

The benefits of system integration

For process plants to be able to fully utilize the potential of modern measurement technology and control methods, all individual subsystems must be integrated into one flow of data. Although this is valid for most industrial processes, we focus here on the biopharmaceutical production industry only.

Situation and current solution - In bioprocesses, the customer will typically use bioreactors to produce his product in batch mode. A multitude of process parameters are controlled and measured on-line using a PLC system and several cell specific parameters may be measured off-line. The PLC takes care of storing its data into its designated storage, while the off-line data is either automatically or manually stored into a different storage.

The limitations - Although a large amount of data is collected for every batch, no automated data analysis is performed. If something goes wrong, off-line data analysis is needed, requiring the manual import of data into separate data-analysis software. If this software only allows univariate data analysis, there is a large risk that intricate relations between problematic parameters are not found. If multivariate data-analysis software is used, a large amount of operator training and expertise is required to avoid uncertain or even incorrect interpretations. Slow deviations in the functioning of the process may not be detected until too late.

Proxedra's solution - The Proxedra software is interfaced to the control system and all auxiliary equipment (see Figure 1), which in addition to the logging of all measured parameters in a database,

allows real-time processing of the data. For example, the process may now be visualized using multivariate projection methods with the obvious advantage of being able to present complex multidimensional data in a simple and understandable way to the process operators.

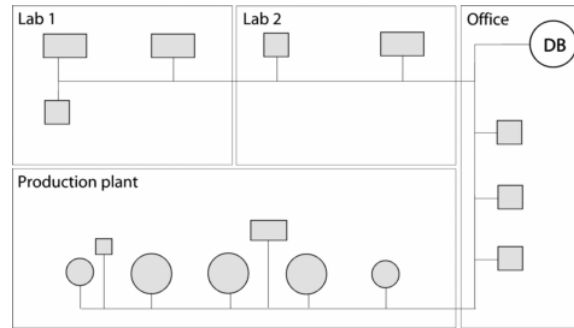


Figure 1: Example of system integration in a process plant. All instruments, PCs, and hardware are interconnected and store their data into a database (DB).

Other advantages of real-time data processing are: (1) the sensitivity of process control can be increased by tight interconnection of all on-line and off-line process parameters; (2) drift in processes can be visualized and counteracted for, since real-time analysis of on-line and off-line process parameters allows tight closed-loop control (see Figure 2).

Furthermore, based on the data recorded for previous batches, models capable of predicting the yield of the process or the quality of the product may have been determined. Such models can be applied on any current batch to estimate the outcome of the process in advance. If a poor outcome is predicted, the proc-

ess may be terminated early, whereby time and money are saved.

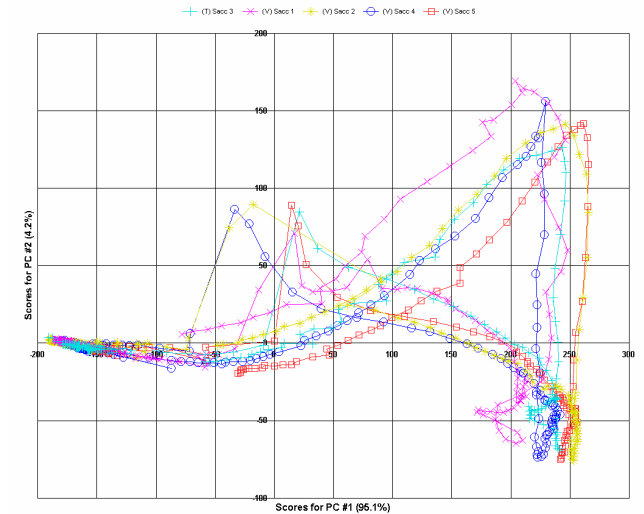


Figure 2: Simple visualization of process deviation in yeast fermentations.

The positive effects of system integration can thus be summarized as: (1) enables automatic on-line data-analyses – today lots of data are available but no one looks at it; (2) simplifies the task of process validation; (3) improves product quality and process economics; and (4) prepares for knowledge management – allows a company to effectively handle the intellectual capital and intangible assets.

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