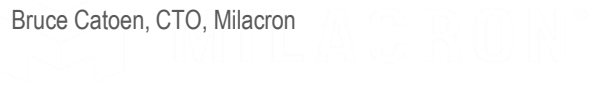


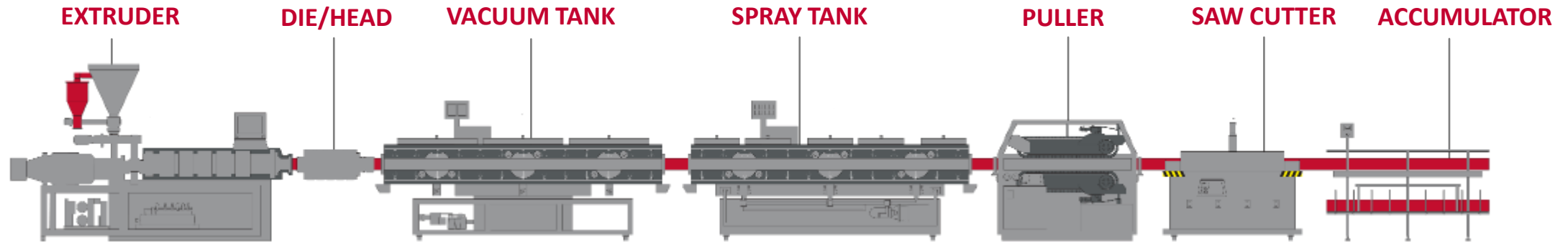
IloT's impact on the molding factory of the future

May 10, 2017

Bruce Catoen, CTO, Milacron



Complexity is constantly increasing



10 to 16 PLC controlled elements, 250 ft long lines

- Thinner, faster
- Higher temperatures
- Higher pressures
- Increased complexity
- Increased precision
- New resins
- Multi-material
- Higher cavitation
- Color change
- Reduced scrap
- Reliability



Workcell Today

Up to 16 independent devices

E-Drive Controller

Single Drive

Dual Drive

Quad Drive

(4) Wires permission /status

(4) Wires – permission and Trigger

(4) Wires – permission /status



M2 Controller

Temperature

SVG (Priamus, Kistler)

Water flow Monitoring



E-Multi Controller

E-Drive Controller

Hot Runner Controller

Indexing Plate

E67 – 50 wires

(4) Wires permission /status

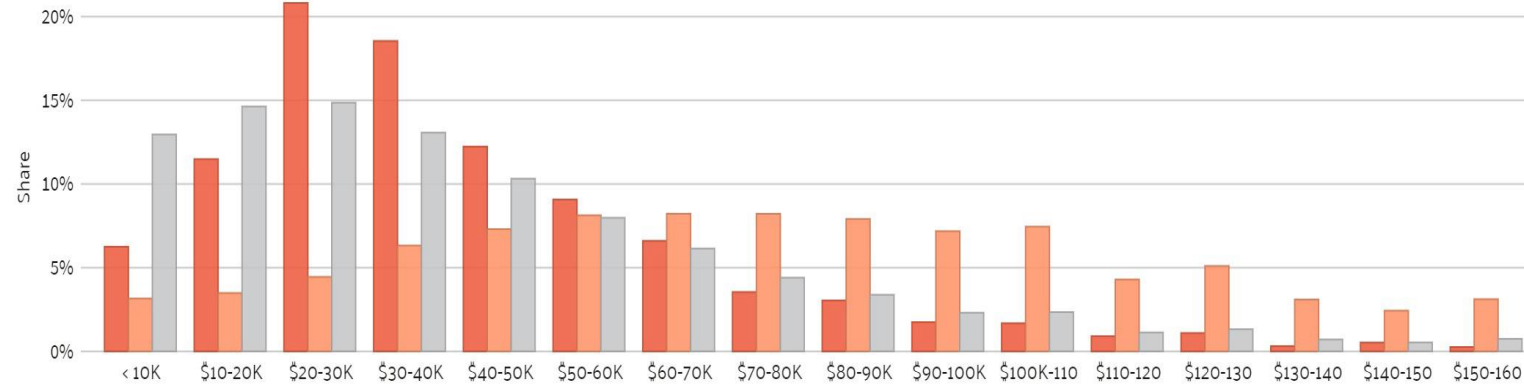


Aging, Skills declining and Wage Gap widening

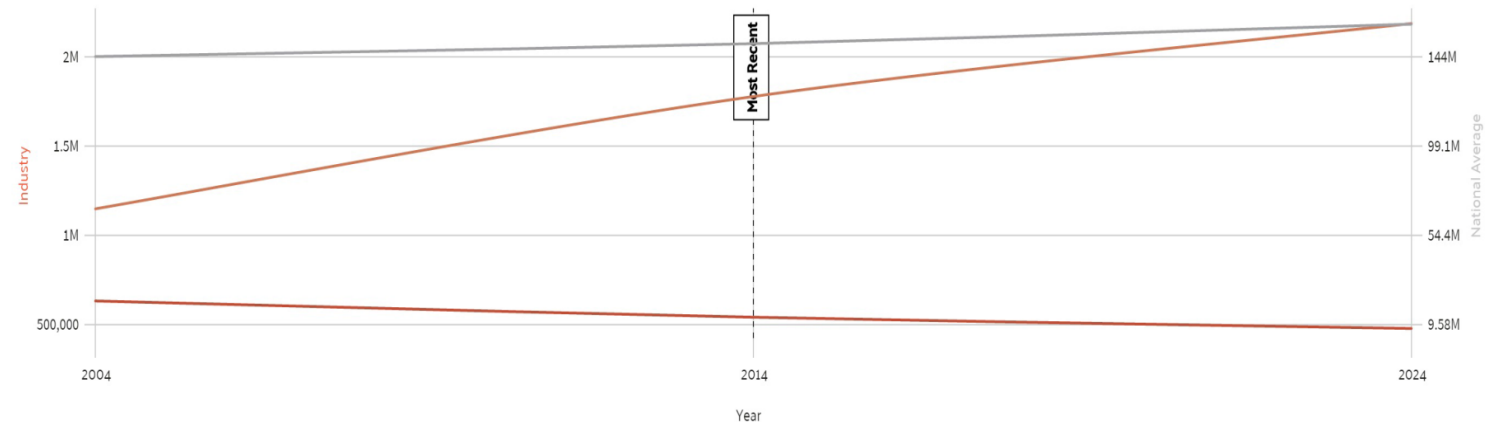


- The average plastics professional earns significantly less than the average computer professional
- The average age of a plastics professional is 43 years with a median of 50
 - Expected employment growth is negative 5% vs national average of 6.5%
- The average age of a computer professional is 40 years but the median is 30 years.
 - Average employment growth is expected to be 13%

Wage Distribution for Plastics Product Manufacturing



Job Growth for Plastics Product Manufacturing

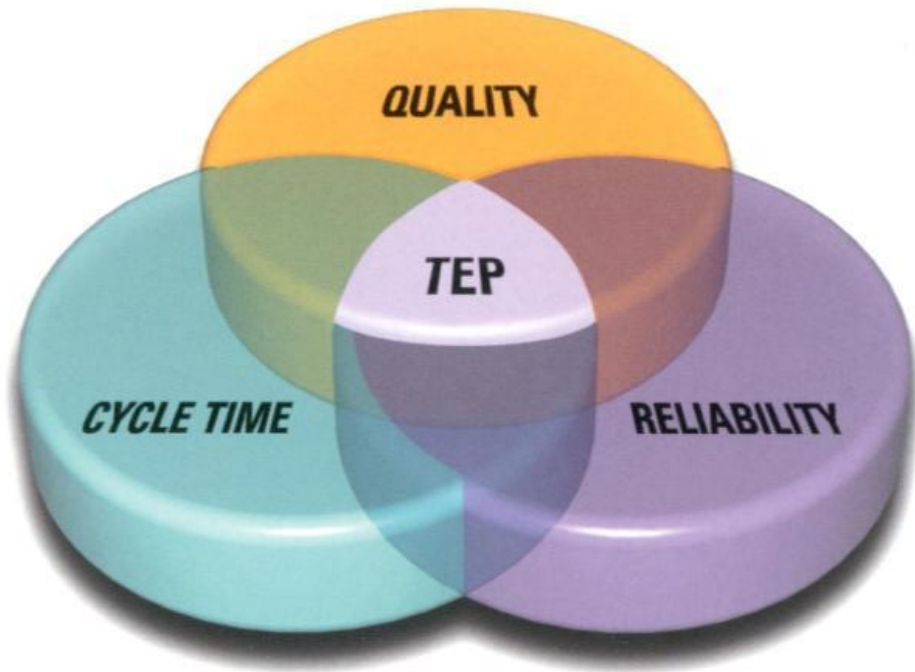


Dataset: Industry Projections
Source: Bureau of Labor Statistics

Sources: Bureau of Labor Statistics and National Census Bureau

DATAUSA:

Every % matters in today's factory



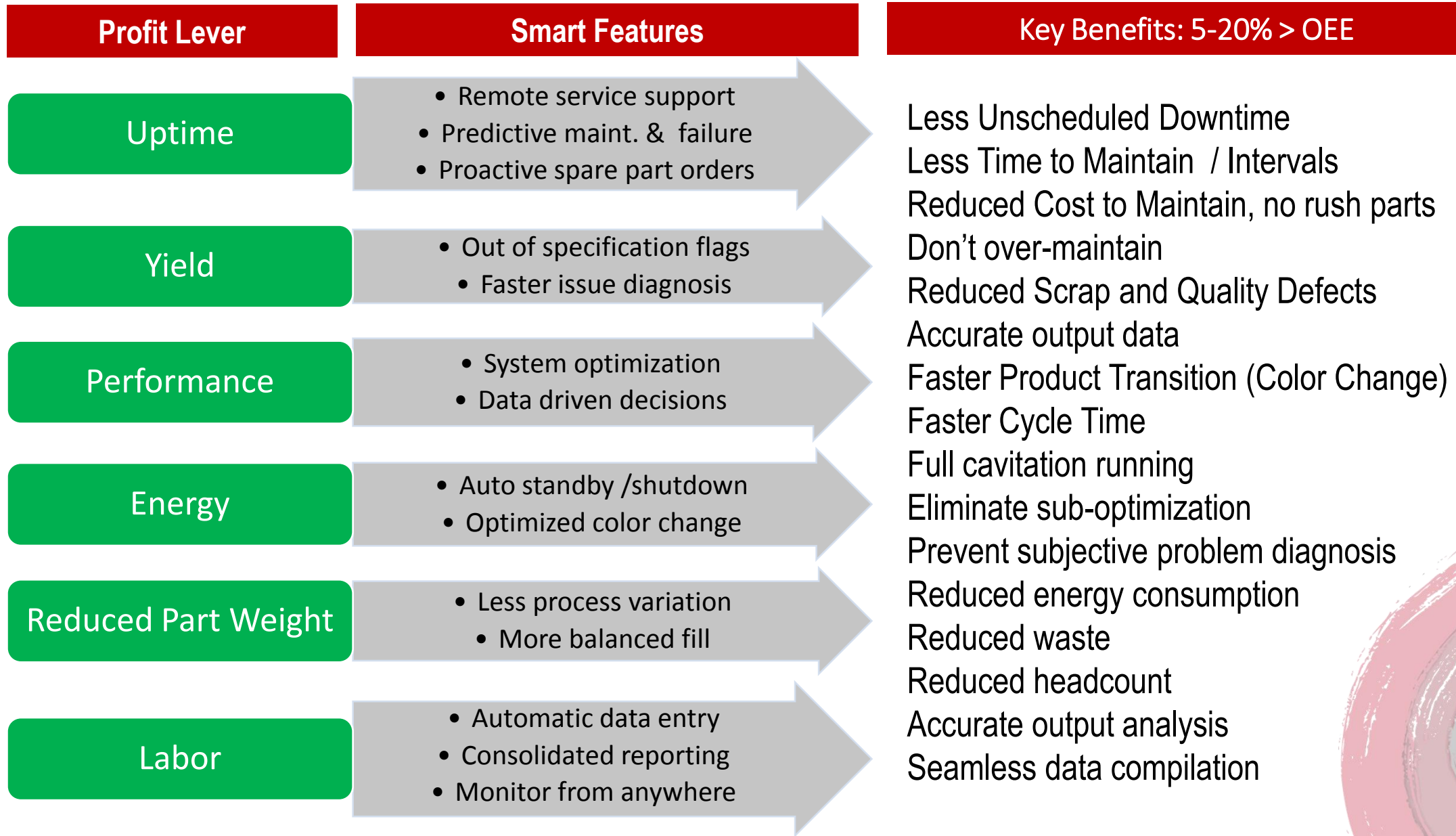
OEE Factor *	Average Molder	Top 10% Molder
Uptime /Reliability	84%	94%
Cycle time	95%	98%
Quality	96%	98%
OEE	76%	90%

* OEE.com

The Impact of 1% OEE

1%	Baseline	Faster	Scrap	Uptime
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	90	91
Scrap (%)	3	3	2	3
Impact		2M parts	2.2M parts	2.2M parts

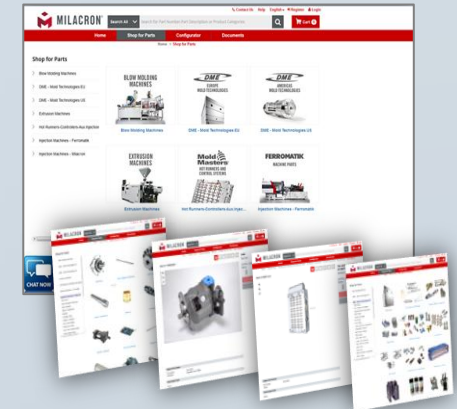
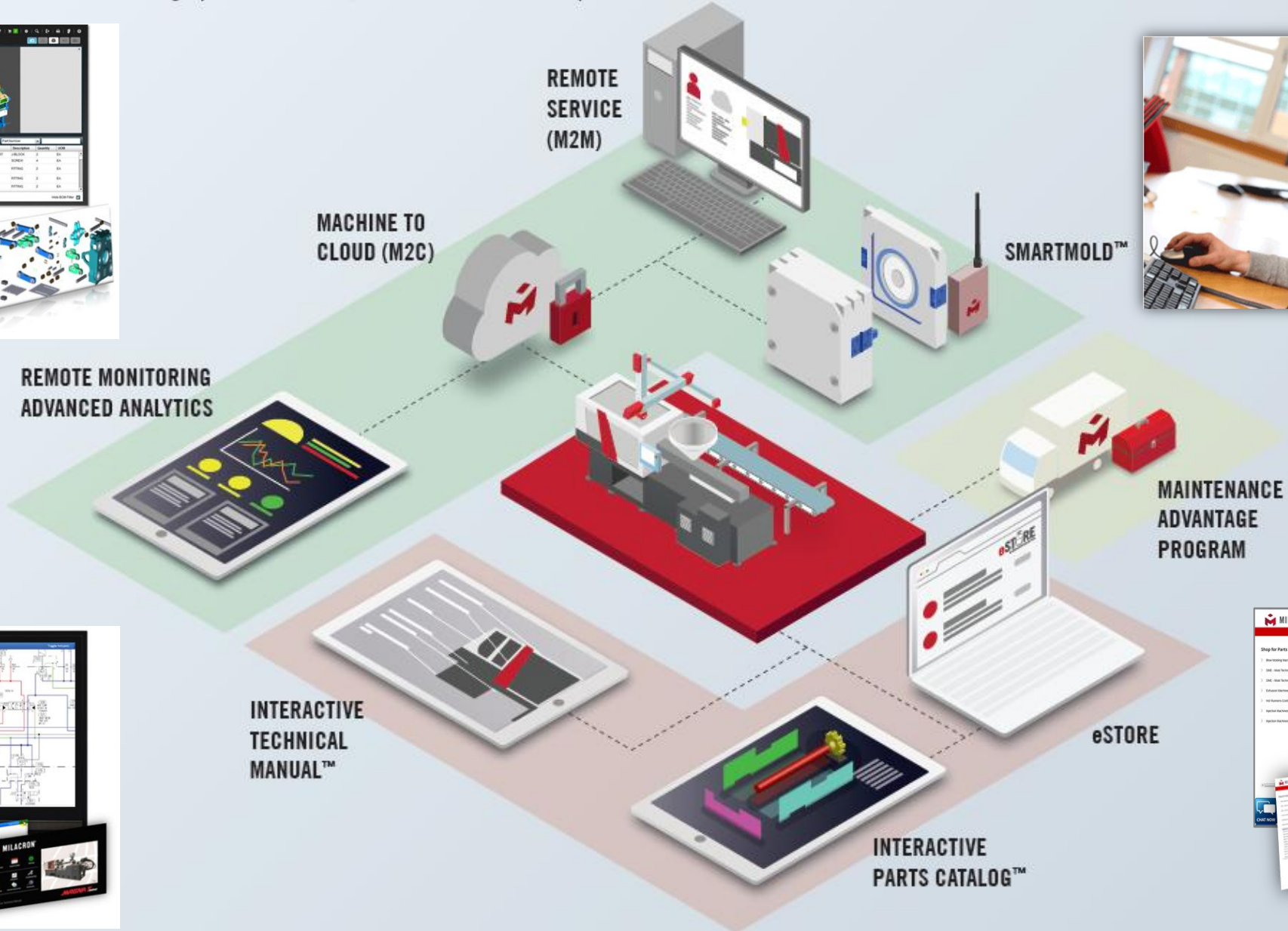
How IIoT can Help increase profits



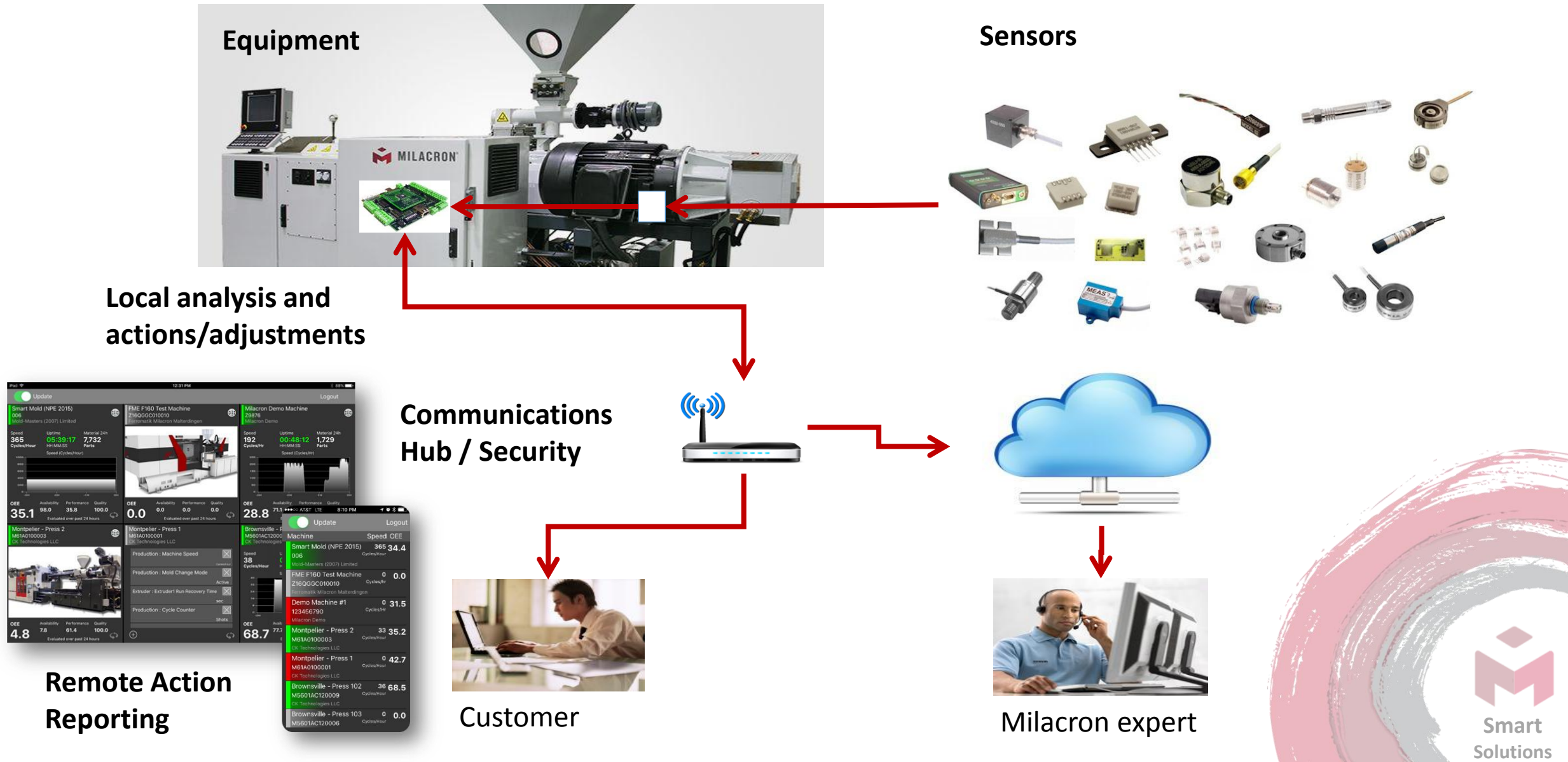
But IIoT must be Intuitive, Practical, Simple



IIoT is a tool to provide a Suite of Products



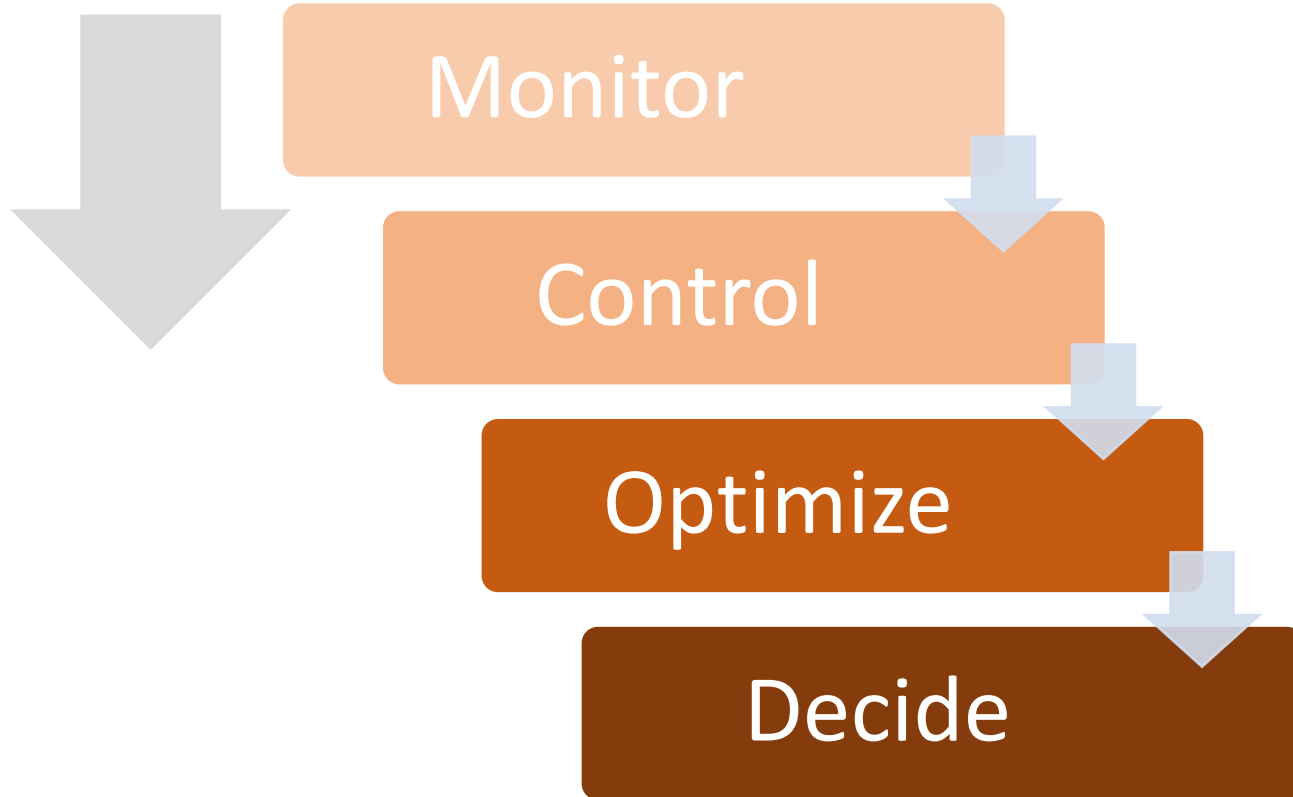
Typical Smart Device configuration



What Smart Devices Do Differently



Complimentary to plant monitoring



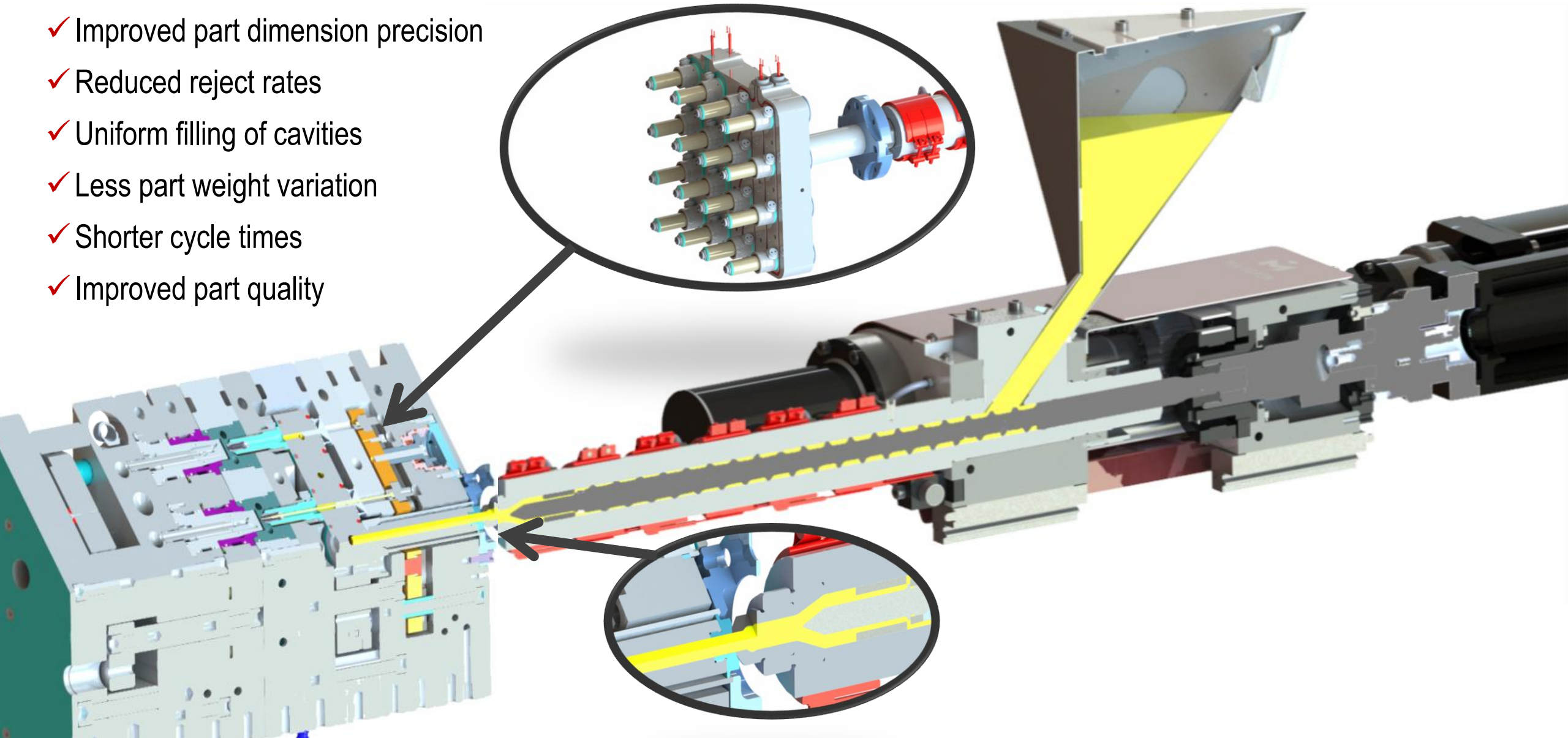
What can be measured now?

- Strain / deformation
- Vibration
- Acceleration
- Movement
- Pressures
- Sound
- *Stop and start*
- *Amperage and load*
- *Air flow and vacuum*
- *Moisture*
- *Speed*
- *Temperature*
- *Power consumption*
- *Leakage*

Sensors, Computing speeds, Single wire communication, The cloud, Security

Example : Impact of homogenous melt

- ✓ Improved part dimension precision
- ✓ Reduced reject rates
- ✓ Uniform filling of cavities
- ✓ Less part weight variation
- ✓ Shorter cycle times
- ✓ Improved part quality

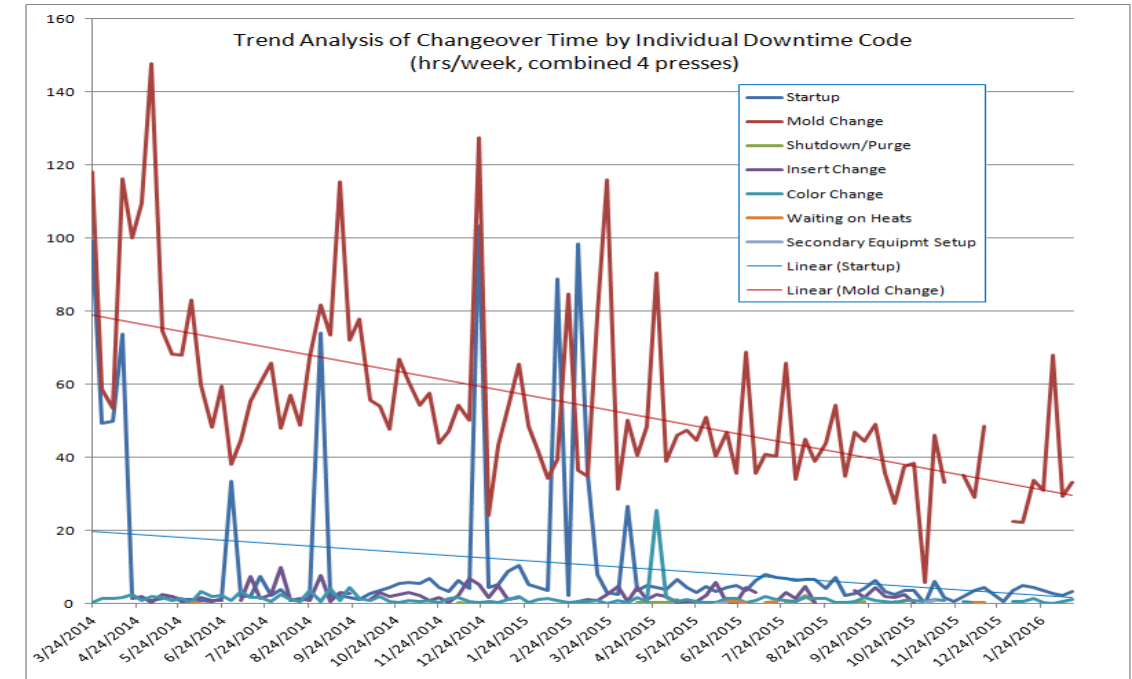


Example: Impact of Smart Monitoring on OEE

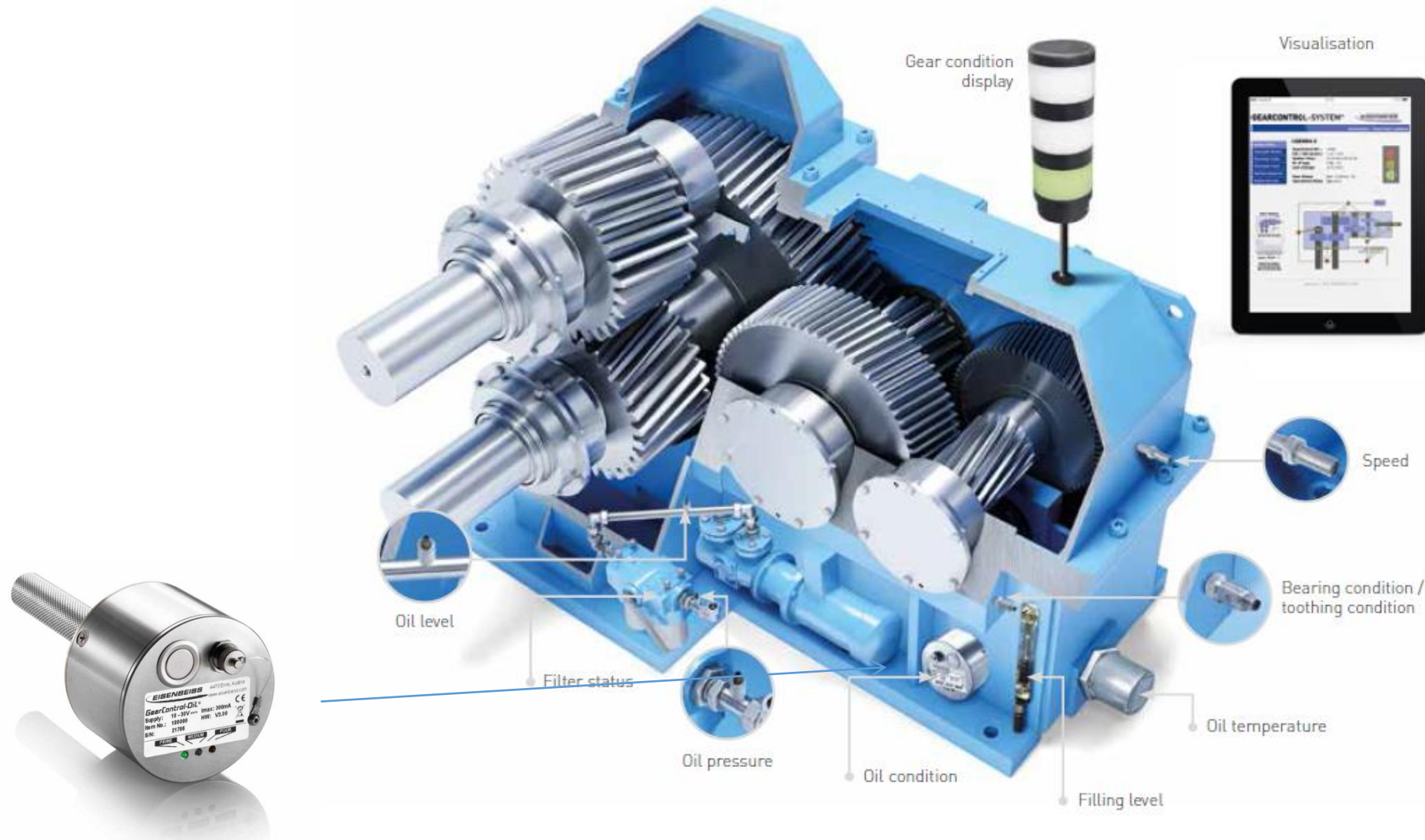


- 4 presses equipped with smart monitoring of OEE 18 months ago
- OEE improved 9.8%
- Changeover downtime cut by more than 100%
- 80% of service calls handled remotely and resolved within the same day
- No rush deliveries for parts
- Remote loading of software
- Reduced labour for data input and consolidation

% OEE	Aug-14	Feb-16	OEE Increase
Press 1	64.4	79.2	14.8
Press 2	70.7	75.7	5.0
Press 3	64.6	71.6	7.0
Press 4	49.3	61.8	12.5



Example: Smart Extruders



Smart Connected Workcell of the future



E-Multi
Controller

E-Drive Controller

Hot Runner
Controller

Auxiliary Axis
Spin stack
Rotary Table
Index plate
Core functions



M2 Controller

Temperature

SVG, Waterflow

SeVG

Energy/Cavity
Balancing*

Auxiliary Axis*



Servo
Controller

Valve Gates

Servo Core
Functions

- Get started with the basics, then add more features
- Needs to be easy to install and use
- Must solve problems
- Dollars for data does not work
- Standard and common Communications protocols are key (OPC-UA will help)
- Getting over the IT / Security hurdle
 - Trust for cloud computing
- Knowledge / Skills / training is a key
- Ask your suppliers for help

IIoT will create competitive advantage



“Successful companies will use the industrial internet of things to capture new growth by increasing production, fuelling innovation and transforming their workforce”

Paul Dougherty

