

Industry 4.0

Relevance and Implications In Indian Industry

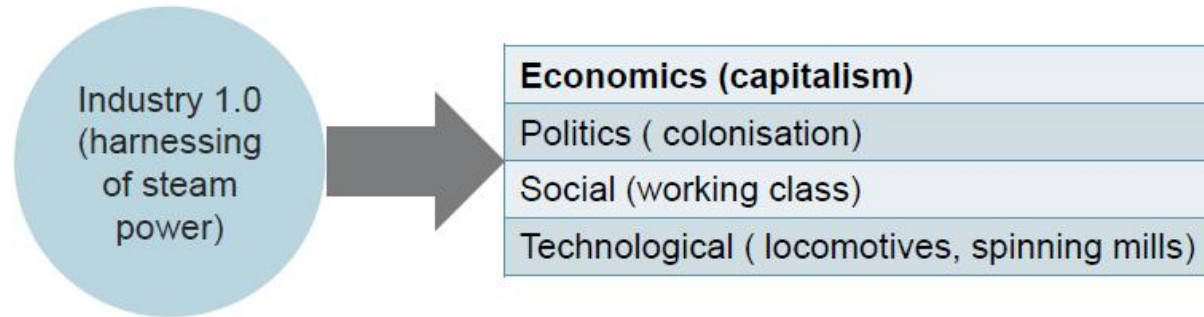
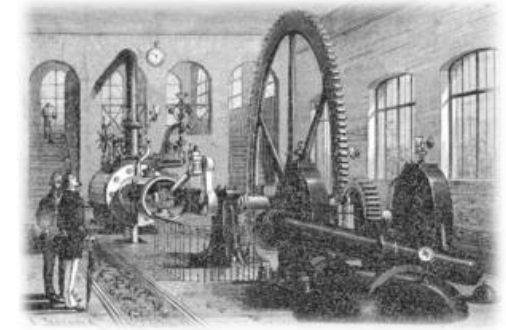
Is Industry 4.0 a Revolution?

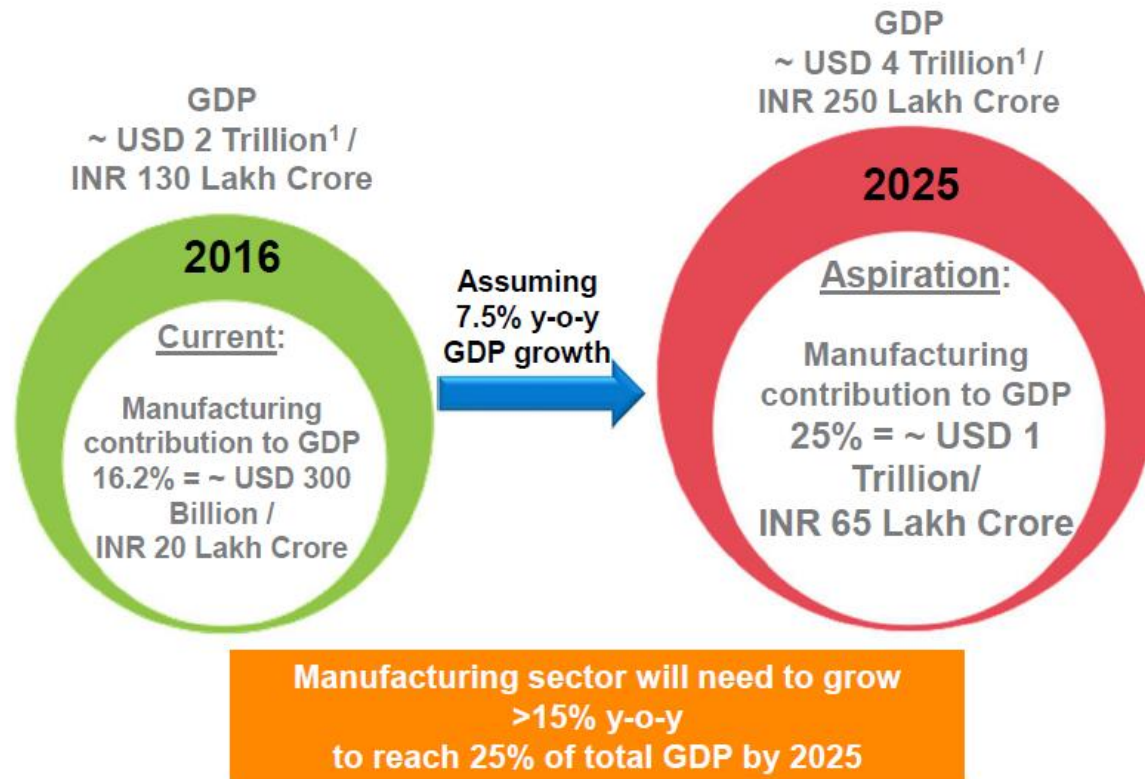
YES!

Revolution happens before it is declared / people realize.

INDUSTRY 4.0 a Revolution

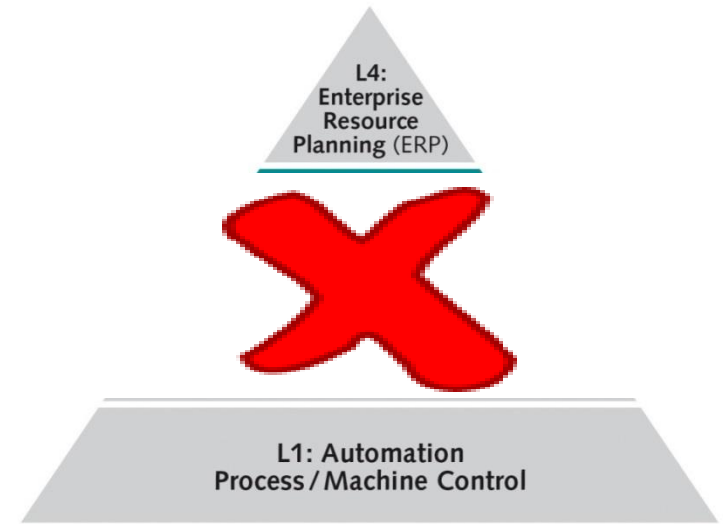
A movement is called a revolution when it impacts multiple dimensions of society.





Today's Manufacturing

- L1 - At the first level the machines have replaced the humans, thereby reducing time & increased production. PLC/SCADA operates the machine automatically. PLCs collect huge amount of data which can be used for analysis
- L2 - The Line Management system controls the manufacturing line based on inputs from L1.
L2 get the inputs through human intervention by manual data collection from L1.
- L3 – MES collects huge amount of data from L2 & presents information in form of Trends, Charts, OEE & other performance indicator to the analysts or Decision Makers.
- L4 - The Top level is the ERP, which is now commonly used by all industries to manage the production system.



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Due Human Intervention there is disconnect between L1 & L4

Today's Manufacturing

Today's Scenario

Due to Human Interventions there are risks/possibilities of

- Showing more production than actual
- Showing Less Downtime than actual
- Showing less rejections than actual

Result

- Mismatch between Raw Material Consumption vs Actual Production
- Financial Losses
- Inefficiencies gets unnoticed
- Investment in additional Manpower to identify the deficiencies.

Expectations

What Do We Want

Correct Information on

- Productivity
- Rejection
- Downtime
- Early warning on possible problems
- Energy Efficiency

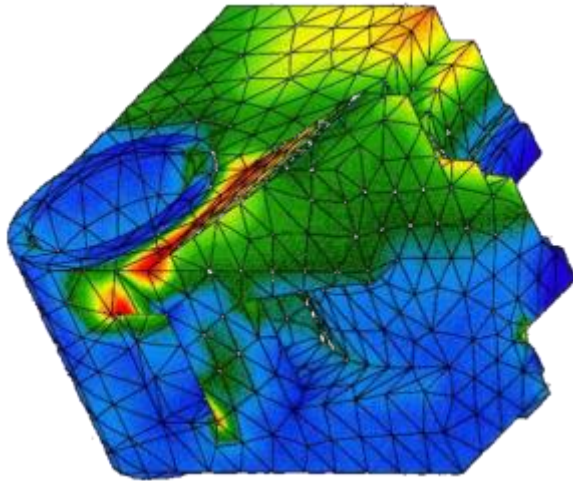
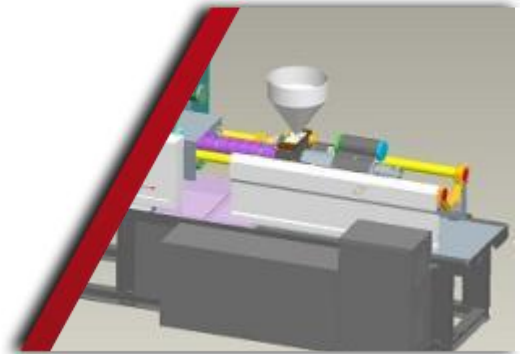
Result

- Correct & Informed decision based on above inputs
- Improved Financials

Global Designing

Engineering & Software Development

- Advance Computer Simulations viz.:
 - Finite Element Analysis (FEA)
 - Stress & Impact Load Analysis



Cellular Manufacturing

Assembly & Run-off

- Manufacturing & Process Excellence through Cellular Manufacturing Techniques which helps in
 - Cell Manufacturing Concept – Injection, Clamp, Hydraulics & Electrical + Electronics
 - Synchronous Material Feeding
 - Flexibility for Customization
 - Reduction in Floor Time
- ERP for Enhanced Business Productivity



Support Manufacturing

Paint Shop

- Pressurized Grit Blasting Room
- Pressurized Wet Paint Booths
- Pressurized Solvent Extraction System
- PNG fired Paint Baking Ovens
- Complying with current environmental regulations as per ISO 14001:2004

Heat Treatment Shop

In-house Gas Nitriding Shop ensures Superior Quality Surface Hardening of:

- Barrels
- Feed Screws
- Tip Seat Valves



Precision Part Manufacturing



Solutions with IoT



The Difference 1% Makes

Small improvements add up to make big differences in your operation.
All molders can uncover areas of improvement to recover lost productivity costs.

Factor	Baseline	Performance	Availability	Quality
Cavitation	48	48	48	48
Weight (g)	2.9	2.9	2.9	2.9
Cycle (s.)	5.5	5.4	5.5	5.5
Uptime (%)	90	90	91	90
Scrap (%)	3	3	3	2
Improvement (Production Vol.)	231.6 M Parts	+2.3 M	+2.3 M	+2.4 M
1% Annual Net Profit +		\$2,888	\$2,888	\$2,888

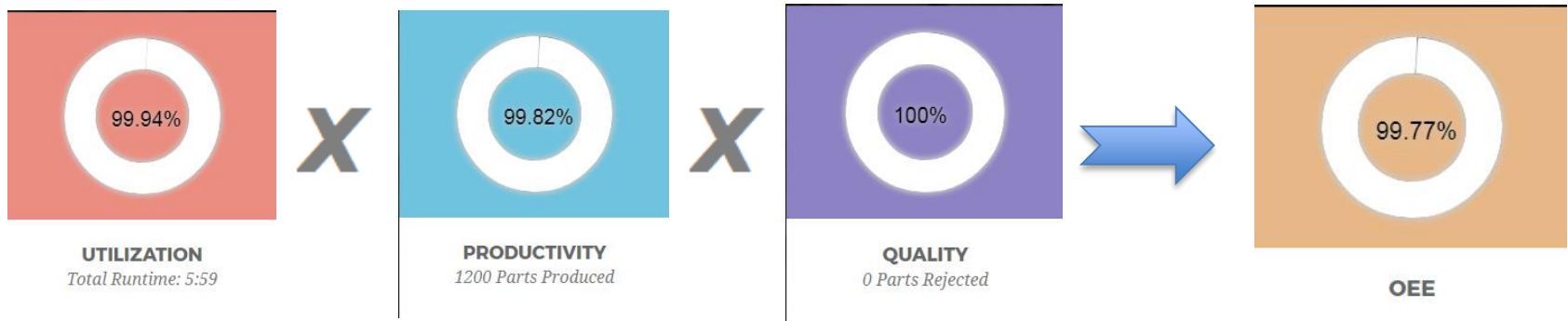
Figures in \$USD. Net profit calculations estimated off a cap & closure application. For reference only.



OEE Factor	World Class Manufacturing	Top 10% Molder	Average Molder
Availability	95%	94%	84%
Performance (Cycle)	98%	98%	95%
Quality	99.9%	98%	96%
OEE	93%	90%	76%

←
Most significant improvement opportunity

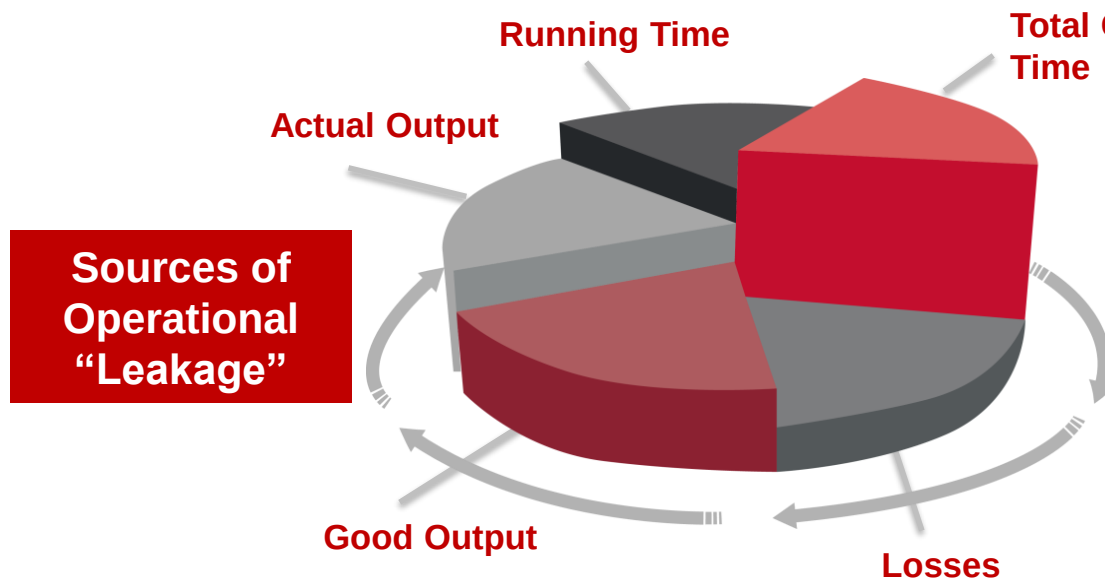
OEE – Overall Equipment Efficiency



- **OEE** gives a clear idea on how an equipment is performing or is being operated.
- It gives insight into the performance of the equipment and its user.

The Challenge

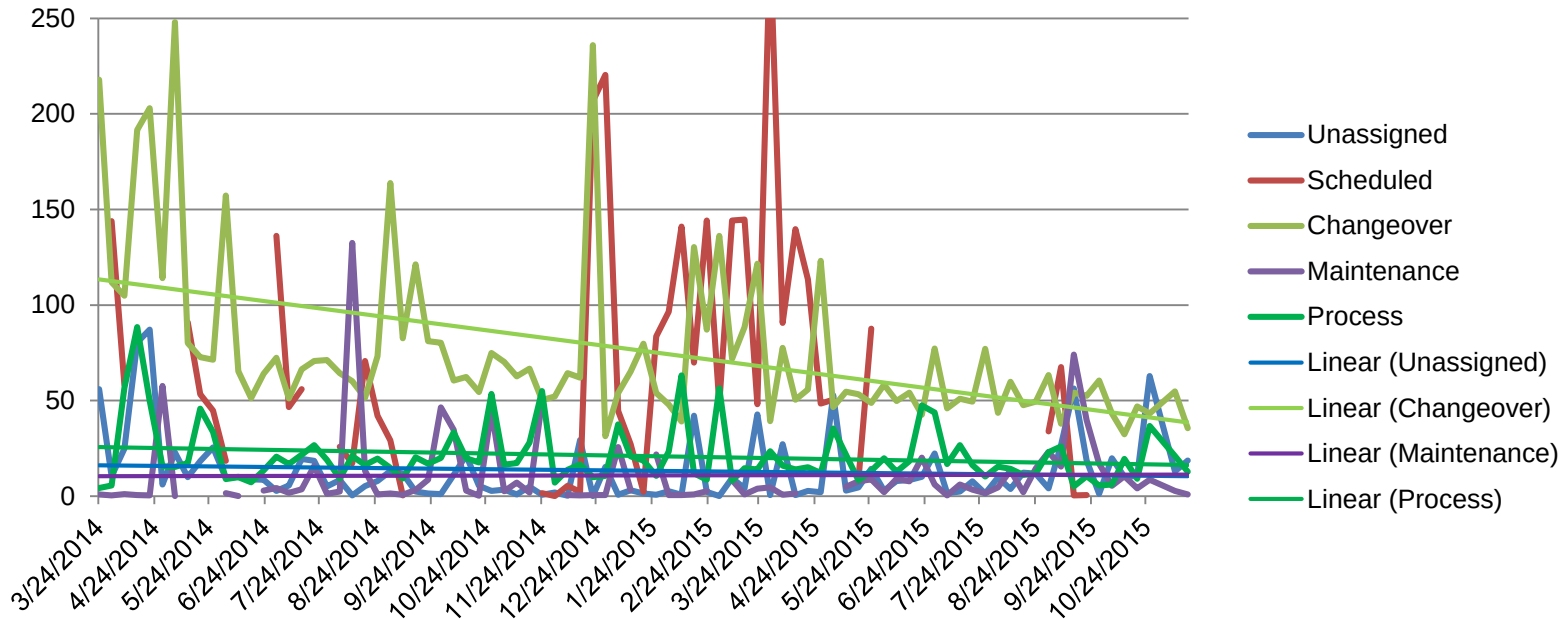
- Any reduction in **OEE** is a major issue that costs your business money that is difficult to recapture.
- Margins continue to get thinner and thinner.
- Milacron **M-Powered** is the **solution** that provides the data to help identify these opportunities and put money back in your pocket.



Overall Equipment Effectiveness	Recommended Six Big Losses	Traditional Six Big Losses
Availability Loss	Unplanned Stops	Equipment Failure
	Planned Stops	Setup and Adjustments
Performance Loss	Small Stops	Idling and Minor Stops
	Slow Cycles	Reduced Speed
Quality Loss	Production Rejects	Process Defects
	Startup Rejects	Reduced Yield
OEE	Fully Productive Time	Valuable Operating Time

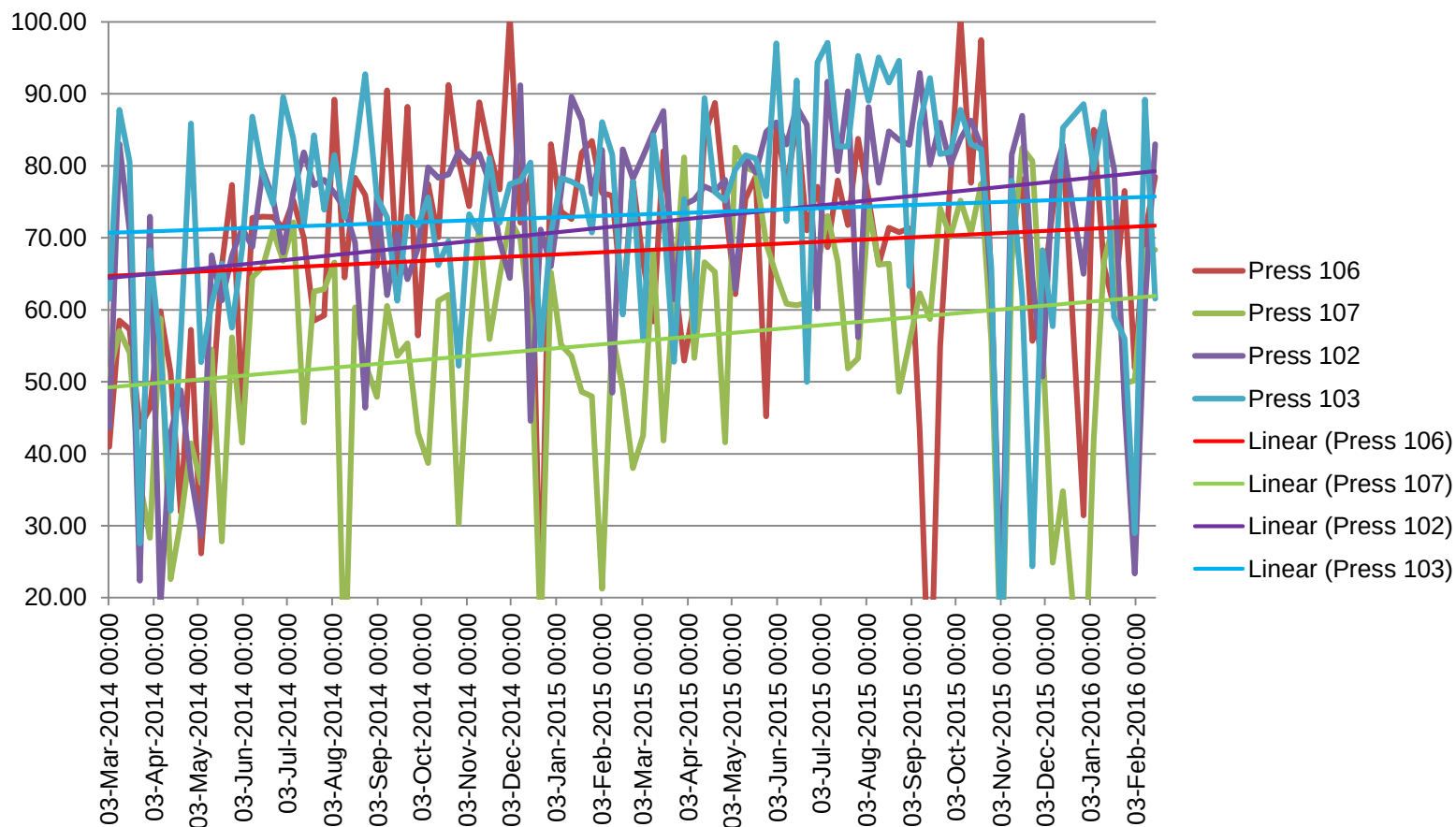
Capture the Six Big Losses to gain additional actionable insight to the OEE Factors of Availability, Performance, and Quality.

Downtime Improvement Case Study



- **Changeover downtime** was **reduced by 64%** in a 20 month period while using the **Milacron M-Powered** cloud solution.
- Focus was always on Changeover improvements on the machines, with more opportunity to address the unassigned and scheduled downtime instances as well.

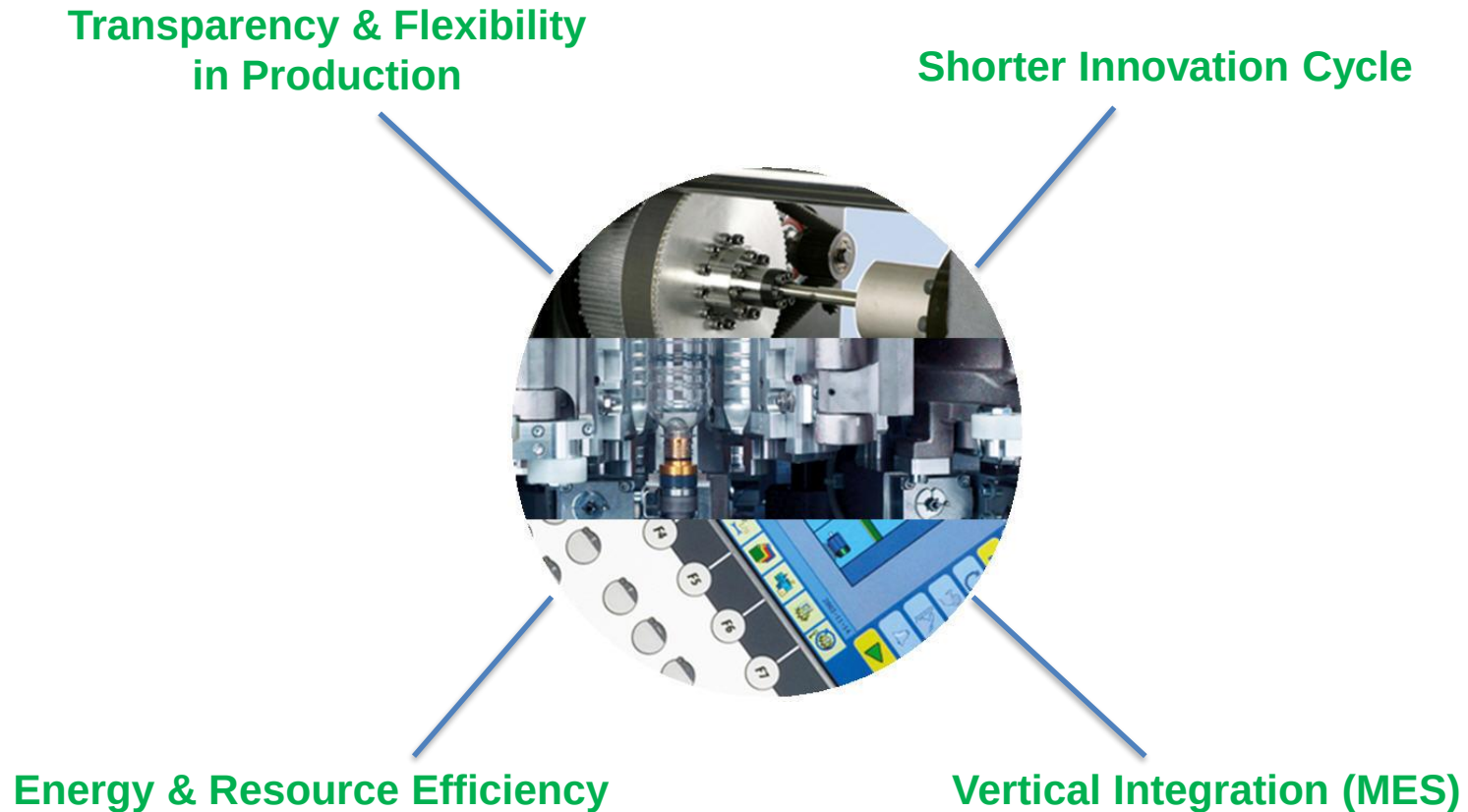
Overall OEE Improvements



A **9.8% OEE Increase** on a 40 second cycle was equal to 300,000 more parts across 4 machines in 20 months

	3-Mar-14	16-Feb-16	Increase	Average
Press 102	64.4	79.2	14.8	9.8
Press 103	70.7	75.7	5.0	
Press 106	64.6	71.6	7.0	
Press 107	49.3	61.8	12.5	

The Solution – Smart Factory



INDUSTRY 4.0 is the path to Smart Factory

SMART FACTORY

A Fundamental change
in the fabric of industry !

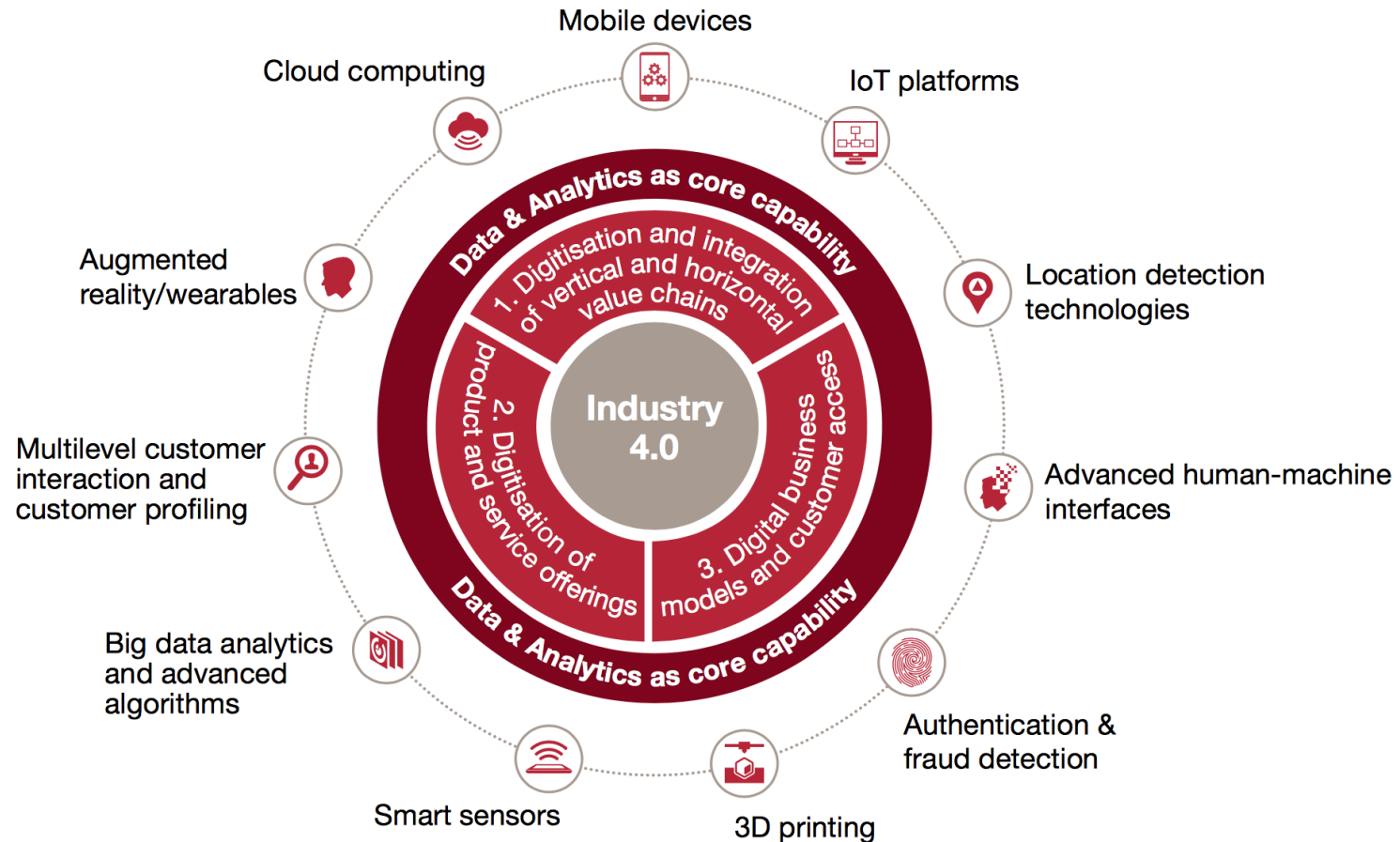
Transformation from linear
Value-Chain to Value Network

Close cooperation across companies,
disciplines and cultures



INDUSTRY 4.0

Use of above equipments/methods/software individually or in combination results in improved productivity



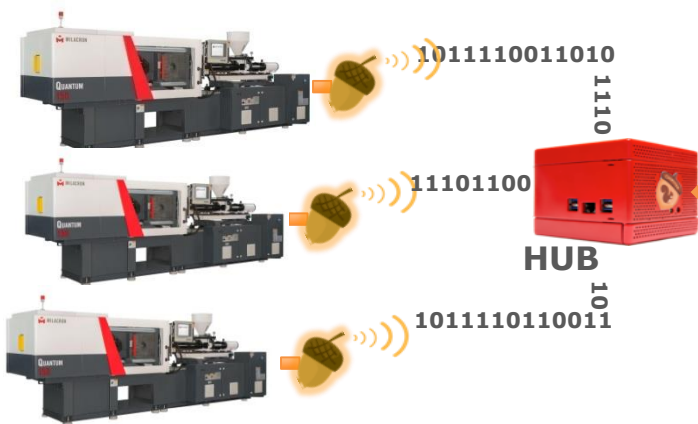
Connect all Equipment

**Cloud Based Analytics
Report/Summary**



**Head Office/Branch
Office/Factory
Office/Mobile/Tab**

Unit/Plant - 1



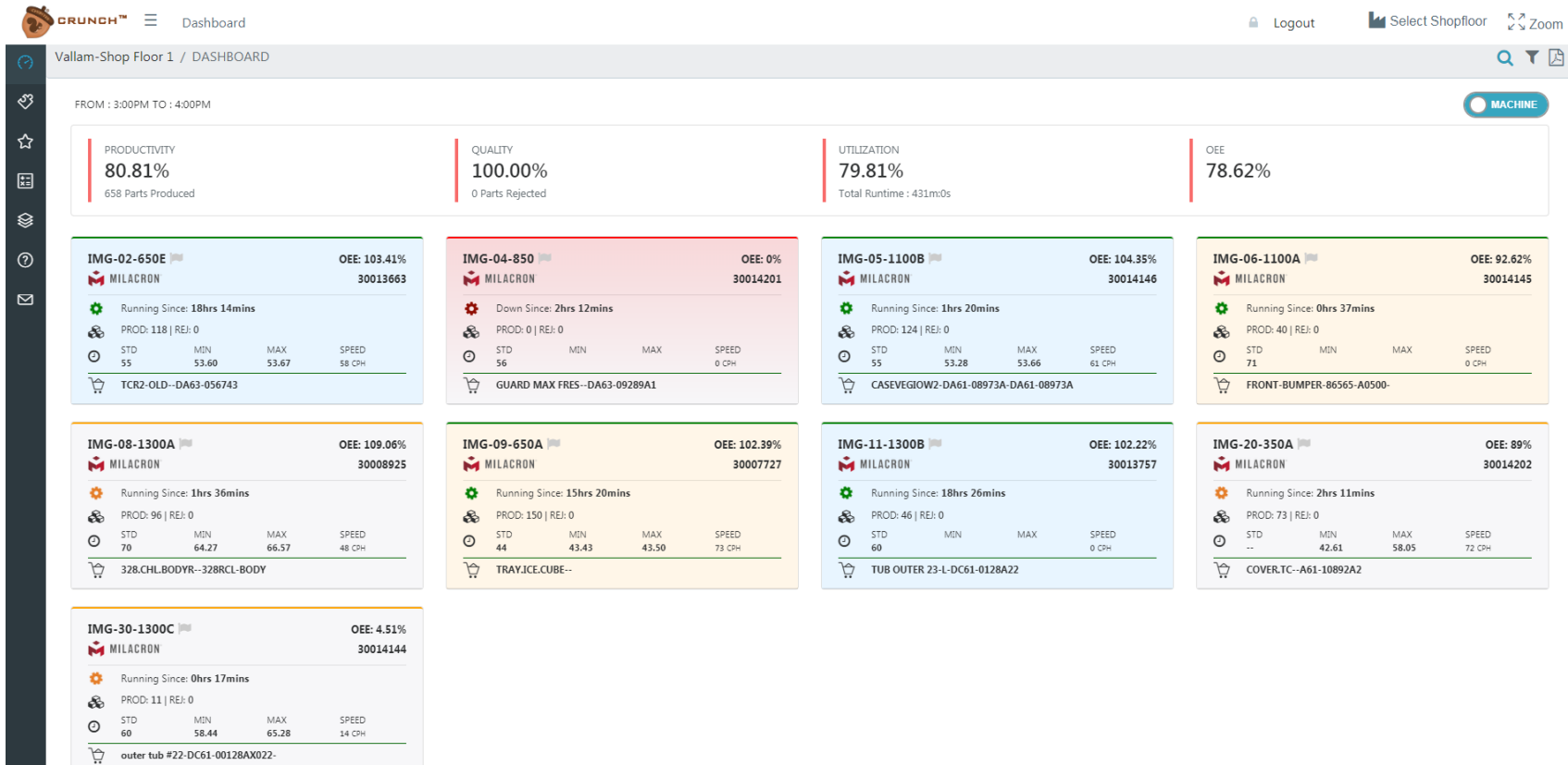
Internet

Unit/Plant - 2



- Collect information from all locations for analysis.
- Single Analytics Platform for the Multiple Locations.

Overview all Equipments

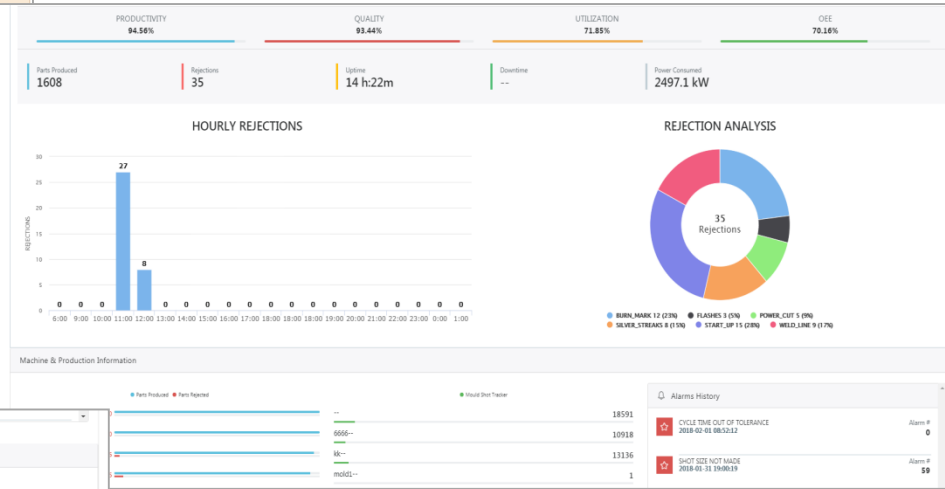
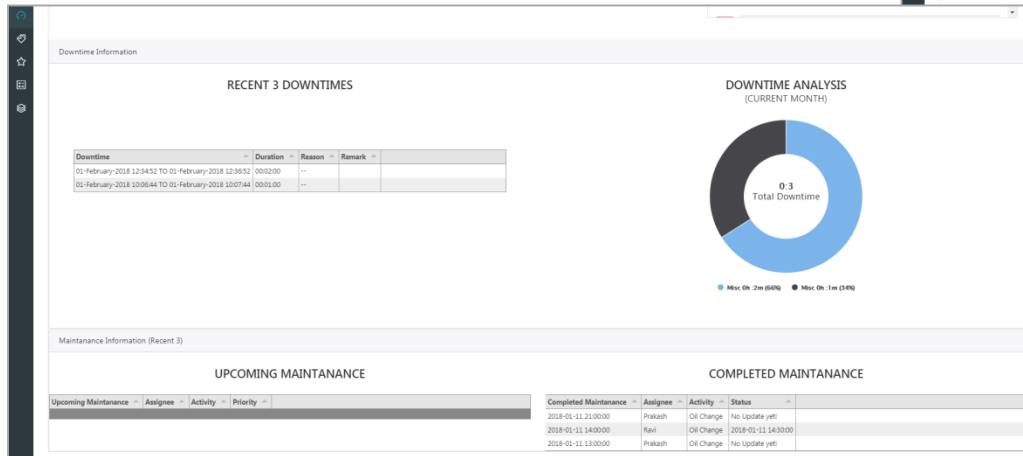


- Dashboard that provides status & information of all equipment at a glance
- Information of Multiple locations are provided on the same screen.
- **Plant level OEE, Productivity, Quality & Utilization is available.**

Overview of Modules

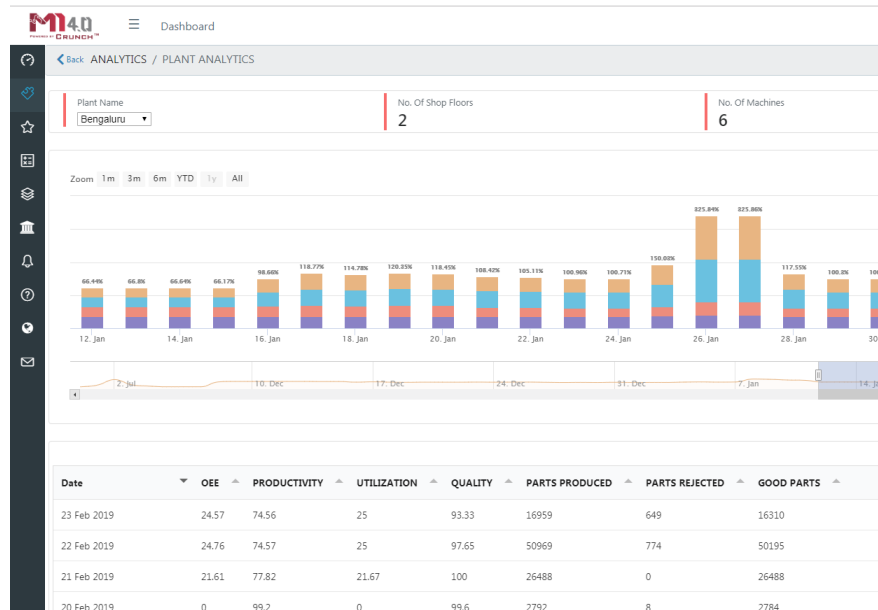


- Real Time Data
- Equipment specific Productivity, Quality, Availability & OEE



- Performance indicator
- Downtime Overview
- Maintenance Schedule
- Production details of each Mold

Overview of Modules



- **Plant Analytics** provides the total analysis of a plant (all shop floors)

- Comparison between the performance of different plants could act as a reference for improvement



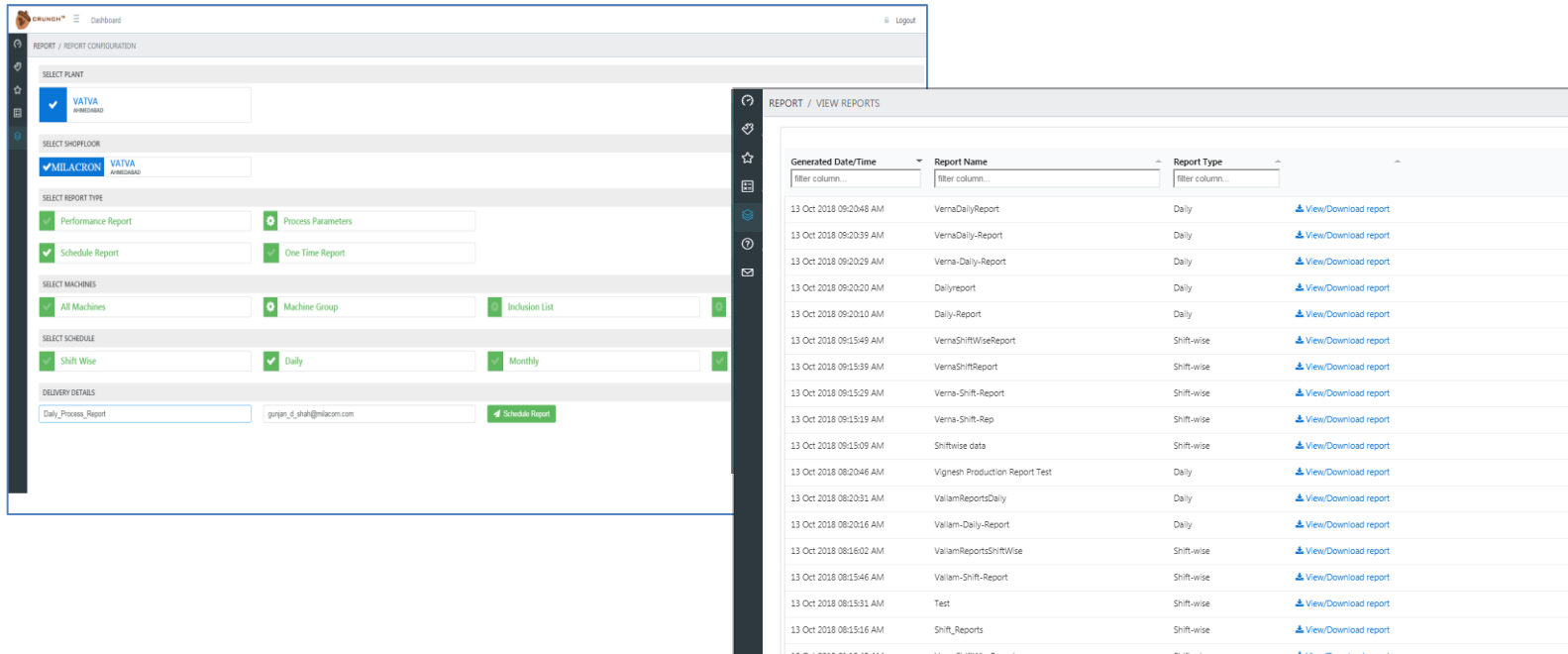
- **Shop Floor Analytics** provides the graphical comparison of the OEEs of all shop floors in a plant.

- Gives Clear idea on the performance of the shop floors with respect to others.

- Helps the Management to take informed decisions.

Various Reports

- **Scheduling** various Reports (Production, Process information etc)
- Reports can be **downloaded OR Emailed** in various formats



The screenshot displays the Milacron Reports interface. On the left, the 'REPORT / REPORT CONFIGURATION' panel allows users to select a plant (VATVA), shopfloor (MILACRON), report type (Performance Report, Schedule Report), machines (All Machines, Machine Group, Inclusion List), schedule (Shift Wise, Daily, Monthly), and delivery details (Daily_Process_Report, email address, and a 'Schedule Report' button). On the right, the 'REPORT / VIEW REPORTS' panel shows a table of generated reports with columns for 'Generated Date/Time', 'Report Name', and 'Report Type'. Each row includes a 'View/Download report' link.

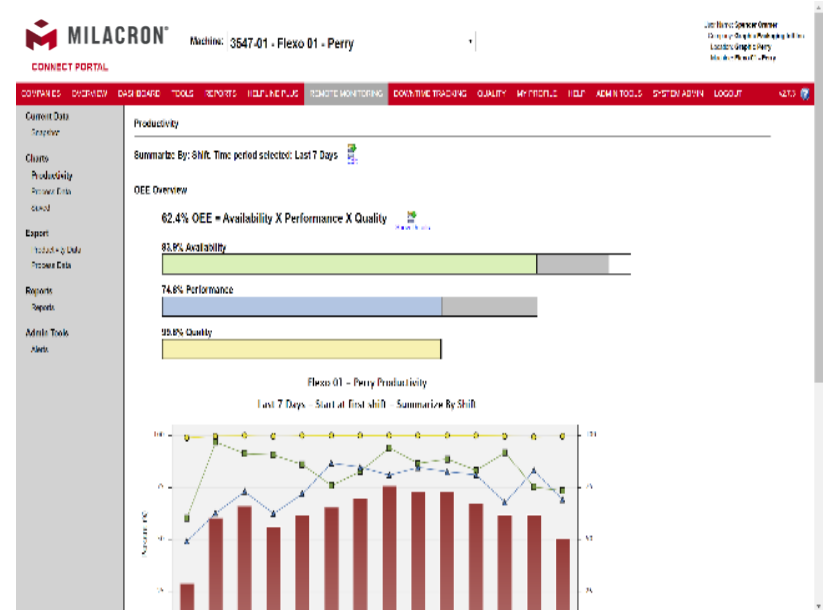
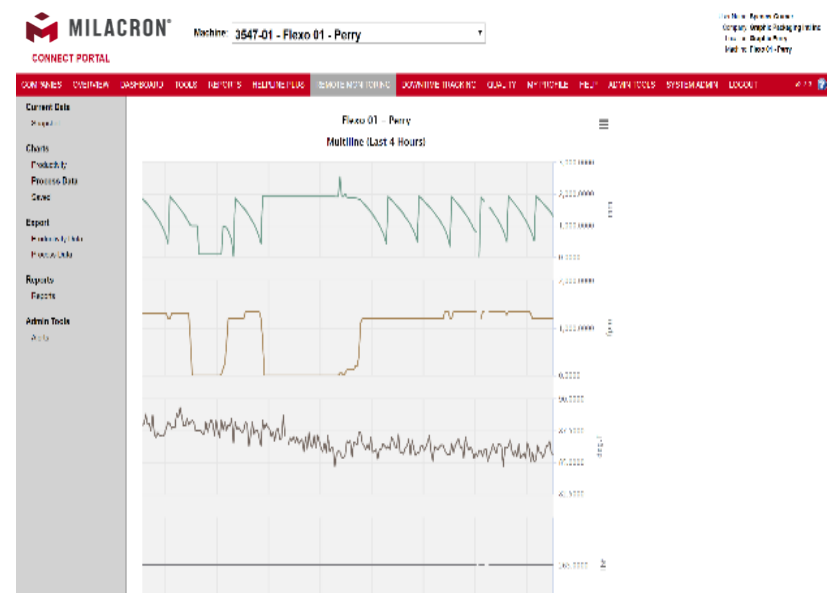
Generated Date/Time	Report Name	Report Type	
13 Oct 2018 09:20:48 AM	VernaDailyReport	Daily	View/Download report
13 Oct 2018 09:20:39 AM	VernaDaily-Report	Daily	View/Download report
13 Oct 2018 09:20:29 AM	Verna-Daily-Report	Daily	View/Download report
13 Oct 2018 09:20:20 AM	Dailyreport	Daily	View/Download report
13 Oct 2018 09:20:10 AM	Daily-Report	Daily	View/Download report
13 Oct 2018 09:15:49 AM	VernaShiftWiseReport	Shift-wise	View/Download report
13 Oct 2018 09:15:39 AM	VernaShiftReport	Shift-wise	View/Download report
13 Oct 2018 09:15:29 AM	Verna-Shift-Report	Shift-wise	View/Download report
13 Oct 2018 09:15:19 AM	Verna-Shift-Rep	Shift-wise	View/Download report
13 Oct 2018 09:15:09 AM	Shiftwise data	Shift-wise	View/Download report
13 Oct 2018 08:20:46 AM	Vignesh Production Report Test	Daily	View/Download report
13 Oct 2018 08:20:31 AM	VallamReportsDaily	Daily	View/Download report
13 Oct 2018 08:20:16 AM	Vallam-Daily-Report	Daily	View/Download report
13 Oct 2018 08:16:02 AM	VallamReportsShiftWise	Shift-wise	View/Download report
13 Oct 2018 08:15:46 AM	Vallam-Shift-Report	Shift-wise	View/Download report
13 Oct 2018 08:15:31 AM	Test	Shift-wise	View/Download report
13 Oct 2018 08:15:16 AM	Shift_Reports	Shift-wise	View/Download report
13 Oct 2018 08:15:01 AM	Vignesh Production Report Test	Daily	View/Download report



- View & Edit the created Schedules.
- View & Download the Old Reports

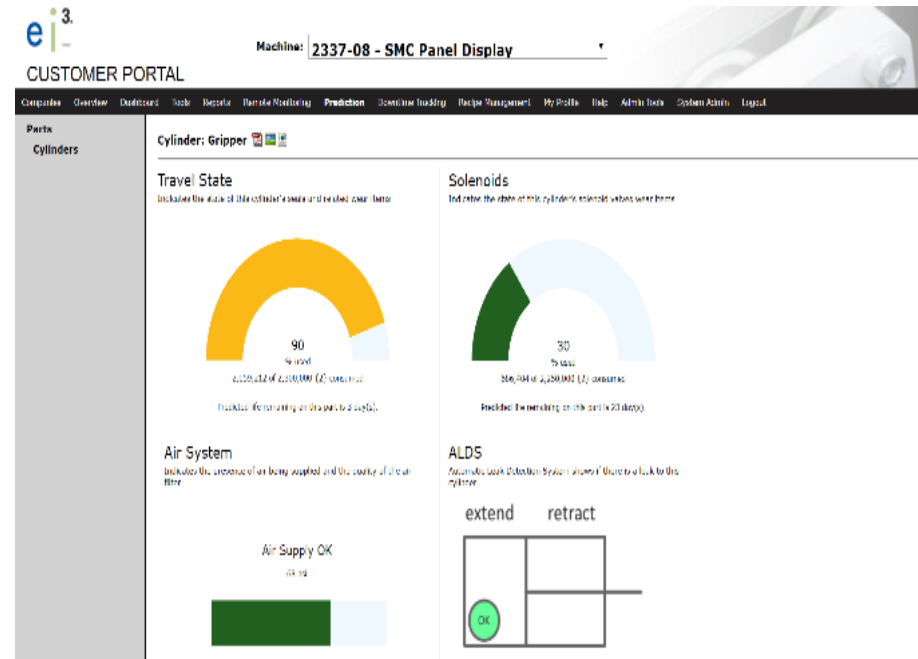
Remote Service, Data & Alerts

- **Remote Service** provides the ability for Milacron experts to provide remote assistance, thus **reducing downtime**.
- Utilize **Data and Alerts** to monitor your process and **prevent costly quality escapes**
- Setup and easily output **ISO quality reports** that can be ran **automatically** at your discretion
- Foundational **building block** for Alerts and **Predictive Analytics**

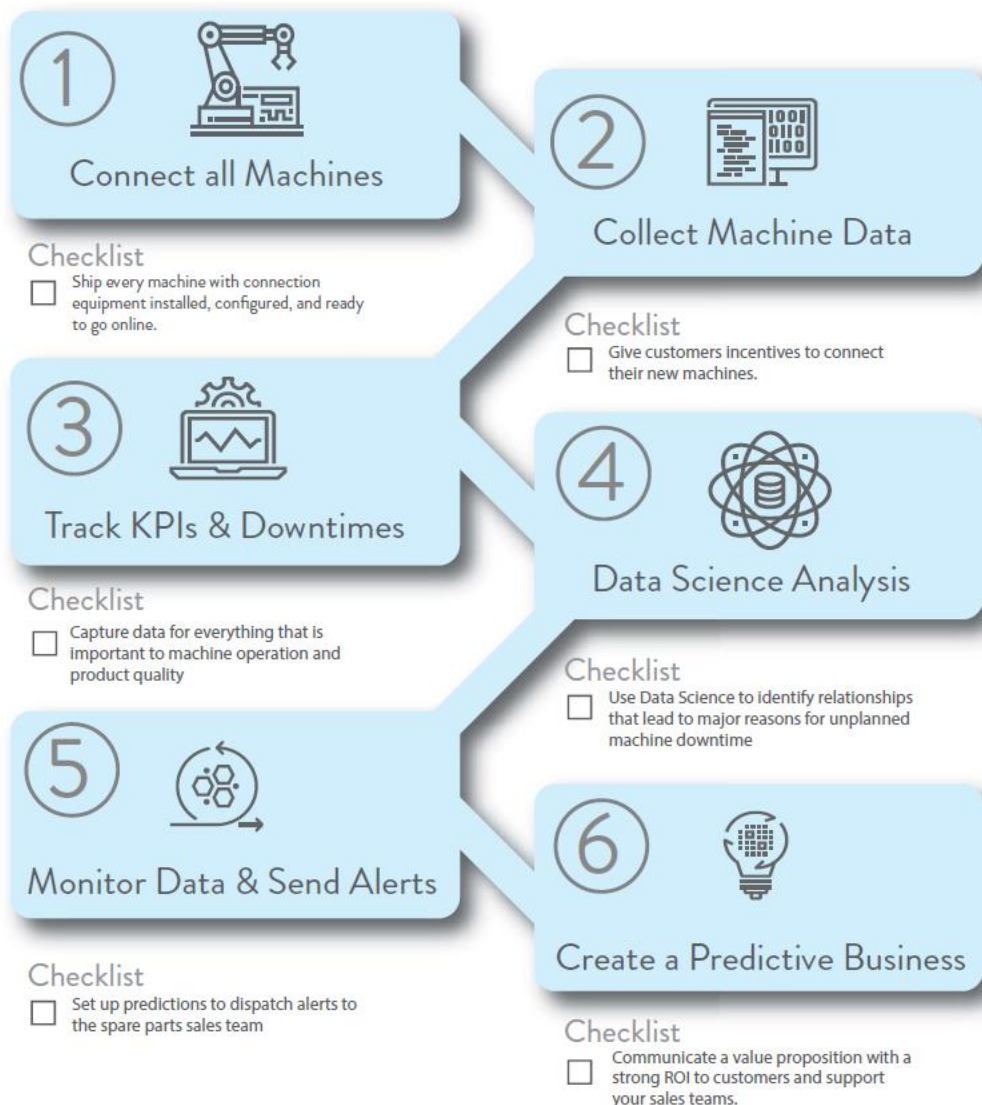


Maintenance Scheduling

- Downtime can be reduced by maintaining (or over-maintaining) the utility.
- **Over-maintenance** leads to **financial losses** due to excessive inventory, frequent replacement of parts.
- To avoid over-maintaining machinery Milacron works with customer to create a **Preventive Maintenance schedule** for every machine based upon actual machine run time and diagnostics.
- This allows for **intelligent stocking programs** to ensure a **lean inventory**
- **Free up workforce** for value-added activities



The M-Powered Path to Predictive



- The **Path to Predictive** is **not an overnight journey**, and will have multiple iterations.

- However, without connecting the equipment and collecting data the process can never begin!

Connect from Anywhere

Companies Overview Dashboard **Tools** Reports Remote Monitoring Downtime Tracking My Profile Help Admin Tools Logout

Schedules
Manage Schedules
Documents
Manual Quality
Tracker
Mobile Portal

Job Management
Job Queue
Jobs
Job Runs
Products
Operations
Customers
Tools Types
Tool Catalog

Milacron Mobile Portal

Milacron Mobile Portal is a native mobile application that allows machine owners to remotely monitor the productivity of their machines. Key performance indicators and data points supporting best practices in lean manufacturing such as Overall Equipment Effectiveness, OEE, are delivered to iOS and Android smartphones and tablet devices.

Mobile Portal (iOS)

Mobile Portal (iOS) is available for the iPhone 3GS and later as well as all models of iPad.



Available on the App Store
Download Mobile Portal (iOS) [here](#)



Mobile Portal

Machine	Speed	OEE
PowerPak #1 574845340 Milacron Demo	108 Cycles/Hr	28.9
PET 110 (PLASTINDI... 30006118 Ahmedabad	0 Cycles/Hr	16.2
ELEKTRON 200... 30007513 Ahmedabad	0 Cycles/Hr	10.4
MT 150 Accupack... 30007820 Ahmedabad	0 Cycles/Hr	28.4
ELEKTRON 180 (OPE... 30007514 Ahmedabad	0 Cycles/Hr	1.7

Mobile Portal

PowerPak #1 PET 110 (PLASTINDI...)

PowerPak #1
574845340
Milacron Demo



OEE **28.9**
Availability 73.5 Performance 41.2 Quality 95.6
Evaluated over past 24 hours

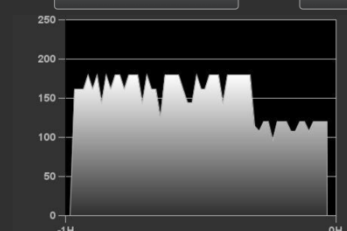
Mobile Portal

PowerPak #1 PET 110 (PLASTINDI...)

PowerPak #1
574845340
Milacron Demo

Speed Up since last stop Material 24h
108 **00:51:33** **1736**
Cycles/Hr HH:MM:SS Parts

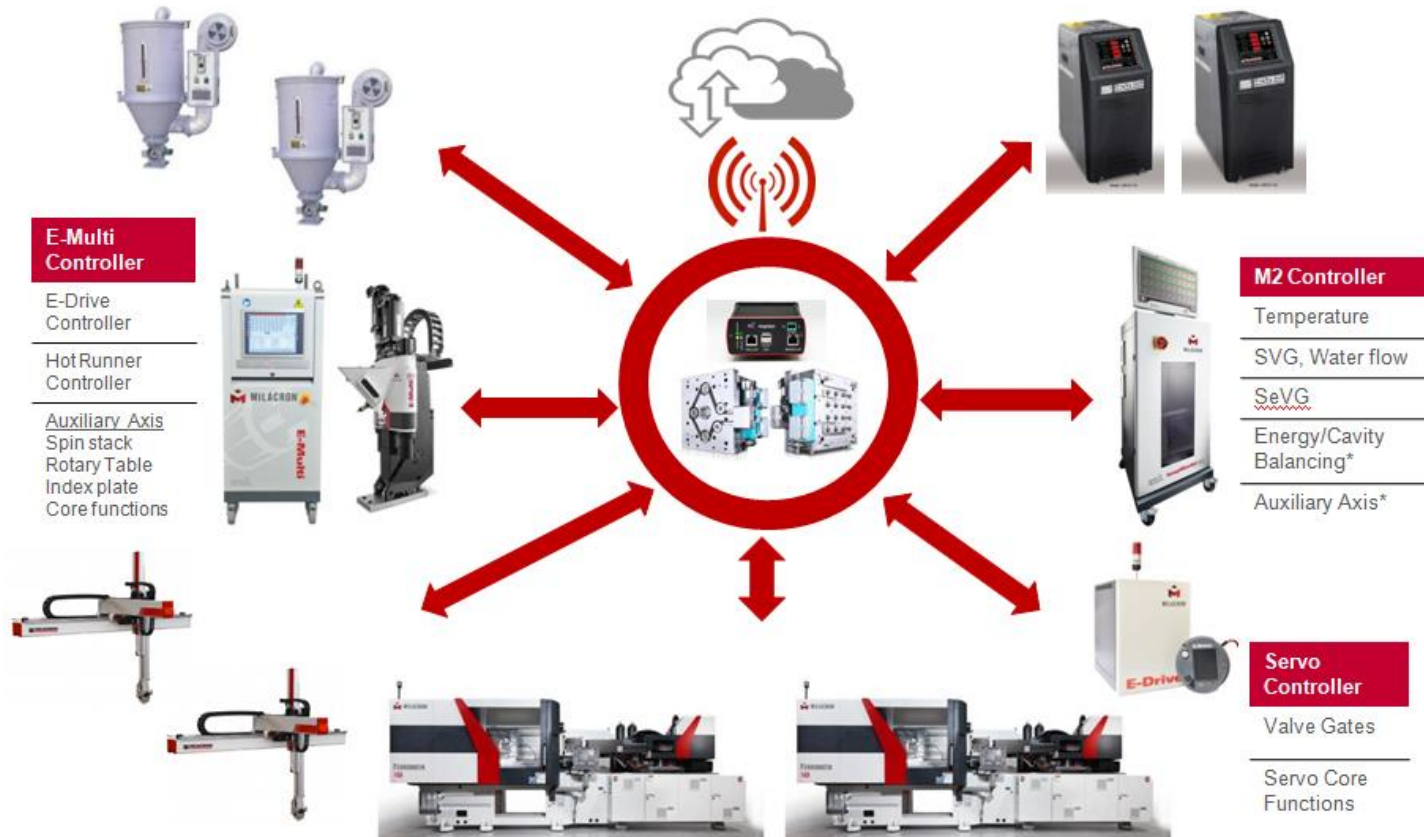
Chart: **Speed: Cycles Per Hour** Hours: **1**



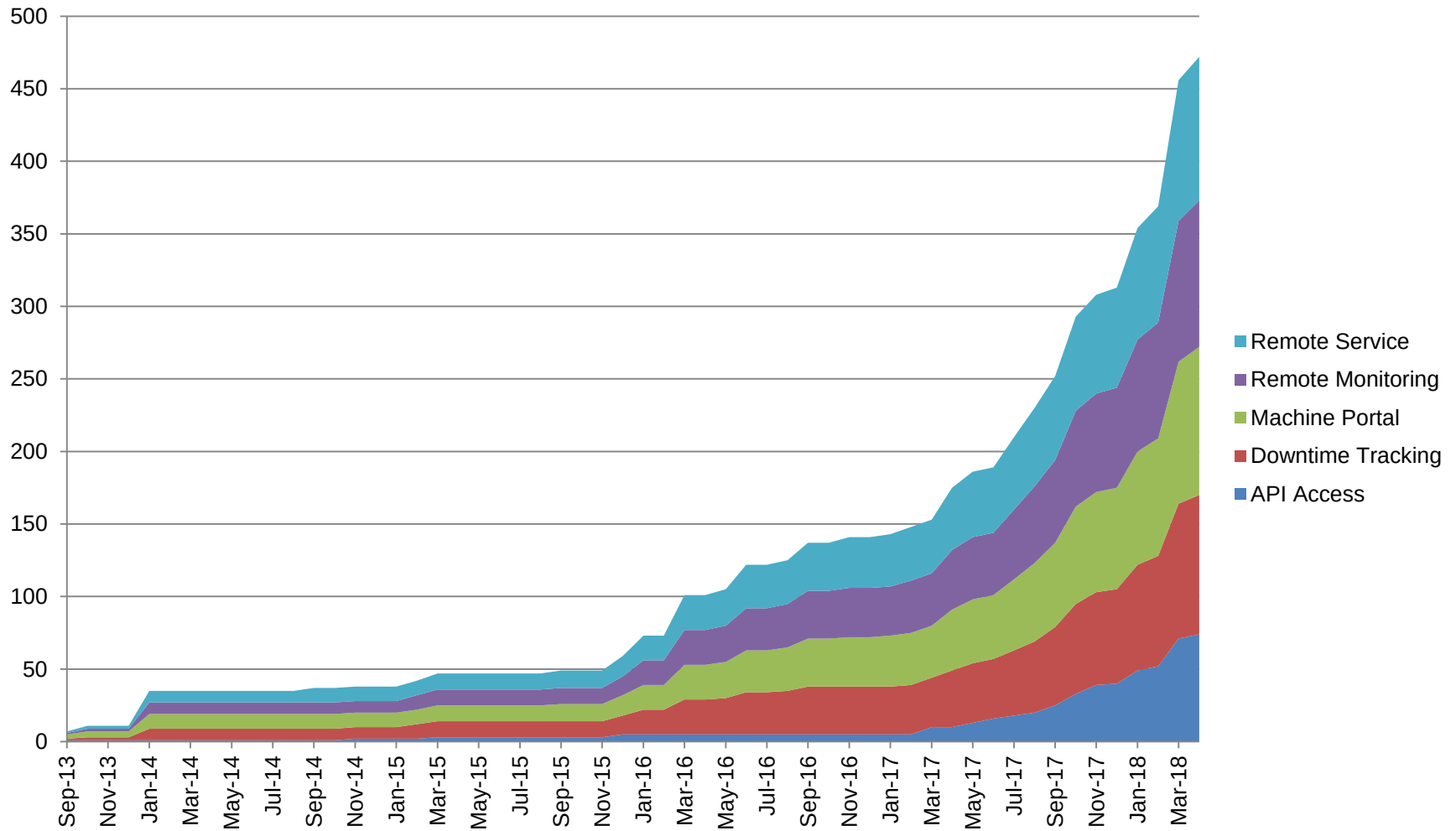
OEE **28.9**
Availability 73.5 Performance 41.2 Quality 95.6
Evaluated over past 24 hours

Connect to Anything

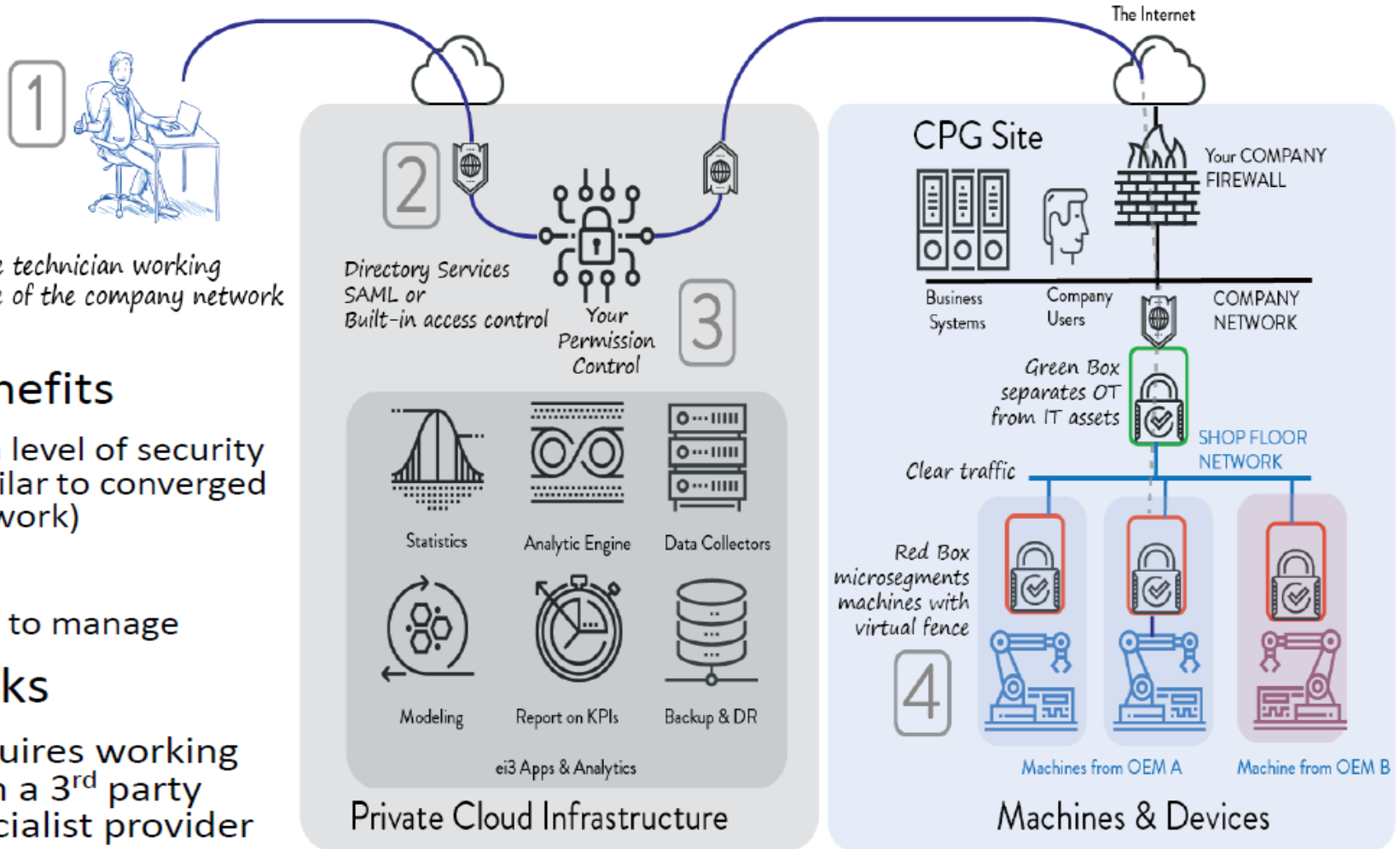
Smart Connected Workcell of the Future



M-Powered Active Users



Security is at our CORE



Benefits

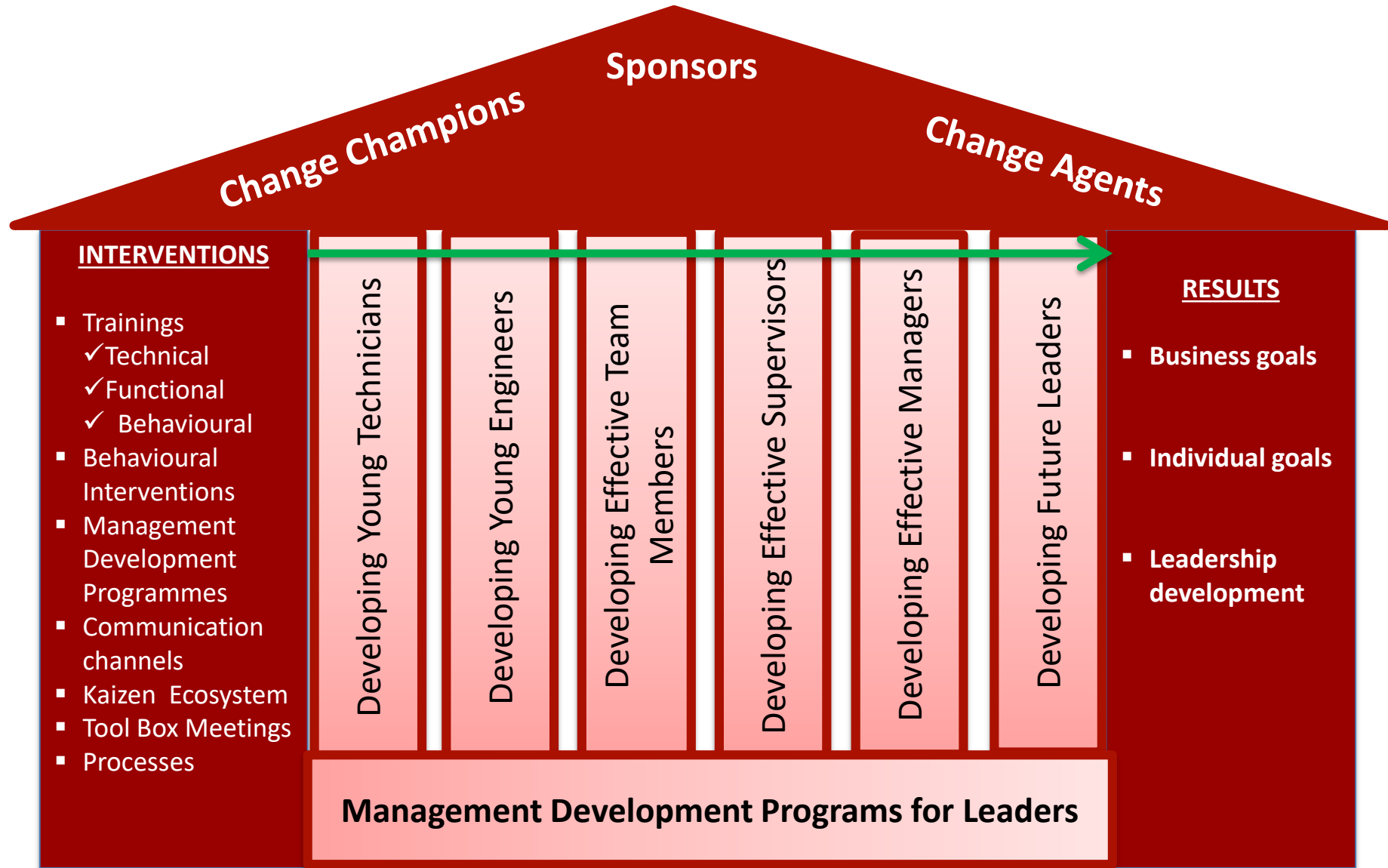
High level of security
(similar to converged
Network)

Easy to manage

Risks

Requires working
with a 3rd party
specialist provider

People Development and Culture Building



Implication of Industry 4.0 on Manufacturing

- Automated OEE data
- Process & Quality Management
- Effective Production Planning
- Predictive Maintenance & Machine Life check
- Downtime Analysis for finding the root causes of repetitive problems.
- Quick Production & Process parameters reports & Management information
- Better utilization of Manpower

Future - “Act on –What I See”



Thank You & Jai Hind

