

## ImPACts

### Industrial Methods for Process Analytical Chemistry - From Measurement Technologies to Information Systems

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: K-Projects

COMET subproject, duration and type of project:  
imPACts, 09/2014 – 08/2018, multi-firm

### “All-in-one: a new perspective on bioprocesses”

Producers of pharmaceutical products are required to fulfil highest quality standards. Therefore, a significant amount is invested in sophisticated monitoring systems. Researchers from TU Wien in cooperation with Sandoz GmbH took a closer look. They developed a system that combines measurements from different sources and a mathematical description of the process and the biochemical reactions. This combination offers a cost effective monitoring system to guarantee the quality during the production process.



#### Complex biochemistry

In the production of many daily goods, complex chemical and biochemical reactions are involved. To control and supervise those, knowledge about the current production state is necessary. Therefore, the technicians and chemists need to collect a lot of information in order to adapt process variables - as the addition of certain nutrients and reactants - properly.

In the sector of pharmaceutical production, the demands (in addition to these challenges mentioned above) towards a safe and clean product are extremely high and have to be met without any compromises!

Chemical and biochemical companies need to invest a lot in acquisition and development of measurement devices. Although nowadays sophisticated analytical devices and sensors exist there are still some variables which are only hardly or not at all measurable.

In the context of the COMET K-Project imPACts researchers from TU Wien, in cooperation with the Tyrolean producer of pharmaceuticals Sandoz GmbH, developed a novel tool to contribute to improved pharmaceutical production. The All-in-One – bioprocess monitor!



#### All-in-One?

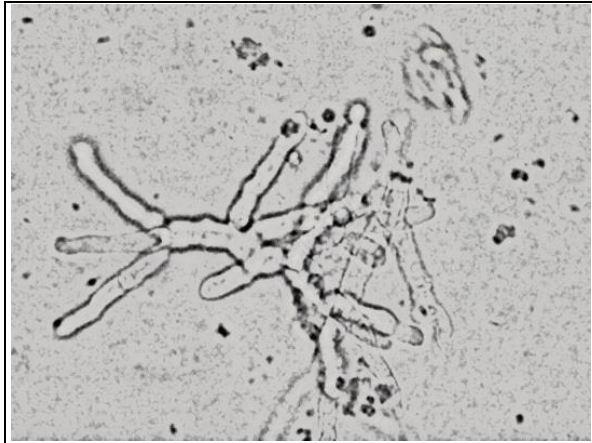
Why do we call this “All-in-One” – bioprocess monitor?

A team of multidisciplinary researchers tried to combine the knowledge and useful methodologies from their disciplines like microbiology, engineering and applied statistics to improve the available In-Process control system.

The process and its internal reactions are described by mathematical relations. Additionally, some of these entities can be measured actively. By combining the measurements with model predictions, the so called soft-sensor calculates the most probable process states.

By doing so the plant technicians receive deeper insights in the running process which enables them to better control and predict process events.

From now on all needed information is available in real-time at any time point of the production. Entities that were so far not-measurable can simply be deduced from the model, which is coupled with available measurements.



**Fig. 1:** These hyphal growing microorganisms (200x magnification) produce antibiotics as secondary metabolite, but only under certain controlled conditions. (Picture: TU Wien)



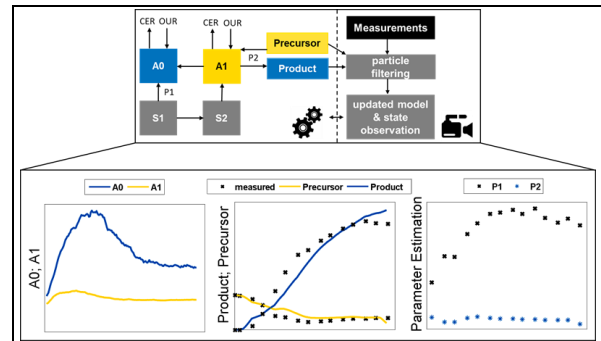
### Impact and effects

The big advantages of this monitoring approach for biochemical processes are its flexibility and cost efficiency.

The mathematical description can be easily adapted to specific processes and products, which can be linked to any kind of measurements.

By using different information sources, the requirements for each individual source are reduced while the overall accuracy and stability of the results remain highly satisfactory.

In addition to that, the system enables to estimate entities in real-time which are difficult to measure, or even non-measurable. They can be determined by simple secondary measurements or measurements with long sampling intervals, which are interlinked with the model predictions.



**Fig. 2:** The All-in-One – monitor combines simulations of a mathematical process description with available measurements to determine the actual process state. (Graphics: TU Wien)

Within this joint project, researchers from Sandoz GmbH and TU Wien created an intelligent and cost effective bioprocess monitoring system. In production the system assists to make right decisions, enabling a safer and more efficient production.

### Contact and information

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### Project partners

Organisation	Country
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**Further information on COMET – Competence Centers for Excellent Technologies:** [www.ffg.at/comet](http://www.ffg.at/comet)

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