



# IMPRESS 2: Summary of Impact WP Achievements

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# WP4 Creating Impact

- As is common to all EMPIR projects IMPRESS 2 has a WP focussed on disseminating results
- Rather than present the results themselves the purpose of this Introduction to WP4 is to make you aware of what has been disseminated and what can be accessed
- Documentary standardisation has been a key dissemination route under the project, a more detailed talk on this topic will follow

# Project Website(1)

- The project ends at the end of January 2021. A short time after that all key project outputs will be publically available on the project website
  - <http://empir.npl.co.uk/impress/>
  - The exception is peer review papers as it takes a number of months for some journals to publish. But, these will be open access

The screenshot shows a web browser window displaying the IMPRESS 2 website. The browser address bar shows the URL <http://empir.npl.co.uk/impress/>. The website header includes a navigation menu with links for Home, About, News and events, Activities, Partners, Documents and publications, Members' area, and Contact. The main content area features a large banner titled "IMPRESS 2: Metrology for Air Pollutant Emissions" with a background image of a factory emitting smoke. Below the banner is a detailed infographic with the following sections:

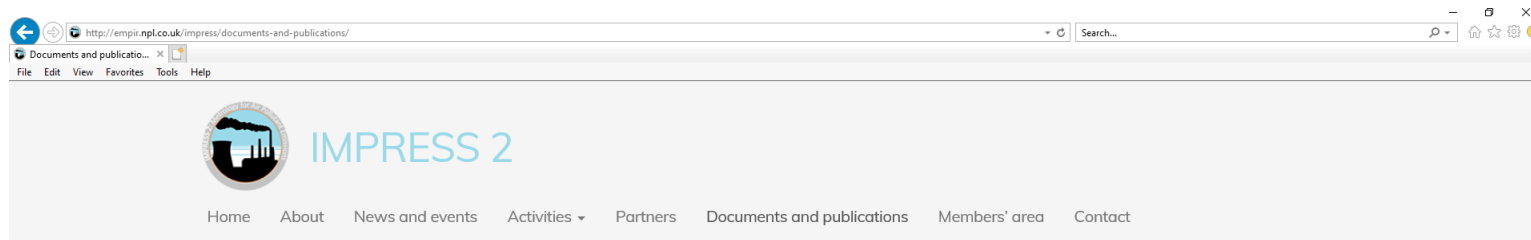
- Economic and Societal Drivers**
  - The EC estimates "400 000 premature deaths and associated health costs of €200 - €300 billion p.a. attributable to air pollution".
  - €160 billion p.a. of the above cost is attributable to Europe's 10 000 largest polluting facilities.
  - 64% of the EU's urban population is exposed to particulate matter (PM) above WHO guidelines; residential biomass burning heaters are "the most important contributors to total PM emissions in the EU".
- Conventional Contribution**
  - There are no SPMs for PM<sub>10</sub>, formaldehyde or H<sub>2</sub>.
  - Existing SPMs have not been validated; interfering sites have NO<sub>2</sub> SPMs.
  - Low concentration limit measurements.
  - Uncertainty work associated with filter SPM measurements.
  - Sensor calibration and wall absorption.
  - SPMs available in data for some sites are 40-70% uncertain.
- Business Contribution**
  - No SPMs for non-ferrous copper compounds (PM<sub>10</sub>), organic germane oxides (PM<sub>10</sub>), polychlorinated biphenyls (PM<sub>10</sub>) or the No real time on-line techniques capable of quantifying PM<sub>10</sub> emissions from road and aviation sites in Europe.
- Future Directive Needs**
  - To meet 2020 air quality guidelines for 2020.
  - Knowledge of target legislation will continue to be developed; therefore, work must start now involving the best generation of scientists.

At the bottom of the infographic, there is a flowchart showing the process from "Requirements" to "Standards" and "Future Legislative Support". A search bar and the EMPIR logo (co-funded by the European Union and EMPIR Participating States) are visible in the top right of the website content.

At the bottom of the browser window, a Windows taskbar is visible with the search bar containing "Type here to search", the system tray showing the time as 15:11 on 08/01/2021, and a notification for "tpTscnS add-on from McAfee, Inc. is ready for use."

# Project Website(2)

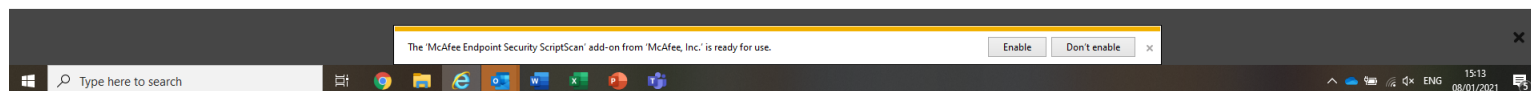
- Most of what you are likely to be looking for will be under the “Documents and publications” tab



## Documents and publications

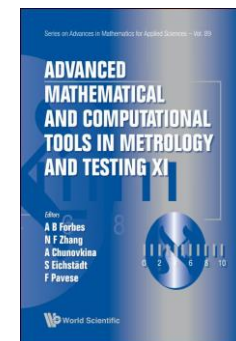
### Papers

- Optical detection of ammonia inside a stack: Comparison of different techniques*  
F. D'Amato, S. Viciani, A. Montori, A. Lapini, I. Fraboulet, J. Poulleau  
*Set-Up of a New Sampling Method to Measure Condensable PM from Residential Solid Biomass Heating Generators*  
F. Hugony, C. Morreale, G. Migliavacca, S. Tamburrino & M. Gualtieri
- New standard for particle measurements in small scale biomass combustion*  
Sara Janhäll, Lennart Gustavsson, and Daniel Bäckström
- Flow rate measurement in stacks with cyclonic flow – Error estimations using CFD modelling*  
J. Geršl, S. Knotek, Z. Belligoli, R.P. Dwight, R.A. Robinson and M.D. Coleman
- Towards effective emission regulations: A numerical and experimental study on flow measurement uncertainty in stacks*  
Alouette van Hove
- The thermal boundary layer effects on line-of-sight TDLAS gas concentration measurements*  
Zhechao Qu, Olav Werhahn and Volker Ebert



# Example Outputs

- A non-exhaustive list to show the range and types of outputs includes:
  - Annual presentations to CEN/TC 264 'Air Quality'
  - Special session at FLAIR 2018 on the 'Metrology of Combustion'
  - Invited presentations at leading industrial emission conferences
  - Training course for flow engineers on uncertainty quantification, Bayesian statistics, data-assimilation, data-fusion  
<https://aerodynamics.lr.tudelft.nl/~rdwright/cfddiv/Misc/2019-05.IMPRESS II.UQ in flow metrology.pdf>
  - Masters thesis on flow measurement uncertainty in stacks <http://resolver.tudelft.nl/uuid:f56ff5c1-8a9c-4b5c-b404-ab421b7ede59>
  - Book chapter on quality assurance in emissions monitoring  
[https://doi.org/10.1142/9789813274303\\_0034](https://doi.org/10.1142/9789813274303_0034)
  - Presentation Lot20: preparatory group for Eco-Design Directive
  - Guidance document on uncertainty of dTDLAS measurements



# Peer Review Publications

## ■ So far

- Optical detection of ammonia inside a stack: Comparison of different techniques. *Measurement* <https://doi.org/10.1016/j.measurement.2020.107746>
- Flow rate measurement in stacks with cyclonic flow – Error estimations using CFD modelling. *Measurement* <https://doi.org/10.1016/j.measurement.2018.06.032>
- Narrow stack emissions: Errors in flow rate measurement due to disturbances and swirl. *JA&WMA* <https://doi.org/10.1080/10962247.2020.1832621>
- The thermal boundary layer effects on line-of-sight TDLAS gas concentration measurements. *Applied Spectroscopy* <http://journals.sagepub.com/doi/10.1177/0003702817752112>
- Set-Up of a New Sampling Method to Measure Condensable PM from Residential Solid Biomass Heating Generators. *EU BCE*
- New standard for particle measurements in small scale biomass combustion. *EU BCE*

## ■ Non-exhaustive list of some still to come...

- Discussion of the metrology basis of regulation affecting industrial emissions
- Discussion of measurement issues in enforcing increasingly stringent emission limits
- EN 1911 chloride quantification comparison (presented this morning)
- ILC of analysis of PAH stack samples
- Monte Carlo uncertainty analysis of stack manual flow monitors