

D6.4 Workshop: “Novel Technologies in Steam Cracking Furnaces”

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Document history

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V1	03/02/20	First draft	Stijn Vangaeve

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EXECUTIVE SUMMARY

1.1 Description of the deliverable content and purpose

This report describes the activity carried out during the workshop: “*Novel Technologies in Steam cracking furnaces*”, as well as the organizational procedures. The workshop is part of the Grant Agreement of the IMPROOF project. The workshop was organized by the Laboratory for Chemical Technology of Ghent University. The goal of the workshop was to provide the attendants with a broad overview of the state-of-the-art and emerging technologies in the steam cracking industry.

1.2 Brief description of the state of the art and the innovation breakthroughs

This part is not relevant for this deliverable, being it focused on the preparation and implementation of the workshop.

1.3 Corrective action

The official title of the workshop was slightly changed with respect to the original one: “*Furnace Workshop*” was changed into “*Novel Technologies in Steam Cracking Furnaces*”. The primary reason for this change was to have a clear title describing the workshop content. Ahmed Kadi replaced Gilles Theis as the representative speaker from John Zink.

2 PREPARATION OF THE WORKSHOP

2.1 Date and Location

The workshop took place on Tuesday the 28th of January 2020 in the iGent building of Ghent University, Tech Lane 126 Ghent, across the Laboratory for Chemical Technology. The participants had the opportunity to enrol for the connected workshop “*Computational Fluid Dynamics assisted Process Intensification*” on the day before, the 27th of January 2020.

2.2 Schedule


Table 1 shows the schedule for the 28th of January:

Table 1: Schedule workshop: “*Novel Technologies in Steam Cracking Furnaces*”.

Time	Activity
08:30 – 09:00	Arrival
09:00 – 09:15	Introduction by prof. Van Geem (UGent)
09:15 – 10:15	dr. Marco van Goethem (TechnipFMC)
10:15 – 11:15	dr. David Brown (AVGI)
11:15 – 11:30	Coffee break
11:30 – 12:30	dr. John Olver (Emisshield)
12:30 – 13:30	Lunch
13:30 – 14:30	dr. David Van Cauwenberge (BASF)
14:30 – 15:30	dr. Dietlinde Jakobi & Steffen Heyland (Schmidt + Clemens)
15:30 – 16:00	Coffee break
16:00 - 17:00	Ahmed Kadi (John Zink)


2.3 Workshop promotion

People were invited to the IMPROOF event through different channels. The Laboratory for Chemical Technology mailing list was used to contact people who had attended previous events organized by the Lab. Each partner ensured that they were properly represented and promotion on the IMPROOF website and on LinkedIn lead to the registration of 60+ participants from various companies and from academia.



IMPROOF workshop

27-28 January 2020 at Ghent University



IMPROOF project

IMPROOF is a European Union H2020 project* which aims to improve the energy efficiency of steam cracking furnaces, while reducing emissions of greenhouse gases and NO_x.

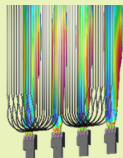
The strongly industrially oriented consortium is composed of the following partners:

AVGI, Ayming, CERFACS,

LRGP-CNRS, CRESS, Dow,

Ghent University, John Zink,

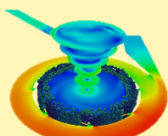
POLIMI, Schmidt & Clemens and TechnipFMC



Computational Fluid Dynamics assisted Process Intensification (27 January)

Speakers:

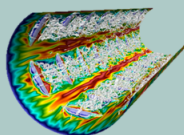
prof. T. Poinso	CERFACS
prof. P. Perreault	University of Antwerp
prof. T. Arts	von Karman Institute
prof. A. Cuoci	POLIMI
prof. V. Francia	Heriot-Watt University
prof. K. Van Geem	Ghent University



Novel Technologies in Steam Cracking Furnaces (28 January)


Speakers:

dr. M. van Goethem	TechnipFMC
dr. J. Olver	Emisshield
G. Theis	John Zink
dr. D. Jakobi	Schmidt & Clemens
dr. D. Van Cauwenberge	BASF
dr. D. Brown	AVGI



Practical information:

- This workshop will be organized by the IMPROOF consortium but registration is open for all stakeholders from both industry and academia.
- The two-day workshop will take place at Ghent (iGent building, Tech lane 126) 27 and 28 January 2020.
- Attendance is free of charge, but registration is required: eventmanager.ugent.be/improofWorkshop
- Due to the limited capacity of the event (90 participants), participants who register but fail to attend, will be charged with a no show fee of € 50 (except for valid reasons)



*This project has received funding from the European Union H2020 (H2020-SPIRE-04-2016) under grant agreement n°723706

Figure 1: Advertising flyer made for the IMPROOF Workshop.

3 WORKSHOP ACTIVITIES

3.1 Speakers

A detailed biography of every individual speaker can be found in Appendix A.

Dr. Marco van Goethem as the first speaker of the day. He introduced the audience to various technologies commercialized by TechnipFMC ranging from the triple-lane layout for an enhanced cracking coil performance to the implementation of the Swirl Flow Tube (SFT). He explained how TechnipFMC went from acquiring the patent to industrial implementation with all the obstacles along the way.



Figure 2: dr. Marco van Goethem presenting at the IMPROOF Workshop 28 January 2020.

The Senior R&D manager of AVGI, dr. David Brown, gave a presentation on cracking furnace developments. Based on his 44 years of experience in the petrochemical industry, he discussed various projects he was involved with and how different technologies have emerged over time.

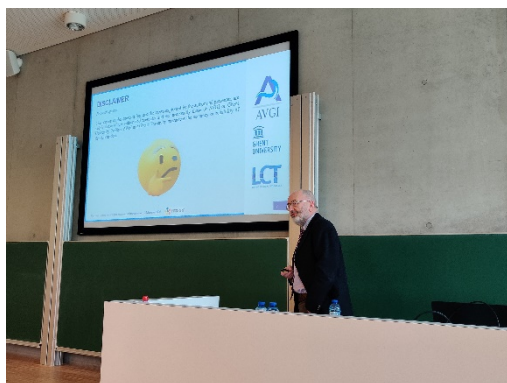


Figure 3: dr. David Brown presenting at the IMPROOF Workshop 28 January 2020.

Dr. John Olver, the CEO of Emissshield, gave a presentation on the effect of high emissivity coatings on the energy efficiency of a steam cracking firebox. He showed how NASA originally invented the technology and how Emissshield transferred their insights to the chemical industry. He also disseminated results related to spectral normal emissivity and pilot plant energy savings obtained within the IMPROOF project.

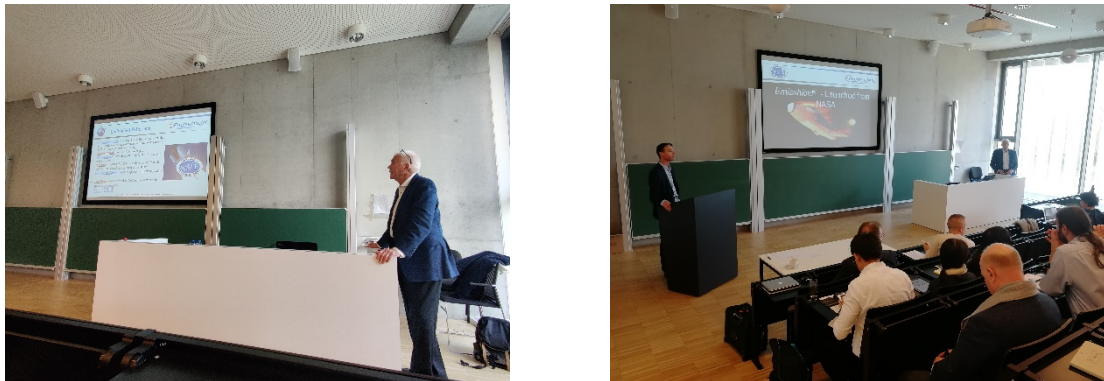


Figure 4: dr. John Olver presenting at the IMPROOF Workshop 28 January 2020.

Dr. David Van Cauwenberge works as technology manager for the BASF Antwerp steam cracker. He showed the work he performed during his PhD which led to the patent of dimpled reactor coils. He also disseminated the preliminary results obtained during a collaboration of BASF with John Zink where they installed multiplexed tunable diode laser absorption spectroscopy (TDLAS) which measures real time oxygen concentrations and temperature inside the firebox. Analysis of the obtained data allows BASF to improve the furnace energy efficiency and process safety.



Figure 5: dr. David Van Cauwenberge presenting at the IMPROOF Workshop 28 January 2020.

Dr. Dietlinde & Steffen Heyland showed some insights into the R&D work performed at Schmidt & Clemens which led to the developments of alumina containing alloys and the 3D reactor technology SCOPE. These technologies are already implemented in industry so Schmidt & Clemens was able to show some promising results on the run length increase.



Figure 6: dr. Dietlinde Jakobi & Steffen Heyland presenting at the IMPROOF Workshop 28 January 2020.

Ahmed Kadi showed the results obtained by John Zink Hamworthy Combustion obtained within the IMPROOF project. Biogas and oxy-fuel combustion experiments on an industrial scale have been performed showing that both implementations are a viable alternative to conventional combustion. However, various changes have to be made to the existing furnace and



Figure 7: Ahmed Kadi presenting at the IMPROOF Workshop 28 January 2020.

4 ACHIEVEMENTS

Overall, we have received only positive feedback from the participants. During the lunch break a group picture was organized, as shown in Figure 8.

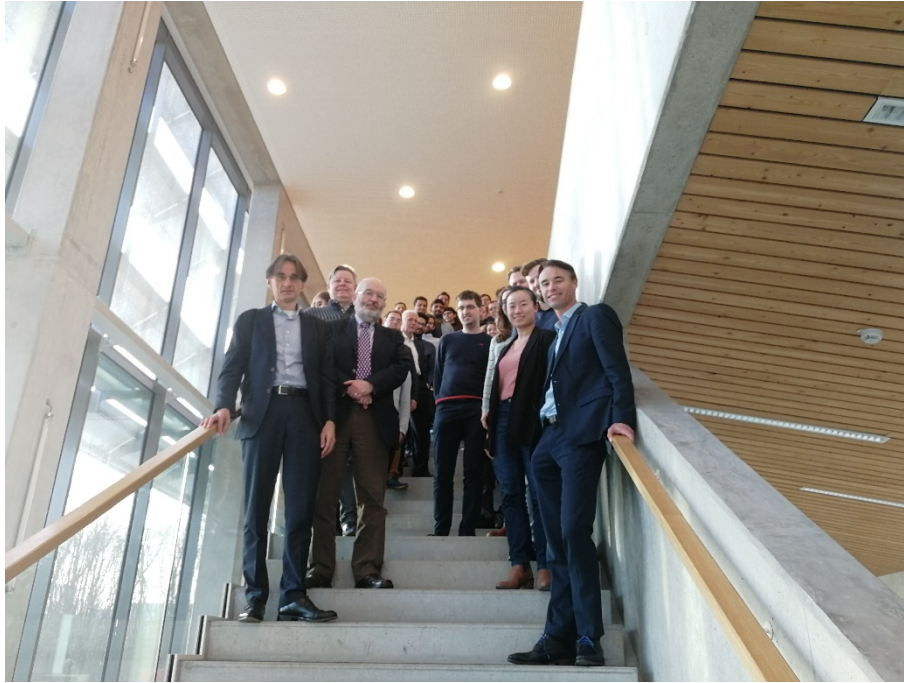


Figure 8: Group picture of the workshop participants

The audience was very heterogeneous with participants both from academia and industry, in total 68 people registered for the event. The final list with signatures can be found in Appendix B.



Figure 9: Distribution of the workshop participants between academia (24) and industry (44) (left) and the distinction between people directly involved in the project (18), people working for one of the IMPROOF partners but not directly on the project (21) and external participants (29) (right).

APPENDIX

A. Speaker biographies

Speaker 1: Marco van Goethem (TechnipFMC)

Marco obtained his PhD in Chemical Engineering at the Delft University of Technology, and has 20 years of experience in the modelling of steam cracking and reforming furnaces. As one of the main authors of SPYRO® Suite 7, he has contributed to the development of several of TechnipFMC's proprietary technologies, i.e.: Swirl Flow Tube®, Large Scale Vortex® Burner, NOX Post Processor, multi-lane cracking furnace simulation. Marco currently manages the "makers of SPYRO®" (Pyrotec) and various product development projects such as SFT®.

Marco is married and a loving father of his three children. He is also a cycling fanatic, he finds much enjoyment in many cycling exercises and events.

Speaker 2: David Brown (AVGI)

David is the Senior R&D Manager with AVGI. Before joining AVGI in 2017 he was with TOTAL for 8 years as a Cracking Furnace Specialist working in Feluy, Belgium. David moved to Belgium from Houston in 2009 after a 28 year career with the former Stone & Webster. His first job in the petrochemical industry was with the former ICI, starting 44 years ago! David holds master's degrees from the University of Cambridge; a doctorate from the University of Oxford; and is a Chartered Engineer and a Fellow of the (British) Institution of Chemical Engineers.

Speaker 3: John Olver (Emisshield)

Dr. John W. Olver is the President, CEO and founder of Emisshield Incorporated, located in Blacksburg, Virginia, USA. Emisshield focuses on the commercialization of technologies primarily in the chemical, material and physical sciences. The company specializes in thermal enhancement projects worldwide in the market areas of Petrochemical, Glass, Baking, Fabric, Iron and Steel and Aerospace. He is the recipient of a B.S. Degree in Civil Engineering from Lafayette College in 1969, a M.S. Degree 1971 and Doctorate 1975 from Virginia Tech in engineering. Registered Professional Engineer in numerous states and a member of various professional organizations. Previous owner of a specialty engineering firm, Olver Incorporated, founded in 1973, serving as Chairman, President and Chief Executive Officer. In 1985, Olver Incorporated was sold to its employees and Dr. Olver continued as a consultant until 2004. Dr. Olver started Olver Laboratories Incorporated (1973-1985), providing complete environmental testing, pilot plant evaluations, chemical engineering process design confirmations and biological monitoring. Dr. Olver founded a large privatization company in 1991 and served as President until 2001 when it was sold to private investors. He currently serves as a Managing Partner of Ursa Major, real estate management company, founded in 1983. Dr. Olver has published many technical articles on the environment, chemistry, physics and heat transfer.

Speaker 4: David Van Cauwenberge (BASF)

David Van Cauwenberge is an alumni of the Laboratory for Chemical Technology, who completed his PhD on steam cracking reactor design using computational fluid dynamics in 2017. While working for BASF, David was mostly involved in process automation but since the start of this year he returned to his roots as technology manager for the Antwerp steam cracker.

Speaker 5: dr. Dietlinde Jakobi & Steffen Heyland (Schmidt & Clemens)

Dr. Dietlinde Jakobi is holding a master's degree in technical chemistry and a Ph. D. in natural sciences from the Technical University of Aachen, Germany. Dr. Jakobi joined Schmidt + Clemens in January 1999. She is currently the Corporate Director of the Sales and the Research & Development Services Department. Dr. Jakobi and her team published a significant number of papers related to high temperature alloys and technologies used for different industrial high temperature applications and the development results of the S+C research & development team have contributed to decisive new inventions and numerous worldwide patents.

Steffen Heyland is holding a masters degree in process engineering from the University of Siegen, Germany. Since March 2013 Heyland is Manager for Steamcracker Performance Analyses within the Schmidt + Clemens "Research & Development Services" Department. In this position he is mainly doing customer support for general questions and plant performance optimization by means of applying new technologies.

Speaker 6: Ahmed Kadi (John Zink Hamworthy Combustion)

Ahmed Kadi replaced Gilles Theis as the John Zink Hamworthy Combustion representative for this Workshop.

B. List of participants

(see following pages)