



Whitepaper

# Smart Management of **Die-casting Cells.**

# Could smart management of an entire die-casting cell transform productivity?

For a number of years now, the control of die-casting machines has given foundries clearer visibility, improved quality and enhanced productivity. What would happen if we could extend digital control across the entire cell?

## The digital advantages the industry already enjoys

Since the first PLC controllers were introduced in the late 1980's, digital evolutions have introduced many advantages for die casting around the world.

### These include:

- **Improved quality** – with closed loop control of critical functions like shot control to improve quality and reduce scrap
- **Enhanced productivity** – with digital data available in one single point of contact, providing more accurate process control and equipment condition status to achieve better repeatable quality
- **Clearer visibility** – with user interfaces giving each operator an easy-to-understand picture of production
- **Improved troubleshooting** – with alarms to notify issues and reduce the time spent solving problems
- **Agile operations** – with saved recipes making it easier to switch between products and faster to set-up for different production runs
- **Availability of information** – with historic data to monitor machine and process performance as well as for factory wide communication by OPC UA (Open Platform Communications Unified Architecture).

Bühler proprietary control units, DataView and DataNet, are active in thousands of foundries around the world, delivering these advantages every day, but digital control of the die-casting machine is only part of the picture. What about the rest of the cell?

## What's missing?

While adding more and more sophisticated digital control options for the die-casting machine, it is often peripheral components that cause stoppages and downtime in production.

For example, a sprayer becomes blocked. A ladle goes out of sync. A trimming press becomes too blunt to operate efficiently.

Some die-casting cells can have as many as 15 to 20 different peripherals completing critical tasks as part of a process. It only takes one to malfunction or perform outside regular parameters for production to be interrupted.

### How big a problem is this?

It's not unusual for foundries to suffer an interruption to die-casting production every 40 minutes to 60 minutes.

With a digitally controlled die-casting machine, the interruption may trigger an alarm or an automatic shutdown. The operator now has to walk around the cell, identify the exact problem and fix it (if possible). Once fixed, the operators has to reset all of the peripherals to their default home position, before production can restart.

Each hour of downtime on a single cell can cost a customer hundreds of Euros and put pressure on delivery schedules. Getting cells back up and operating quicker can save significant sums. Avoiding these interruptions altogether would be even better.

## Thinking about the cell as a single entity

**“To achieve a step change in die casting, it’s not enough to focus on single components. To significantly boost productivity, we have to tackle the system as a whole.”**

— Jonathan Abbis, Managing Director, Bühler Die Casting

The logical solution to all these interruptions is to think of the cell as one system, rather than a machine equipped with a lot of peripherals.

If you can extend digital control across all of the peripherals and components in a single monitoring and control system, there could be significant advantages for operation and future digital integration with smart systems.

A major challenge is that all of these devices and components are made by different manufacturers, favoring different digital protocols and interfaces.

And of course, each process is unique to the part being manufactured, requiring a different combination of peripheral devices and critical components.

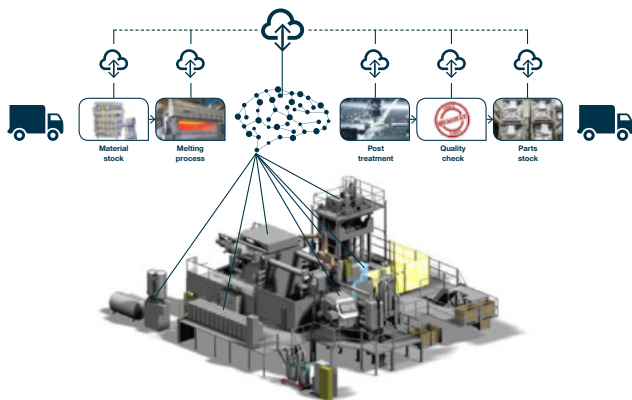


Figure 1: SmartCMS – the brain of the digital cell.

## Introducing SmartCMS – the digital brain for an entire cell

Bühler has been working on this issue for many years and has at last come up with a solution.

SmartCMS.

If we think of a die-casting cell like a human body, with lots of different tasks carried out by different parts, then SmartCMS is the brain, ready to coordinate all of that activity in the most effective way.

SmartCMS lays the foundation for the smart management of entire die-casting cells, with the capability to collect information from every component and peripheral in a single control system.

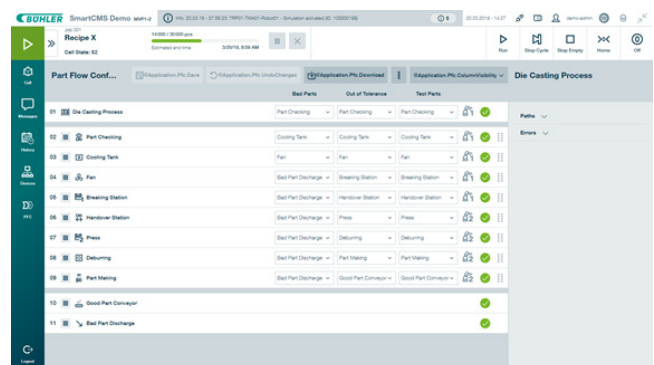


Figure 2: SmartCMS – easy and intuitive user interface.

## How does it work?

Using interfaces with a standardized protocol called BühlerFlex, SmartCMS is designed to accept inputs from virtually any intelligent device, sensor or component.

Based on the latest technology and enhanced with specially designed connectors for older equipment where required, now all of the critical components and peripherals from the cell can be connected in one digital system.

That can deliver improvements through equipment connectivity, cell automation and operation, centralized alarms, data collection, flexible part flow and recipe management while saving time and improving uptime in numerous ways:

### **1. Centralized user interface puts the operator in total control**

By linking all of the cell components through a single user interface, SmartCMS provides a single screen to view all of the cell components. Real-time alarms and diagnostics can immediately identify a problem with any part of the cell, saving diagnostic time and effort.

### **2. Recipe management speeds up set-up and production changes**

Recipe management allows operators to set all components from the SmartCMS user interface, making start-up and production changes smoother, faster and more consistent. Operators no longer need to walk around a cell separately

setting up robots, sprayers or tempering settings – it will all be done automatically, as soon as a recipe is chosen. Misaligned equipment with the wrong setup within a die-casting cell belongs to the past.

### **3. Home button transforms restarts**

After a shutdown, a 'Home button' can reset all components back to their default position, without operators having to walk around the machine or deal with individual components and peripherals. This alone could shorten production downtime by hours each week.

### **4. Flexible part flow eases production bottlenecks**

Changing part of a process, for example, adding or removing a traceability code or stamp applied through a marking device, traditionally takes a good deal of time. SmartCMS enables the user to program different flows and easily switch between them, saving time and making production planning simpler. Quality sampling, taking one part in every 1,000 for inspection for example, can also be automatically managed in this way.

### **5. Automated part rejection simplifies scrap management**

SmartCMS also enables the automation of part rejection. If the system detects that a part has not been produced within the set parameters, it can automatically be removed from the process, saving energy and making scrap management simpler.

## SmartCMS as a foundation for the future

Once a foundry installs SmartCMS on a die-casting cell, it has the foundation for a raft of sophisticated functionality, which is in Bühler's development pipeline over the next few years.

Planned developments include:

- Using machine learning (ML) and artificial intelligence (AI) to allow SmartCMS to improve process performance in real-time. At the moment, development is particularly focused on thermal management, cooling, quenching, spraying, furnace control, robots and press trimming.
- Enabling SmartCMS to improve product tracking and traceability, performance analysis and quality control. Using intelligent algorithms and IoT technology with root cause analysis, SmartCMS can identify trends and enhance the management of maintenance, recipes, energy consumption, safety and process flow.
- Using SmartCMS's Industry 4.0 infrastructure to communicate with wider Smart Factory solutions that connect with other parts of the process.

### Making future digital services possible

SmartCMS can create opportunities for an optional range of wider digital services, aimed at improving die-casting performance.

The digital services include: Die Casting Dashboards for cell monitoring, remote support and history performance data, Predictive Analytics to avoid expensive failures and Downtime Analysis. The availability of data across the entire cell makes improvements in processes, production and operation possible

## Is this the start of a brave new Digital Cell?

Bühler's vision is for a Digital Cell that delivers 0% scrap; 40% less cycle time; 24/7 uptime. That may be some way off, but SmartCMS, whilst delivering immediate advantages, also provides the first important step towards the Digital Cell becoming a reality.

**SmartCMS is on show at GIFA in Düsseldorf, in June 2019.**

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