GRANT AGREEMENT No.: 764902 **Project Acronym: TOMOCON** **Project title: Smart tomographic sensors for advanced industrial process control**	TOMOCON Smart Tomographic Sensors for Advanced Industrial Process Control	
Deliverable Rel. No. **D7.5.**	Lead Beneficiary **CTH / HZDR**	
EU Del. No. **D26**	Type **Report**	
WP No. **WP7**	Date: **14.02.2022**	Revision: **0**

Innovative Training Network

TOMOCON

Deliverable Title

Substantial Conference Participations

Description

This deliverable describes the substantial conference participations by the ESRs with the presentation of their results to the scientific public.

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Approved by Supervisory Board:		28.02.2022

Dissemination Level: **Public**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Grant Agreement No. 764902.

Revision Sheet

Revision Number	Purpose of Revision	Effective Date
0	Initial Issue	28.02.2022

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Substantial Conference Participations

As part of the network-wide training of the TOMOCON project, all ESRs have participated in international conferences and workshops to inform the scientific public about the state-of-the-art of their research project and present their research results to a wider audience. Furthermore, conference presentations and visits have been considered a very important part of the TOMOCON training education as they have enabled the ESRs to learn about current trends in the field, establish relationships with other researchers and gain confidence in technical speech and presentation in a scientific environment within and outside of Europe. During the TOMOCON project, the ESRs and their supervisors presented their research work at many renowned international conferences and workshops. A highlight of the training and dissemination was certainly the TOMOCON sessions at the 9th World Congress on Industrial Process Tomography (2018) in Bath (UK) and the 21st World Congress of the International Federation of Automatic Control IFAC-21 (2020) in Berlin.

TOMOCON session at WCIPT-9, 2nd to 6th September 2018, Bath, UK

The 9th World Congress on Industrial Process Tomography (WCIPT-9) which took place from 2nd to 6th September 2018 in Bath, UK, hosting the world-wide experts in the field of process tomography, was attended by many TOMOCON ESRs and their supervisors. During the conference, the ESRs presented their research projects and results and benefited from exploring new themes in the science and technology of Industrial Process Tomography (IPT). The TOMOCON Coordinator Prof. Uwe Hampel also gave an overview of the TOMOCON project and outlined its importance for research and the IPT community.

The TOMOCON highlights included:

- Prof. Uwe Hampel, HZDR: “TOMOCON: A Marie Skłodowska-Curie European Training Network on Tomography-based Control in Industrial Processes”
- Benjamin Sahovic (ESR 1), HZDR: “Investigation of upstream and downstream flow conditions in a swirling inline fluid separator – experiments with a wire-mesh sensor and CFD studies”
- Dr. Martina Bieberle, HZDR: “Advanced correction algorithms for ultrafast X-ray computed tomography”
- Dr. Thomas Wondrak, HZDR: “Numerical Aspects of Contactless Inductive Flow Tomography for Crystal Growth”
- Matthias Ratajczak, HZDR: “Contactless Inductive Flow Tomography for Models of Continuous Casting and Crystal Growth”
- Imamul Muttakin (ESR 12), University of Bath: “Direct capacitance measurement for tomographic imaging of metallic objects”
- Panagiotis Koulountzios (ESR 13), University of Bath: “Ultrasonic Tomography for automated material inspection in liquid masses”
- Prof. Dr. Marko Vauhkonen, University of Eastern Finland: “Electromagnetic Flow Tomography for Imaging Asymmetric Single and Multiphase Flows”
- Dr. Timo Lähivaara, University of Eastern Finland: “Estimation of Porous Material Parameters Using Ultrasound Tomography and Deep Learning”
- Dr. Tomasz Rymarczyk, Netrix S.A.: “Application of Electrical Tomography for Spatial Analysis of Damp Walls Using Statistical Methods”

TOMOCON session at 21st IFAC Virtual World Congress, 11th to 17th July 2020

The 21st IFAC World Congress took place as a virtual conference from 11th to 17th July 2020 hosting the world-wide experts in the field of process tomography. TOMOCON participated with an own session entitled "Process control with tomographic sensors" chaired by the TOMOCON Coordinator Prof. Uwe Hampel. The session had in total six contributions from which four contributions came from the TOMOCON ESRs, one from the TOMOCON Advisor Prof. Masa Takei and one external contribution. The sessions' presentations were of very high quality and included video and audio sequences. Overall, the congress achieved a very high resonance with about 3,000 papers in more than 250 virtual sessions.

The TOMOCON highlights included:

- Ivan Glavinić (ESR 2), HZDR: "Flow monitoring for continuous steel casting using Contactless Inductive Flow Tomography (CIFT)"
- Matheus Martinez Garcia (ESR 4), Delft University of Technology: "Control of a Gas-Liquid Inline Swirl Separator Based on Tomographic Measurements"
- Shereen Abouelazayem (ESR 9), Technical University of Liberec: "Switched MPC Based on Clogging Detection in Continuous Casting Process"
- Marzieh Hosseini (ESR 14), University of Eastern Finland: "LQR Control of Moisture Distribution in Microwave Drying Process Based on a Finite Element Model of Parabolic PDEs"
- Prof. Masa Takei, Chiba University, Japan: "Image Reconstruction in Electrical Impedance Tomography via Artificial Neural Network In Two-Phase Flow"

During the second half of the project, the participation in conferences and workshop was to a certain extent limited as many events were cancelled due to restricting Covid-19 regulations in the individual countries or were conducted virtually. Nevertheless, the ESRs took the opportunity to present their latest research results and activities to a wider scientific audience in virtually conducted conferences and workshops.

An overview of the individual ESR's conference participations is given below.

ESRs Conference Participations

ESR 1 Benjamin Sahovic, Helmholtz-Zentrum Dresden-Rossendorf, Germany

B. Sahovic, H. Atmani, P. Wiedemann, E. Schleicher, D. Legendre, E. Climent, R. Zamanski, A. Pedrono, U. Hampel, Investigation of upstream and downstream flow conditions in a swirling inline fluid separator – experiments with a wire-mesh sensor and CFD studies. *9th World Congress on Industrial Process Tomography*, 2-6 September 2018, Bath, UK.

B. Sahovic, P. Wiedemann, E. Schleicher, U. Hampel, Investigation of upstream and downstream flow conditions in a swirling inline fluid separator. *Annual ProcessNet Conference and Annual DECHEMA Conference on Reaction Engineering*, 27-29 May 2019, Würzburg, Germany.

ESR 2 Ivan Glavinić, Helmholtz-Zentrum Dresden-Rossendorf, Germany

I. Glavinić, S. Eckert, F. Stefani, T. Wondrak, Control of liquid metal flow in a laboratory model of a continuous caster with Electromagnetic Brake and Contactless Inductive Flow Tomography. *SteelSim 2021*, 4-7 October 2021, Vienna, Austria (Online).

I. Glavinić, F. Stefani, S. Eckert, T. Wondrak, Flow Feature Extraction with Contactless Inductive Flow Tomography in Presence of the Variable Magnetic Field of an Electromagnetic Brake. *10th World Congress on Industrial Process Tomography (WCIPT-10)*, 13-16 September 2021, Online.

I. Glavinić, F. Stefani, S. Eckert, T. Wondrak, Real time flow control during continuous casting with Contactless Inductive Flow Tomography. *Electromagnetic Processing of Materials 2021*, 13-17 June 2021, Riga, Latvia (Online).

I. Glavinić, S. Eckert, F. Stefani, T. Wondrak, Contactless Inductive Flow Tomography for control of liquid metal flow with electromagnetic actuators. *TMS 2021 Annual Meeting & Exhibition*, 15-18 March 2021, Online.

I. Glavinić, M. Ratajczak, F.Stefani, T.Wondrak, Flow monitoring for continuous steel casting using Contactless Inductive Flow Tomography (CIFT). *IFAC 2020 World Congress*, 11-17 July 2020, Berlin, Germany (Online).

I. Glavinić, S. Abouelazayem, M. Ratajczak, D. Schurmann, S. Eckert, F. Stefani, J. Hlava, T. Wondrak, Flow control in the model of a continuous caster by using Contactless Inductive Flow Tomography. *TMS 2019 Annual Meeting & Exhibition*, 10-14 March 2019, San Antonio, TX, USA.

ESR 3 Yuchong Zhang, Chalmers University of Technology, Sweden

Y. Zhang, R. Yadav, A. Omrani, M. Fjeld, A Novel Augmented Reality System To Support Volumetric Visualization in Industrial Process Tomography. *15th International Conference on Interfaces and Human Computer Interaction (iHCI 2021)*, 21- 23 July 2021, Online.

Y. Zhang, M. Fjeld, A. Said, M. Fratarcangeli, Task-based Colormap Design Supporting Visual Comprehension in Process Tomography. *Eurographics & Eurovis 2020*, 25-29 May 2020, Norrköping, Sweden (Online).

Y. Zhang, Y. Ma, A. Omrani, R. Yadav, M. Fjeld, M. Fratarcangeli, Automated Microwave Tomography (MWT) Image Segmentation: State-of-the-Art Implementation and Evaluation. *International Conference in Central Europe on Computer Graphics, Visualization and Computer Vision 2020*, 19-21 May 2020, Pilsen, Czech Republic (Online).

Y. Zhang, M. Fjeld, Condition monitoring for confined industrial process based on infrared images by using deep neural network and variants. *2nd International Conference on Image, Video and Signal Processing*, 20-22 March 2020, Singapore (Online).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Grant Agreement No. 764902.

Y. Zhang, Y. Ma, A. Omrani, R. Yadav, M. Fjeld, M. Fratarcangeli, Automatic Image Segmentation for Microwave Tomography (MWT): From Implementation to Comparative Evaluation. *12th International Symposium on Visual Information Communication and Interaction (VINCI 2019)*, 20-22 September 2019, Shanghai, China.

ESR 4 Matheus Martinez Garcia, Delft University of Technology, The Netherlands

M. M. Garcia, B. Sahovic, M. A. Sattar, H. Atmani, E. Schleicher, U. Hampel, L. Babout, D. Legendre, L. M. Portela, Control of a Gas-Liquid Inline Swirl Separator Based on Tomographic Measurements. *IFAC 2020 World Congress*, 11-17 July 2020, Berlin, Germany (Online).

M. A. Sattar, M. M. Garcia, R. Banasiak, L. M. Portela, L. Babout, Scaling of Electrical Resistance Tomography Data of Swirled Liquid-Gas Separation Using Fast Camera Imaging. *PTZE – Application of Electromagnetism in Modern Engineering and Medicine*, 13-16 September 2020, Jastarnia, Poland (Online).

ESR 5 Artem Blishchik, Delft University of Technology, The Netherlands

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ESR 6 Hanane Atmani, INPT, France

H. Atmani, R. Zamansky, E. Climent, D. Legendre, CFD approach to simulate two phase flow inline-separator coupling IBM, LES, Lagrangian Tracking and VoF methods. *14th International Conference on CFD in Oil & Gas, Metallurgical and Process Industries*, 12-14 October 2020, Trondheim, Norway (Online).

H. Atmani, D. Legendre, R. Zamansky, E. Climent, A. Pedrono, A hybrid Lagrangian-IBM method for the CFD of inline bubbly flow separation. *18th International Workshop on Trends in Numerical and Physical Modelling for Industrial Multiphase Flows*, 14-18 October 2019, Benguerir, Morocco.

H. Atmani, D. Legendre, R. Zamansky, E. Climent, A. Pedrono, B. Sahovic, E. Schleicher, U. Hampel, M. A. Sattar, L. Babout, R. Banasiak, Hybrid CFD simulation of two phase flow in inline flow splitters using VoF and Lagrangian models. *10th International Conference on Multiphase Flow (ICMF)*, 19-24 May 2019, Rio de Janeiro, Brazil.

ESR 7 Adel Omrani, Karlsruhe Institute of Technology, Germany

A. Omrani, R. Yadav, G. Link, J. Jelonnek, A time-reversal imaging algorithm for localization and moisture level detection in the polymer foam in an industrial microwave drying system. *18th International Conference on Microwave and High Frequency Application (AMPERE 2021)*, 13-16 September 2021, Gothenburg, Sweden (Online).

R. Yadav, A. Omrani, M. Vauhkonen, T. Lähivaara, Complex-permittivity estimation of a polymer foam using microwave tomography for the application of microwave drying. *18th International Conference on Microwave and High Frequency Application (AMPERE 2021)*, 13-16 September 2021, Gothenburg, Sweden (Online).

Y. Zhang, R. Yadav, A. Omrani, M. Fjeld, A Novel Augmented Reality System To Support Volumetric Visualization in Industrial Process Tomography. *15th International Conference on Interfaces and Human Computer Interaction (iHCI 2021)*, 21-23 July 2021, Online.

A. Omrani, R. Yadav, G. Link, M. Vauhkonen, T. Lahivaara, J. Jelonnek, A Combined Microwave Imaging Algorithm for Localization and Moisture Level Estimation in Multilayered Media. *15th European Conference on Antennas and Propagation (EuCAP)*, 22-26 March 2021, Düsseldorf, Germany (Online).

R. Yadav, A. Omrani, M. Vauhkonen, G. Link, T. Lähivaara, Microwave Tomography for Moisture Level Estimation Using Bayesian Framework. *15th European Conference on Antennas and Propagation (EuCAP)*, 22-26 March 2021, Düsseldorf, Germany (Online).

A. Omrani, G. Link, J. Jelonnek, A Multistatic Uniform Diffraction Tomographic Algorithm for Real-Time Moisture Detection. *IEEE Asia-Pacific Microwave Conference (APMC)*, 8-11 December 2020, Hong Kong (Online).

Y. Zhang, Y. Ma, A. Omrani, R. Yadav, M. Fjeld, M. Fratarcangeli, Automatic Image Segmentation for Microwave Tomography (MWT): From Implementation to Comparative Evaluation. *12th International Symposium on Visual Information Communication and Interaction (VINCI 2019)*, 20-22 September 2019, Shanghai, China.

ESR 8 Soheil Aghajanian, Lappeenranta University of Technology, Finland

S. Aghajanian, G. Rao, P. Koulountzios, L. Jackowska-Strumiłło, M. Soleimani, T. Koiranen, Towards real-time control of a semi-batch crystallization process by electrical and ultrasound tomographic techniques. *15th International Conference on Chemical and Process Engineering*, 23-26 May 2021, Naples, Italy (Online).

S. Aghajanian, H. Nieminen, T. Koiranen, Precipitation of calcium carbonate in highly alkaline solution through carbonated water. *2nd International Process Intensification Conference*, 27-29 May 2019, Leuven, Belgium.

ESR 9 Shereen Abouelazayem, Technical University of Liberec, Czech Republic

S. Abouelazayem, I. Glavinić, T. Wondrak, J. Hlava, Switched MPC Based on Clogging Detection in Continuous Casting Process. *IFAC 2020 World Congress*, 11-17 July 2020, Berlin, Germany (Online).

S. Abouelazayem, I. Glavinić, T. Wondrak, J. Hlava, Adaptive Control of Meniscus Velocity in Continuous Caster based on NARX Neural Network Model. *IFAC Workshop on Adaptive and Learning Control Systems*, 24-26 December 2019, Winchester, UK.

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S. Abouelazayem, I. Glavinić, T. Wondrak, J. Hlava, Control of Jet Flow Angle in Continuous Casting Process using an Electromagnetic Brake. *IFAC Symposium on Control, Optimization and Automation in Mining, Mineral and Metal Processing*, 28-30 August 2019, Stellenbosch, South Africa.

ESR 10 Muhammad Awais Sattar, Lodz University of Technology, Poland

M. A. Sattar, L. Babout, Towards The Combination Of Data Reduction And Augmented Reality For Online And Onsite ERT-Based Monitoring Of Inline Fluid Separation. *10th World Congress on Industrial Process Tomography (WCIPT-10)*, 13-16 September 2021, Online.

M. A. Sattar, M. M. Garcia, R. Banasiak, L. M. Portela, L. Babout, Scaling of Electrical Resistance Tomography Data of Swirled Liquid-Gas Separation Using Fast Camera Imaging. *PTZE – Application of Electromagnetism in Modern Engineering and Medicine*, 13-16 September 2020, Jastarnia, Poland (Online).

M. A. Sattar, R. Banasiak, J. Nowakowski, A. Voutilainen, J. Hartikainen, M. Mononen, L. Babout, Estimation Of Phantom Vortex Size For Liquid Gas Separation Using Electrical Tomography. *International Interdisciplinary PhD Workshop (IIPhDW)*, 15-17 May 2019, Wismar, Germany.

G. Rao, M. A. Sattar, R. Wajman, L. Jackowska-Strumiłło, Application of the 2D-ERT to evaluate phantom circumscribed regions in various sucrose solution concentrations. *International Interdisciplinary PhD Workshop (IIPhDW)*, 15-17 May 2019, Wismar, Germany.

ESR 11 Guruprasad Rao, Lodz University of Technology, Poland

Y. Zhang, A. Nowak, G. Rao, A. Romanowski, M. Fjeld, Is Industrial Tomography Ready for Augmented Reality? A Need-finding Study of How Augmented Reality Can Be Adopted by Industrial Tomography Experts. *2021 IEEE International Conference on Virtual Reality and Visualization*, 17-20 October 2021, Nanchang, China / Online.

G. Rao, S. Aghajanian, L. Jackowska-Strumiłło, Implementation of K-means clustering segmentation to visualize calcium carbonate crystals in high conductivity solution detected using ERT. *10th World Congress on Industrial Process Tomography (WCIPT-10)*, 13-16 September 2021, Online.

S. Aghajanian, G. Rao, P. Koulountzios, L. Jackowska-Strumiłło, M. Soleimani, T. Koiranen, Towards Real-Time Control of a Semibatch Crystallization Process by Electrical and Ultrasound Tomographic Techniques. *15th International Conference on Chemical and Process Engineering*, 23-26 May 2021, Naples, Italy / Online.

G. Rao, M. A. Sattar, R. Wajman, L. Jackowska-Strumiłło, Application of the 2D-ERT to evaluate phantom circumscribed regions in various sucrose solution concentrations. *International Interdisciplinary PhD Workshop*, 15-17 May 2019, Wismar, Germany.

ESR 12 Imamul Muttakin, University of Bath, UK

I. Muttakin, M. Soleimani, Direct Capacitance Measurement for Tomographic Imaging of Metallic Object. *9th World Congress on Industrial Process Tomography (WCIPT-9)*, 2-6 September 2018, Bath, UK.

ESR 13 Panagiotis Koulountzios, University of Bath, UK

P. Koulountzios, T. Rymarczyk, M. Soleimani, Ultrasonic Tomography for automated material inspection in liquid masses. *9th World Congress on Industrial Process Tomography (WCIPT-9)*, 2-6 September 2018, Bath, UK.

ESR 14 Marzieh Hosseini, University of Eastern Finland, Finland

M. Hosseini, A. Kaasinen, G. Link, T. Lähivaara, M. Vauhkonen, Electrical capacitance tomography assisted control in a microwave drying process. *Inverse Days 2021*, 14–16 December 2021, Tampere, Finland.

M. Hosseini, A. Kaasinen, G. Link, T. Lähivaara, M. Vauhkonen, Imaging moisture distribution of polymer foams in a continuous microwave drying process. *10th World Congress on Industrial Process Tomography (WCIPT-10)*, 13-16 September 2021, Online.

M. Hosseini, A. Kaasinen, G. Link, T. Lähivaara, M. Vauhkonen, LQR Control of Moisture Distribution in Microwave Drying Process Based on a Finite Element Model of Parabolic PDEs. *IFAC 2020 World Congress*, 11-17 July 2020, Berlin, Germany (Online).

ESR 15 Rahul Yadav, University of Eastern Finland, Finland

R. Yadav, A. Omrani, M. Vauhkonen, T. Lähivaara, Complex-permittivity estimation of a polymer foam using microwave tomography for the application of microwave drying. *18th International Conference on Microwave and High Frequency Application (AMPERE 2021)*, 13-16 September 2021, Gothenburg, Sweden (Online).

A. Omrani, R. Yadav, G. Link, J. Jelonnek, A time-reversal imaging algorithm for localization and moisture level detection in the polymer foam in an industrial microwave drying system. *18th International Conference on Microwave and High Frequency Application (AMPERE 2021)*, 13-16 September 2021, Gothenburg, Sweden (Online).

R. Yadav, A. Omrani, G. Link, M. Vauhkonen, T. Lähivaara, Imaging porous materials with microwave sensor and learning- based reconstruction algorithm: Experimental study for industrial drying application. *10th World Congress on Industrial Process Tomography (WCIPT-10)*, 13-16 September 2021, Online.

Y. Zhang, R. Yadav, A. Omrani, M. Fjeld, A Novel Augmented Reality System to Support Volumetric Visualization in Industrial Process Tomography. *15th International Conference on Interfaces and Human Computer Interaction (iHCI 2021)*, 21–23 July 2021, Online.

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R. Yadav, A. Omrani, M. Vauhkonen, G. Link, T. Lähivaara, Microwave Tomography for Moisture Level Estimation Using Bayesian Framework. *2021 15th European Conference on Antennas and Propagation (EuCAP)*, 22-26 March 2021, Düsseldorf, Germany.

A. Omrani, R. Yadav, G. Link, M. Vauhkonen, T. Lähivaara, J. Jelonnek, A Combined Microwave Imaging Algorithm for Localization and Moisture Level Estimation in Multilayered Media. *2021 15th European Conference on Antennas and Propagation (EuCAP)*, 22-26 March 2021, Düsseldorf, Germany.

R. Yadav, M. Vauhkonen, G. Link, S. Betz, T. Lähivaara, Microwave tomography for estimating moisture content distribution in porous foam using neural networks. 2020 *14th European Conference on Antennas and Propagation (EuCAP)*, 15-20 March 2020, Copenhagen, Denmark.

Y. Zhang, Y. Ma, A. Omrani, R. Yadav, M. Fjeld, M. Fratarcangeli, Automatic Image Segmentation for Microwave Tomography (MWT): From Implementation to Comparative Evaluation. *12th International Symposium on Visual Information Communication and Interaction (VINCI 2019)*, 20-22 September 2019, Shanghai, China.

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