

Affordable, fast to develop custom automation

Custom automation is needed, but not at any price

Biological and chemical processes need often to be automated to achieve products that are ready for the market – e.g., cell-therapies, cultivated meat, drugs. In many cases, existing automated solutions such as bioreactors and fermenters are used, increasing process efficiency and reproducibility, allowing scale-up/out, and reducing personnel intervention and costs. For the automation of some processes, however, the development of new custom technology is needed, the existing automated solutions not being flexible enough to adapt to the process requirements. Such development is very often long and expensive, putting the viability of numerous projects in danger and preventing new products from entering the market.

In this context, innovative approaches to realize custom automation fast and affordably are required, as the one proposed by the company OSPIN together with the company Heidolph Instruments. With Hei-PROCESS – this is the name of the product developed by the two companies - existing lab devices and sensors are combined through modern software technology and work together as if they were part of a same device on automating specific processes. As shown in the case example in the next section, these device combinations can be modified anytime, adapting to the specificities of each process, and new functionalities can be created out of the existing ones - for instance, with a pump and a pH sensor a pH controller is realized.

Case example: a process from IBZ-Salzchemie GmbH & Co. KG



Figure 1: OSPIN-Heidolph setup at IBZ.

IBZ is a family-run business located in the Freiberg mining area with extensive knowledge in the processing of salt and salt solutions, including condensation, crystallization, and brine purification as well as the separation of salt mixtures by flotation. The company provides services and solutions for process development and optimization ranging from lab to pilot plant scale.

Whilst looking for ways to automate and continuously run a process for impurity removal, IBZ got to know Hei-PROCESS and asked the Heidolph-OSPIN team to propose an automation approach. The process to be automated consisted of three main steps, each involving pouring a solution into a 10 L

tank equipped with stirrer and manually adjusting the pH to a different level (4, 5 and 6 respectively) to precipitate a different substance. The resulting purified brine constitutes the desired product.

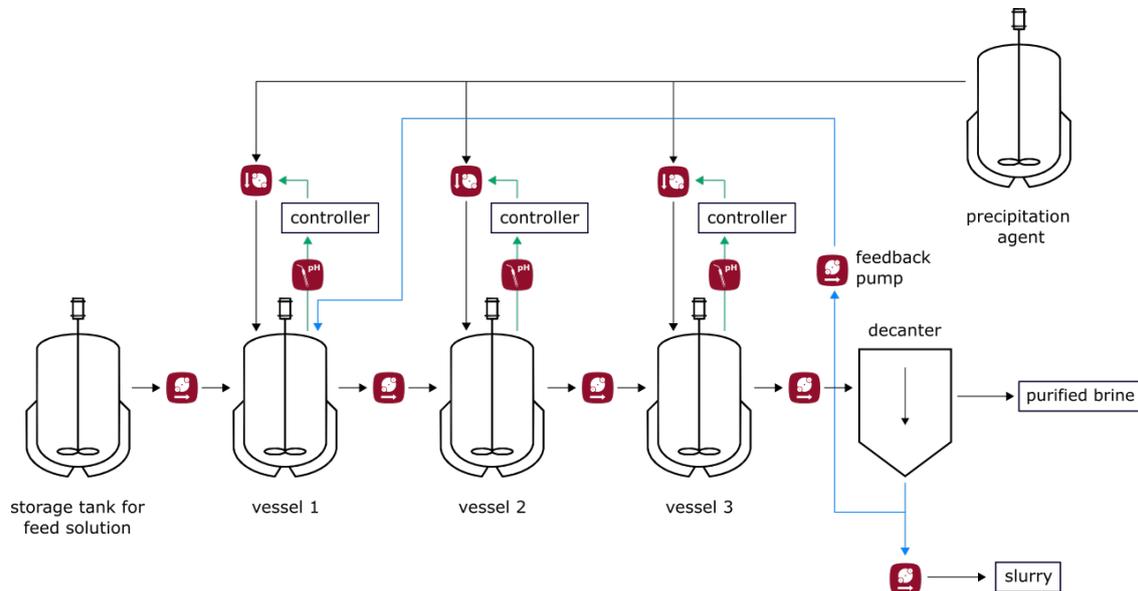


Figure 2: Process scheme of the automated setup.

The automated solution that was proposed is shown in Figure 1 and Figure 2 and involves 9 pumps (Hei-FLOW Ultimate 120, Heidolph Instruments) and 3 pH sensors (Hamilton ARC) interconnected, monitored, and controlled through the cloud-based web application of OSPIN. Each tank has two pumps and a pH sensor associated to it:

- one pump is used to pump the solution into the tank through tubing,
- the second pump connects the tank to a reservoir containing an alkaline solution and works together with the pH sensor to dynamically adjust the pH: the sensor continuously measures the pH and when the pH is below the target value set by the user the software gives the pump the command to add more of the alkaline solution into the tank – this pH-pump combination is called *pH controller* (see green line in Figure 2).

To avoid liquid overflow, the pump taking out the solution from one tank and transferring it to the next one must pump at a flow rate that is equal to the sum of the flow rate of: the pH controller pump and the pump pumping the solution into the tank. This algorithm is also taken care by the software.

Finally, a pump transfers the remaining solution from tank 3 into the product container, where the slurry (solids formed during the process) is then pumped out. During the development process the engineering team was asked to add an extra pump in order to pump part of the slurry back to the first tank (see blue line in Figure 2), as this accelerates the whole process: thanks to the flexibility of HEI-PROCESS this request could be accommodated in no time. As in the manual process, every tank is equipped with a stirred mixing the solution.

All the devices are orchestrated by the software: the process is designed once with the OSPIN process editor (see Figure 3), where all parameters such as flow rates and pH targets are set and is then run automatically as many times as needed. The process editor is recipe-based, meaning that a process is divided into phases and in each phase the user can set a new target for each device.



The automated setup was developed and installed in less than 6 weeks and allows IBZ to:

- Continuously and automatically run the process – i.e., new stock solution is added whilst the product is being extracted – saving time and costs.
- Monitor the process from any browser, even remotely.
- Easily program different processes (for instance with different pH) and let them automatically run by pressing on one button.

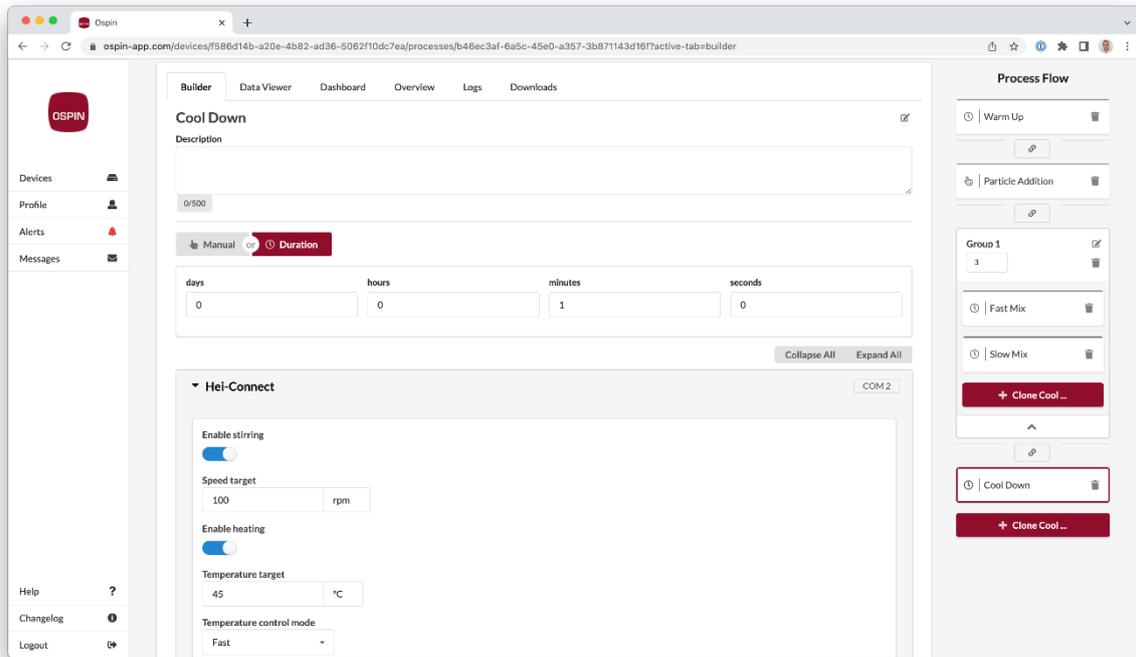


Figure 3: OSPIN process editor.

Hei-PROCESS democratizes custom automation

When automating a process, it is crucial to use the most suitable automation technology, without accepting compromises allowing to move ahead fast but leading in the long term to efficiency loss and high costs. Hei-PROCESS custom-adapts to a wide range of processes, as any device having a digital interface can be integrated into the platform and linked to other Heidolph or third-party devices. At the same time, it stays affordable and allows solutions to be developed quickly, as shown in the case example.

Are you looking for the best solution to automate your process? Contact the OSPIN team: info@ospin.de