.

February

Rubber Division, ACS, Carbon Blacks Manufacturing, Properties and Applications in Rubber Compounds online course, www.rubber.org/training/ - February 8.

University of Akron, Akron Polymer Training Services, RPA Testing of Rubber Processability and Dynamic Properties course, National Polymer Innovation Center, Akron, OH, www.uakron.edu/apts/ - February 8-9.

University of Akron, Akron Polymer Training Services, Rubber Technician Training course, National Polymer Innovation Center, Akron, OH, www.uakron.edu/apts/ - February 12-14.

Rubber Division, ACS, Optimizing Rubber Molding Process Through Advanced Simulations online course, www.rubber.org/training/ - February 13.

University of Akron, Akron Polymer Training Services, Structure/Property Relationships in Polyurethanes online course, www.uakron.edu/apts/ - February 14-15.

University of Akron, Akron Polymer Training Services, Polymer Compounding, Formulating and Testing of Plastics, Rubber, Adhesives and Coatings online course, www.uakron.edu/apts/ - February 14-16.

Rubber Division, ACS, Electroelastomers: Applications, Principles and Opportunities online course, www.rubber.org/training/ - February 15.

Rubber Division, ACS, Essentials of Rubber Technology online course, www.rubber.org/training/ - February 21.

University of Akron, Akron Polymer Training Services, Rubber Molding Processes: Principles, Troubleshooting and Mold Design online course, www.uakron.edu/apts/ - February 21-23.

Rubber Division, ACS, Essentials of Silicone Rubber online course, www.rubber.org/training/ - February 22.

Rubber Division, ACS, The Fatigue Limit of Rubber webinar, www.rubber.org/training/ - February 28.

March

Messe Frankfurt Ltd., Smart Production Solutions Guangzhou 2024, China Import and Export Fair Complex, Guangzhou, China, www.spsinchina.com - March 4-6.

Rubber Division, ACS, The Art of Networking: It's Not Who You Know, It's Who Knows You webinar, www.rubber.org/training/ - March 5.

JEC Group, JEC World 2024 International Composites Show, Paris-Nord Villepinte, Paris, France, www.jec-world.events - March 5-7.

University of Akron, Akron Polymer Training Services, Understanding Raw Materials, the Building Blocks of Rubber Compounding online course, www.uakron.edu/apts/ - March 13.

Rubber Division, ACS, Rubber Explained course, ACE Laboratories, Ravenna, OH, www.rubber.org/training/ - March 15.

Rubber Division, ACS, U.S. Regulatory Compliance in the Rubber Industry webinar, www.rubber.org/training/ - March 26.

Active Communications International, European Biopolymer Summit, Ghent, Belgium, https://www.wplgroup.com/aci/event/european-biopolymer-summit - March 26-27.

Rubber Division, ACS, Global Rubber Technology: Processes, Current Status and Future Trends webinar, www.rubber.org/training/ - March 28.

April

Ohio Rubber Group, Spring Technical Meeting, Hilton Garden Inn, Twinsburg, OH, www.ohiorubbergroup.org - April 16.

TechnoBiz, Rubber Compound Conference, Century Park Hotel, Bangkok, Thailand, https://conference.technobiz.org - April 22-23.

TechnoBiz, Rubber Molding Conference, Century Park Hotel, Bangkok, Thailand, https://conference.technobiz.org - April 24-25.

Rubber Division, ACS, Spring Technical Meeting, Hilton Polaris, Columbus, OH, www.rubber.org - April 30 - May 2.

May

Plastics Industry Association, NPE: The Plastics Show, Orange County Convention Center, Orlando, FL, www.npe.org - May 6-10,

University of Akron, Akron Polymer Training Services, Structure/Property Relationships in Polyurethanes online course, www.uakron.edu/apts/ - May 9-10.

FinnTex LLC, The Latex Conference 2024, Hilton Fairlawn, Akron, OH, jimfinn1215@finntexusa.com - May 14.

University of Akron, Akron Polymer Training Services, Rubber Technician Training course, National Polymer Innovation Center, Akron, OH, www.uakron.edu/apts/ - May 20-22.


AGC
Fluon®
Fluon+™
AFLAS®
FLUOROELASTOMERS
High-Performance Fluoropolymers for the Oil & Gas Industry
When failure is not an option.

Spray system for molding efficiency

The MC 2 is a further development of the MC 1 automatic spray gun, primarily intended for use in continuous spraying extrusion systems of rubber profiles. The MC 2's needleless design ensures a consistent material flow, eliminating bottlenecks and preventing blockages, even when processing viscous materials, according to the manufacturer.

Equipped with the updated Xline air nozzle system, the MC 2 is said to offer improved functionality and handling, very fine atomization and a high level of application efficiency. The MC 2 enables thin film thicknesses with an adjustable spray pattern. The amount of material is not metered through a needle in the material nozzle, but only via the material feed, so there are no bottlenecks in the material flow area. This prevents the material passage from clogging, even with materials with large particles.

The material is fed to the apparatus via a pump or pressure container and dispensed in doses. The material flow within the apparatus is free of undercuts, which prevents material build-up and ensures very good flushability, according to the company. This means, for example, that media with large particles can be sprayed without causing blockages.

A stainless steel cannula guides the material to the outlet at the material nozzle. Atomization takes place via the company's Xline air nozzles. The material flow is interrupted via the feed device. The MC-2 and other so-called needleless devices are used for coating rubber profiles on extrusion systems (in-line process). When using these profiles in the automotive sector, paints with large particles are often used.

Since there is no needle, there is said to be no clogging, even with large particles and/or low flow rates. The system is said to feature very good atomization and adjustability of the spray pattern similar to the M18. The cannula is screwed into the material nozzle, which is said to provide very good flushability. (*Krautzberger*)

www.krautzberger.com

Wet blast system

Rubber bond coating is said to be essential for many industries. The company has developed the Auto-Komet wet blast system specifically design for this process. The wet blast system uses high pressure water combined with abrasive particles to deliver a superior finish and improved production performance, according to the company. With the Auto-Komet system, the firm is said to help customers increase productivity, reduce costs and maximize quality in the rubber bond production processes. Because it requires less time and labor than traditional processes, customers are said to experience significant savings in operating expenses, as well. (*Guyson*)

www.guyson.com

LSR injection molds

A 16-cavity fully automatic piston mold with an 8-drop valve gate cold runner has been exhibited running with Sumitomo's SE-EV-A advanced all-electric 130T machine using Shin-Etsu Silicones of America's KEG2003H-50 material with a Kri-Color additive. Automation was provided by Yushin while showcasing its FRA-1530S/D/DS all-axis servo driving robot, and Nexus showcased its Servomix X20 dosing unit. Frigel provided the chiller for this cell. The manufacturer of the 16-valve mold is said to be a global leader in tight tolerance complex geometry liquid silicone rubber (LSR) injection molds, focusing on the medical industry. The firm is said to assist OEMs and job shop molders with their thermoplastic mold requirements. The company also builds overmolds to produce quality finished products. (*M.R. Mold & Engineering*)

www.mrmold.com

Injection molding software

With the AkvisIO IME (injection molding edition) data analysis software, this company is said to be helping its customers take a further step towards the digitalization of injection molding: All of the data from machines and process monitoring systems like ComoNeo and ComoScout can now be visualized and analyzed synchronously and across processes. In addition to suitable machines and tools, high performance and transparent injection molding processes are often said to require more in-depth optimization with sensors and continuous production monitoring. Moreover, when it comes to designing processes that are optimal over the long term, data management and data analysis are said to play a decisive role: They are the missing, often underutilized, link in the value chain of modern materials processing. AkvisIO IME is said to bridge this gap and enables customers to manage and analyze data across devices and processes. The data analysis software for recording, storing and analyzing high frequency sensor and machine signals during injection molding is intended for use by both process engineers and data scientists. (*Kistler*)

www.kistler.com

Rubber mold cleaning

A complete line of manual, automatic, CO_2 and robotic mold cleaning systems is supplied by the company. Since 1963, the firm has provided state-of-the-art mold cleaning equipment and technology to the rubber industry globally. Systems are available to process tire, compression, injection, platen and bladder molds. (*Friess Equipment*)

www.friessequipment.com

Mold release agents

This global manufacturer of professional grade industrial cleaning, maintenance and manufacturing chemicals, and parent of Franklynn DiamondKote and Franklynn Crystal mold release agents, announced the launch of DKW-4185 water based semi-permanent mold release. Based on years of previous water based release development, DKW-4185 is said to be a premium release agent that carries universality for a variety of elastomers, including but not limited to natural rubber, sulfur cured EPDM, polyacrylate and a variety of fluoroelastomers. Designed for many molding applications, including anti-vibration parts, seals and gaskets, and general rubber molded parts, DKW-4185 is said to offer excellent cycle life, cleaner molds and reduced scrap rates compared to earlier products. The release agents are available in pails, drums and totes from the plant in Olathe, KS. Product features are said to include stable, non-transferring and excellent release properties; improved cosmetics and fewer defects; increased mold life and less frequent mold cleaning required; forms a tough, durable release film; water based formula avoids complications found in solvent-based products; promotes good rubber flow; and more. (*ITW Pro Brands*)

www.itwprobrands.com

Injection molding machines

A version of the CX series with the name suffix #185 includes a package of additional features that are normally subject to a charge and are now integrated at no extra cost. This is said to enable users to boost quality and efficiency in injection molding applications in the clamping force range from 500 to 4,200 kN, while at the same time reducing operating costs immediately and noticeably, according to the manufacturer. The BluePower servo drive is said to optimally control the pumps according to current demand or energy requirements. This is said to significantly reduce electricity requirements, thus lowering operating costs as well as CO_2 emissions from production. BluePower insulating sleeves are placed around the plasticizing cylinder to stabilize the temperature profile there, and thus improve process stability. They also reduce warm-up time by up to 30%, resulting in corresponding energy savings, according to the company. The APCplus (adaptive process control) machine function continuously analyzes the injection molding process and quickly and accurately compensates for material and environment related fluctuations in melt viscosity, according to the firm. This is said to enable zero-defect production. (*KraussMaffei*)

www.kraussmaffei.com

Molding software systems

Moldex3D 2023 is the company's latest version of molding analysis software to seize opportunities with its global customers in the continuously advancing industry. The software focuses on four main concepts: reliability, efficiency, augmentation and liberation. It not only strengthens simulation performance, but also provides user-friendly interfaces and various cloud services, according to the company. The API function can streamline workflow, enhance software and hardware capabilities, achieve digital twins and seamlessly connect the virtual and the real. The software continues to improve simulation performance, according to the company. The most critical factor that affects forming is material properties. The company's research and development center has conducted real injection experiments using nearly 400 different materials to optimize parameters in the material library, enhance reliability and make the results of molding analysis closer to reality. In terms of molding analysis, Moldex3D 2023 upgrades venting analysis, including compressibility and air temperature calculation. It accurately simulates the temperature and pressure changes of air in the mold cavity during the filling process. (*Moldex3D*)

www.moldex3d.com

Cryogenic deflashing

Medical molders are said to be provided by this company with a rapid, consistent and cost-effective alternative to hand trimming molding flash. Nitrofreeze cryogenic deflashing is an automated, computer controlled batch process that removes flash from tens to thousands of molded parts all at the same time. This patented process will not change part tolerances or surface finish, is more consistent than hand trimming, and is safe for medical plastics and medical silicones. During Nitrofreeze cryogenic flashing, batches of molded parts are cooled below the polymer's glass transition temperature (T_g) so that the flash becomes hard, brittle and easy to remove. The parts are then blasted with a specified cryogenic grade polycarbonate media that comes in different diameters to meet part specific challenges. This proven process is especially efficient at removing flash from cross-holes, blind holes and other geometries that are hard to reach with hand tools, according to the company. Medical molders are said to enjoy the fact that Nitrofreeze cryogenic deflashing will not change critical part tolerances or mar surface finishes. The speed and consistency of this automated deflashing process is extremely attractive. When a medical molder needed to deflash silicone distal handles, Nitrofreeze is said to have saved the company over six hours of deflashing labor for every 1,000 pieces. The molder had tried buffing and trimming, but these labor-intensive techniques took upwards of 20 seconds per part. With volumes of 3,000 to 4,000 parts per release, the molder chose cryogenic deflashing instead of other alternative technologies, according to the company. Although flashing stood as tall as 0.036" in some areas, Nitrofreeze is said to have achieved a tight flash tolerance of only 0.005. (*Nitrofreeze Cryogenic Solutions*)

www.nitrofreeze.com

Silicone molding solutions

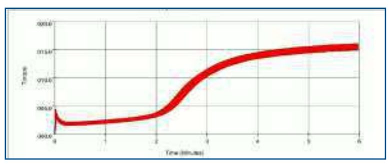
As an internationally active full system and service supplier, this company specializes in the processing and dosing of liquid silicone. The firm is said to be a global player in the production of high quality silicone and multi-component moldings. From high precision molds to dosing systems and cold runner technologies developed in-house, the company is said to supply all the solutions from its own production. Process development, including rheological and thermal simulation of the mold, also takes place at the firm. Production on machines and systems from the company is said to conserve resources, save material, result in minimum flash and is waste-free. With perfectly optimized cycle times and up to 512 cavities, the molds are said to ensure the highest possible efficiency. At the same time, the company is said to ensure the perfect coordination of the production flow. From the development of the injection moldings and the implementation of the turnkey system through to the production of the injection moldings, quality assurance and packaging, the firm is said to ensure the complete interlinking of all the processes. The company processes liquid silicone rubber (LSR), solid silicone, silicone-silicone and silicone-thermoplastic. (*Elmet*)

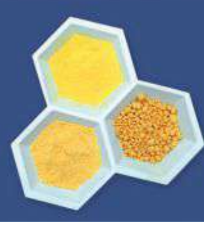
www.elmet.com

Injection molding system

The operation of injection molding machines is often said to be complex and requires great technical expertise during the various process sequences. In smartOperation, the firm offers a digital service product that is said to enable defect-free machine operation, increases process stability and thus boosts efficiency in production. In particular, machine operators without in-depth prior knowledge of injection molding technology are said to benefit from the advantages of smartOperation.The smartOperation is an intuitive machine function that enables separation between process settings and the actual operator interface. The machine operator is guided through the entire production process in a clear and structured manner by means of simple instructions. This is said to ensure a standardized, optimum production process. The smartOperation system is said to offer customers the opportunity to significantly reduce the error rate in the operation of injection molding machines. In addition, the company is said to present a solution to counteract the global shortage of skilled workers. The smartOperation is said to give even machine operators without prior knowledge the ability to operate the company's injection molding machines immediately. (*KraussMaffei*)

www.kraussmaffei.com





Portable tire recycling

For recyclers shredding tires, the loading and unloading of shredded materials from conventional scrap containers can be a logistical bottleneck in their operations, wasting labor and time, according to the company. The challenge is that portable shredding systems have not been designed to take advantage of one of the recycling industry's most labor efficient types of containers: open-top walking floor semi-trailers which simplify loading and unloading. Traditional portable shredders cannot reach the height of an open-top walking floor semi-trailer, which is the said to be the standard in the recycling industry. When loading scrap containers, typical portable shredder conveyors can only reach about 9' high at best, while the ubiquitous semi-trailers can be up to 13' high. As a result, tire recyclers are said to have been limited to using roll-off trailers or dumpsters with these kinds of systems. Another difficulty the industry faces is an excessive amount of shredder downtime and associated costs for knife sharpening and maintenance due to the voluminous processing of bulky materials. These obstacles are said to be resolved with portable, high-volume shredder trailer systems specifically designed to work with open-top walking floor semi-trailers. (*BCA Industries*)

www.bcaindustries.com

Bulk bag discharger

A mobile frame-mounted bulk bag discharger with flexible screw conveyor is said to allow rapid, dust-free discharging and conveying of bulk solid materials at multiple plant locations. The Bulk-Out BFF Series discharger allows forklift loading of bulk bags from 36" to 84" (914 to 2,134 mm) tall. A removable bag-lifting cradle with Z-Clip strap holders permits bulk bags to be attached securely at floor level from an ergonomic standing height, and then forklifted into cradle cups atop the discharger's upright posts. The bag spout is pulled through a 12" (305 mm) diameter iris valve which is then closed around the spout, preventing material flow. The spout can then be untied, the snap-action access door closed, and the valve released slowly, allowing controlled flow into the enclosed hopper through the bulk bag interface chute. Complete discharge is aided by Flow-Flexer bag activators that press against opposite bottom sides of the bag at timed intervals to form a steep "V" shape, and top-mounted Pop-Top extension devices that raise the uprights as the bulk bag empties, promoting the flow of material from the corners of the bag through the bag spout. The hopper is vented to a Bag-Vac dust collector that creates negative pressure within the sealed system to contain displaced air and dust, and vacuum any particles trapped in bag creases during disconnect. Reverse pulse air jets on a timed cycle dislodge material accumulated on the filters, returning it to the material stream. (*Flexicon*)

www.flexicon.com

High viscosity mixing

Double planetary mixers from the company, which come in a wide range of configurations and sizes ranging from ½ pint to 750 gallons, are said to be dependable workhorses for mixing thick, sticky or putty-like materials. The pictured sanitary double planetary mixer Model DPM-4S and sanitary discharge system Model DS-4S are fully customized and engineered for efficient processing of medical grade silicone formulations in a portable workstation, according to the company. The heavy duty 4-gallon double planetary mixer features two patented high viscosity HV stirrer blades which rotate on their own axes while orbiting the mix vessel on a common axis with a slicing motion that pushes product forward and downward, and is said to be ideal for ultra-high viscosity materials. Designed for vacuum operation, the mixer is equipped with an electromechanical lift to raise/lower the vacuum hood and a 50 psig heating/cooling jacket on the mix can. Multiple sets of vacuum hood and mix cans are supplied for convenient cleaning with minimal downtime. All product contact parts are constructed from stainless steel type 316, 150 grit finish and electropolished. Operated through a 7" color touchscreen interface, PLC recipe controls are said to deliver superior batch-to-batch consistency. (*Charles Ross & Son*)

www.mixers.com

Rubber mixer control

Mixer control is said to be critical to quality and production efficiency in rubber compounding. Most often to produce a rubber compound, a combination of plastic resin (pellets, flakes, powders or liquid) is combined with other materials, including liquids and bulk solid materials. This company has introduced a customized system for a rubber compounding application. The system includes a variety of mechanical equipment, such as a bulk bag unloading system, complete automation of the mixing and batching processes, and the electrical controls. Batched ingredients (liquid and solid materials) must be mixed. A specialty mixer is used, such as the internal mixer, in which heat and pressure are applied simultaneously. The internal mixer uses two interrupted spiral rotors moving in opposite directions at a set rpm, as required by the compounding process for the specific rubber compound being produced. Mixer process control is required to produce the end product and is automated for optimal efficiency. This is a part of the company's overall automation and process control system, which includes the mixing/blending, main batching, auxiliary batching and drop mill processes, extruding and cooling. (*Sterling Systems & Controls*)

www.sterlingcontrols.com

Rheology laboratory

A state-of-the-art rheology laboratory offers its services for a fee. Measuring the flow characteristics of rubber and plastics is said to help predict how a customer's material will flow through the company's extrusion dies before production. In addition, tooling geometry is virtually optimized, and the project can be viewed in 3D CAD. Machines used include a rotational rheometer, scanning calorimeter, thermal conductivity meter and a CT scanner. The rotational rheometer quickly generates viscoelastic data for polymer melts, precisely capturing polymer melt properties. The test temperature ranges between ambient and 300°C. The lab's scanning calorimeter characterizes the thermal properties of a polymer sample, such as: crystallization temperature, glass transition temperature and head capacity of the sample. Knowing these thermal properties permits the simulation of shear heating, and hot and cold spots in the flow area. The company's thermal conductivity meter is used to determine the thermal conductivity of the polymer sample across a range of temperatures. Capable of high definition measuring, the IM-8000 Series image dimension measurement system is said to have triple the detection performance. (*Guill Tool & Engineering*)

www.guill.com

Biobased tire oil products

Widening the scope for the company's biobased tire oil Nytex BIO 6200, a recent study shows that the biobased tire oil performs well in rubber compounds reinforced with carbon black, according to the company. Previously published results from comparative studies have been based on silica-reinforced rubber formulations designed for high performance tire tread. These studies, in addition to performance testing in real tires, are said to have provided very good results for key properties, confirming that Nytex BIO 6200 will perform at least as well as conventional mineral tire oils without the necessity of any major recompounding. Produced with renewable feedstock, Nytex BIO 6200 is said to provide tire manufacturers with the added benefit of sustainability, while retaining the performance of current mineral oils. Compounds made with the biobased oil were performance tested alongside conventionally formulated compounds for tire tread, as well as sidewall application. In accordance with the general trend within the tire market, TDAE and MES were used as reference oils for tread and sidewall, respectively. The study was said to confirm that Nytex BIO 6200 also works well in polymer blend formulations using carbon black filler. (*Nynas AB*)

www.nynas.com

PTFE micropowders

PTFE micropowders evolved out of PTFE (polytetrafluoroethylene) coating materials that have been used for a long time in non-stick cookware. However, their uses are said to extend beyond that. PTFE has many useful properties such as being resistant to water, heat, electricity and friction. Because of these properties, PTFE is said to improve the durability and strength of thermoplastic and elastomer products. It can also enhance the performance of inks, coatings and specialty oils when used as an additive, according to the company. The synthetic fluoropolymer PTFE was accidentally discovered by a DuPont scientist over 80 years ago while developing a new refrigerant. It has an extremely low coefficient of friction, said to make it the slipperiest material known and perfect for non-stick applications. It is classified as a thermoplastic and can tolerate wider temperature ranges (-180°C to 250°C) than other insulators, according to the company. (*AGC Chemicals Americas*)

www.agcchem.com

Latex rubber emulsions

Eco-friendly latex rubber emulsions are widely used in latex gloves and can be used to manufacture adhesives, cord dipping, anti-corrosion media products, moisture-proof cloth, food packaging paper coating, glue coatings, sealants, bonding and caulking, butyl hot melts adhesives, etc. They can also be used for waterproof coating modifications; used as a modifier, they are said to improve the elasticity and viscosity of many anionic emulsions. Additionally, they can be used as a coating for various fabrics and nonwoven fabrics to enhance barrier properties, improve fabric strength and handling performance. Some typical commercial/industrial applications include use in awnings, tents, carpet backings, protective clothing and upholstery. Some typical medical applications include use in bed linens, operating room clothing, hospital gowns and incontinence pads. Adding PTFE micropowders to compounds can improve water, heat, electrical and friction resistance of thermoplastic and elastomer products, according to the company. It is also said to fortify inks, coatings and specialty oils for greater performance. (*ChemPacific*)

www.chempacific.com

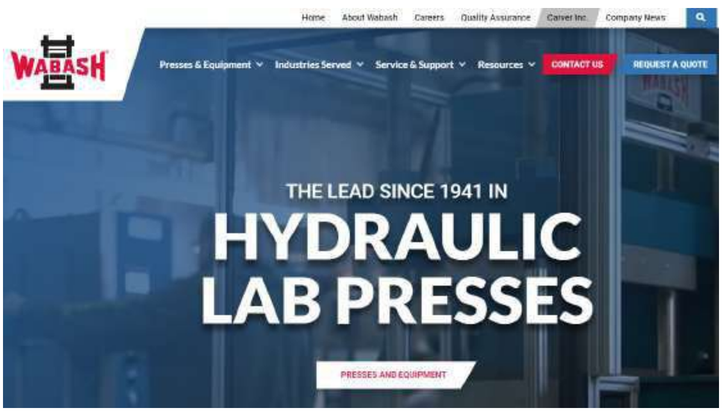
Third-stream additives

NovaSperse third-stream additives and PURmix compounds for liquid silicone rubber (LSR) are offered by the company. LSR dosing systems are said to have entered a new level of metering and calibration performance, resulting in vastly improved range-of-control tolerances. These improvements are said to open tremendous opportunities for tailoring functional and mechanical properties during the liquid injection molding process. The company's elastomer technologists, compounders and pigment specialists are said to work closely with the materials scientists and application engineers at the company to create fully customized LSR dispersions and compounds to meet unique customer specifications. (*NovationSi*)

www.novationsi.com

Corporate Sponsor

Rubber World Industry Links



Wabash MPI (www.wabashmpi.com) is a leading international supplier of standard and custom presses for aerospace, medical, recreation, automotive, energy, education, ASTM, and rubber and plastics testing, research and development laboratories and other applications. Customers rely on Wabash MPI for complete new equipment start-up, preventative maintenance and other field service needs. Wabash MPI also offers calibration services with certifications for pressure and temperature using devices traceable to NIST.

Since its modest beginnings in 1941, Wabash MPI has emerged as a premier domestic and international supplier of production and laboratory hydraulic, pneumatic and electric presses. With over 12,000 presses produced, its ISO 9001:2015 certified manufacturing facility in Wabash, IN, has the experience and expertise to tackle the most challenging press applications.

Wabash MPI has expanded over the years into presses for production compression molding, transfer molding, c-frame, as well as presses with vacuum assist. Several standard models are available to choose from, or Wabash MPI can custom build a press to specifications. Presses can be produced in sizes from .5 to 1,200 tons, and bed sizes from 6” x 6” to 6’ x 12’, for molding, laminating, trimming, forming, bonding sizing, etc. Customers may choose from a range of clamp force options, platen bearing and cooling options, enhanced control packages or from an exhaustive list of standard and custom options and accessories.

Products offered by Wabash MPI include compression presses (four-post, Genesis and Vantage), vacuum presses (slab side and vacuum shroud), transfer presses, electric presses, ASTM presses (rubber and plastic), pneumatic presses, laboratory presses (Genesis), custom engineered presses (compression molding, large platen and vacuum shroud), as well as used equipment.

CHEMICALS AND MATERIALS
R.D. Abbott
AGC Chemicals Americas
AirBoss Rubber Solutions
Akrochem Corporation
Akron Dispersions, Inc.
APV Engineered Coatings
ARP Materials
Brenntag Specialities
Cabot Corporation
Cancarb Limited
Carter Brothers
Chemours
Çınar Kauçuk
Cri-Sil Silicones
Davis-Standard
DRP Industries
Eagle Elastomers
ECO USA
Elmet
Emsodur
Evonik
Goldsmith & Eggleton
H&R Group
HallStar Company
Harwick Standard
Infinity Rubber
Kayton Industry Co., Ltd.
Kenrich Pertochemicals
Kumyang
Monolith Materials
Polymer Solutions Group
Polymer Valley Chemicals, Inc.
Pyropel, Inc.
Renkert Oil
Struktol Company of America
Tokai Carbon Cancarb Limited
Valex
Vanderbilt Chemicals

MACHINERY AND EQUIPMENT
The Bonnot Company
Davis-Standard
Desma USA, Inc.
Doss Visual Solution
Emsodur
French Oil Mill Machinery Co.
Gomaplast Machinery
Guill Tool and Engineering Co.
Hilma Div. of Carr Lane Roemheld
HITEC Luxembourg
Jing Day Machinery Industrial Co.
Kayton Industry Co., Ltd.
LWB Steinl
Reliable Rubber & Plastic Machinery
Samson Machinery
Seika Machinery
Sprinter Marking
Troester Machinery Ltd.
Tung Yu Hydraulic Machinery Co.
United Feed Screws
UTH GmbH
UTPVision
VMI Americas Inc.
Wabash MPI/Carver

MOLD RELEASES
ITW Franklynn
McLube
Release Coatings of New York

CUSTOM CALENDERING
Hoosier Racing Tire

TESTING EQUIPMENT / LABORATORIES
Akron Rubber Development Laboratory, Inc.
Facts, Inc.
Future Foundation
Gibitre Instruments
Hoosier Racing Tire
Hoto Instruments
Rex Gauge
Seika
The L.S. Starrett Co.
SDS Systemtechnik
Starrett Bytewise
TA Instruments
Ueshima Seisakusho
Uncountable
Wallace Instruments

CUSTOM MIXING & COMPOUNDING
Carter Brothers
Eagle Elastomer
Hoosier Racing Tire
Polymerics

RUBBER SHOWS
International Elastomer Conference
Rubber Tech India

@ rubberworld.com

Release Coatings of New York (www.rcony.com), since its inception, has dedicated itself to being the most cost-effective, highest quality, most customer sensitive coating supplier in the international rubber industry.

With a sophisticated testing laboratory at its Wellsville, NY, headquarters, Release Coatings of New York, an ISO 9001:2015 certified release agent manufacturer, develops state-of-the-art water based release agents on a timely basis. Every Release Coatings of New York product meets or exceeds all current federal and state guidelines for environmental and human safety.

As an integral part of its customer service program, Release Coatings of New York batch tests virtually every shipment and maintains strict statistical process control. Data are made available on a quarterly basis to assist customers in meeting their own quality goals.

This company's current line of release agents includes flexible mandrel, rigid mandrel, formed hose releases, hose/tube and pan cure releases, nylon tape coatings and injection, compression mold release products. The TM-1852-1 is a unique water borne emulsion that provides excellent release for EPDM peroxide/sulfur cure mandrels with polychloroprene tubing. It is also used as an excellent release for nylon mandrel applications. TM-919-TGX-1 is an excellent universal lube for formed hose that could be used for EPDM, CPE, AEM, Vamac, FKM, NBR and NBR/PVC. TM-942 is an excellent mold release for rubber/metal bonding which provides excellent adhesion properties along with multiple releases.

Release Coatings of New York's experienced marketing and field development personnel are always available to meet with customers, assuring that its products meet current performance needs and future requirements. Release Coatings of New York research scientists and marketing personnel are in constant communication with clients around the world as part of an ongoing continuous improvement program.

Maplan USA (www.maplan.at/en) provides uncompromising quality through its more than 170 year company history of meeting manufacturer requirements for high quality rubber parts. Maplan supplies the Edition Series with an excellent price/performance ratio. The development and design of the machine is done in Europe where each machine component is manufactured to the highest quality standards. The optimum configuration of the machine models results in a very small floor space. So use of the Maplan Edition results in a high output per square meter of facility space.

The fully hydraulic clamping system of Maplan's Edition Series provides support for nearly the whole cavity area. The clamp unit is designed fully hydraulic. The solid main clamping piston supports nearly the whole cavity area and guarantees the stability of the machine. By the optimum parallel clamping of the mold, an optimum part quality is reached, meeting customers' high precision requirements. The clamping unit is available with 160 tons, 250 tons and 400 tons clamping force.

Maplan's Edition machine series is equipped with the successful Maplan FIFO injection unit. This unit works to the well proven first in, first out principle. This means that the material first plasticized will be injected first. A constant L/D ratio guarantees the homogeneous preparation of the compound. Another benefit is the very short distance from the pot chamber to the nozzle. This means that very little injection pressure is lost during the injection. The nozzle is permanently cooled so it is not necessary to use a nozzle lift, therefore removing the risk of nozzle leakage. The well-engineered Maplan FIFO injection unit guarantees precise shot accuracy and perfect repeatability.

Regarding the machine control system, the most effective control for rubber injection molding machines, PC5000touch, is used. This trendsetting multitasking process technology allows the highest precision at all control processes and positionings.

If you would like your web site featured here contact your sales rep
Dennis Kennelly, dennis@rubberworld.com, Mike Dies, mike@rubberworld.com or Pete McNeil, pete@rubberworld.com

Rubber Division
American Chemical Society
rubber.org

NEVER STOP LEARNING!

CONVENIENCE: Most all our learning opportunities are virtual only with some in-person courses at our partner's locations.

CEUs: We have partnered with The University of Akron to offer CEUs for many of the courses we offer, as well as for our Basic, Intermediate and Advanced Rubber Technology Self-paced Learning opportunities.

TRAINING PASS: You can purchase a training pass to attend all our virtual courses and webinars for ONE YEAR for ONE PRICE. Individual passes, as well as company level passes with tiers of up to 50 trainees are available.

Visit rubber.org/training for details about these courses, including full descriptions and pricing.

UPCOMING LEARNING OPPORTUNITIES

- **January 16, 2024**
  Webinar: *Utilizing Lab Equipment for Efficient Development & Problem Solving*
- **January 17, 2024**
  Course: *An Introduction to Continuous Vulcanization*
- **January 18, 2024**
  Webinar: *How to Create & Deliver Scientific Presentations*
- **January 24, 2024**
  Webinar: *Strength & Endurance in Rubber*
- **January 30, 2024**
  Webinar: *Introduction to Compounding, Mixing & Testing*
- **February 8, 2024**
  Webinar: *Carbon Blacks Manufacturing, Properties & Applications in Rubber Compounds*
- **February 13, 2024**
  Webinar: *Optimizing Rubber Molding Process through Advanced Simulations*
- **February 15, 2024**
  Webinar: *Electroelastomers: Applications, Principles & Opportunities*
- **February 21, 2024**
  Course: *Essentials of Rubber Technology*
- **February 22, 2024**
  Course: *Essentials of Silicone Rubber*
- **February 28, 2024**
  Webinar: *The Fatigue Limit of Rubber*
- **March 5, 2024**
  Webinar: *The Function & Selection of Ester Plasticizers*
- **March 7, 2024**
  Webinar: *The Art of Networking: It's Not Who You Know, It's Who Knows YOU*
- **March 15, 2024**
  Course: *Rubber Explained*
- **March 26, 2024**
  Webinar: *US Regulatory Compliance in the Rubber Industry*
- **March 28, 2024**
  Webinar: *Global Rubber Technology - Processes, Current Status & Future Trends*

All webinars are FREE for Rubber Division, ACS Members and all Rubber Division, ACS courses are FREE for undergraduate Student Members (discount for masters & graduate Student Members)!

People in the News

Science & Technology Awards announced

Katrina Cornish
Charles Goodyear Medal

Andrew Chapman
Melvin Mooney Technology Award

Namita Choudhury
George Stafford Whitby Award

Radek Stocek
Sparks-Thomas Award

The Rubber Division of the American Chemical Society announced the 2024 winners of seven distinguished industry awards. Winners will accept these awards and be celebrated at a banquet hosted by Rubber Division, ACS, and sponsored by Alpha Technologies on May 1 during the Spring Technical Meeting in Columbus, OH. Each Science & Technology Award Winner will also give a presentation in the technical session following the banquet.

Charles Goodyear Medal – Dr. Katrina Cornish
Dr. Katrina Cornish was named the 2024 Charles Goodyear Medalist. The most prestigious award given by Rubber Division, ACS is sponsored by HF Mixing Group and was established in 1941 to perpetuate the memory of Charles Goodyear as the discoverer of the vulcanization of rubber. It honors individuals for outstanding invention, innovation or development which has resulted in a significant change or contribution to the nature of the rubber industry.

Melvin Mooney Distinguished Technology Award – Dr. Andrew Chapman
Dr. Andrew Chapman was selected for the 2024 Melvin Mooney Distinguished Technology Award, sponsored by Lion Elastomers. This award perpetuates the memory of Melvin Mooney, the developer of the Mooney viscometer and other testing equipment, and honors individuals who have exhibited exceptional technical competency by making significant and repeated contributions to rubber science and technology.

George Stafford Whitby Award for Distinguished Teaching and Research – Dr. Namita R. Choudhury
Dr. Namita R. Choudhury was named the winner of the 2024 George Stafford Whitby Award for Distinguished Teaching and Research, sponsored by Cabot. This award honors teachers and academic scientists for distinguished, innovative and inspirational teaching and research in chemistry and polymer science. The award perpetuates the memory of George S. Whitby, head of the rubber laboratory at The University of Akron and for years the only one who taught rubber chemistry in the USA. It honors outstanding international teachers of chemistry and polymer science, and recognizes innovative research.

Sparks-Thomas Award – Dr. Radek Stocek
Dr. Radek Stocek was chosen for the 2024 Sparks-Thomas Award, sponsored by Endurica, LLC. This award perpetuates the memory of William J. Sparks and Robert M. Thomas, chemists who developed butyl rubber. It recognizes and encourages outstanding scientific contributions and innovations in the field of elastomers by younger scientists, technologists and engineers who are within 25 years of earning their undergraduate degree.

Chemistry of Thermoplastic Elastomers Award – Greg Patnode
Greg Patnode was selected for the 2024 Chemistry of Thermoplastic Elastomers Award, sponsored by Renkert Oil, LLC. This award recognizes the contributions of scientists in the field of thermoplastic elastomers. Particular emphasis is placed on innovations that have yielded significant new commercial or patentable materials.

Fernley H. Banbury Award – Dr. Andreas Limper
Dr. Andreas Limper is the winner of the 2024 Fernley H. Banbury Award, sponsored by ACE Laboratories. The Fernley H. Banbury Award perpetuates the memory of Fernley H. Banbury, the inventor and developer of the internal mixer that bears his name, and honors innovations in production equipment, instrumentation, control systems or improved processing technologies widely used in the manufacture of rubber articles.

Bioelastomer Award – Dr. David Dierig
Dr. David Dierig was selected for the 2024 Bioelastomer Award, currently sponsored by Rubber Division, ACS. This award honors scientists who have made an outstanding contribution to the understanding or utilization of biomaterials, including naturally derived elastomeric polymers and protein-based bioelastomers. It recognizes contributions in the field of biotechnology and biomaterials as these relate to elastomers and rubbery materials.

Rubber Division, ACS, based in Akron, OH, is an international association of chemists, engineers, technicians, scientists, plant managers, sales and marketing professionals, and others in the rubber, polymer or related fields within industry, academia and government. Rubber Division works to educate, connect and grow the evolving elastomer industry through educational, technical, business and networking activities. Visit www.rubber.org for more information.

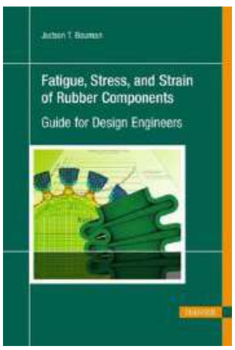
Greg Patnode
Chemistry of TPEs Award

Andreas Limper
Fernley H. Banbury Award

David Dierig
Bioelastomer Award

Classifieds

Classifieds



Fatigue, Stress, and Strain of Rubber Components

This book covers the fatigue testing of specimens, curve fi tting of equations to the test data, and theuse of such equations in life prediction. Earlier chapters are background in the nature of rubber, historyof its usage, brief mention of types of rubber and manufacturing methods. Stress-strain testing andbehavior is covered to the extent relevant to fatigue analysis. Also, the text covers the application offi nite element analysis to components to determine high stress points that are vulnerable to fatigue-failure. It is a very useful reference for practicing engineers charged with the responsibility to designstructural rubber components where fatigue life is a concern.

www.rubberworld.com/book-store

Index To Advertisers

Rubber World
SALES STAFF

DENNIS J. KENNELLY
Senior VP-Associate Publisher
1741 Akron-Peninsula Rd.
Akron, OH 44313-5157
Ph: 330-864-2122/Fx: 330-864-5298
Email: dennis@rubberworld.com

MIKE DIES
Marketing Representative
1741 Akron-Peninsula Rd.
Akron, OH 44313-5157
Ph: 330-864-2122/Fx: 330-864-5298
Email: mike@rubberworld.com

PETE MCNEIL
Sales Consultant
1741 Akron-Peninsula Rd.
Akron, OH 44313-5157
Ph: 330-864-2122/Fx: 330-864-5298
Email: pete@rubberworld.com

India

KAPIL SURI
Address B - 4/5, Vasant Vihar
New Delhi - 110057
India
Mobile: +91-9810248458
Email: kapshan@hotmail.com

RINGIER TRADE PUBLISHING
East China - **VIVIAN SHANG**
Phone: +86-21 6289-5533 EXT 169
vivian@ringiertrade.com
North China and South China

MAGGIE LIU
Phone: +86-20 8732-3316, EXT 9332
Email: maggieliu@ringiertrade.com

Hong Kong
MIKE HAY
Phone: +852 2369 8788 ext 11
Email: mchhay@ringier.com.hk

Taiwan
SYDNEY LAI
886 4 2329 7318
Email: sydneylai@ringier.com.hk


Leading the industry in
waterbased
TREAD
STRIPING
INK & CUSTOM
APPLICATION EQUIPMENT
APV®
ENGINEERED COATINGS

GRAHAM ENGINEERING

The ULTRA R/S for Rubber Extrusion

The machine you know with the quality you trust

AMERICAN KUHNE

LEARN MORE AT AMERICANKUHNE.COM