Enabling Digital Chromatogram Review for a Faster and More Reliable Operation

Chromatogram review is a monitoring method used to verify process performance in packed-bed chromatography processes. By observing key process parameters such as chromatography column outlet conductivity or UV absorbance, it is possible to identify the signs of a poorly packed column, resin degradation, or equipment malfunction. Therefore, chromatogram review is implemented as an in-process control (IPC) to decrease variability and identify suboptimal performance, thereby enhancing yield and ensuring high product quality (**1**).

The industry standard practice relies on trending univariate parameters (e.g., chromatographic peak asymmetry and product yields) and on performing a qualitative visual comparison of chromatography profiles against a reference batch. The latter is set as a control check to be performed by operators before proceeding with the next stage of a process.

That assessment used to be executed by printing a physical copy of the chromatogram of a batch and then comparing that printout with a standard operating procedure (SOP) that contains the reference chromatogram. The same process would be reviewed later by quality assurance personnel. That approach led to a time-consuming, paper-intensive process that was prone to mistakes caused by the variability inherent to visual comparison of chromatogram profiles not only in different plots, but also on different sheets of paper.

Now that process has been reimagined as part of the drive toward Industry 4.0 and the desire to become a digital facility, enabled with systems that can respond to changes in real-time and act proactively with the necessary corrective behaviors.

With the new digital chromatogram dashboard, printing becomes unnecessary, and multiple phases and parameters are viewed simultaneously, leading to shorter review time. Reliability is increased because the dashboard enables monitoring of a live batch overlaid on reference batches preselected by a subject matter expert. That is facilitated by implementing the SIMCA® and SIMCA®-online software suites by Sartorius (**2**). As a leading contract development and manufacturing organization (CDMO), Fujifilm Diosynth Biotechnologies strives for increased partner trust and collaboration. Thus, these dashboards (and many others with multivariate models) can be accessed by a partner, providing it with a real-time window to the process (Figure 1).

By digitalizing the existent business process and upskilling the stakeholders to use the tool, resource time expenditure is optimized tenfold (shorter review time, fewer investigations expected), the paper footprint is reduced (~10,000 sheets/year), and data accessibility is on demand. The review process is not hidden and is readily available to different departments.

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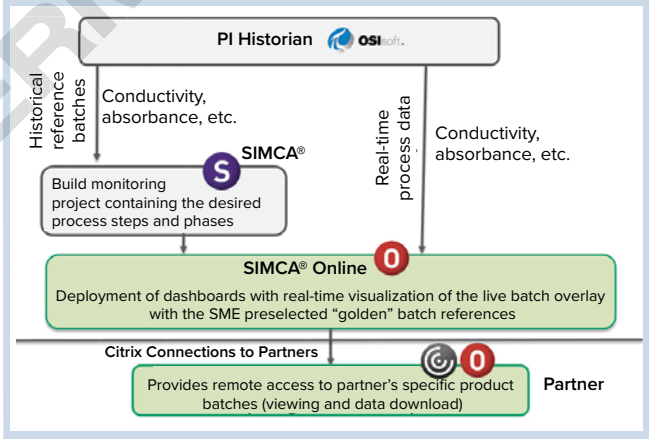
Figure 1: System and data communication diagram; historical data available in the data historian are used as reference batches and to build the digital chromatogram project. During production, data ingested from the manufacturing SCADA system to the data historian (OSI PI) are transmitted to SIMCA-Online through SimApi at real-time frequency (**2**). The visualization dashboards are made available to operators, quality assurance personnel reviewers, and the partner.



References

1 ICH Q7: *Good Manufacturing Practice Guidance for Active Pharmaceutical Ingredients*. The International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH), 2016.

2 *Data Analytics AB. SIMCA-Online Technical Guide.* Sartorius Stedim, 2020; https://umetrics.com/kb/simca-online-technical-guide.

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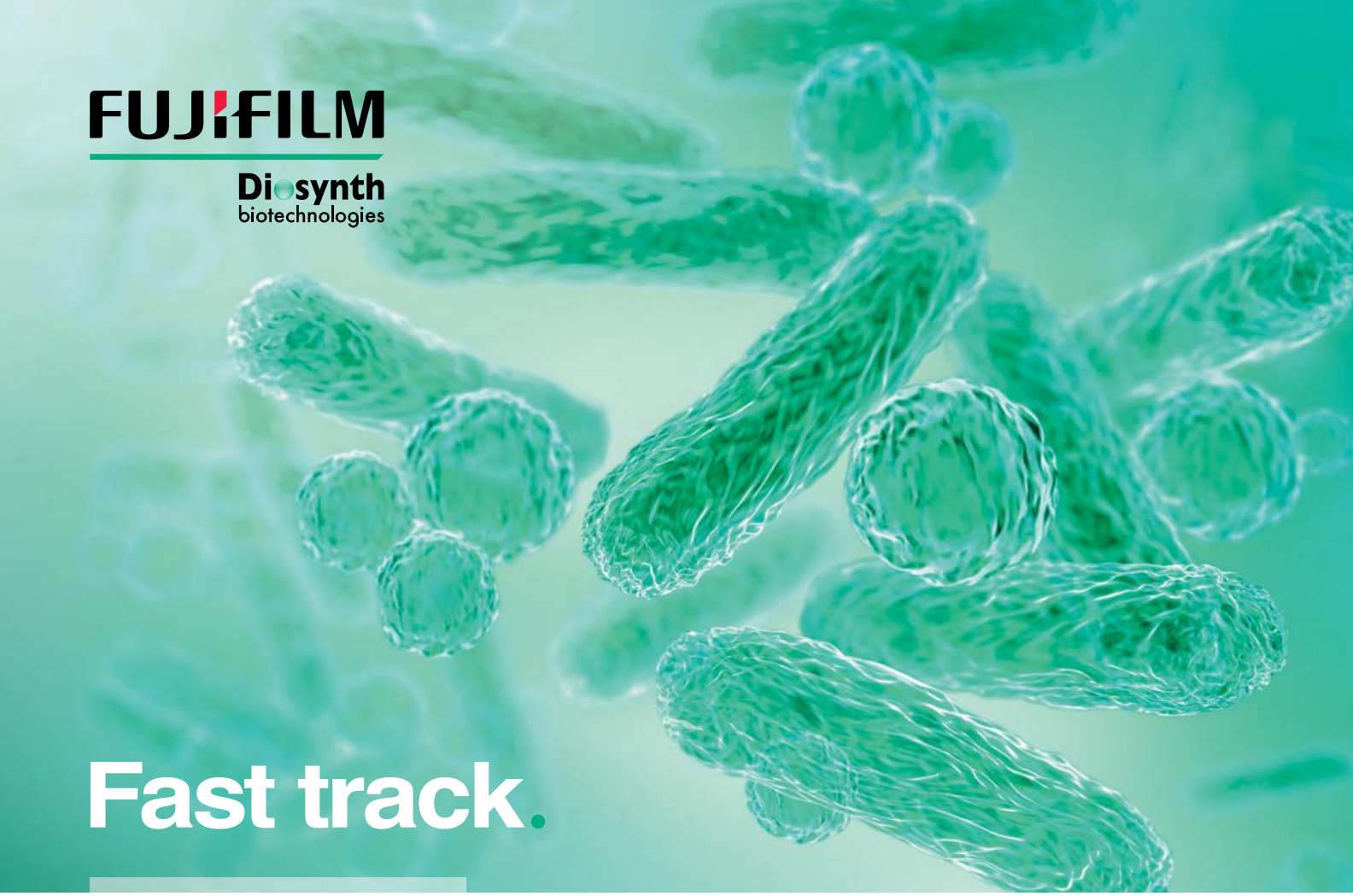

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