

# The journey to digital end-to-end forming solutions

It is clear that digitisation is the future of glass forming. But what will it look like, and how will we get there? Bucher Emhart Glass explains.

**W**ithout a doubt, the future of glass forming is digital.

In the glass-container factory of the future, the forming process will be controlled and optimised automatically by digital technology, with little or no intervention from human operators.

For the moment, however, that vision has yet to be made a reality.

To achieve it, two things will need to be working hand in hand. The first is a way to analyse and interpret the production data from different sources like sensors, machines etc. to find out what needs to change. And the second is actuators that can change parameters accordingly.

## From operators to mission controllers

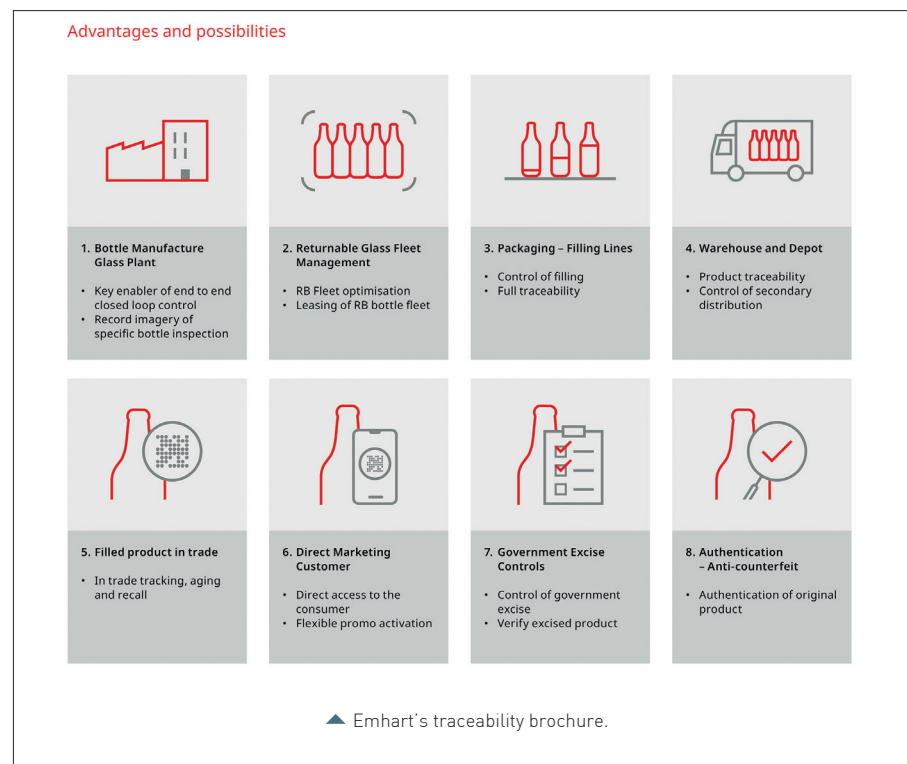
Let's take a look at how things work today. Instead of automated data processors and actuators, humans are doing both: data analytics and actuation. This needs operators and managers that have a long experience in glass making.

First, they analyse readings and user interfaces to find out what is going on within the forming line. Then they draw on their own experience to make the right changes.

At the same time, they collect data for other purposes – for example, they keep track of wear and tear to moulds and do a lot of time for repetitive tasks like mould swabbing.

Now let's fast-forward into the future. Operators have moved up from the factory floor to the control room, where they make decisions aided by multiple sensors, cameras and digital assistants. They've become mission controllers – rather like air traffic controllers at airports.

However, these mission controllers don't work alone. They can call on



assistance from an expert team at their equipment suppliers. If there is a problem, the supplier's technicians can log into the system remotely to analyse problems and run optimizations as required.

## Correlated data is the key

Any digital technology improvement starts with data. The more data you can access, the greater the potential to transform your production process.

However, it's not enough just to amass data for its own sake. First, your data has to be cleaned\* – that is, a true representation of reality.

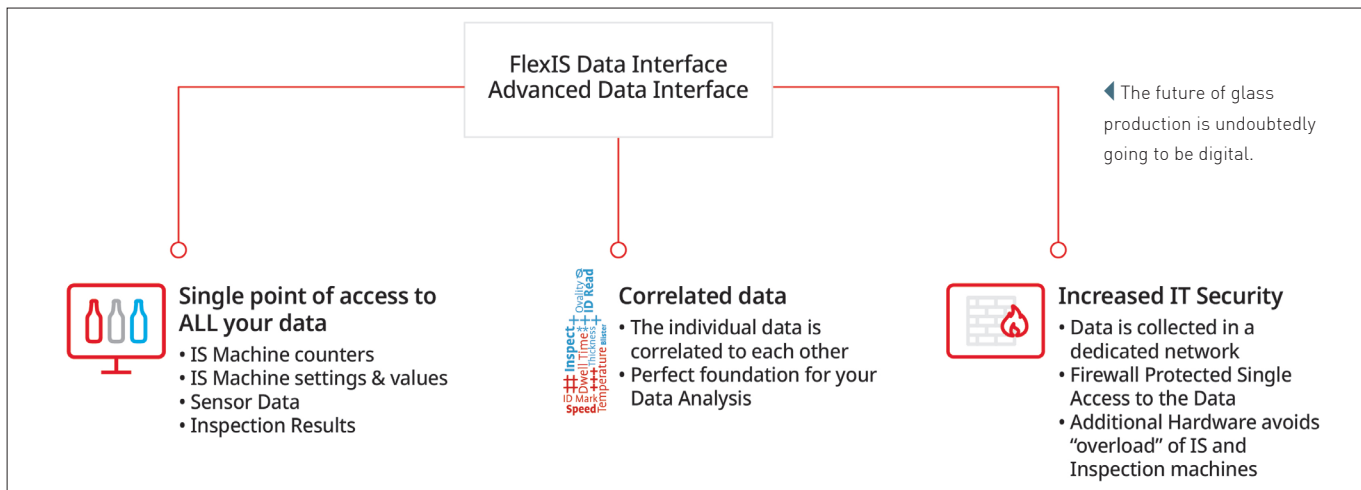
Second, your data points must be correlated – that is, you have to be able to match them up with the time, article or

section they refer to.

What are the most valuable types of data on the forming process? The most obvious candidates are furnace and forehearth data, machine data from forming and inspection, sensor data and data from auxiliary equipment.

There are also some other sources that may be less obvious, but are still essential. They include video camera data, to detect human interactions with the machine, and intelligent tooling data, which recognizes which tools are used and when they are changed.

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Finally, there is also environmental data, which records ambient changes in temperature and humidity.

### How data helps

Having gathered our data, what will we be able to do with it?

First and foremost, cameras and sensors will be able to detect anomalies in the operation of the machine. They can then pre-warn operators about deviations, and propose an action to return to an optimal process.

Detailed data analysis will also lead to a deeper process understanding of the interactions between different process steps.

For example, we will be able to see how changes in the batch house influence the furnace, the IS machine and ultimately the quality of the finished container.

For larger businesses, productivity will be boosted still further as benchmarking and data-based best practices can be rolled out across multiple sites.

### The holy grail of automation

The ultimate goal of digitisation is automatic process change, where digital systems analyse sensor data and automatically alter process parameters with no human intervention at all.

The main areas where this could be possible are furnaces and forming. Indeed, some automatic controls are already in use – for example, model predictive forehearth controls and closed-loop controls on IS machines.

In the future, we'll see these areas joined up, so the system combines multiple controls across more than one machine – for example, managing the IS machine and the forehearth at the same time.

### Robots, cobots and more

Robots will be closely integrated – both mechanically, to the machines, and electronically, into the controls. That will allow them to act as 'go-betweens', bridging the physical and digital worlds. In this role, they could be automatically deployed to carry out adjustments that go beyond parameter alterations and require physical intervention – for example, delivery adjustments or changing forming material.

However, it's unlikely that glass-container forming will ever be carried out in so-called "dark factories".

There will still be work that can only be done by humans – especially during job changes. However, cobots (collaborative robots) and robotic exoskeletons will be there to lend a hand.

### Tomorrow starts today

All this might sound far-fetched. But it's already a reality in other parts of the glass industry. For example, operators in the flat glass sector very seldom leave their

air-conditioned control rooms.

Of course, forming a complex whisky bottle for a global brand is not the same as making a windowpane. But the direction of travel is clear.

As you read this, operating plants are collecting the first data sets that can be correlated right down to the individual container.

At the same time, the first AI models are being trained to predict process outcomes like wall thickness distributions.

And meanwhile, out on the floor, robots are swabbing and starting to adjust deflectors based on blank-loading readings.

It's an exciting time to be involved with glass forming. Over the next few years, we'll start to see different types of data brought together and used in completely new ways. The future is digital – and it has already started! ■

**Bucher Emhart Glass, Cham, Switzerland**  
<https://www.emhartglass.com/>

