



## VIRTUAL PEFTEC 2021 - A GREAT SUCCESS GLOBALLY

PEFTEC 2021 ran on 24th and 25th November as a completely virtual event, but organiser Marcus Pattison says: "It was a great success. Naturally, we were disappointed not to operate the physical conferences and exhibitions that we have run in the past, but as a virtual event PEFTEC 2021 offered a number of important advantages.

"Registered participants were able to log in free of charge, from the convenience of their home or office, without the cost or inconvenience of travel or accommodation. As a result, the number of attendees was more than double the usual number, with participants from 95 countries. However, the presentations have all been recorded, and are still available by registering at [www.peftec.com](http://www.peftec.com)."

The PEFTEC events began in 2015, offering participants a unique opportunity to focus on the latest research, technologies, techniques, methods, standards and regulations relating to monitoring and analysis within the Petroleum, Petrochemical, Chemical and Refining industries. Visitors to the events have been able to join conferences and seminars, and meet some of the world's leading providers of technology and testing services at the events' exhibitions. The main objective for the 2021 event was therefore to offer the same facilities in an online format.

Two conferences were available at the virtual PEFTEC 2021 event; one focusing on Process Monitoring, and the other on Laboratory Analysis.

### PEFTEC Process Monitoring Conference

This session was chaired by Dr Edo Becker, who said: "The key issues addressed by these sessions included sustainability, new Process Analytical Technology (PAT), robust sampling techniques, how PAT can help to achieve carbon-footprint reduction, smart sensors, catalyst development and process operation." He added: "Participation by the virtual attendees was excellent with high levels of interest being shown in PAT trends, networking and ideas for new research subjects."

The first session focused on the use of PAT and soft sensors, providing an insight into the latest research. This was followed by a description of the requirements to set up a robust sampling and GC analysis program to provide real time optimisation data for plant control. One speaker explained why traditional on-line GCs provide much greater flexibility, control and sensitivity than miniaturised instruments.

Hydrogen can be utilised for fuel cell applications and an explanation was provided on how to ensure the quality of hydrogen, and how these new technologies will be incorporated. Industry standards were also discussed and the importance of this issue was addressed in relation to the fight against climate change.

In the field of catalyst research, spectroscopic technologies can help to speed up the development and design of new types of catalyst by investigating their microscopic properties both on-line and in-situ. These feed directly into the next stage of process development in a pilot plant study.

Smart sensors can be easily installed and provide new ways of gathering information on hazardous chemical process streams. They can act independently and talk to the control system via advanced communication protocols for more efficient plant control and optimisation.

Pilot plant operation was also discussed, with an explanation of the ways in which on-line GCs can help to understand by-product formation and catalyst activity. For example, new smart ways have been found to set-up classical laboratory instruments for continuous operation.

Several of the speakers said that PAT can help to achieve the sustainability targets of processing companies by reducing energy costs and the amount of by-products from a chemical process. PAT engineers should therefore promote this within their companies and provide evidence of savings both in costs and carbon footprint. PAT can help refineries in many ways; helping to optimise processes, better understand feedstocks and improve the efficiency of refinery planning.

### PEFTEC Analytical Conference

Explaining the key features of the 2021 conference Anupam Giri from SABIC said: "This year particular emphasis has been given to environmental issues such as recycling and renewables. The subjects being addressed include broad aspects of analytical challenges in petroleomics covering separation science, spectroscopy, thermal and elemental analysis, as well as innovative and high-throughput processes for recycling. In addition, a short-course on GCxGC will be conducted to introduce this powerful separation tool to the beginners; highlighting the fundamentals as well as applications on exploring the petro-chemistry. The program will allow 'Industry-Institute-Individuals-Interaction' in this field to learn about the latest updates, developments and future needs from each other."

The first session (Two-Dimensional GC) was chaired by Frank David from the Research Institute of Chromatography (RIC) in Belgium. This started with a keynote presentation by Prof. Philip Marriott from Monash University in Australia, who described new approaches to overall sample 'global profiling', with strategies to

provide a best-case separation goal. These are based on well-established multidimensional gas chromatography (MDGC), and newer comprehensive GCxGC methods. The role of these tools for discovery and improved characterisation were described.

Gas oils quantitative analysis by GCxGC FID was then discussed with the introduction of the VUV detector providing new possibilities with its ability to discern between the majority of hydrocarbon families.

A study was then described in which the composition of dodecene products produced from different feedstocks and catalysts was investigated by applying GCxGC coupled with photoionisation (PI) and TOFMS.

The analysis of heavy constituents in petrochemical products remains a challenging task due to low volatility making them inaccessible for gas chromatography; and low solubility making them unsuitable for liquid chromatography. To minimise fragmentation, pyrolysis GCxGC was coupled to PI high-resolution mass spectrometry. Low energy PI yielded enhanced sensitivity and selectivity as a result of the dramatic reduction in fragmentation, as well as providing an increase in the number of compounds identified. High-resolution MS combined with soft PI was found to be extremely useful.

The next session on Mass Spectrometry was chaired by Dr. Christopher Rüger from the University of Rostock in Germany. The first speaker explained the importance of pyrolysis in the recycling of solid plastic waste (SPW), however the chemical nature of pyrolysis char is not fully understood, but has potential in material science e.g. batteries, catalysis, water purification or to generate further chemicals. The speaker explained how a comprehensive set of thermal analysis mass spectrometric platforms enabled an in-depth chemical description of plastic pyrolysis char; providing valuable information for reactor design.

Direct Analysis in Real Time (DART) mass spectrometry was then described with examples showing how GCxGC-MS did not reveal any differences between similar but different age samples, whereas negative-ion DART showed distinctly different mass spectra.

In the final presentation of the session, the application of Fourier-Transform Ion Cyclotron Resonance Mass Spectrometry (FTICR) in Pyrolysis oil produced from plastic waste materials was described.

After lunch, Dr Edo Becker chaired a session on Thermal and Elemental

Spectroscopy. Seeking to simplify and speed up laboratory operations, the characterisation of base oil by advanced spectroscopic and chemometric tools was described, as well as the application of this new approach to catalyst research and development.

In order to avoid contamination in recycling processes the application of spectroscopy in mixed municipal waste was described. This was followed by an explanation of the ways in which analysis with thermo-rheological tools enables the optimisation of extrusion and blending.

The next session was chaired by Dr Anton Ginzburg from KU Leuven in Belgium, and focused on Recycling. The concept of circular plastics (Truecircle initiative) was discussed, highlighting the challenges and opportunities in chemical and mechanical recycling. This included examples in polyolefin-based materials for food- and non-food applications. Participants asked about value creation and energy efficiency as well as bad publicity relating to plastics.

The group-type analysis of recycled feedstock was then described with the determination of trace level impurities by GC and comprehensive GC×GC. The audience was particularly interested in how the EPED detector compares to the conventional AED detector.

Novel concepts for the identification and quantification of hydrocarbon streams originating from pyrolysis were presented, using several GC techniques and comprehensive GC×GC. A particular focus was given to GC coupled to a novel vacuum UV detector in comparison with conventional detailed hydrocarbon

analysis via GC-FID and GC×GC.

In the final presentation of the session, the challenges relating to the analysis of malodour compounds using multi-dimensional GC×GC were described. This prompted questions about the types of waste samples that were analysed and the sample preparation protocol.

After the break, Dr. Beate Gruber from BASF in Germany chaired a session on Instrumental/ Method Development. Recent Micro GC developments, such as operation with a phone or tablet, were described for out-of-lab and process applications. Bio-oils obtained from lignocellulosic biomass pyrolysis have the potential to replace petroleum-based fuels, but they are complex and contain water, so an analytical method was described. This couples supercritical fluid chromatography with ion mobility spectrometry - mass spectrometry (SFC-IMS-MS) for bio-oil characterisation.

Historically the analysis and certification of gasoline, jet fuel, diesel and biodiesel blends has required the use of numerous analytical technologies and methodologies, which can be costly and complex. A platform-based approach to fuels analysis that employs a single, automated analytical approach using GC-VUV was therefore described.

Dr Melissa Dunkle from Dow Benelux then chaired a session which was a short course on GC×GC in Petrochemical Applications and Data Evaluation. Melissa delivered a presentation on diverse detection techniques in GC×GC, which was followed by Anupam Giri who described the application of GC×GC in a variety of petrochemical applications.

## Summary

Whilst it was unfortunate that PEFTEC 2021 had to be a virtual event, Marcus Pattison believes that it was an outstanding success. "As a free online event, we were able to bring PEFTEC to a much wider audience than ever before. The usual participants from the refinery and petrochemical sectors were present, but we also welcomed much broader global participation with more researchers, students, laboratory technicians and process managers.

"This year, there was also a marked increase in the numbers of people working on environmental issues such as waste management and recycling, and we anticipate this being a growing theme as we plan for PEFTEC 2022.

"Nevertheless, we have now issued an open invitation to all interested parties for 'Topics of Concern' – if anyone would like to suggest which subjects PEFTEC 2022 should address, or if they would like to be considered for the delivery of a presentation, we would be delighted to hear from them."

PEFTEC 2022 will take place on 8th & 9th June in Rotterdam, and as a hybrid event, it will offer the advantages of a physical event at which people can meet face to face, with the benefits of the same virtual platform so that anyone who is unable to attend in person, can do so online.

Read, Print, Share or Comment on this Article at: [petro-online.com/Article](https://petro-online.com/Article)



### Author Contact Details

Graham Meller, Buttonwood Marketing Ltd • Buttonwood House, Main Rd, Shutlanger, Towcester, Northants NN12 7RU, UK

• Tel: +44 (0)1604 862 404 • Email: [gmeller@buttonwoodmarketing.com](mailto:gmeller@buttonwoodmarketing.com) • [www.buttonwoodmarketing.com](http://www.buttonwoodmarketing.com)