PMM Plastics Machinery & Manufacturing™

Cutting-edge innovations for injection molding machines

Injection molding machines are evolving to incorporate the latest technology, including artificial intelligence, IoT, Industry 4.0 and energy savings. This eHandbook details how machinery makers worldwide are adding features to make processors more efficient, profitable and sustainable.

CUTTING-EDGE INNOVATIONS FOR INJECTION MOLDING MACHINES

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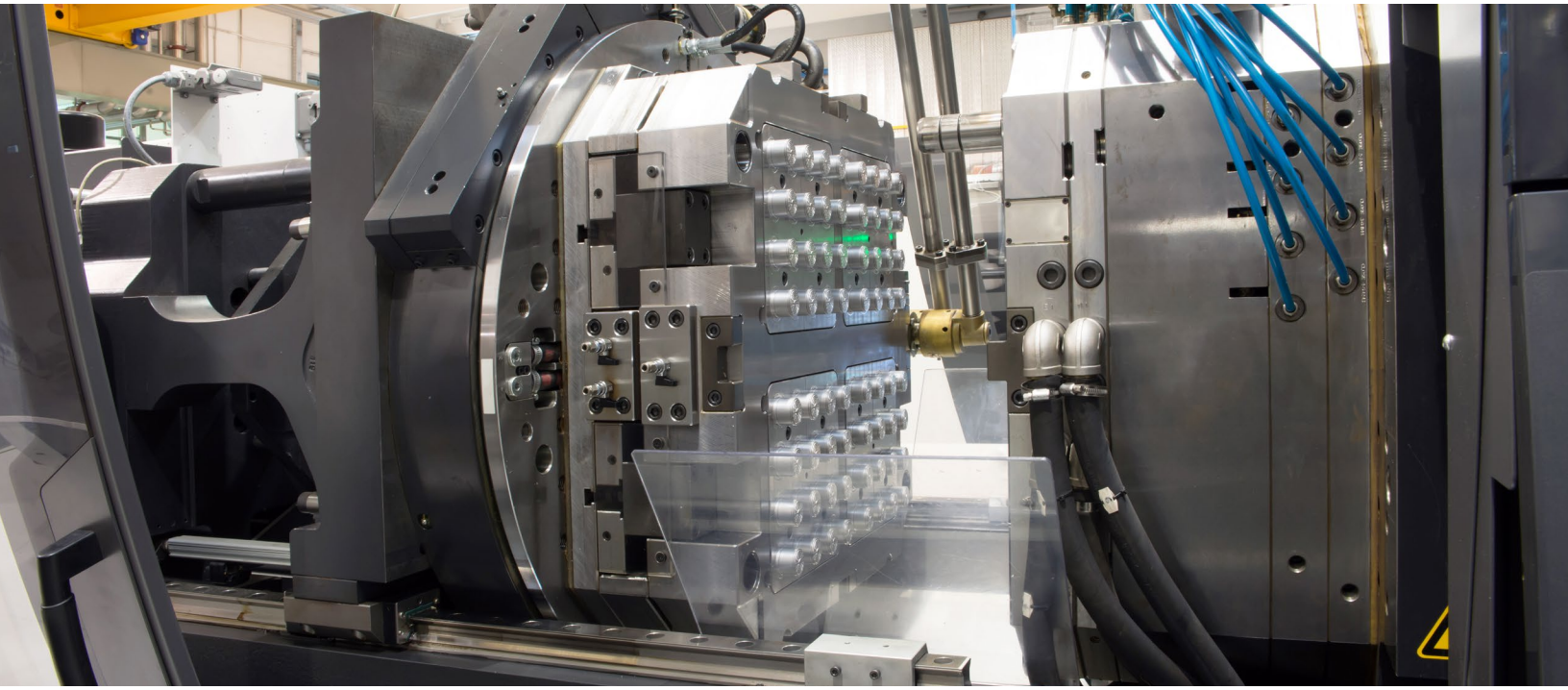

INTRODUCTION

Manufacturers of injection molding machines have poured huge resources into making their products faster, repeatable, reliable and safer. Control systems have become more sophisticated and at the same time easier for operators to use.

The stories in this eBook describe many of those advances and how the latest technology helps processors struggling with labor shortages, stringent quality standards and the demands of shorter runs production runs.

New equipment makes initial setup quicker, change overs easier and can sense when there is a production problem. Many can also make necessary corrections without help from an operator.

Machinery technology is evolving very fast and a machinery sales representative can be an important asset to a processor.

I hope these stories help the next time you need to purchase a new molding machine.

RON SHINN, editor
Plastics Machinery & Manufacturing

INJECTION MOLDING MACHINE MAKERS ADVANCE INDUSTRY 4.0

Ease of use, support for sustainability efforts were major points of emphasis at NPE2024, as OEMs roll out new controls and features.

KAREN HANNA — ORIGINALLY PUBLISHED JUNE 12, 2024

Display screens throughout NPE showed the status of injection molding machines (IMMs), alongside, at times, pictures of the parts they were creating.

Cavitation, pressure, temperature, information from auxiliaries — all the endless streams of data were set off by three colors: red, yellow and green, with drop-down boxes offering the opportunity to further explore any of seemingly hundreds of parameters.

Welcome to "nerdy territory," as Dana Ford, controls engineer for Wittmann's auxiliary equipment, calls it. When it comes to injection molding machine operation, Industry 4.0 has gone mainstream.

"All this data is improving the quality of the product, the cycle time it takes to produce a product," Ford said. "If all these people are able to make twice as many parts at half the cost, they're going to be able to out-compete the guy that can't use all the data."

From trimming cycle times to optimizing the use of recycled materials, the ability to collect data and tweak production based on it offers molders many benefits, said representatives of injection molding machine makers — and molders are beginning to embrace Industry 4.0.

"I would tell you that last NPE, it was more of a buzzword, but now, it's really taking off," said David Sharp, divisional manager for Wittmann's IMMs.

OVERCOMING FEAR

Reflecting their company's motto, "It's all Wittmann," the five injection molding work cells in the Wittmann booth exhibited a sophisticated choreography of primary machines and auxiliary equipment.

But in actual molding shops, anxiety about all that connectivity persists, said Giorgio Pigozzo, CEO of Wittmann's digital division.

"There is a fear the cloud isn't a safe place," he said. Change is a hard sell and, he said, "always a painful task."

About half of machines aren't leveraging data, said Hannes Zach, sales director of digital solutions at Engel. He sees a lot of promise in artificial intelligence (AI) — but getting everyone on board still is a challenge, with bigger companies especially wary of the possibility of security hacks.

"From my point of view it is the complexity

Chen Hsong's machines at NPE — SM700-TP, SPARK EH100, and JM208-MK6 PRO — sported new controls.
Photo credits: Plastics Machinery & Manufacturing

and huge investment of IT projects, which are the biggest challenges," he said.

Buy-in across the company is important, IMM maker representatives said.

But the systems are safe.

"You need a champion in the company for all this connectivity, and have to have your IT department involved," Sharp said.

In the Shibaura booth, the company touted the medical molding capabilities of its new EC110SXIII IMM. The market demands a high degree of traceability, and molders can have confidence in Shibaura's ability to protect the data, said Hemantha Wansekera, chief information officer for the company and GM for its digital services division.

Wansekera said Shibaura's system uses three levels of security, with firewalls isolating one cell from the next. Rather than being on the World Wide Web — which seems to be the fear of skeptics — the data resides on a private cloud managed by Shibaura.

He reiterated a message many IMM makers expressed: Your data is safe with us.

"Nine out of 10 times, we can actually win the argument because we can prove our system is secure," he said.

TACKLING COMPLEXITY

One possible reason some molders are reluctant to dive into Industry 4.0 is its complexity. But IMM maker representatives say they're prioritizing ease of use. Throughout NPE, manufacturers — such as Boy, Chen Hsong, Haitian, LS MTron, Nissei, Sodick and Wittmann — touted new or optimized controls, and talked about how users of their machines can access their expertise.

Like many other IMM representatives, Steven Ross, senior manager of strategic sales and marketing sales for Sumitomo, stressed his company's partnerships with its customers and other suppliers. Rather than defining Industry 4.0 for its customers, he said, Sumitomo is listening to molders about what they want and need.

"Ultimately, the goal is we can't make it more difficult for customers to buy our equipment," he said. "We want to make it as easy as possible."

To that end, many companies continue to upgrade their controllers.

For example, Boy is updating its Procan Alpha 4 control system to the Procan Alpha 6. Its Operational Data Acquisition software assesses data from the control, allowing the system to cover three areas: production planning and control, quality control and operating cost control.

Users can access the system through personal devices, such as cell phones and tablets.

"The ability to access a Boy injection molding machine from anywhere, around the clock, during ongoing production, is particularly advantageous for employees in a two- or three-shift operation," said Thomas Kühr, head of electrical design for Boy. "However, this access is not limited to machine operators alone. Other departments such as production planning, purchasing, costing, etc., directly benefit from the data of the ODA system."

Ease of integration was a central theme for Wittmann.

To simplify programming and robot use, the company introduced its Control Room technology, which comes in two versions: the Control Room TeachBox, which provides connectivity with an injection molding machine through the controller of the Wittmann robot that tends to it; and a PC-based version that allows all Wittmann-compatible equipment to be networked within a plant. The PC-based Control Room TeachBox provides connectivity across the plant, according to Jason Long, VP of sales for Wittmann USA.

"This allows the customer access to all their Wittmann-connected equipment through the customer's PC," Long said. "They could even get remote access, if the customer has the remote access to their plant network. The Control Room PC application also has an option to allow remote access for Wittmann service to help troubleshoot any Wittmann equipment connected to the Control Room software, through industry standard web access tools, like WebEx."

Tools available from Wittmann reduce the

need for programming that once would have taken hours. Now, preparing a robot can take just minutes, Long said.

As Pigozzo quipped, users aren't "rocket scientists." But they are familiar with social media like Facebook and Instagram — and the usabilty of those interfaces is something Wittmann is trying to emulate.

Meanwhile, in LS Mtron's booth, company leaders spoke with optimism about the company's prospects — they're looking to see their share of the American market explode to 20 percent over the next few years.

LS Mtron's 1,400-ton One-series IMM made a piece of rear door side trim for a Hyundai vehicle in the company's booth, the biggest at the show with an injection molding focus. According to the company, the IMM's controller allows users to customize their system and collect data on injection actions, and provides increased transparency. It offers easy cycle analysis and unit conversion, as well as a memo function that lets users associate that data to a specific mold.

"What we're able to do is to be able to be on the front end of Industry 4.0," said Paul Caprio, president of sales of LS Mtron Injection Molding Machine USA.

MAINTENANCE BY REMOTE

At a time when many molders have struggled to find workers, IMM maker representatives stressed that with Industry 4.0 capabilities, access to expert help always is at the ready.

"One of the biggest things that we feel that is on every customer's mind, every time we visit a customer, anytime they visit us, is the labor shortage," said Vanessa Malena, who was attending NPE for the first time in her new role as president of Engel North America. "And, so, we really want to tell our customers the story here in NPE, and really show them what Engel has done to support them, because they can't always support themselves. ... It's really the training, the service team, the digitalization and the automation to support our customers."

The company's portfolio of digital solutions spans the gamut, she said, from part design all the way to the recapture of value from products at the end of their life, along with access to maintenance assistance.

Access to support was a selling point for Milacron, too, as it demonstrated its M-Powered technology, a portfolio of observational, analytical and support services, available for free with new machines for the first 12 months of ownership. Leveraging real-time machine data, it connects users with support regarding parts, service, rebuilds, retrofit and preventative maintenance.

To help its users, Arburg is looking to further incorporate AI for monitoring variables such as viscosity.

It touted its digital tools at a booth that drew constant crowds, thanks to its giveaway — a molded box for tools of a more traditional variety. Its arburgXworld customer portal features its new Ask Arburg app, which can answer specific questions about machines and processes as well as identify and rectify problems — with no need for on-site service.

According to Martin Baumann, who like Malena was attending NPE for the first time in a new role — as president and CEO of Arburg Inc. — a company survey revealed an average increase in overall equipment effectiveness

of over 26 percent among 200 users of ALS, Arburg's host computer system MES. The company released the newest version, ALS 8.0, in March.

GOING GREEN

While video displayed molding operations in real time, it was men and women in bright yellow shirts charged with collecting waste recycling who brought home one of the most important messages at NPE — that plastics can be sustainable.

For Wittmann's Sharp, who acknowledged sensitivity to the criticisms levied against the plastics industry, it's where "nerdy territory" offers a beachhead to do better.

"We work in the plastics industry. The name for plastics is terrible, and we really want to be in the forefront of changing the name for plastics," he said, as he discussed how his company's HiQ-Flow software can help machines compensate for variances in material characteristics — a feature that allows them to use more recycled material.

On every machine in its booth, Wittmann's ImagoXt software provided energy measurements.

Meanwhile, Shibaura's Wansekera touted one of his company's new features — an app to track the carbon footprint of each part users make.

An automotive-supply-chain customer told him that energy costs and government regulations amplify the need for the app.

"Most customers struggle with it. There's no system for measuring your CO_2," Wansekera said.

Hundreds of data points once out of reach from molders now are a click away, he and other IMM maker representatives showed as they swiped left and right on screens throughout the NPE.

That visibility of data gives users an edge, they said.

"As long as I've been in the business, they've always talked about, but never used it," LS Mtron's Caprio said. But things are changing now, as molders realize they'll need to embrace Industry 4.0 to compete. "The only thing I know is if you don't have it, you're going to get passed by on an order."

All robots assembled in Torrington, Conn., are run for 36 hours as a final quality control check before being shipped to a customer. | *Photo credits: Wittmann USA*

WITTMANN USA PROVIDES THE TOTAL PACKAGE

Its injection molding machines, auxiliaries and automation all speak the same Industry 4.0 language.

RON SHINN — ORIGINALLY PUBLISHED MAY 15, 2024

Having the latest option on a new injection molding machine might make you feel good when writing the check, but the next question should be how easily it communicates with the auxiliary equipment. That's where money is on the line.

Seamless data exchange between every component in a work cell is a feature Austria's Wittmann Group takes for granted because it has been offering it for more than 10 years. Wittmann builds molding machines and just about everything that connects to them.

"Connectivity is what goes beyond being a machinery manufacturer," said Jason Long, VP of sales at Wittmann USA in Torrington, Conn. "We control all the engineering in the

Jason Long
Photo credits: Wittmann USA

background. We have the robot and the TCU and everything else communicating with the molding machine. If you buy the same equipment from multiple vendors, you end up with competitors talking to competitors to try to make the process work."

Plant floor operations are changing and the days of cobbling together equipment from a hodgepodge of vendors are slowly coming to an end.

"We see it over and over again,"said who was named president of Wittmann USA in 2024.. "The resources at our customers have been dwindling over recent years. Now, we might see one maintenance guy for 50 machines. That was unheard of back in the day when you'd have five guys to handle that many machines.

"All of us struggle with finding talent and resources," Morneault said in a recent interview. "So we are able to provide some of those resources with the seamless integration of what we call plug and produce. We just use an Ethernet connection. There is no one else in the industry that can do that."

HOW IT ALL BEGAN

The Wittmann company was founded in Vienna in 1976 by Werner Wittmann, who saw a need for a better water flow regulator when he was working for Engel. His first manufacturing facility was his garage and his workforce consisted of his two sons, Michael and Thomas. Michael is now president of the Wittmann Global Group, and Thomas is managing director of the company's expanding operations in Hungary.

Three years later, Werner Wittmann was building temperature control units, and in 1985, he started manufacturing CNC robots.

Wittmann USA was launched in 1989 as the company continued to acquire and develop new product lines and spread across the globe.

Wittmann took over the struggling Battenfeld injection molding machinery company in 2008 and since has focused on integrating its full line of molding machines, automation and auxiliary products.

The Wittmann Group, with 10 production facilities in six countries, had worldwide sales

Sonny Morneault was named president of Wittmann USA in 2024. | *Photo credits: Wittmann USA*

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of about $427 million and USA sales of nearly $90 million in 2023, edging Germany for the first time to claim the top country in sales.

AMERICAN-MADE ROBOTS

The mix of U.S. products sold in the U.S. varies from year to year, but Morneault said robots make up about 40 percent of sales, molding machines about 30 percent and materials-handling products about 30 percent.

In the U.S., Wittmann has 158 employees, with 120 located in the 145,000-square-foot Connecticut facility. Separate business units in Canada and Mexico serve those countries.

The company also has U.S. technical centers in South Elgin, Ill., and Placentia, Calif.

Unlike most of the other non-U.S. plastics machinery manufacturers that have a big presence in this country, Wittmann manufactures robots, one of its major products, in Torrington. Annual production capacity is about 500 robots. In addition to selling the U.S.-made robots, Witttmann sells some here that are built in Hungary and Austria.

Workers assemble wiring for robots at Wittmann USA in Torrington, Conn. | *Photo credits: Wittmann USA*

In the U.S., Morneault said Sepro and Yushin are Wittmann's biggest competitors for robots.

"We make robots for every size molding machine, from little micro-

powered up to 8,000-ton presses," Long said.

Building the robots in the U.S. lets Wittmann offer extensive customization. "We have medical molders that run 32-cavity molds," Long said. "They need cavity separation so we can offer 16 vacuum circuits."

It takes about 40 man-hours to build a robot in Torrington.

Local manufacturing makes that customization possible, Long said. "A customer calls and says, 'I need robots, and I need them to be this spec,' " he said. "Just about everything we do is special. That's because the application is driving the U.S. market."

Generally, about 35 standard robots are in stock for immediate shipment.

MULTIPLE LINES OF IMMS

Wittmann manufactures three lines of all-electric molding machines, ranging from the MicroPower (16 tons of clamping force) and EcoPower (60 tons to 600 tons) to the EcoPower Xpress (175 tons to 600 tons).

There are six lines of servo-hydraulic machines. The SmartPower (30 tons to 450 tons) and MacroPower (450 tons to 2,500 tons) are Wittmann's standard offerings. The rest of the line are specialized vertical machines: the CM series (45 tons to 90 tons), which is

Wittmann USA's facility in Torrington, Conn.
Photo credits: Wittmann USA

tie-bar-less; the VM (65 tons to 225 tons); the VM R (45 tons to 340 tons) with rotary table; and the VPower R (135 tons to 340 tons). The CM, VM and VM R machines can all be equipped with either vertical or horizontal injection units.

Since acquiring the Battenfeld press line in 2008, Wittmann has invested about $70 million in plant and manufacturing improvements. Morneault said all the machines except the VM and CM series have been totally redesigned from the original Battenfeld lines. "That includes the ergonomics, quality and serviceability," he said.

Morneault said the Wittmann MicroPower is the leading micro-molding machine in the U.S. It is an all-in-one production cell that makes very precise parts. The company claims it produces 100 percent good parts.

The EcoPower line claims the best energy efficiency, lowest cycle times and very quiet operation.

The SmartPower servo-hydraulic machines are "incredibly energy-efficient and are the most repeatable and accurate molding machines in the industry," Morneault said. Energy efficiency is the result of Wittmann's patented kinetic energy-recovery system (KERS). SmartPower is technically flexible for multiple processes and applications.

The company switched its large-tonnage MacroPower line last year from a hydraulic to servo-hydraulic platform. "It is one of our top sellers," Morneault said. "MacroPower and SmartPower machines are our most popular in the U.S. market."

MacroPower machines are the most compact large-tonnage machines available, according to the company.

The EcoPower Xpress is high-speed with an all-electric platform and offers long service life at maximum utilization.

Multi-component molding has always been a strength for Wittmann machines in all sizes and tonnages. "Two-shot, three-shot, every configuration you can imagine," Morneault said. "We will put a second or third injection unit wherever the customer needs it. We are very competitive in this market."

Wittmann introduced the latest version of its B8X controller to the U.S. market at NPE. Built entirely in-house, it is the first control system for molding machines it has designed. Supply-chain shortages severely limited the number of controllers Wittmann could buy during the COVID pandemic. "To prevent it from ever happening again, Wittman developed a proprietary design we can manufacture in-house," Morneault said. "We are no longer reliant on any other controller suppliers.

Wittmann USA's facility in Torrington, Conn., is set up with a range of granulators to test customers' materials and determine the best equipment solution. | *Photo credits: Wittmann USA*

"It is the exact same software, and from the outside it looks and feels the same, but the software inside is now Wittmann," Morneault said. That follows the same philosophy Wittmann adopted earlier for its robot controllers.

The previous controller was Wittmann's Unilog B8.

All injection molding machines and components are built in Austria or Hungary. There are generally about 30 presses kept in the U.S. for quick delivery.

A RANGE OF AUXILIARY EQUIPMENT

Wittmann has a wider range of auxiliary equipment than any other primary processing machinery manufacturer, and with one exception, it is all built in-house.

The lineup includes gravimetric and volumetric blenders, central conveying and drying systems, vacuum loaders, dryers, granulators, temperature control units, mold area protection and internal air cooling systems and water flow regulators. Only the gravimetric feeders are not built by Wittmann.

Wittmann builds an extensive line of granulators including G-Max blade and S-Max screenless units, as well as Minor under-the-press models. The Torrington plant is set up to test a customer's material on different granulators, analyze the results and recommend the best type and size granulator for the application. "There is a huge technology backing to make sure the customer gets the right regrind," Long said.

Plastics processors are showing more interest

in buying complete molding cells instead of piecemeal equipment they have to assemble into a working cell. This plays into one of Wittmann's major strengths.

Molding cells or molding machines with any additional Wittmann product are called multiline projects. A project manager is assigned for these projects "and they work for the customer," Morneault said. "Project managers are the ones who are integrating and coordinating shipments, timing installations, managing details of the installation and tracking service time and dollars.

"That is a big advantage for a customer who does not have in-house resources to do that," Morneault said. He described a recent customer in the appliance industry who purchased multiple work cells. Wittmann supplied all the equipment, seamlessly integrated all the individual pieces and trained the customer's staff.

Wittmann has 35 field service technicians in the U.S. and supplements that with four independent service providers. In the past, service technicians specialized in molding machines, robots or materials-handling equipment. They are currently being cross-trained to work on everything Wittmann sells.

"It's more seamless for the customer," Morneault said. "It is less time for the customer and saves us and him money."

Web service is also available around the clock.

SMART TECHNOLOGY LINKS COMPONENTS

Wittman's take on Industry 4.0 is called Wittmann 4.0. It consists of smart production components such as TEMI+, a modular MES that supports old and new Wittmann machine models and Wittmann 4.0 auxiliaries; the QuickLook 4.0 app, which provides a production status check via smartphone; HiQ packages to monitor material quality, control viscosity and active closure of a non-return valve; and Expert StepForce, which provides step-by-step clamping force build-up during injection.

Wittmann defines a smart work cell as one in

Wittmann USA's facility in Torrington, Conn. | *Photo credits: Wittmann USA*

which an injection molding machine has access to the capabilities and status of auxiliary units in order to make intelligent changes. This improves part quality and ensures the collection of traceability data.

With Wittmann 4.0, robots and auxiliaries can be plugged into the molding machine and automatically recognized by it. Their displays are also available on the molding machine control panel.

Product connectivity is key to Wittmann, and it has invested heavily in software engineers. "We have a really big software organization," Morneault said. "To make all these products communicate and sync together and integrate seamlessly has been a humongous challenge, but we have been doing this for many years now."

This is how it works: Everything in the work cell is central to the machine controller. The controller on the molding machine recognizes what is plugged in. It confirms the identity of the auxiliary, then it calls up that machine's software, so the same software is on both it and on the auxiliary control. The two machines can then communicate seamlessly. It is not a virtual network computing (VNC) connection or shadow connection.

This process enables useful error messages. If the molding machine controller sees that the TCU needs to reach 200 degrees Fahrenheit and the TCU that is plugged in is capable of reaching only 150 degrees Fahrenheit, it blocks production and alerts the operator that another TCU is needed.

Manufacturers in North America have generally been slow to embrace smart factory concepts.

"Captive molders who run one job don't really care much about the connectivity," Morneault said. "They care about data acquisition, maybe. But if they are not changing molds very frequently, they don't really care about how easy it is to connect and push data out to the entire work cell.

"The guys who are doing 10 mold changes a day per work cell care a lot about it because if you can save 5 minutes or 10 minutes per mold change, that's money."

The knowledge of workers in processing plants is also changing, which makes another good argument for Wittmann's plug-and-produce approach. "There are 75 million baby boomers who are going to retire over the next 5 to 10 years," Morneault said. "That creates a huge gap for the next generation. We are going to lose so much talent in our industry over the next five years."

Wittmann specializes in building automation solutions for customers, and items such as bowl feeders, conveyors and vision systems generally run off the robot. "Our robots have so much power that 80 percent of our customers only use about 10 percent of the functionality of their robots," Long said. "The robot control incorporates all these things. We don't need separate PLCs and HDMIs."

Long said being able to work through the robot controller saves money.

Worldwide, sales of injection molding machines are slow and Morneault said he does not see that improving much this year. But Wittmann's wide range of products serves as a cushion during slow periods.

KRAUSSMAFFEI HIGHLIGHTS SMART MANUFACTURING TECHNOLOGIES

Components of its platform include process and machine monitoring, energy optimization and troubleshooting using augmented reality.

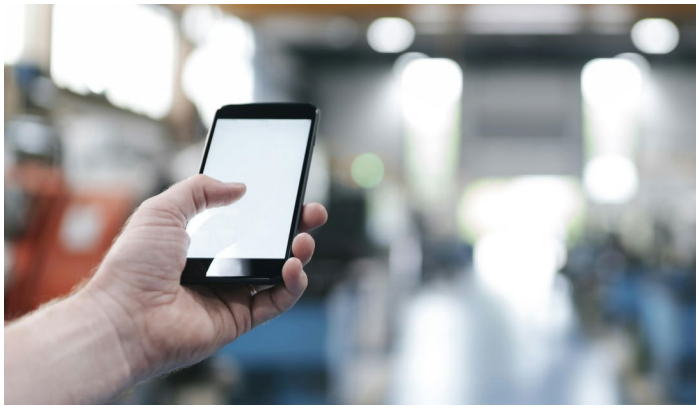
BRUCE GEISELMAN — ORIGINALLY PUBLISHED MAY 20, 2024

KraussMaffei, based in Germany, is one of the leaders among plastics processing equipment manufacturers in developing smart technologies, or what it calls digital products.

It has offered production monitoring technologies for years and continues to roll out new products, including recently introduced components to optimize injection molding machine energy consumption and help even novice operators run injection molding machines like professionals. The new products are described in detail later in this story.

KraussMaffei highlighted its digital technologies, including the use of sensors and production monitoring software, during NPE. Injection molding machines (IMMs) at its booth were connected to its socialProduction platform via the KraussMaffei smartCube, a computer system that collects data from KraussMaffei machines.

"SocialProduction falls under the category of production monitoring, where customers can collect data from their KM machines and visualize it, and they can do some data analysis," Ranjith Pola, director of digital solutions and controls at KraussMaffei USA, said prior to NPE. "This is a cloud-based application. All the data is collected from the machine and saved on the Amazon Web Services cloud securely. That's how customers can access their machines' information anywhere, even on a mobile phone from home, and look at what their machines are doing."



KraussMaffei offers apps to apply smart factory technology to various aspects of production.
Photo credits: KraussMaffei

SocialProduction sends users messages independently to report events and problems that have occurred. The software also allows users to communicate with each other about these issues with texts and images. It enables monitoring of IMMs, production processes and the

condition of machine components.

For example, productionMonitor, one of the socialProduction components, generates an overview of the machinery that can be viewed on monitors in a plant or remotely on a PC, tablet or smartphone. It helps users efficiently monitor the performance of each connected machine.

With processSupport, another socialProduction component, artificial intelligence helps identify deviations in production processes and communicates those deviations to users. KraussMaffei has developed its own complex algorithm for identifying such deviations, according to the company. The early detection of deviations and proactive communication to the operator increases efficiency.

The liveCare condition monitoring component offers continuous online monitoring of the condition of machine components. This allows users to implement condition-based and proactive maintenance strategies without the need for additional sensors. For example, the software can keep track of wear on an IMM screw or the distance a clamping unit has moved since its last service.

The socialProduction components are available individually or as a package to KraussMaffei IMM users.

Another digital offering from KraussMaffei is remoteAccess, which allows a KraussMaffei service technician to provide comprehensive remote support through secure cloud-based access via the control system. He or she can analyze and quickly resolve software, hardware or process problems, according to the company.

SmartAssist establishes secure audio and video communications between a plastics processor's technicians working on a machine and KraussMaffei experts who can assist in diagnosing and correcting any problems or malfunctions. With augmented reality, text and symbols can be superimposed onto pictures of actual objects in the plant to facilitate troubleshooting, according to the company. The smartAssist software can run on either a user's smartphone or with a set of smart glasses from a variety of manufacturers including Microsoft.

"During COVID, we used it a lot," Pola said.

"One new amazing product that we are going to present at NPE is smartOperation," Pola said. "This is the tool for helping non-skilled operators start and stop the machine in a pre-programmed way. It makes the operation of our complex machines as easy as operating a coffee machine."

SmartOperation offers intelligent digital support for the operator during production with simple instructions, even for complex processes, Pola said.

A KraussMaffei video on smartOperation says that once a process is set up by an expert, anyone can start the machine by pressing one button on the control screen. SmartOperation then tells the operator what to do next during every step of the operation. It guides the machine operator through the entire production process in a clear and structured manner by means of simple instructions. No prior knowledge of injection molding is necessary, according to the company.

SocialProduction and smartOperation are available for KraussMaffei IMMs. RemoteAccess and smartAssist are also available for IMMs, as well as reaction process machinery (RPM) and extrusion machines.

IMM MAKERS OFFER HELP FOR CUTTING ENERGY USE

Suggestions include pairing tonnage to application, rather than running at maximum clamping force, if it's not necessary.

KAREN HANNA — ORIGINALLY PUBLISHED OCT. 31, 2024

Recent disruptions to the grid — like the outages caused by Hurricane Helene and Milton — have put a spotlight on the urgency for manufacturers to get a handle on their power consumption. Unfortunately, when it comes to their power use, a lot of plastics processors are operating in the dark.

"We're noticing a lot of customers who don't know all these tips and tricks on the electrical side of things, paying a ton of money because they just don't quite know how they're being billed for the stuff," said Ben Hartigan, marketing coordinator for the Absolute Group of Companies, which in North America sells Haitian IMMs as well as a line of robots.

According to Hartigan and representatives of other injection molding machine (IMM) makers, manufacturers can get help from their suppliers to spot opportunities for savings. OEMs also offer technology add-ons that can help IMM users curb their consumption.

While energy consumption rarely factors as a top consideration for plastics processors in the U.S., Hartigan warned against taking it for granted.

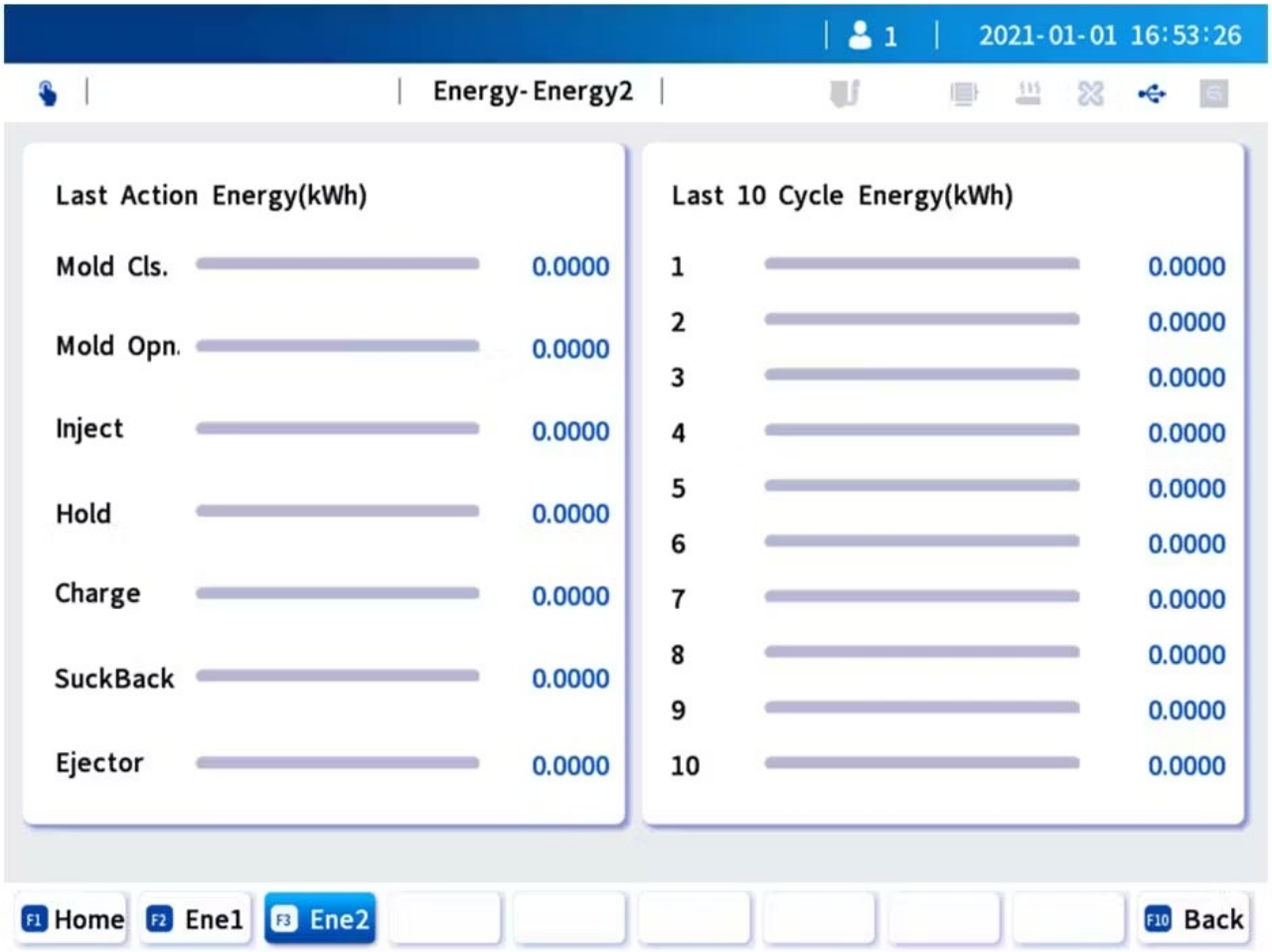
"In the summertime, that's when this becomes an issue, with everyone's AC units on ... we have a few [customers'] factories down South where they're told, 'Hey, you can't run production for the next three days. Sorry,' " he said.

One way for processors to gain a bit more control over their energy is by analyzing when they use it the most. By staggering machine starts and leveling out power consumption, users can see big breaks on their bills, which are calculated based on peak usage periods.

"If you turn all your machines on all at once, we've seen customers hit like a 2,000 percent-over-usage thing, and then the utility company has no choice [but] to go, 'We're going to bill you at this number,' " Hartigan explained.

To manage fluctuations in power needs, users of large-tonnage Absolute Group IMMs can turn off power to their machines' clamp unit, while the heater bands — now available as standard — stay on the injection unit during mold changes. This strategy reduces the need to build up heat between molding processes, saving both time and energy.

Another strategy is to match clamping force



Absolute Haitian's injection molding machines provide users with data about energy consumption to help them optimize their processes. | *Photo credits: Absolute Group of Companies*

to application. Rather than running at 100 percent of an IMM's capabilities, a processor might be able to crank down the juice, saving money, as well as wear and tear on both the machine and tooling.

Too many users "beat on their machines for no reason," Hartigan said.

"It's like driving your car, pedal to the metal, but you're going 25 miles an hour, but you're just accelerating super fast, for no reason," he said.

Other OEMs have developed machinery technologies to optimize IMM energy consumption, regardless of how movements are actuated.

Nissei, for example, touts its IMMs' dynamic braking and regenerative resistors "that will actually dump power back into the grid that could make them more energy-efficient," said Joe Kendzulak, the executive technical adviser and GM of Nissei America.

The system, available for machines with clamping forces of at least 220 tons, also can return the energy back to the machine , instead of simply losing the energy as heat, he said.

Sodick goes even further. It's trying to cut out the need for a process that accounts for about

one-third of all the energy that goes into the injection molding process: drying.

To reduce drying needs, IMM OEMs, including Sodick, can custom-design vents in their machines to allow volatiles, gases and moisture to dissipate from the injection molding process. Such vents are application-specific; however, machines with the vents also can perform other applications, with or without venting.

Often, though, the vents can become clogged — an issue that Sodick avoids with its special AI-Vent system that takes advantage of the latest artificial intelligence (AI) and vision technologies to optimize the process and automatically adjust the feeding pace and screw rotation.

Kohei Shinohara, senior VP for Sodick-Plustech, called it a "monitoring and thinking venting process. The goal is to reduce electric consumption by, in this case, [taking] out the material dryer from the molding process."

The system is especially effective because of the particulars of Sodick's two-stage machines, which separate plasticizing and injection. While material in typical reciprocating-screw machines moves both back and forth with the screw, material in the two-stage machines doesn't retract — making it easier for Sodick to pinpoint the optimal location for venting.

"That's the area, that's the position, that most gas [is] generated at the compression zone," Shinohara said. "We can pin-spot the hole, and we can maximize the venting effect by that, so that makes our vented machine more effective than others."

With AI-Vent, molders can process materials without using the time or energy required for drying — even when incorporating hygroscopic materials or batches made with recycled-content percentages of up to 50 percent. Drying demands about 36 percent of all the energy in injection molding, according to analysis by Sodick.

Like Sodick, many OEMs are investing in Industry 4.0 technologies to help their customers manage energy use.

For example, the Absolute Group's HT Energy, an energy-tracking module a standard feature on its IMMs, now is newly available as standard on its Generation 5-series IMMs.

Shibaura Machine has been touting a similar feature since NPE2024, when it rolled out its Sustain app.

The app offers a suite of features including real-time energy monitoring and predictive maintenance insights, enabling manufacturers to make data-driven decisions that drive continuous improvement and resource conservation. It can calculate the carbon footprint of each plastic part produced on Shibaura IMMs.

According to Hemantha Wansekera, CIO for the American division of the company, the app "empowers manufacturers to optimize energy usage, reduce waste and meet increasing demands for auditable carbon reporting."

Having transparency into their energy consumption can save processors money — and maybe even prevent some headaches, according to IMM makers.

With energy-monitoring technologies, IMM users can better optimize their processes, said Peter Gardner, president of the U.S subsidiary of LS Mtron.

"Customers who are in the know and who are interested in doing so will play around with the process," he said.

This training area is used during the eight-week course all new service technicians must complete.
Photo credits: Engel North America

ENGEL INVESTS IN ITS FUTURE

Family ownership steers the maker of injection molding machines and automation through challenging times.

RON SHINN — ORIGINALLY PUBLISHED DEC. 17, 2024

Despite a worldwide slump in injection molding machinery sales, market leader Engel GmbH has experienced good sales and increased market share. What's the secret?

"Engel is a family-owned business," said Vanessa Malena, president of Engel Americas. "When it comes to continuous improvement, we really invest in the company. The family's investment volume is at least $500 million over [the last] five-year span, and then R&D is about $70 million every year.

"Whether it is for sustainability, recycling or energy-saving equipment, they are putting their money into the future Engel," Malena said.

The formula appears to be working. Austrian-based Engel once built injection molding machines in Canada and York, Pa., but stopped at both locations by 2010. Now it has 10 production sites worldwide, including York, where automation equipment is built, and a new injection molding and automation plant in Querétaro, Mexico. Headquarters for the

Vanessa Malena, Engel's president of the Americas, and Benjamin Lettner, executive VP for operations, at the company's York, Pa., headquarters.
Photo credits: Engel North America

Americas business unit is in York.

Worldwide sales for the most recent fiscal year ended March 31 were $1.7 billion, down just 6 percent from the previous year in a market some industry associations estimated to be down by as much as 40 percent. Approximately 51 percent of Engel's sales are in Europe and 31 percent in the Americas.

Although specific figures are not released, Engel is widely believed to be the market leader in North America in terms of sales.

Malena, who joined the York operation in 2017 and became its president in 2022, stressed the stability of being a family-owned company. "I think that's a very critical part of our DNA. In this day and age of every company buying every other company, we continue to be family-owned and run by the fourth generation of the original inventor of Engel.

"And with that, we feel very strongly with families first," she said during a recent interview at the York headquarters. "So, our motto is to be the first, but it's also family first, and you feel that in this building. Even though we've grown quite a bit, it's still a very tight-knit organization."

The York facility serves as headquarters for the Americas. It houses a tech center for showcasing molding machines and conducting machine and automation runoffs, one training center for customers and another for service technicians, storage for stock machinery, a spare parts hub for North America and an automation center for engineering and building custom automation cells.

A second tech center in Corona, Calif., includes spare parts and machine storage, service and training functions.

Engel molding machines sold in North America come primarily from two production plants in Austria, but molding machines are also built in Asia. The new plant in Querétaro, which represents a $31 million investment for Engel, has recently started shipping machines to Mexico and South America but is waiting on Underwriters Laboratories approval to send presses to the U.S.

Engel announced early this year that it was reorganizing its business into three separate global regions — the Americas, Europe and Asia. Part of that reorganization concept

is putting machinery production closer to customers, so the new plant in Mexico will benefit North American customers, Malena said. The plan is to eventually have each of the three global regions operate generally independently.

Engel currently stocks about 80 injection molding machines in the U.S. and Mexico for quick delivery. Most of those machines have clamping forces ranging from 50 tons to 1,500 tons. The strategy also includes the factories in Austria, China and South Korea building machines for North America and then holding them in storage until needed to replace units sold out of the North American inventory.

That strategy will also be used at the Mexican factory when it achieves higher production levels.

Molding machines with more than 1,500 tons of clamping force, two-component machines, insert machines and other custom configurations are generally ordered from an Austrian plant when they are sold in North America. Many of these machines will also eventually be built in Mexico.

What about tariffs on machines coming into the U.S.? "The plant in Mexico is the right decision for Engel because whether there is a tariff here or in Austria or in China or in Mexico, the machines are still closer," Malena said. "There's the shipping, both in time and money. If there is a war or some other type of global issue, we have machines local."

A FULL MENU OF MACHINES

Engel sells a wide range of molding machines, including two-platen, toggle, horizontal and vertical tie-bar less. Sizes range from 30 tons of clamping force up to 6,000 tons. It has built one molding machine with 12,000 tons of clamping force.

It can equip injection molding machines with its Inject 4.0 digital solutions to boost performance. The company says it has added digital

Engel has a classroom and customer training area at its North American headquarters in York, Pa.
Photo credits: Engel North America

options to 14,500 machines and has about 10,700 networked with the company.

Inject 4.0 capabilities include technologies to compensate for process fluctuations and provide consistent part quality; reduce energy consumption and scrap; reduce batch fluctuations when using recycled materials; provide a view of parameters needed for better planning of resources; and simplify operations to minimize errors. Inject 4.0 includes state-of-the-art security standards to protect users' data.

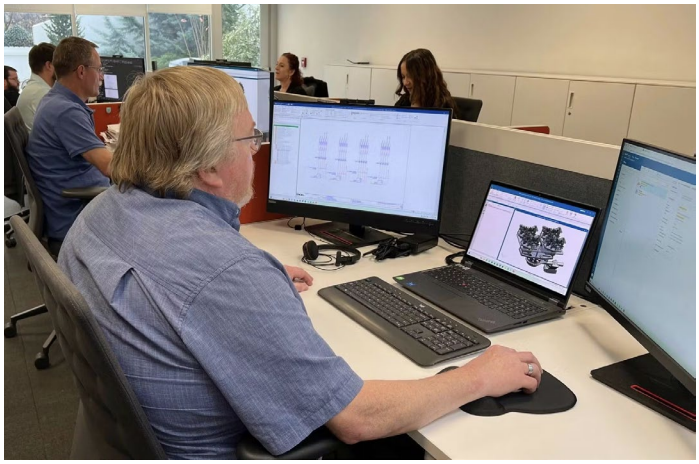
Benjamin Lettner, executive VP for operations in North America, said Engel's North American core competencies are local mechanical, electrical and software engineering support; local application and technology support; injection molding machines from 30 tons of clamping force to 6,000 tons; automation center for robots and automation systems; and spare parts hub for the Americas.

BUILDING CUSTOM AUTOMATION

In York, there is a 30-person group that designs and builds custom automation solutions for North American processors. Once the automation project is built and ready to install, the integrator who built the cell travels to the customer's site to work with the installation team.

The automation group delivers 350 to 400 solutions a year. There are 13 bays in the York plant where automation projects can be assembled simultaneously.

Malena said that demand for custom automation is growing. "Our customers say that even if they have automation engineers, they are just doing their best to keep things running. They don't have automation engineers to design something in-house and put it together. They would rather go to a company like Engel who can provide a turnkey solution."



The automation operation team designs custom solutions for Engel customers. | *Photo credits: Engel North America*

In addition to custom automation solutions, Engel also stocks about 35 robots it builds in York and in Mexico for quick delivery in North America. The plant in Mexico will eventually be able to build automation products directly from raw materials, Malena said.

REGIONAL APPROACH TO CUSTOMER SERVICE

Engel has 260 employees in North America. It divides its sales and service teams into four regional business units to move those functions closer to customers. A fifth team, headed by VP Jon Kelm, is responsible for the medical and packaging market across North America.

Two regional VPs also have responsibilities for specific end markets in addition to their territories. Larry Alvey, central regional VP, is responsible for automotive, while Franco Pettine, VP for the Northeast and Midwest, is responsible for the teletronics and technical molding markets. Other regional VPs are Eric Fuentes in the West and Jason Holbrook in the South.

Engel keeps an inventory of spare parts at its facility in York, Pa. | *Photo credits: Engel North America*

This arrangement takes an extra investment by Engel. "Larry Alvey deals with the central region, but he wears a second hat for automotive," Malena said "He has a team that deals with automotive customers all over the country. If a customer is based in Detroit, but they have locations all around the U.S., Canada and maybe even Mexico, he has a key account person within the automotive business unit that deals with them everywhere.

"We found it costs us a bit more, but it gives our customers that real hands-on, one person who knows every location."

Malena and Lettner both like to talk about Engel's customer service. "We feel very strongly that if we cannot support our customers with the service technicians and with spare parts, those customers will go elsewhere," Lettner said.

The customer service division is also divided into four regional teams, each with dedicated service technicians, spare parts coordinators, hotliners — the first point of contact for customers needing help — and schedulers.

"The service team mirrors our sales team, so that a service manager and regional manager for sales are dealing with the same customers, and their teams are dealing with the same customers," Malena said.

"I think it makes us more agile because decisions for the customer can be made on a lower level," Lettner said. "Our regional service manager for the West is very focused together with the region sales manager, and they talk to each other, come up with a solution and implement it, or they ask us, and we say 'Yes, let's do it.'

"Also, for the customers, they know their counterparts. They know their scheduler by name. They know their service techs. They know their parts people. They know their

hotline person. They know the people they are dealing with," Lettner said.

Engel has 85 service technicians in the U.S. and Canada and another 30 in Mexico. The goal is to increase the number in the U.S. and Canada to 100, Lettner said.

"We serve a lot of customers with a lot of machines," Lettner said. He estimated there are about 13,000 Engel machines currently running in the U.S. and Canada.

Engel puts new service technicians through an extensive eight-week training program in York. "We don't contract service out to other companies," Lettner said. "We want to do it ourselves. We want to train them. We want to control their skill set."

He said new service technicians learn all the machinery types. "That is very extensive with us, from the drive systems, hydraulics, electrics, vertical, horizontal, big and small machines and also robotics," Lettner said. "We have seen pretty good results from when a person came here [for the eight-week course] and when they left. We have even had positive feedback from customers."

The hands-on training program is mandatory for all new service technicians. It covers Engel support tools and systems, basic theoretical concepts such as hydraulic systems, and hands-on practice in repair and troubleshooting techniques.

Engel's service organization has strong ties to the sales team, but one unique aspect is a group within the service team called service consultants. They go into processing plants and work with plant-level leaders to review the plant's machinery and how it is being used, suggest upgrades and new digital products or even additional preventive maintenance programs the plants should implement. "They are basically salespeople on the service side," Lettner said.

A change implemented this year is to have a service person on call during holidays. Service technicians volunteer for the duty and are paid a bonus. "On any given holiday, there is always an emergency at one of our customers," Lettner said. "Our customers are surprised how quickly we can respond to them."

SPARE PARTS AVAILABLE 24/7

Engel maintains a 24-hour hotline for troubleshooting and spare parts that is manned every day of the year.

"It is not uncommon for customers to call us in the middle of the night and say they need an emergency spare part shipped," Lettner said. "Our spare parts person on call comes into the facility, picks the part and organizes transport. People don't have the funding to put inventory on their shelves. They expect us to have it."

Engel maintains a $25 million parts inventory in York and a smaller inventory at the Corona tech center. Some 98 percent of requests are shipped the same day and delivered in one to three days. If a part is needed that is not available in the Americas, the York facility requests it from an inventory of $76 million worth of spare parts near the Vienna airport. That facility is open 365 days a year. Delivery time is three to four days.

APPRENTICESHIPS TRAIN TECHNICIANS

To replace retiring service technicians, Engel also has a four-year, 8,000-hour apprenticeship program. Students take courses for a half-day

at a nearby training institute and work and train in the York facility for the second half of the day. They live in Engel-provided housing and are paid a salary.

There are currently 17 apprentices in the program and the first class of five graduated last month. They are going to full-time, journeyman service technician jobs in the regions where they live or will join the automation team in York.

For its robust customer training program, Engel has five full-time trainers who trained about 250 people from processing companies this year in York, Corona, Detroit and Quebec, plus more at customers' plants. Classes, open to employees from any company using Engel molding machines, typically consist of 10 to 11 people and they include hands-on training. There is a big demand for training, Malena said.

Engel apprentices train on a large injection molding machine. | *Photo credits: Engel North America*

PRICING STAYS COMPETITIVE

Malena said that Engel's market share in North America has increased despite the overall market being in a slump and having more competitors than ever before. "We have loyal customers, and we also have something that a lot of our competitors do not have — we are family-owned and cash-strong.

"We are able to be very competitive with pricing. We are always working on our cost model to be competitive," she said. "We offer turnkey systems with automation, and we have complete solutions. We have industry knowledge.

"We could sell our pricing point based on what we have to support our customers," she said. "For example, 85 service technicians, 24-hour support, engineers on staff, our spare-parts inventory.

"Our customers understand that we cannot be the bottom of the barrel because Engel is not the bottom," Malena said. "We are not the throw-away machine after five to 10 years. We build machines that will last 15-, 20-plus years. And we have the support system to support them. So, I absolutely think that we do get competitive."

Malena said Engel has customers in North America who say Engel's competitors frequently try to sell them molding machines that are less expensive. "They say, 'But we can't buy a partnership' to the lower-cost seller.

"That's something we feel very strongly about," Malena said. "We will walk through fire for those customers. We'll send a service tech in on a Christmas morning, and they know that. So, they stick with us. I think it is a good thing to have that partnership."

HYBRID VS. ELECTRIC INJECTION MOLDING MACHINES: DEBATE CONTINUES

Price, energy efficiency, ability to handle specialized in-the-mold actions all factor into decision.

KAREN HANNA — ORIGINALLY PUBLISHED OCT. 29, 2024

At Fakuma, Boy, which makes hybrids and electrics, rolled out a new machine series, the Electric. Equipped with electromechanical injection, dosing and ejector drives, as well as a small hydraulic tank, they can be classified as electrics, but not as all-electrics. Clamping forces of machines in the series range from about 39 tons to 90 tons. | *Photo credits: Boy Machines Inc.*

Some questions have sparked heated debate for ages: Dogs vs. cats? Beatles or Rolling Stones? The plastics arena is no different:

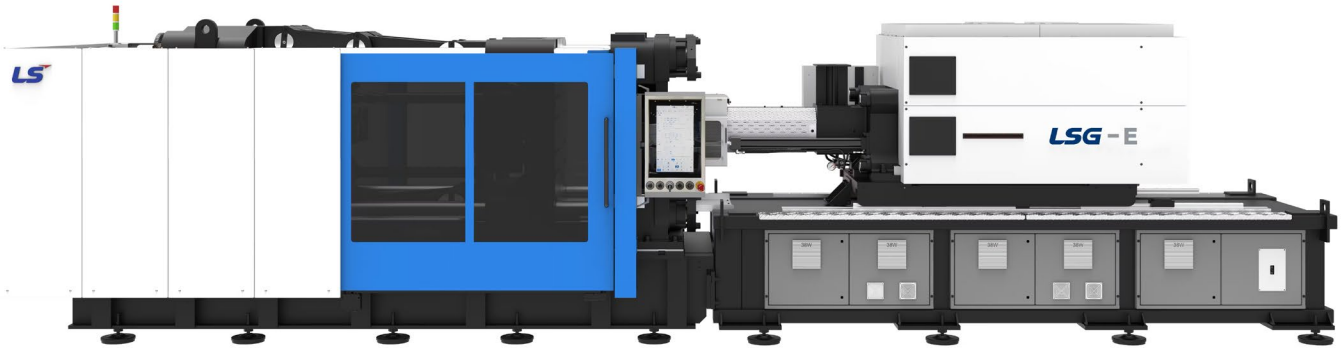
Electric vs. hydraulic?

Whether you're a partisan of one or the other, the right answer might all depend.

While manufacturers continue to roll out new machines that reflect demand for electric IMMs — including, most recently, an electric IMM series from Boy and, in the future, a 1,500-ton all-electric press from LS Mtron — OEM representatives say what kind of machine you choose comes down to balancing factors like energy consumption, price, precision and cleanliness.

They say many of the old tropes — that hydraulics are bigger or cheaper, for instance, or that electrics are cleaner — just aren't so clear-cut anymore.

"There is a very interesting notion that the molding machine market has about electric machines being more energy-efficient than a servo-hydraulic machine. They're not. They're really only about ... 5 or so percent more energy-efficient than a servo-hydraulic. Granted, compared to an old-school classic hydraulic machine, they're about 50 percent more energy-efficient," said Ben Hartigan, marketing coordinator for the Absolute Group of Companies, which in North America sells Haitian IMMs as well as a line of robots.



LS Mtron is pushing the limits on expectations regarding the maximum size of all-electrics. Its newest 1,500-ton LSG-E injection molding machine likely will be available in the U.S. starting in 2025. | *Photo credits: Boy Machines Inc.*

Based on factors like the supplier and application, perceptions about electrics, hydraulics and hybrids vary.

PLUGGING IN

Some representatives suggest going all the way — all-electric — while others, like Hartigan, tout a more-measured approach. On one end of the spectrum are LS Mtron's Peter Gardner and John Wiley, who are proponents of all-electrics.

"More customers, as they're replacing older hydraulic machines that have come to the end of their life, [are] replacing them with electric. And that's been kind of a no-brainer for, say, smaller machines," said Gardner, president of the U.S. subsidiary of the South Korea-based company.

Over a long career that included about 20 years at KraussMaffei, Wiley, who serves as LS Mtron's director of customer service, has overseen a lot of equipment installations and maintenance.

He asserted that all-electrics are more energy-efficient, using energy only when required, rather than continuously as hydraulics do. The servos allow the mechanisms governing movements such as injection to "hibernate" without drawing on power, he and Gardner explained.

The difference is especially noticeable in applications that require long cooling times, Gardner said.

"When things are cooling in the mold and you're not recovering on the screw side or on the shot side of the machine, the servo motors just are doing nothing," Gardner explained, making them "very, very, very efficient, especially in the longer cycle times."

"A traditional hydraulic machine will just run and spin the pumps, and your power consumption is going to be like 30 percent of maximum, so it's wasting energy, where the electric will go into hibernation mode," Wiley said.

Compared with a 20-year-old hydraulic IMM, for instance, a new all-electric uses about half as much energy. For plants that have maxed out their energy usage, that's a big

consideration — it means they can accommodate more, new machines without more power.

"It doesn't tax their infrastructure in terms of the power consumption or the water tower on top of the building and their water distribution system. They're not having to add anything," Gardner said.

But LS Mtron's executives' praise for all-electrics goes beyond energy-consumption benefits.

Generally, the machines have fewer moving parts, making them easier to install and maintain.

And while all-electrics offer more feedback and monitoring than hydraulics, from a mechanical point of view, the design "is rather simplistic," Wiley said.

"It is interesting to mention that when you go with all-electric, there's less moving parts, so that also affects your performance, as far as maintenance, as far as unscheduled downtime, as much as your supply chain. You do not have to stock a tremendous amount of parts," he said.

As an example, Gardner said a typical small hydraulic IMM might have 400 components, compared with only 100 for the same-sized all-electric model.

That extra complexity — along with hydraulic-specific tasks, such as replacing oil and bleeding air out of the system — contributes to a bigger burden for users of hydraulic IMMs.

By comparison, Gardner called all-electrics "plug-and-play."

"I think we have seen a pro-all-electric sentiment, just because your MRO, just because of your preventative maintenance and your consumable parts are down. Traditionally on a hydraulic machine, you have to change the filters, you have to send your oil out for treatment. There's so many external costs other than the initial purchase, and then the initial purchase also comes into play, because you're not buying literally hundreds and hundreds of gallons of hydraulic oil at $8 or $9 a gallon," Wiley said.

All that oil produces its own energy concerns — especially if you're trying to maintain a comfortable environment for your workers.

"With the hydraulic reservoir, in years past, the tonnage pretty much mimics the oil capacity. So a 500-ton machine would take 500 gallons of oil, and if the oil heats at 110 degrees, that's 110 degrees at 500 gallons of oil, which is a tremendous heat sink, if you have a controlled environment production hall," Wiley said.

It all adds up, Wiley and Garder said, to big savings.

According to an analysis provided by Gardner, over a year, an LS Mtron user would spend $6,698 related to the resources to run one of the company's 386-ton all-electric IMMs, compared to $15,903 to run a hybrid or $23,771 for a hydraulic. Costs include electricity, as well as oil and water requirements.

MEET ME HALFWAY

But not everyone is sold is on all-electrics.

"I have to throw the stone that not everything [about] the electric machine is energy-efficient. But some of the [characteristics of] hybrids can be advantageous," said Kohei Shinohara, senior VP for Sodick-Plustech.

For some, choosing the right machine type inspires a bit of ambivalence: It depends.

At Fakuma, Boy, which makes hybrids and electrics, rolled out a new machine series, the Electric. Clamping forces of the compact, two-platen servo-hydraulic machines in the series range from about 39 tons to 90 tons

They have electromechanical injection, dosing and ejector drives, so they can be classified as electrics, said Marko Koorneef, president of Boy Machines. But because they have a small hydraulic tank, they're not all-electrics.

"Advantage of this machine is that if you need core pull in your tool you do not need to buy a separate hydraulic unit (which are loud and dirty) to activate the core pull,"Koorneef said in an email.

By contrast, the company's hybrid IMMs have a bigger hydraulic tank; they also come with a hydraulic ejector, but can be specified with an electric ejector.

After working with all-electrics, Koorneef said users sometimes shy away from them. On the other hand, users new to all-electrics tend to be more interested in them.

"Our advice to choose all-electric or servo-hydraulic would completely depend on the application the machine will be used for, and we advise our customer to take a serious and close look before making a decision based on market trend or feeling," he said.

Nissei, which in 1983 first pioneered electrics. also makes a mix of machines that includes servo-hydraulics.

"What's your preference?" asked Joe Kendzulak, the executive technical adviser and GM of Nissei America. "The electric machine may run a little bit faster, or do you want a hydraulic machine that's a workhorse? That's how we offer up our machines."

Typically, Kendzulak said, all-electrics cost about 10 to 20 percent more.

What customers decide is nuanced, he said.

"Some [sales] territories were 85 percent hydraulic being sold over the electrics, and then there's other territories more maybe it's like 60/40," he said.

For Kendzulak and the Absolute Group's Hartigan, precision and repeatability — rather than energy efficiency — are the strongest selling points of all-electrics.

"The people who really care about precision and repeatability are generally the smaller molders. So, 500 tons and under, we have seen a massive uptick in electric machines. I would say at least two-thirds of the market, if not more, will say, 'Hey, we're going electric no matter what.' And it makes sense ... repeatability, it's a little cleaner, it's quieter ... they all run perfect and nice," Hartigan said.

But for molders who don't need that level of precision, the drawbacks of all-electrics might outweigh the benefits.

To perform actions such as core pulls and other actions within the mold, which typically are hydraulically driven, molders with all-electrics must install a separate hydraulic power unit with a pump, which takes labor and space, he said.

"One of the big struggles in all-electric, a true all-electric, is that you can't really run these functions because you need hydraulic oil to move them," he said. "So, a lot of the time, we'll see in these beautiful clean rooms, you'll have this perfect, very expensive electric machine, and next to it is a gross hydraulic unit in a clean room ... leaking oil. It kind of defeats the point. So, the flexibility of hybrids, being

able to run a lot of these hydraulic circuits, to run all these extra little doodad features, is a big deal that a lot of customers forget about when they're ordering all-electric."

Shinohara echoed some of Hartigan's sentiments regarding the superiority of hybrids.

"Our technology standpoint, or molding capability, machine capability, we still think our hybrid machine is a higher-performance machine with precision and performance. That's kind of our unique position — that electric is not the higher version of our machine line, but our hybrid has a higher-performance machine," Shinohara said.

Meanwhile, Kendzulak voiced several concerns with all-electrics.

While the LS Mtron executives touted the maintenance benefits of all-electrics, Kendzulak said he sees them as less reliable, with more-demanding upkeep requirements.

"Usually, when people look at electric machines, some of our competitors, they only work on the electric machine for 10 years, and then they don't work on anymore because they say they're obsolete," he said.

On the other hand, he said, "I have customers right around my office here, they have hydraulic machines from 35 years ago still running."

STRIKING THE RIGHT BALANCE

OEMs have found ways to optimize the advantages of the different styles of machines so customers can enjoy the best of both worlds.

Can you really have it all?

As a representative of the world's largest IMM builder, Hartigan thinks so — that the Absolute Group's portfolio is big enough to accommodate most any need. The company produces a full spectrum of machines, from micro models to gargantuan workhorses, with a range of movement-mechanism choices. With its mammoth scale, it's able to innovate efficiently, Hartigan explained.

When it comes to the electric-vs.-hybrid debate, size matters.

But so does the size of the supplier.

"The big break is once you get above 500 tons — a lot bigger parts, part dimensions get a little more tolerance-forgiving — so, it's not really as much of a precision thing; it becomes a cost," Hartigan said. "And electric machines will go exponentially up in price as you go up in tonnage. Just the way the servo motors are designed, as they go up, it gets comically, exponentially expensive. Well, hydraulics is a very linear price scale. The splitting point is right around 500 tons, where, unless you need an electric, if you're going to buy a 2,000-ton molding machine, it's going to be twice as much to buy an electric machine and you're only going to get about less than 5 percent of performance difference."

However, in its recent updates of its Mars and Jupiter lines of servo-hydraulic IMMs, Haitian has leveraged its own size to make the advantages of electric movement more accessible — even on bigger machines.

"What Haitian did with their most recent servo-hydraulic series is they changed the electric screw drive, which is the screw-rotate function, to be all-electric. And they did this without increasing the price of the machine — because of economies of scale, they found a pretty good, efficient way to build these kind of screw motors. So, Haitian now essentially has a hybrid machine for their hydraulic offering,

[which] is really a hybrid with electric-screw rotate, which saves another 20 percent energy savings," Hartigan said.

The world's two best-selling IMM series, the Absolute Group's Mars machines are available with clamping forces from 67 tons to 3,709 tons, while the two-platen Jupiter machines are available from 505 tons to 7,418 tons.

FINDING YOUR FIT

Whether a hybrid or all-electric is right for you comes down to a number of variables, including the application. But just as the Absolute Group has done with its Mars and Jupiter IMMs, other OEMs continue to strive to accentuate the positives of the various approaches.

Like the Absolute Group, LS Mtron is pushing beyond the expected size restraints of servos. Gardner said he thinks there's a demand for even-bigger all-electrics.

"The first buyers of the big-tonnage machines pay a pretty penny, I think, because there's just an economy of scale. There's not as many manufacturers of servo drives, servo motors, who make motors that are a big-enough capacity," Gardner said.

But LS Mtron is pushing the envelope — it's preparing to launch its new 1,500-tonner, which likely will hit the U.S. market early next year, Gardner said.

Currently, "in our top range is the 950-ton electric, and we have quite a few of those being sold. But our customers are the ones pushing us to build even bigger. It's already built and being tested in Korea ... and then will be introduced in the United States," Gardner said.

But will all-electrics ever overtake hybrids in popularity?

Even their biggest advocates — like Gardner and Wiley — aren't sure.

"Energy is relatively inexpensive here in the United States, compared to other parts of the world, so maybe that's not the selling point. ... So, will it take off? I'm in my 37th year of injection molding," Wiley said, "and I see every year, electric becomes more and more, but will it actually dominate the U.S. market? As Peter mentioned, I think I'll be long gone by then."

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