

## 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

### One in a million – an easy task for the Laser

Researchers of the Technical University Vienna have successfully developed a measurement method for industrial application. Until now, this method was only usable in the laboratory. The measurement tool, which is based on a laser-based analysis method, was recently installed at the OMV-refinery in Schwechat. It measures the slightest traces of the gas hydrogen sulphide ( $H_2S$ ). The high accuracy of the method allows to detect 3 molecules of the gas amongst 20 millions of other molecules.



#### Several years of researching the fundamentals

Researchers from the Vienna Technical University have been seeking a laser-based measurement method for the detection of slightest traces of gases for a long time. Different technologies can be suitable for such tasks but in the last couple of years some of them turned out to be more applicable than others. Several years ago a major step was taken for this development in collaboration with other research groups and different companies within the K-project PAC. In cooperation with company partner OMV a tool for the analysis/detection of hydrogen sulphide ( $H_2S$ ) in the refinery Schwechat was started to be developed. The principle for this tool is called „second harmonic wavelength modulation spectroscopy“ (2f-WMS).

Using this technique, a high-frequency modulated laser beam is passed through an arrangement of mirrors, so that it is reflected more than 200-times through the gas, which resembles a distance of 100 meters. Through this large distance, the interaction of the gas molecules

and the laser beam is maximized. At the end of the path, the laser beam is directed onto a high-sensitive spectrometer, which can detect minimal changes in the laser beam, caused by the gas.

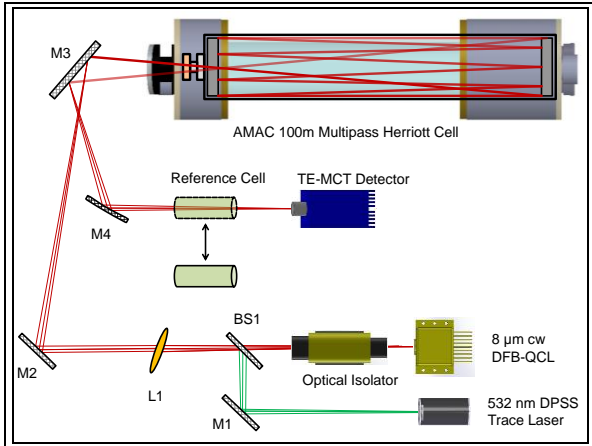


#### Successful implementation in the refinery Schwechat

For many years, the development of such a measurement tool has been of great interest for the refinery Schwechat. The high-precision measurement of slightest traces of this gas is very important for the process monitoring. Small amounts of this component can cause expensive damage in some catalytic processes. However, this project could only be realized within the current K-project imPACTs. The special challenge for the installation of such measurement tool is that a refinery is no common environment, which makes it difficult to implement a new tool.

This sounds obvious when considering that already one single spark may cause a huge

damage. For this reason, safety is the top priority in these kinds of processes. That is why the H<sub>2</sub>S-measurement tool had to be developed according to the highest safety standards by the researchers of Vienna Technical University and OMV. It had to pass several tests prior to implementation.



This sketch shows the path of the laser beam, for measuring the gas molecules (© TU Vienna)

Finally all these steps were taken in the practical implementation. Currently a certified prototype, which fulfils all requirements, was installed in the refinery. In the next couple of months this prototype will show in the real operation if it is able to meet all expectations on the long run.

### Impact and effects

The Vienna Technical University was able to realize a novel measurement tool within the K-project imPACts, which is impressive in terms of technological performance as well as with respect to the practical quality of refinery-suitable implementation.

Certainly the refinery Schwechat of OMV primarily benefits from this technological achievement. The technicians of the company now have an effective measurement tool for the refinery, which enables them to optimize the processes.



This photo shows the developed prototype for the OMV refinery in Schwechat (© OMV)

Furthermore, a young Austrian company could benefit from this research results. The company is specialized on the production of analysis instruments and will take care of the further development and the commercialization. It is still a long way from the now existing prototype to a marketable product. And for that task again – as always – the best specialists are needed!

### Contact and information

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### Project partners

Organisation	Country
Vienna Technical University	Austria
OMV Refining & Marketing GmbH	Austria
Lenzing AG	Austria
Metadynea Austria GmbH	Austria
Sandoz GmbH	Austria

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

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