



M·POWERED

MILACRON'S SUITE OF IIOT APPLICATIONS
Monitors your machine, on-line, 24/7, to make sure it
always runs at its best.



MILACRON®

LEADING THE PLASTICS INDUSTRY IN DIGITAL TRANSFORMATION

M-Powered is a portfolio of easy-to-use observational, analytical and support services that gives customers a competitive advantage. Leveraging Industrial Internet of Things (IIoT) technology, M-Powered runs sophisticated algorithms that utilize real-time machine learning to monitor machine operations and alert before potential issues.

M-Powered yields unique intelligence on:

- Current and Future Operations
- Manufacturing Quality
- Uptime and OEE

The addition to your company’s bottom line from implementing IIoT solutions are: maximum quality, availability, utilization.

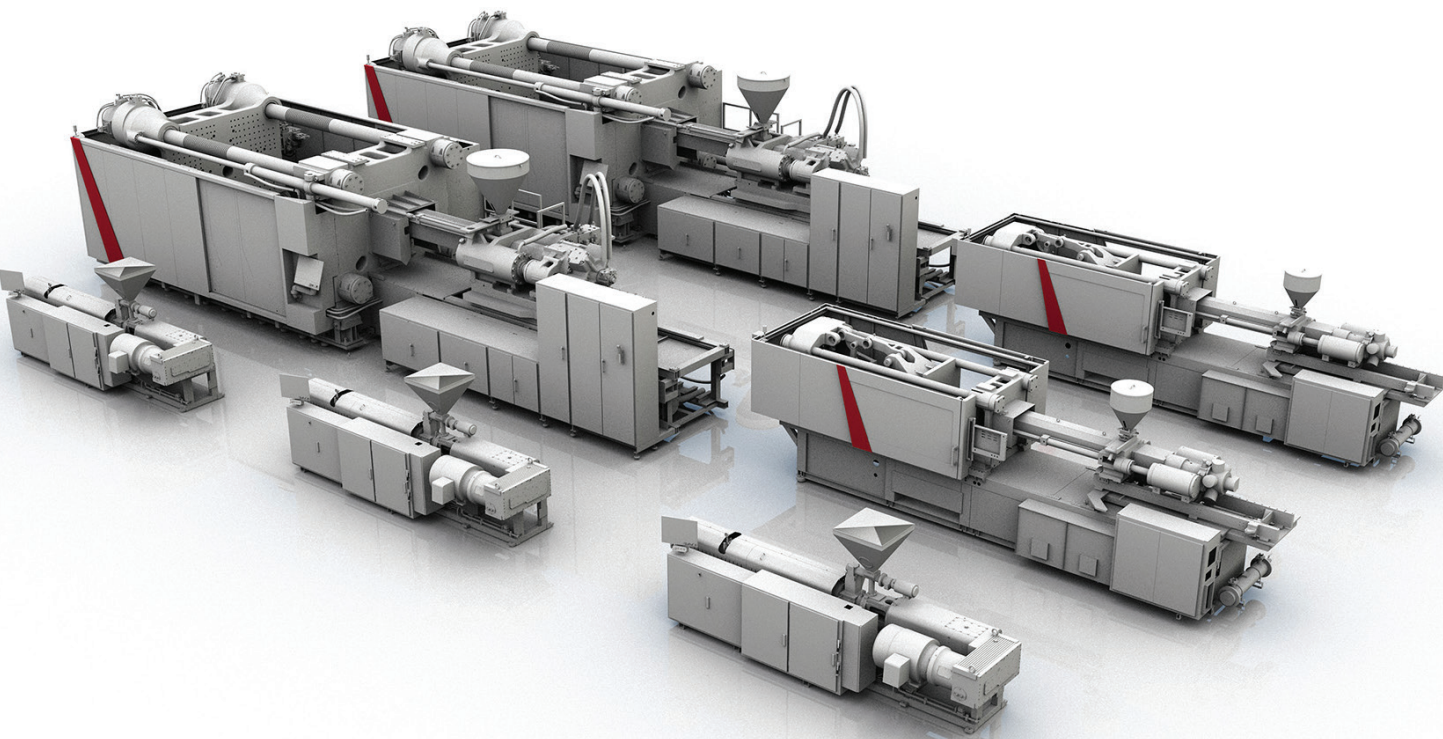


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M-POWERED VALUE DRIVERS



INCREASE MACHINE UTILIZATION

M-Powered modules go beyond the limitations of overall equipment effectiveness (OEE) and benchmarking by providing actionable insights that maximize your machine performance and uptime. Manage your network of geographically distributed assets while we provide intelligence on your shot to shot operations with active monitoring and alerts for critical events.

PREDICTIVE SYSTEM AND MACHINERY MAINTENANCE

M-Powered can closely monitor a growing number of machines and components, intervening in time to replace parts before they go bad or a costly downtime event occurs. M-Powered allows you to gain insights directly from the source, no longer making you dependent on readouts after the fact.

WORK CELL COLLABORATION

Whether injecting or extruding, your up and downstream auxiliary equipment is critical to operation. With a single interface, M-Powered can track key performance indicators (KPIs) of each work cell or an entire line. Measuring your data against traditional benchmarks can lead to significant performance, safety and value improvements.

M-POWERED VALUE DRIVERS

ENERGY & RESOURCE SAVINGS

From electricity to water to hydraulic oil, efficient use of resources is crucial to growing profits. With information aggregated across machines, you can optimize the total energy and resources used to create any part. More importantly, M-Powered can measure your variations in energy usage, scrap rates and other factors and alert operators to shifts in rising production costs. The system can then be utilized to help determine causes for your increased resource usage.

QUALITY IN THE CLOUD

By connecting directly with the controller and additional work cell components, automatic quality monitoring is a realizable goal. M-Powered can record parameters, monitor them, produce real-time statistics and perform long-term analysis. By gathering your machine setpoints into “recipes” and reviewing the actual values against dynamic limits, our online quality solution cultivates sophisticated learning algorithms that distinguish the best recipes and generates alerts as processes fluctuate.

SERVICE & AFTERMARKET PROGRAMS

Machinery service is more efficient with our technician’s remote access to operational data. All you need is a single team member on-site to host a collaborative view and troubleshooting experience. Our service team can immediately access graphical representations of the machines’ functions, troubleshoot, and recommend solutions for various issues. Consumables use, part wear and key process parameters are measured against predictive models that drive replacement programs based on historical cloud data.



M-POWERED MAP ROAD TO A SUCCESSFUL IIOT SOLUTION



DEFINE YOUR KEYS TO SUCCESS

IIoT isn't a one-size-fits-all solution

The vast majority of IIoT or connected solutions focus on singular or basic value propositions. Unfortunately for most of the industrial base, there is not a one-size-fits-all solution. Commonalities can exist such as the decline of skilled labor, but it's important to understand where your problems lie before a solution can be prescribed. Before beginning your journey, ask: are you searching for data to manage, struggling with skilled labor, looking to optimize processes or improve quality, desiring a closer tie to technical support, or looking to decrease costs through predictive models? It's important to select a partner that is flexible to meet your growing needs, can help with any technical solution and work with you to understand your long term goals. Prioritizing the correct problem statements is critical to a successful IIoT implementation.



CHOOSE A CHAMPION

Create an IIoT culture that works for your business

Once the goals have been defined, identifying a champion within your business is necessary to drive a solution. It will be up to the champion to manage the strategy and work with Milacron to create a custom package of applications that will help create an ROI for your business. When the business and finances align, the champion can successfully foster a culture that utilizes the applications and the data to move the strategy forward.



CONNECT EQUIPMENT

Understand your asset capabilities across all machinery and components

It is important to understand the data coming from each individualized work cell and compare it to the fleet of machinery. But to collect data, analyze and optimize, machines must be connected to the Internet. The vast amount of asset information and technical skill that are required to understand what, when, how much and how to collect this information can at times make the task seem impossible. Milacron's M-Powered team will assess the individual components' communication capabilities as well as available data points and work with your champion to develop a cost-effective connection strategy.



TRACK & ANALYZE KPIS

Studies show displaying machine KPIs improves plant floor OEE (up to 5% per year)

Presenting OEE performance and KPIs in an automated fashion can be challenging for manufacturing plants. Most systems require increased levels of human intervention which can affect the integrity of the data. To effectively develop actionable intel, the process needs to remove as many hands-on activities as possible all while Milacron gathers the correct evidence to support objectives. This knowledge is delivered via web pages, dashboards, reports, and mobile apps depending on the need of the user. The aggregation of performance statistics is a key requirement to be able to analyze the abundance of valuable information. If things are trending incorrectly or if the data is not a true measure for your objectives, remedies can be developed to maintain course.

M-POWERED MAP ROAD TO A SUCCESSFUL IIOT SOLUTION



ASSESS THE SOLUTION

Adapt and change based on business needs to drive desired outcome

Your problem statements drive your data and ultimately your results. As your manufacturing processes mature, your solution should follow suit; not only in year one, but all proceeding years. Continually assessing your progression and evolving targets increases ROI and is an integral part of a long-term IIoT success plan. Through internal and external forces, change is a guarantee. Examining your targets and strategy planning periodically will help you identify synergies to achieve your short-term goals and adapt to your desired end-state.



LEVERAGING A GLOBAL NETWORK TO PROVIDE INSIGHT

Gain insight on every connection on every machine across the globe

While some solutions need to be tailored, there are industry lessons that can be shared. Leveraging a global network of connected machines, Milacron not only learns particular customers' machines, but from hundreds across the globe. We analyze data and develop solutions to focus on everything from "micro-stops" to predictive analytics. Milacron's control center will have concierge services specifically dedicated to studying these anomalies across the machine base and providing proactive monitoring to warn customers if deviated patterns have been detected in their machines. It is reasonable to expect an improvement in uptime for connected machines simply through leveraging the install base.



2020: UNDERSTANDING PLASTINOMICS

M-Powered continues to grow based on your needs to provide industry-leading IIoT solutions targeting precise production, advancing diagnostics, capitalizing on sustainability opportunities and expert monitoring of every connected machine; together these achieve ultimate Platinomics.



Quality of Engineering

PARETO data will influence the way Milacron designs and engineers our processing technologies while verifying quality assurance and control of our entire installed base of connected machines.



Deepen Expertise in Market Specific Applications

Milacron has over 50 years in plastics processing, but M-Powered allows us to gain insight on your needs based on your parts and the market that you serve. We have the advantage of finding solutions, backed by data, whether you create classic consumer goods, advanced automotive applications or any part in between.



Solving a Sustainable Vision

We translate IIoT data into thought leadership to innovate efficiency, to create and implement adaptive processing methods, minimize environmental impacts and maximize economic competitiveness.



Find Abnormal Variations, Cycle by Cycle

Milacron will alert you and create countermeasures for any intangible abnormalities in your machines before they make any impact on your bottom line.



Proactive Part Stocking Programs

Never again will you worry about having enough stock to meet your demands or if you have space for replacement parts in your inventory. M-Powered predictive capabilities and dedicated service team will ensure parts arrive in time to avoid unplanned downtime, including parts with longer manufacturing lead times.

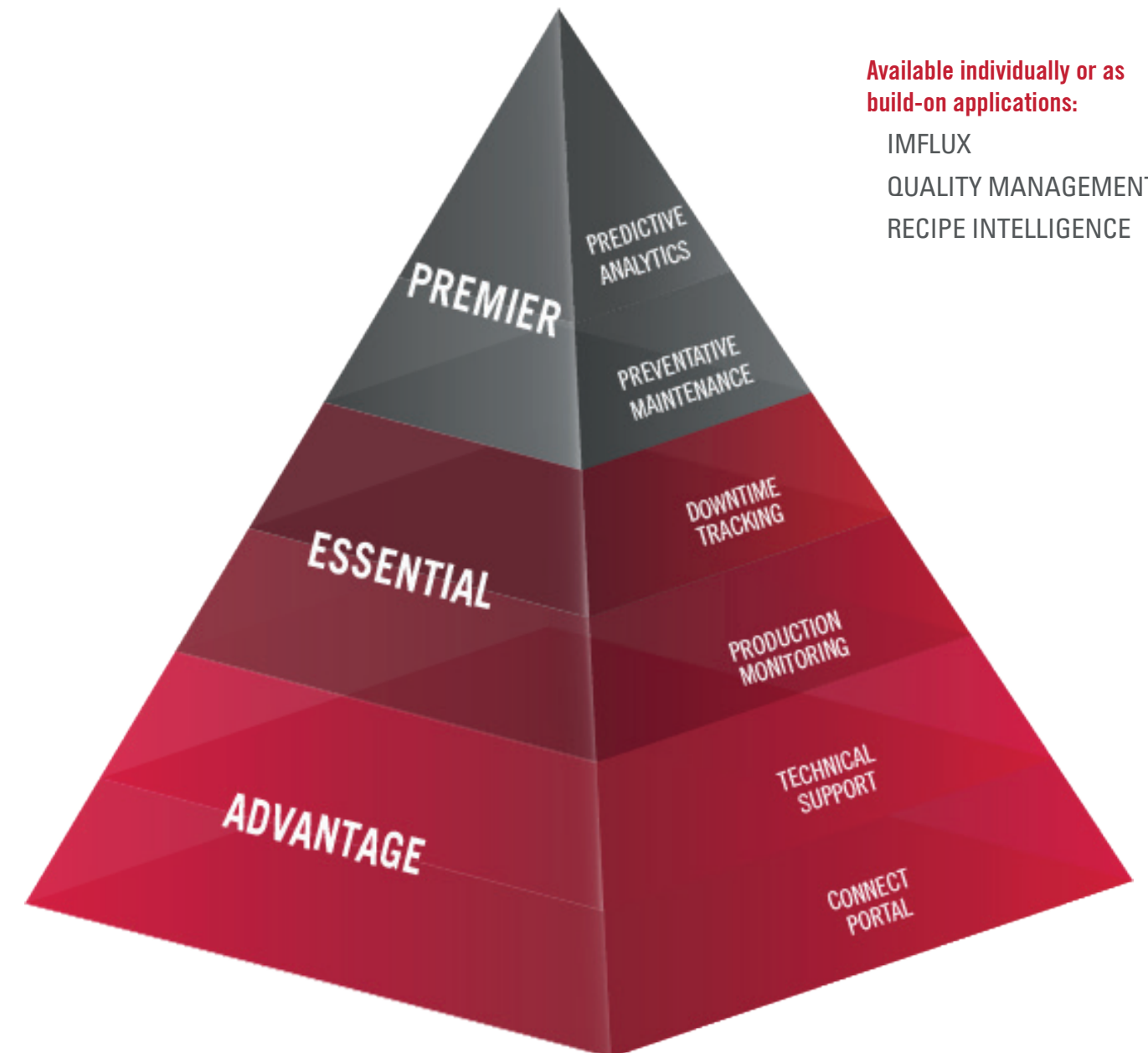


Industry-Leading Remote Diagnostic Capabilities

Dedicated, virtual work stations will allow experienced technicians to view critical machine vitals, including all software screens, analog and digital inputs and outputs, as well as other built-in diagnostics tools. Our teams will be available to minimize equipment downtime and assist on the spot with any potential "micro-stops."

APPLICATIONS

M-POWERED TIERS



Build on the power of IIoT to facilitate improvements in productivity and efficiency by utilizing M-Powered cloud computing and processing analytics.

BENEFITS

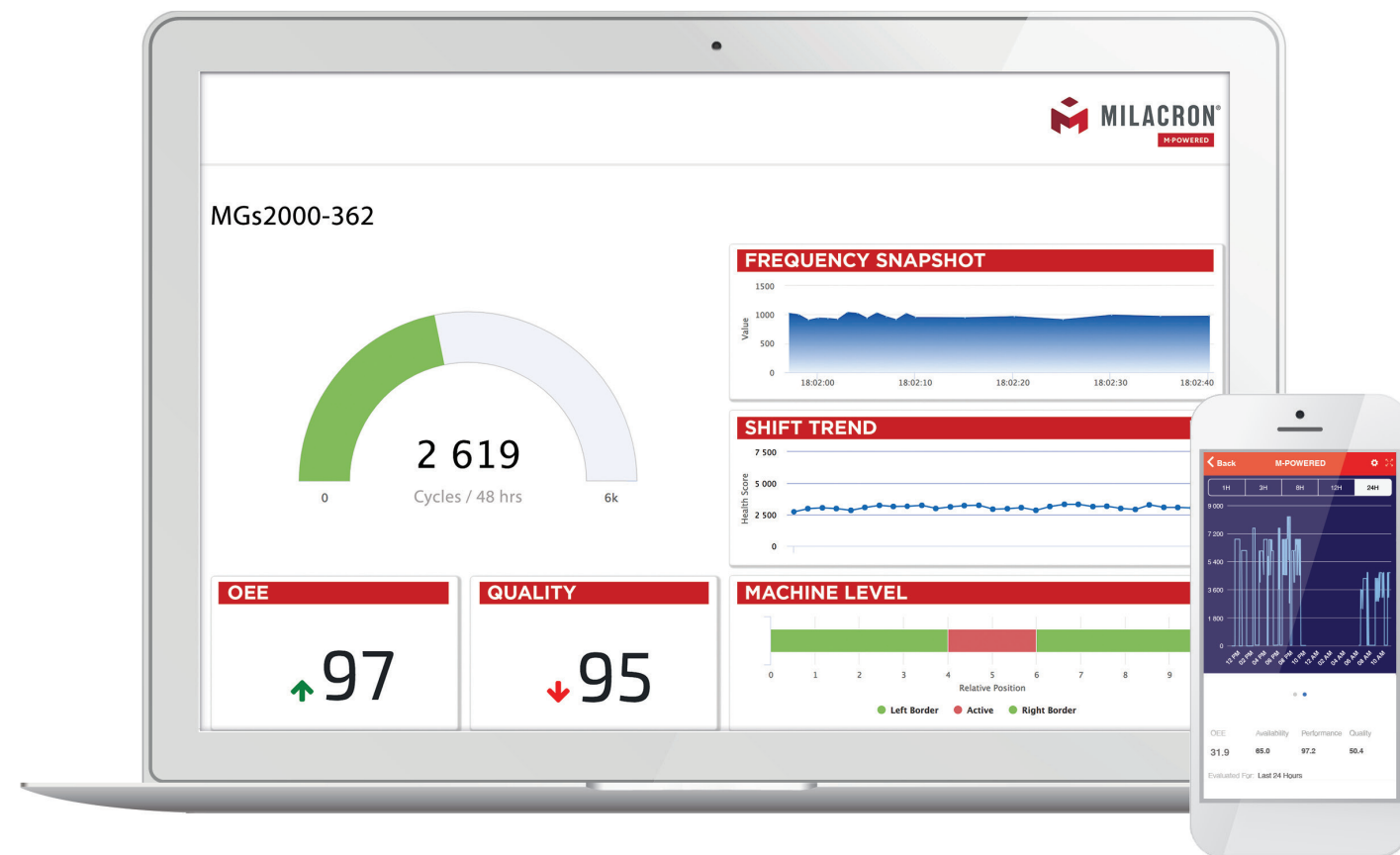
- Automated fleet OEE overview
- Simplified access to data
- On-demand remote technical support (M-F 8-5 EST)
- Troubleshooting and quality escapes analysis
- Expert recommendations based upon machine usage and performance
- Remote technical support (M-F 8-5 EST)
- Reports to center focus on cost drivers
- Industry-leading suite of predictive algorithms
- Tools catered to assist with OEE improvement
- Machine utilization concierge to reduce operation costs
- 24/7 remote technical support

CONNECT PORTAL

DATA AT YOUR FINGERTIPS

The first step to improving your OEE is measuring and tracking the data. More importantly, the value must be dependable and consistent to help drive action. Using real-time machine data, OEE can be calculated at your fingertips, anytime and anywhere.

- Ⓜ **Automated OEE** data collection and reporting used to deliver a reliable truth system
- Ⓜ **Real-time tracking** of your operations
- Ⓜ **Secure** web and mobile applications for reviewing **key performance indicators**
- Ⓜ **Live processing information** directly from your assets



TECHNICAL SUPPORT

REDUCE OR ELIMINATE DOWNTIMES

It can be frustrating to spend hours on the phone troubleshooting and then be told that you need a technician on-site to perform additional troubleshooting steps. When this happens, you want to know that the best and brightest are assessing your situation and providing an accurate first-time fix.

- Ⓜ **Instant access to experienced Milacron technicians** to reduce time spent waiting for on-site support
- Ⓜ **1 in 5 issues** can be **resolved remotely**
- Ⓜ **Reduce downtime durations up to 50%** by utilizing the system's ability to gather vital reports
- Ⓜ **Secure remote access to operator screens** for advanced support



DOWNTIME TRACKING

UNDERSTANDING DOWNTIME TO DRIVE AVAILABILITY

How do you choose what to focus on to increase your availability? Utilize the downtime tracking application to understand what issues are causing setbacks, outages, and downtime and how they are impacting your OEE.



- ☑ Low intervention, manual or automatic downtime coding
- ☑ Machine driven downtime generation ensures accuracy of reporting
- ☑ Built-in PARETO analysis to understand frequency and lengths of downtime
- ☑ Customizable library of downtime category or codes with API integration
- ☑ User-configurable automatic alerting based upon downtime category or unique code

PRODUCTION MONITORING

MAINTAIN PERFORMANCE AND IMPROVE QUALITY

Wear is part of the normal life of a molding machine. Deterioration can display itself in many forms, but two of the leading offenders show up in performance loss or quality escapes. When problems are discovered, you may ask 'Was it a slip with the machine or the operator?' and 'could we have prevented it?' A data repository to help answer these questions is often required to determine root cause.

- ☑ Intelligent productivity historian offers quick access to machine data for analytics
- ☑ RESTful-APIs make dashboarding, reporting and external system integration effortless
- ☑ Generate custom alerts based upon built-in or customizable data
- ☑ Escalate knowledge reports available on a set schedule or on-demand

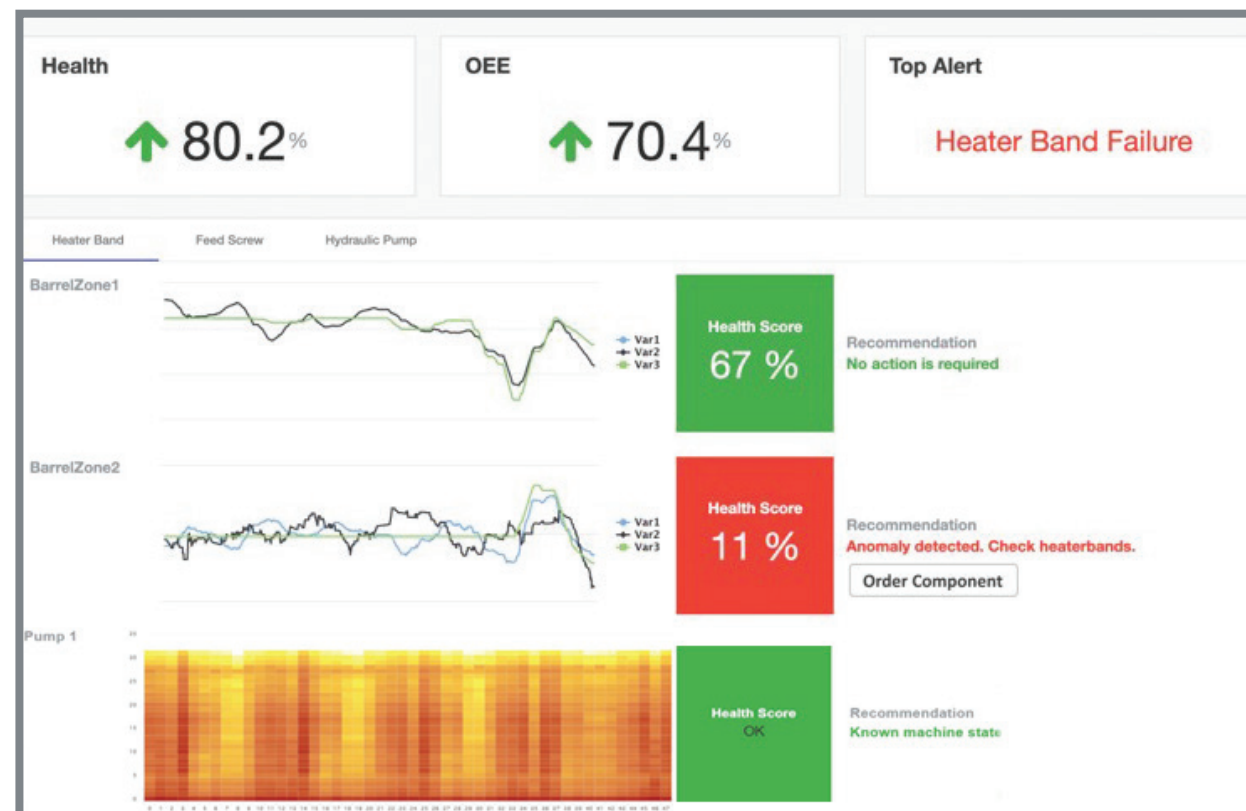


PREDICTIVE ANALYTICS

PREVENT DOWNTIME BY PREDICTING FAILURES

Downtime is a costly combination of people, parts, unnecessary maintenance operations and unmade product. Machine data tells a story of a drifting component and sequences that can identify unique signatures. Studying this on a large scale can be difficult, but when combined with thousands of machine years, machinery expertise and a team of data scientists, it is possible to prevent downtimes altogether.

- 📌 **Predict costly downtimes** due to failing heater bands or pumps and worn screws
- 📌 **Predict quality escapes** with remaining useful screw life scores
- 📌 **Easy to digest machine health dashboard** complete with recommendations for monitored components
- 📌 **Reduce on-hand stock expense** through pre-emptive part stocking programs or on-demand order before failures occur

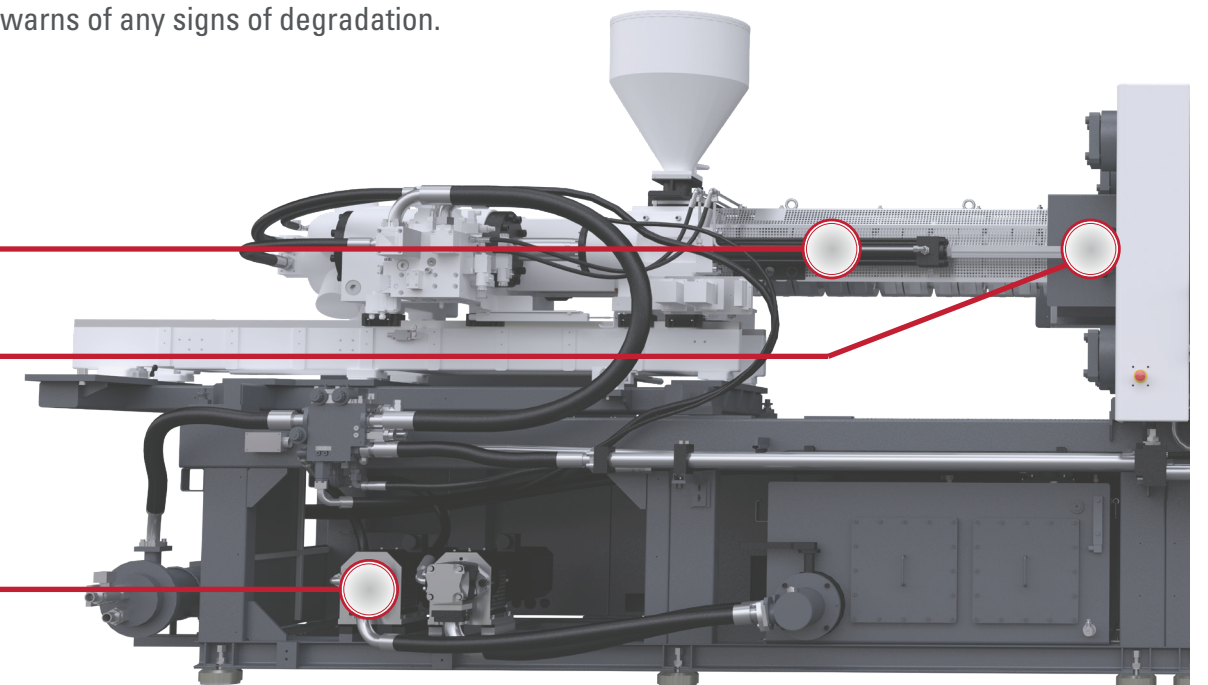


MILACRON PROPRIETARY PREDICTIVE COMPONENTS

Digitally track the health of a growing number of machine components. Should a replacement become necessary, the patent-pending application will provide warning ahead of potential failures that could create unplanned downtime.

Worn plasticizing screws or screw tips are leading offenders for scrap. These components often require lengthy downtime to troubleshoot and measure, and can come with a significant lead time. Subjected to wear-and-tear, failures are gradual, but must be managed. M-Powered Predictive Maintenance uses a novel non-invasive method for monitoring performance, giving maintenance staff unrivalled insight into the operations of the injection-end components, helping them plan for the inevitable.

Heater band failures can cause increased scrap, mask processing issues and unnecessarily increase wear to your screw and barrel. Don't let issues with heat affect production. M-Powered Predictive Maintenance delivers real-time continuous performance monitoring of the heater bands and warns of any signs of degradation.

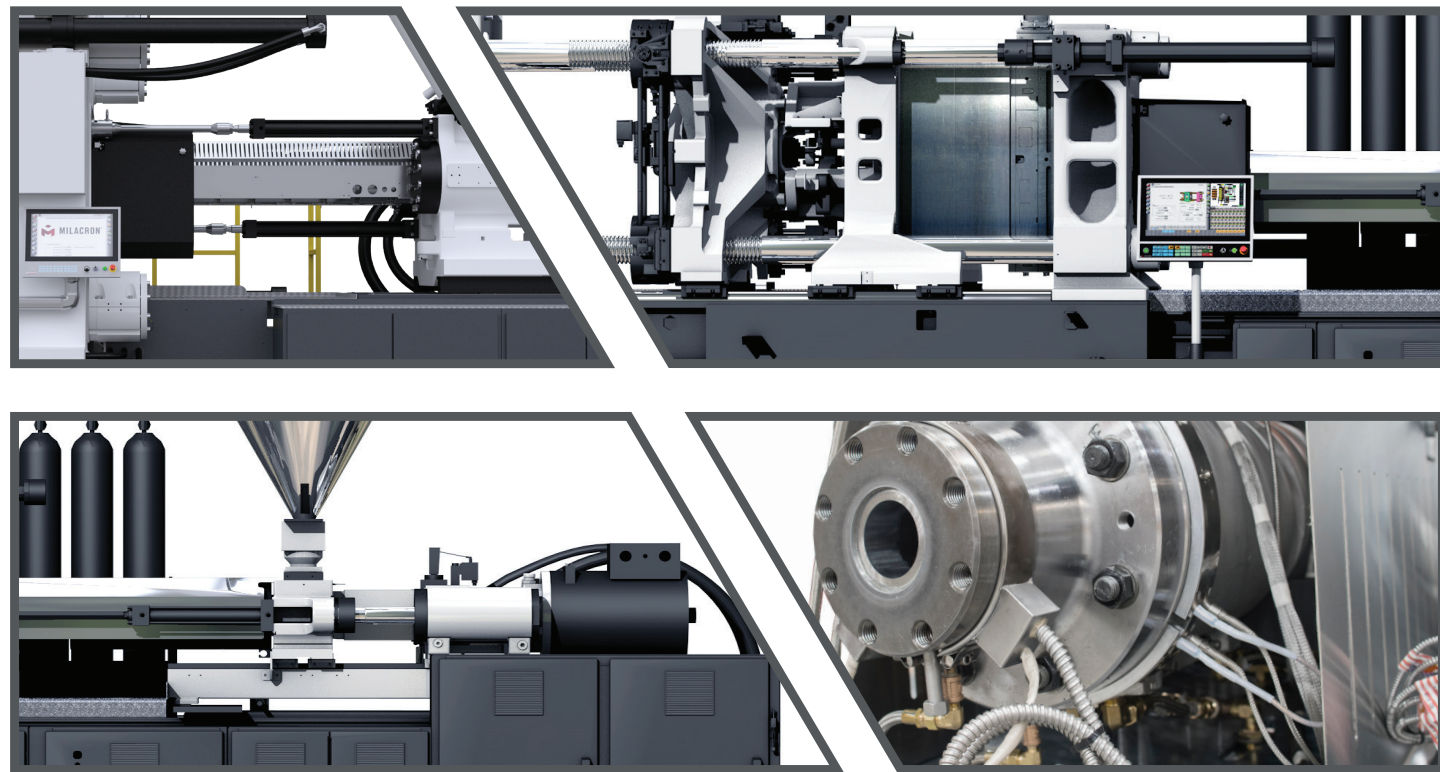


Hydraulic pumps are the heart of your molding machines, pushing oil throughout the system to deliver performance. Failures result in expensive and extended downtime to flush the system and could result in performance loss if any other components suffer residual effects. M-Powered Predictive Maintenance uses cutting-edge vibration and acoustic analysis to monitor your pumps 24/7. Machine learning algorithms track any unusual measurement and provide early warning to pump degradation.

PREVENTATIVE MAINTENANCE

USAGE DRIVEN MAINTENANCE*

Proactive preventative maintenance (PM) generally requires dedicated personnel and parts; however it can be difficult to showcase ROI with the hope that it shows up in performance improvements and uptime. Aggregated real-time usage reports are the next step to ensure equipment is maintained properly and cost-efficient.



- Ⓜ **Boost machine performance** through smart maintenance calculations
- Ⓜ **Improve efficiency** using system generated scheduling
- Ⓜ **Extend life** of machine, mold, tooling and auxiliary components
- Ⓜ **Reduce costs** using intelligent stocking programs

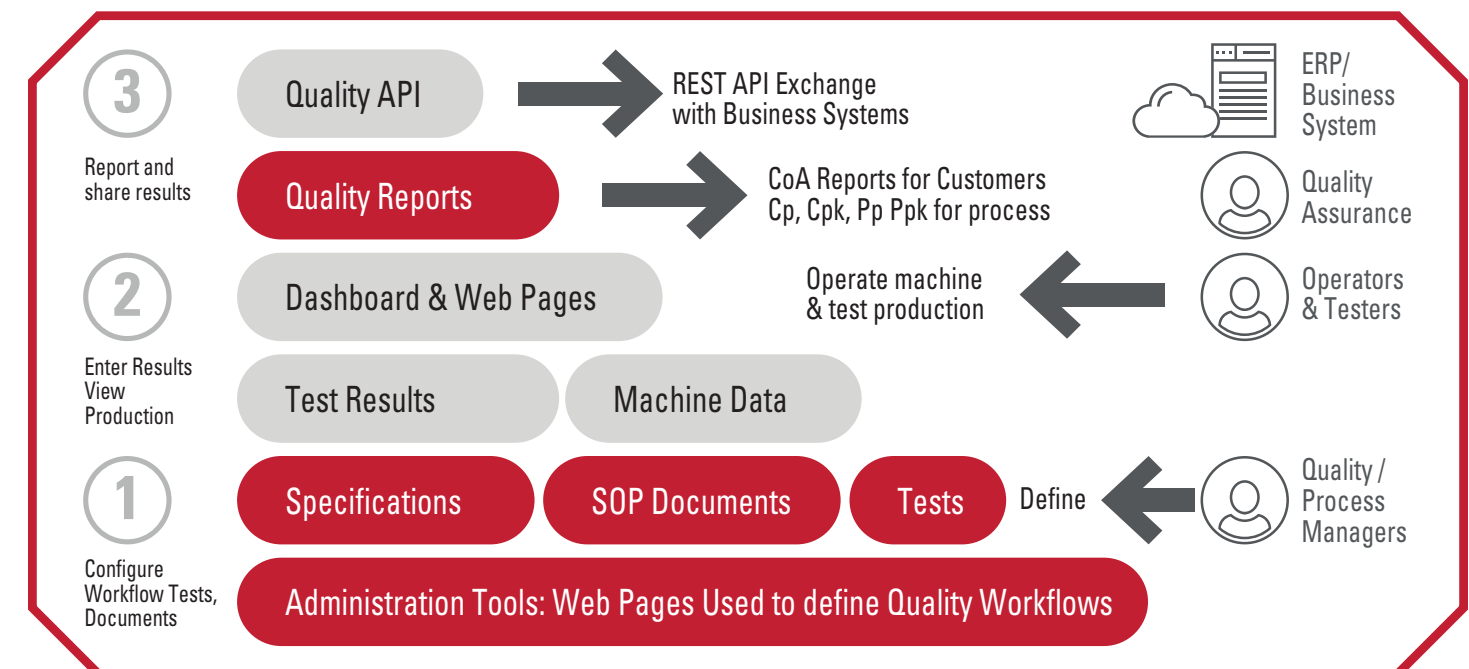
*Available Fall 2020

QUALITY MANAGEMENT

TRUE QUALITY IS PRICELESS

Measuring quality accurately takes a coordinated effort from quality managers, six-sigma black belts, machine operators and other various personnel. When a quality escape happens, it can be tricky to assess and coordinate with processing data after the fact to determine root cause. Molders need answers quickly to understand the possible affected product, what could have caused the issue and in some cases, quickly eliminate potential root causes.

- Ⓜ **Increases quality** by combining manual and online test results in a single application to effectively determine quality trends
- Ⓜ **Set up proactive alerts** to potential quality escapes that could result from changes in process
- Ⓜ **Boost productivity** by removing the need for manual combination of work cell and quality measurements
- Ⓜ **Automatically generates CoA (Certificate of Analysis) reports** to assist with ISO 9000 compliance



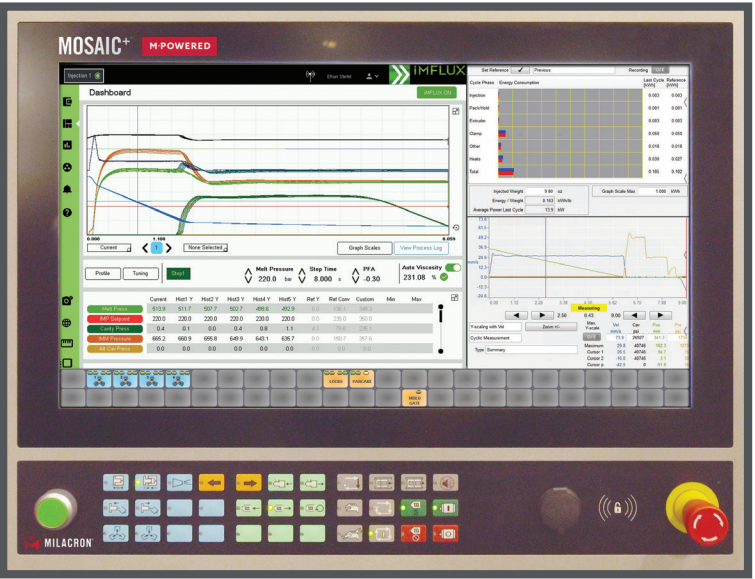
iMFLUX

A wholly owned subsidiary of Procter & Gamble

REAL-TIME ADAPTIVE PROCESS

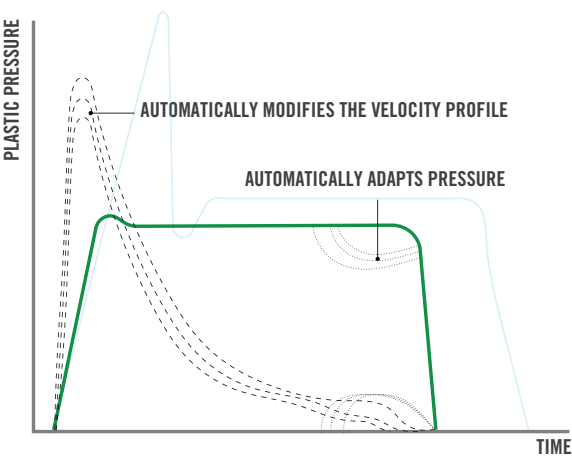
Cutting edge technology of adaptive processing control backed by years of processing exploration. Improve part quality while decreasing the energy required to produce it. This technology will allow for a number of real-time adjustments to mold and materials changes.

- Ⓜ Increase productivity by up to 50% on existing injection molding machines
- Ⓜ Intentional solutions to further assist your team in maximizing productivity
- Ⓜ Process is ideal for most molding applications
- Ⓜ Especially advantageous for wide specification materials, recycled materials, and bio-materials



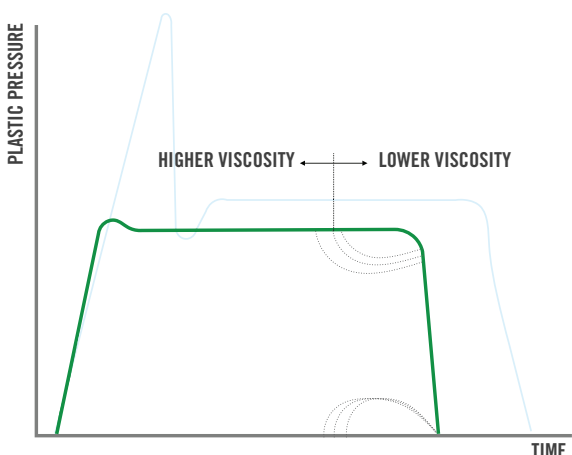
IMPROVES OEE

By reducing cycle and instantaneously adapting to the changing conditions inside of the mold, iMFLUX delivers improved process consistent, higher output, far less operator interactions while generating less scrap and rework.



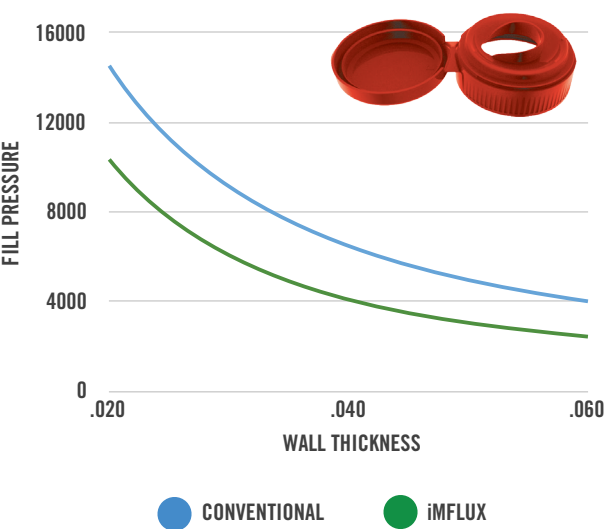
RESIN FLEXIBILITY

Molders can choose to 'reinvest' pressure savings to broaden material choices. Automatic adjustments made to process as viscosity changes allows for the use of wider spec resins and allowance in regrind percentage. Without requiring processor intervention, lower shear conditions permit the use of shear sensitive materials in more applications.



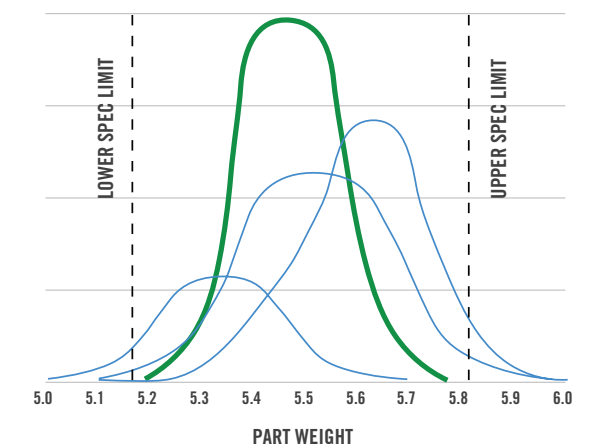
LIGHT WEIGHTING

Lower pressure also allow for higher flow length to thickness ratios (L/T), enables light-weighting, and reduces the need for flow leaders.



SUSTAINABILITY

Automatic compensation for batch to batch viscosity shifts enables for the used of broader ranges of renewable materials allowing the parts to maintain specification with little operator interventions.



REDUCES TONNAGE

Lower pressure equals lower tonnage. Using less pressure and lower clamps opens up part and mold design freedoms unattainable conventionally. Common pressure and clamp force reduction range between 25 to 40%.

MOLD CAVITATION		
Conventional		iMFLUX
750T	Machine Size Limit	750T
23T	Tonnage per Cavity	15T
32	MAX CAVITIES POSSIBLE	48

MACHINE SIZING		
Conventional		iMFLUX
3.6	Clamp Force Factor	2.6
735	32 Cavity Requirement	480

50%
CAVITATION
INCREASE

35%
TONNAGE
REDUCTION

AUTO VISCOSITY ADJUST

Recognizes any change in material viscosity and automatically adjusts pressure setting while maintaining identical flow rates throughout the mold filling and packing phases

AUTO PROCESS TUNING

Process optimizer tunes your process to the mold, material, and operational environment, to get the maximum possible performance, quality, and operational efficiency.

PROCESS NAVIGATOR

The system uses sensors in the machine, feed system, and mold to provide a complete understanding of critical molding parameters. This provides unsurpassed insights for how to maximize throughput, quality and overall performance of the molding system.

RECIPE INSIGHT

CRITICAL INTELLIGENCE TO OPTIMIZE YOUR PROCESS

Setting up a good process, validating and maintaining its integrity are critical to part quality and identifying changes in operation. Controls typically provide the ability to monitor set points and variation, but this can become difficult to manage and monitor on a machine by machine basis.

Name		Version	Loaded by		Modified	Target		Machine Speed		Notes	Alarms
ACA-679		7	System Account		Yes	69.0 cycles/hour		Running at 68 cycles/hour			
Status	Priority	Type	Description		Category	Units	Low Limit	Target	High Limit	Current Value	Active Value
	1	Act	Injection 1 Fill Position Cushion		Injection 1	in	0.5	0.75	1.0	0.6989	0.4431
	1	Act	Injection 1 Fill Time		Injection 1	s	4.0	5.0	6.0	4.8816	6.936
	1	Act	Injection 1 Recovery Time		Injection 1	s	11.59	16.59	21.59	17.0436	23.9712
	1	Act	Cycle Time		Production	s	49.5	52.0	54.5	52.4796	57.1176
	1	Act	Injection 1 Max Inject Pressure		Injection 1	PSI	700.0	1000.0	1300.0	973.92	---
	1	Act	Injection 1 Transfer Pressure		Injection 1	PSI	600.0	900.0	1200.0	804.07	---
	1	Act	Injection 1 Barrel Zone 1 Act		Temp	degF	415.0	440.0	465.0	440.10	---
	2	Set	Injection 1 Barrel Zone 1 Set		Temp	degF	415.0	440.0	465.0	440.0	---

- Create, store and maintain recipes** via cloud interface
- Decrease scrap and part variation** by utilizing change and alarm logs to immediately alert plant staff to setpoint or process variation
- Work cell integration** allows for users to track auxiliary changes in conjunction with machine data
- Optimize your process** using built in tools to understand ideal settings to maintain the highest quality

M-POWERED COMPATIBILITY

	Connect Portal	Downtime Tracking	Production Monitoring	Technical Support	Predictive Analytics	Preventative Maintenance
MOSAIC +, II, I						
ENDURA TOUCH/ENDURA						
FANUC - Roboshot ¹				IN PROGRESS	IN PROGRESS	
B&R						
XTREEM			§ ²			
ALLEN BRADLEY						
SIEMENS						
NON-MILACRON			§ ³			
486, VSX, VSL, CAMAC						

¹ Roboshots require LINKi or Mold24i

^{§2} Advanced Analytics have 50-60 data elements each cycle

^{§3} Non-Milacron - M-Powered Standard hardware can be added to support production monitoring package if a standard communication protocol is readily available

AUXILIARY COMPATIBILITY

Auxiliary equipment managed by the M-Powered cloud has a direct effect on efficiency and safety benefits for the operator. It can extract process parameters from each auxiliary component and then monitor them, provide real time alerts and execute long-term analysis on your complete work cells. These can be converted to visual dashboards for anyone to see.

- Robot Part Handling
- Press Side & Central Granulators
- Conveyors or Conveyor Systems
- Magnetic Mold Clamps & Mold Changing Systems
- Dryers
- Water or Air-Cooled Chillers
- Blenders
- Hot Runner Controllers
- Mold Temperature Controllers
- Central Water Processing

APPLICATION PROGRAMMING INTERFACE ACCESS

APIs allow websites to grab information from databases and display it in another place, such as another website or an ERP/MES system. This can be used in several ways, publicly or privately. With the right setup, M-Powered's API tools allow you to easily display machine analytics onto displays across your factory floor.

APIs are private and secure. Instead of providing an open door, an API request will require a 'key' to obtain access to the requested information. If the key does not match, the API call is denied, and the information does not go through. Practically speaking, this allows the creation of customized data dashboards and informative Andon displays as needed using M-Powered's secure API calling system.



API BENEFITS

APIs easily allow access to fast, reliable and secure shot by shot and minutely data for every connected machine in your fleet. M-Powered's advanced API suite provides access to productivity and operational data, costly downtime events and hundreds of process parameters with a few simple clicks. This data can be accessed programmatically to reduce barriers typically found when attempting to integrate asset data with plant-level systems.

Use this real-time data to support projects ranging from material ordering all the way down to automatic part rejection **to drive OEE and surpass the competition.**

DATA SECURITY

M-Powered gives you an unmatched level of security, integrity, expertise and application availability, all vital to the success of your business operations. The cornerstone of our security architecture is based on:



End-to-End Data Protection

Security of any data is guaranteed from the creation of the machine data, the transfer to the cloud, to the application and any API integration back into the computer system.



Managed Secure Network

Complete fully customizable user administration autonomy with granular access rights based on corporate division, machine and user – role. All transactions are completely auditable, and there are no limits on the number of users.



Geolocation – Private & Dedicated Servers

Private and dedicated servers physically located in your chosen geography provide redundancy, backup and fail-over with 24/7 availability to your machine data, with unlimited data storage.



Compliance to International Security Standards

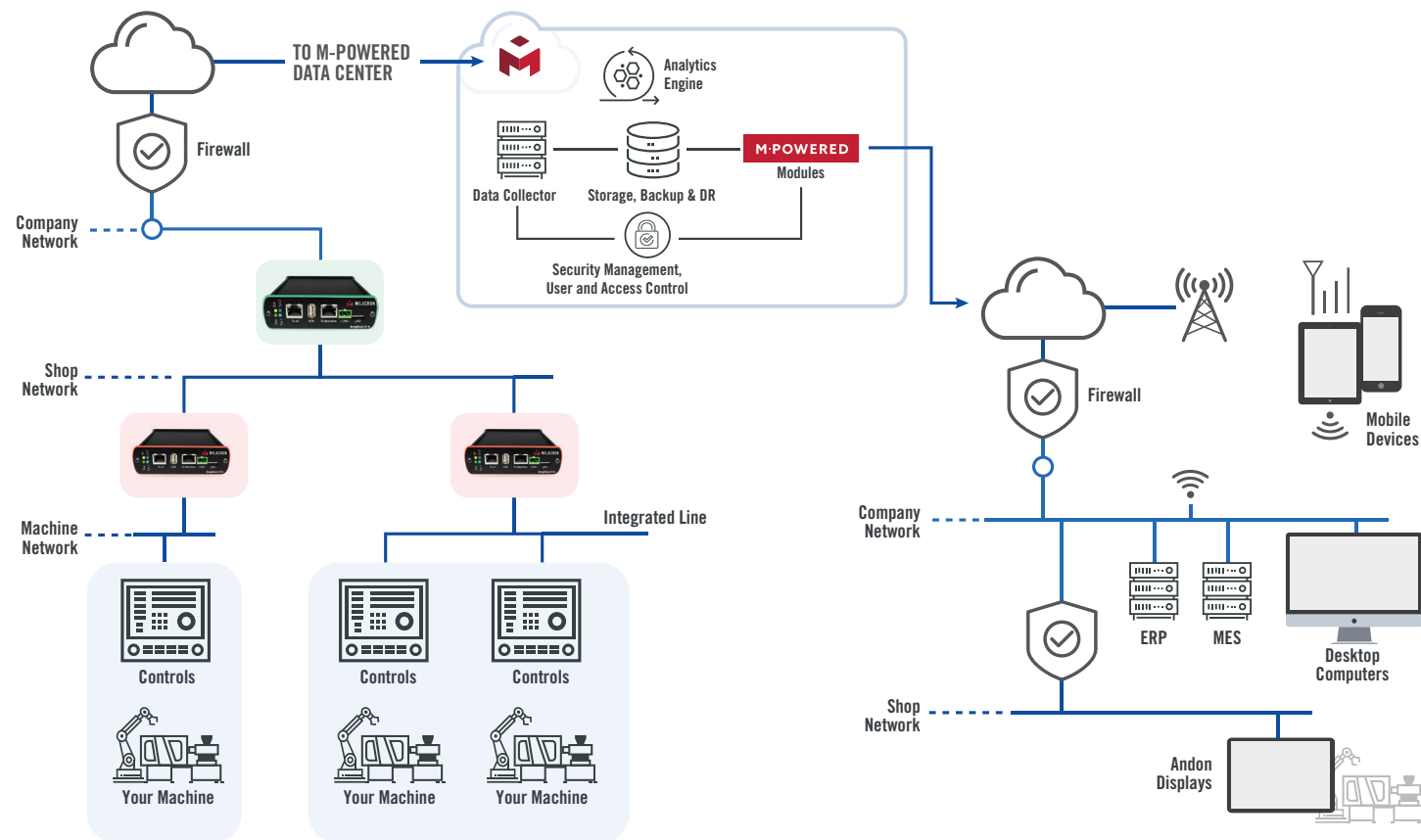
We constantly monitor and improve applications, systems and processes to provide a robust and secure solution. Certified to be in compliance with International Standard Organisation (ISO) 27001:2013, by DEKRA Certification B.V.



M-Powered maintains a secure connection for remote monitoring and access to equipment. While utilizing M-Powered hardware technology, your business is protected by the combined built-in security of a Virtual Private Network (VPN), firewall and other trusted protocols. M-Powered software isolates and silos each machine and your network for ultimate protection.

M-POWERED SECURE & PRIVATE CLOUD

M-Powered data centers around the world provide scalable, cloud-based data storage. These are home to our analytics, security and user administration and application modules that are accessible through web connections to registered and authenticated users.



KEY CAPABILITIES

- 🔒 **Certificate and key management**, provisioning of our edge devices with configurations and updates over our secure links
- 🔌 **Seamless integration** with your backend systems such as ERP, MES, inventory management, or supply chain applications, through a host of open and flexible APIs
- 🔍 **Provision of "Edge Analytics"** as well as custom integrated solutions to act on machine data in real-time, and data caching during network outages

AMPHION S14 HARDWARE

This plug-and-play IIoT edge device operates without complicated integration or development requirements over existing internet connections or via cellular links.

KEY FEATURES

- Secure VPN networks
- Edge Device with local caching
- Machine troubleshooting access
- Advanced access control features
- Data collection from devices
- Easy to set up and maintain hardware
- Cloud tools to manage network
- Secure subnets for machines

COMPATIBLE WITH

- ArcNet
- Control Net
- Data Highway +
- Ethernet
- Modbus
- OPC
- OPC-UA
- Profibus
- RS-232
- RS-422
- ... and many more



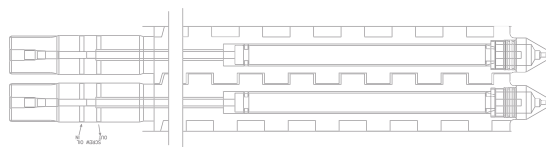
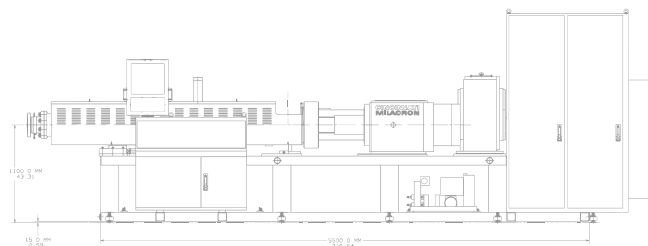
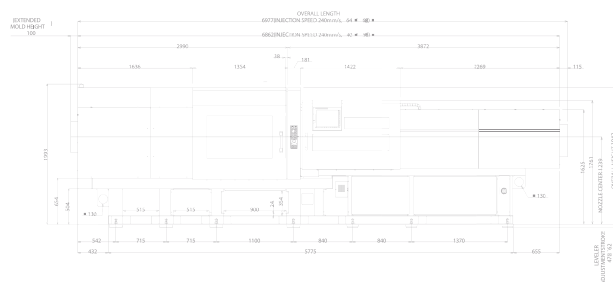
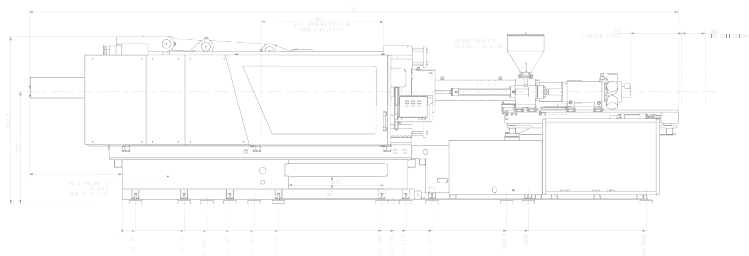
GREEN BOX AMPHION

Securely encrypts and consolidates all data generated on your site before it is transmitted to the data center via the Internet.



RED BOX AMPHION

Isolates each machine from other machines and everything else on your network. Interrogates your machines' controllers for status and data and can execute edge based filtering and analytics. Data is relayed to the green box while encrypted, or in plain text on your shop network, to allow you to monitor all data that is collected.



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