



Gas Analysis Working Group (GAW): Status and perspective 2019

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Motivation for the Gas Analysis Working Group (GAW) and the way we work together

Motivation

Exchange and sharing information and experiences on recent methodologies in gas sampling and gas analysis for bioenergy processes (gasification, biogas, combustion, pyrolysis, ...)

The way we work together

- [Website](#), [Wikis](#), [Online Polls](#) and Virtual Task Boards ([VTB](#)) to provide information on current status of analytical technologies in the fields of interest
- [Workshops](#) and [Webinars](#) on all issues regarding gas sampling and analysis, as well as on general issues which are relevant for GAW (ELN, HAZOP, ...)
- [Working together in joint measurement campaigns](#) to gain and deepen specific knowledge and intensify direct personal exchange ([host site](#)).



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One of our challenges: Complexity

Multiple business areas

Modern home furnaces



Agriculture biogas

Waste-to-energy plant



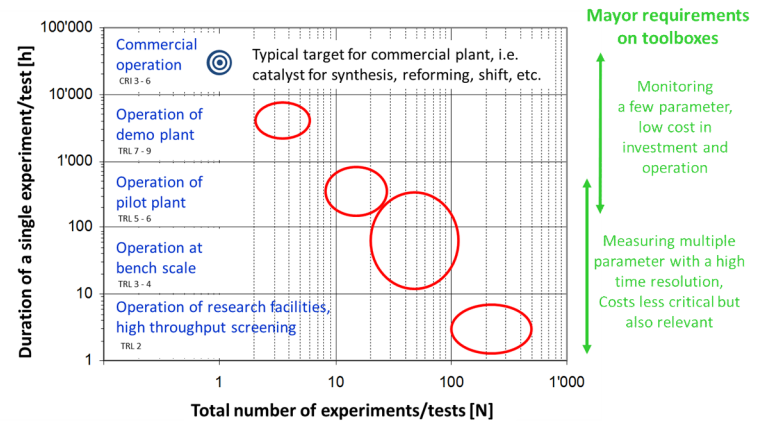
Automated woodchip combustion



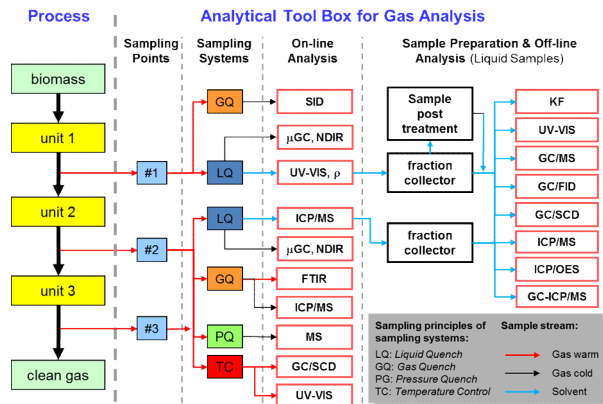
Waste water treatment plant

Picture source: SFOE 2016

Maturity level of bioenergy technologies



Multiple analytical instruments



Multiple organisations (academia & industry)





How can we as a community handle this complexity ?

Step 1: Slicing the elephant



Step 2: Building cross-functional committed teams



Gas Analysis Working Groups: Since 2016

Here we are looking for your input. We want to concentrate on relevant issues. Therefore we will ask you to choose what is relevant for yourself or for your group. This feedback enables us to steer the activities in the best possible way.

Your participation in topical groups, Status of interest on:

Tar online measurement systems

- [Tar online measurement systems](#)
- [Laser based/optical measurements of BTX+PAC](#)

Sulphur measurement (technique and equipment)

- [GC-X sulphur measurement \(FPD, PFPD, SCD\)](#)
- [Sulphur measurement with Micro-GC](#)
- [Low cost total sulphur measurement](#)

FTIR

- [FTIR measurement \(technique & equipment\)](#)

Particle sampling and analysis

- [On-line particle measurements](#)

Supporting devices for gas sampling

- [Design & operation of gas dilution systems](#)

ELN & LIMS - electronic laboratory notebook & laboratory information management system

- [ELN & LIMS](#)



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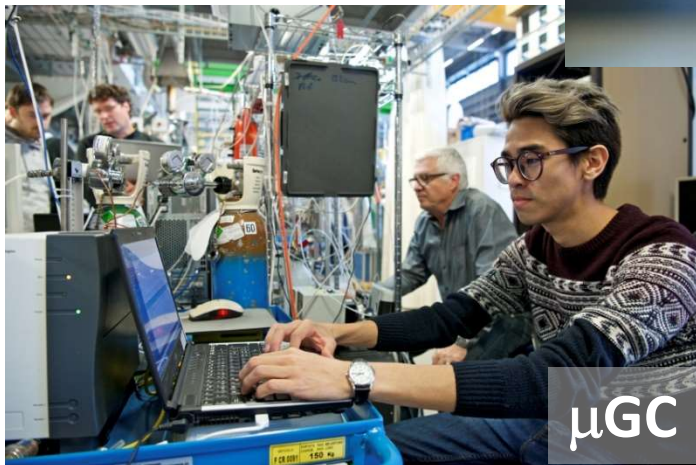
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An example of a cross-functional committed teams: Tar online host site October 2016
Group managers, seniors, technicians and PhD students are working co-located together





An example for network management in one Working Group: Doodle, Wiki, WEBinar

Doodle polls for the identification of core team

Status of interest on: Tar online measurement systems

Umfrage von Serge Biollaz | 13 | 0 | vor 16 Tagen

Wo: WEBinar

Please let other experts know your intensity of interest on tar online measurement systems. This will help to team up and coordinate common actions in that field.



13 Teilnehmende

	No interest: Sorry, actually no interest on this subject. Maybe my interest will increase in the future.	Passive follower: Please keep me up-to-date. I will give feedbacks on a case-by-case base.	Active follower: Please keep me up-to-date. I will give others my feedback to outcome of core team.	Core team: I'm personally committed to spent time on this subject and share my experience with others.
Serge Biollaz (PSI)				✓
Marcel Huber (MCI)			✓	
Reinhard Seiser (UC)		✓		
Johan Kuipers (ECN)				✓
Markus Kleinhappl				✓
Felix Fischer (TUM)		✓		
Julian Borgmeyer (T)				✓
Sebastian Fendt (TL)		✓		
Stefanie Reil (Fh UV)		✓		
Wiebren de Jong (TI)		✓		
York Neubauer (TU)				✓
Jörg Schneebeili (PS)			✓	
Andreas Gredinger (✓
Ihr Name	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Platform for the exchange: Wiki & WEBinar



Meetings

Webmeeting 30.11.2016, 9:00 AM - Second review of online and offline results

Webmeeting 11.11.2016, 9:00 AM - review of first online and offline results

Meet and Greet meeting 25.10.2016, 8:45 AM

Webmeeting 14.10.2016, 9:00 AM - first results from pre-tests, discussion about ex

Webmeeting 07.10.2016, 9:00 AM - finalize experimental setup

Webmeeting 29.9.2016 - requirements on the test gas Generator

Webmeeting 23.9.2016, Preparing Team-Meeting/WEBinar 29.9.2016


Webmeeting 2.9.2016, Consolidation of Framework

Webmeeting 22.8.2016, Kickoffmeeting York & Serge



An example for network management in one Working Group: Wiki

Logged in as: Serge Biollaz (serge) [Update Profile](#) [Log Out](#)

 **GAWiki** [Recent Changes](#) [Media Manager](#) [Sitemap](#)

Trace: - [start](#)

Measurement campaign at the Paul-Scherrer-Institute (PSI) in Villigen/Switzerland

Time: week 43/2016 (October 24-28)

Aim: On-line measurements of tar species and mixtures of aromatic compounds supplied from test-gas generation systems [Edit](#)

Previous host site and individual activities

Generic learnings from round robin tests Have a look on following presentation, page 6 and following pages:
[GAW 2014 Berlin](#)

[Previous work](#)

Main objectives of this Round Robin test and host site

[Objectives](#)

Technical topics

- [applied sampling / analytical methods](#)
- [setup of the test gas generation systems](#)
- [requirements of the analytical tools](#)
- [literature](#)
- [questions, requests, open issues, to do's](#)

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- ◊ Measurement campaign at the Paul-Scherrer-Institute (PSI) in Villigen/Switzerland
- ◊ Previous host site and individual activities
- ◊ Main objectives of this Round Robin test and host site
- ◊ Technical topics
- ◊ Infrastructural topics to run and operate this host site
- ◊ Measurements with On-line Systems and test gas generation system - TGG
- ◊ Results
- ◊ Publication of results
- ◊ IEA task meeting in Lucerne/CH October 26th
- ◊ Travel, Accomodation, Customs
- ◊ Task management
 - ◊ Meetings
 - ◊ Gantt Chart
 - ◊ KANBAN Board
- ◊ Training



An example of one outcome of good network management: Research Paper



Biomass and Bioenergy

Volume 117, October 2018, Pages 63-70



Research paper

Comparison of two on-line tar-monitoring devices with off-line liquid sample tar-analysis operated on a test gas generation system applying ethene pyrolysis

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Received 2 October 2017, Revised 10 July 2018, Accepted 11 July 2018, Available online 26 July 2018.

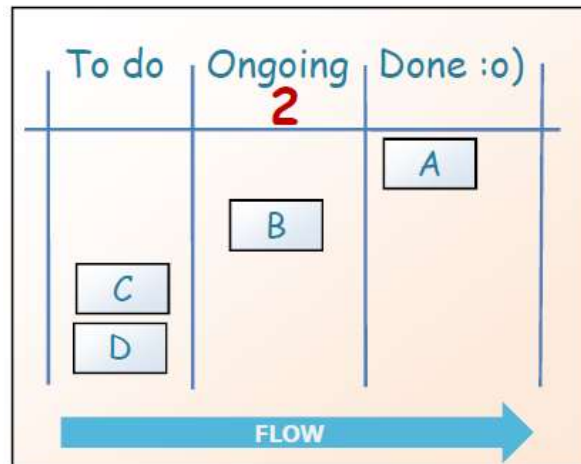


An example for network management in one Working Group: Virtual Task Boards (VTB)

With a **Task Board** the workflow is visualised

From To-do-list to done

KANBAN



Virtual Task Board (VTB) for a working group using





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Trello as a platform for feedback & questions

The screenshot shows a Trello board interface. At the top, there's a navigation bar with 'Boards' and a search icon. The board title is 'Gas Analysis Workshop Berlin 2017' with 'Personal' and 'Private' indicators. Below the title, there are several cards. The first card is titled 'e-mail inbox' and contains the text 'Serge Biollaz, What is LOD for UV diodes?'. The second card is titled 'Analysis of complex tar mixtures with laser induced fluorescence – fundamental aspects'. The third card is titled 'Optical on-line tar sensing using UV diodes'. The fourth card is titled 'IEA Report Gas sampling and Analysis (Q&A)'. There are also 'Add a card...' buttons for each card and an 'Add a list...' button on the right.

The screenshot shows the detail view of a Trello card. The card title is 'Serge Biollaz, What is LOD for UV diodes?'. Below the title, there's a description: 'Please comment on the limit of detection (LOD)'. There are 'Thanks' and 'Serge' comments. The 'Add Comment' section has a text input field with 'Write a comment...' and a 'Save' button. The 'Activity' section shows a log entry: 'SB Serge Biollaz emailed this card to e-mail Inbox 2 minutes ago'. On the right side, there are 'Add' options: 'Members', 'Labels', 'Checklist', 'Due Date', and 'Attachment'. Below these are 'Actions' options: 'Move', 'Copy', 'Subscribe', and 'Archive'. At the bottom, there's a 'Share and more...' link. On the far right, there's a preview of an email with the following details: 'Von: Biollaz Serge M.A. (PSI)', 'An: 'wsnyjb9qdqqey0ybkasb@boards.trello.com'', 'Cc:', 'Betreff: Serge Biollaz, What is LOD for UV diodes?'. The email body contains the text: 'Please comment on the limit of detection (LOD)', 'Thanks', and 'Serge'. The email is dated 'Do 07.09.2017 11:51'.

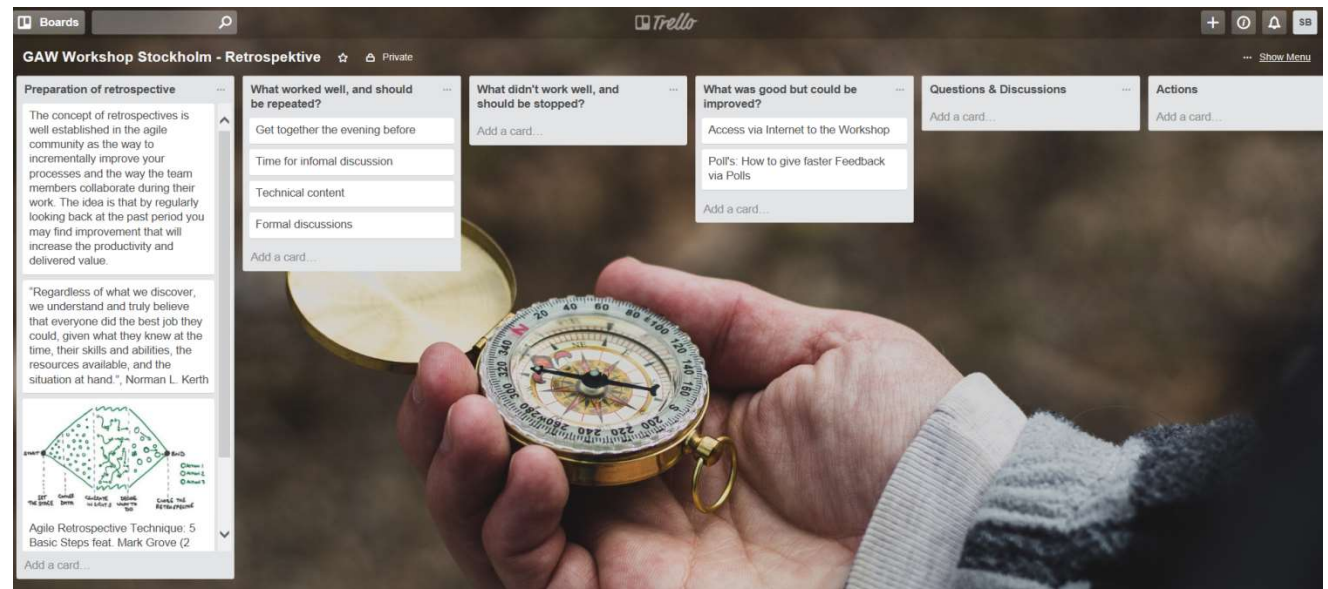


Continuous improvement based on retrospectives

Key questions for retrospectives

- What worked well, and should be repeated?
- What didn't work well, and should be stopped?
- What was good but could be improved?

Using the Trello-Platform
for retrospectives with
distributed teams





Outlook gasification: IEA report “Gas analysis in gasification of biomass & waste”



The WEB-conference format “200-20-2-2”

Up to **200** Participants

discuss in up to **20** focused group (for ~ 20 min)

in a **2** hour WEB-conference

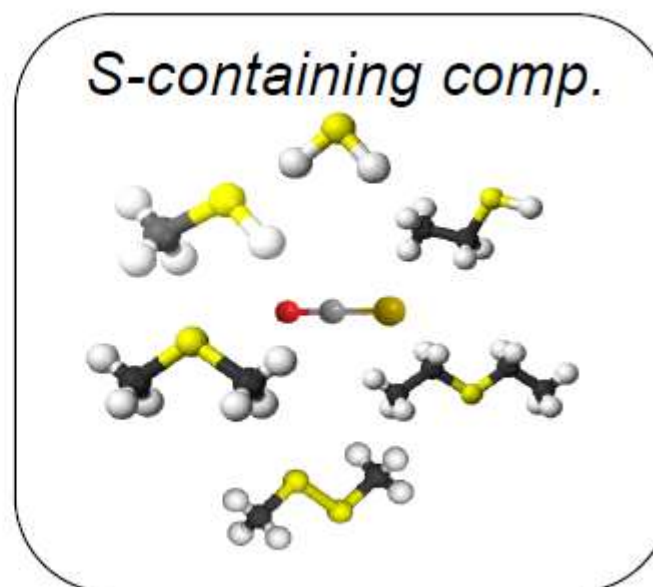
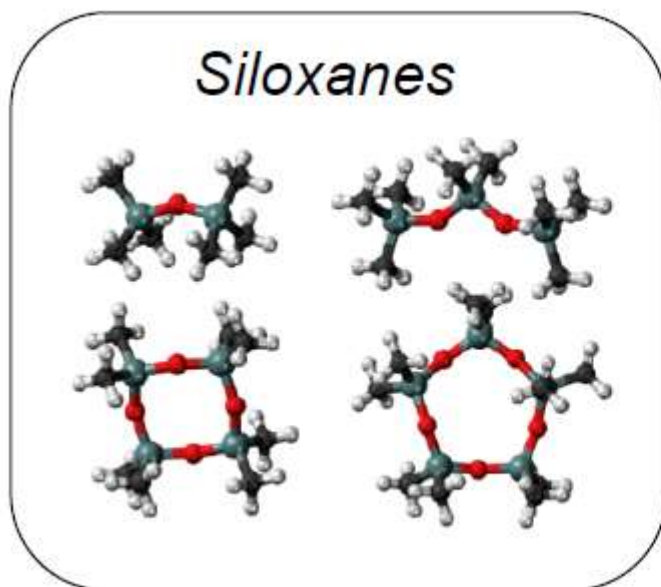
WEB-conference every **2nd** week



Outlook biogas: EMPIR 18SIP03 Si-S/Biogas

Core team:    

Project duration: 1.6.2019 – 30.5.2021



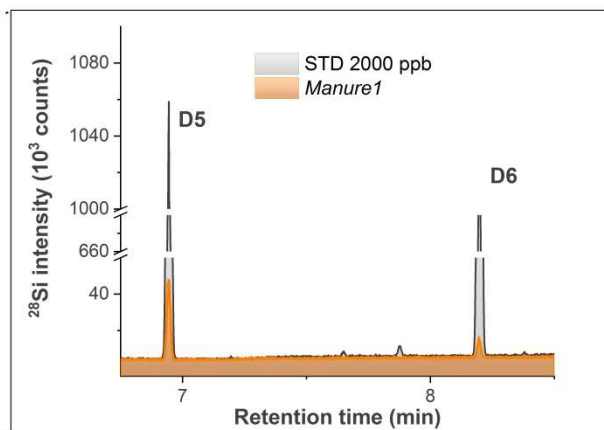
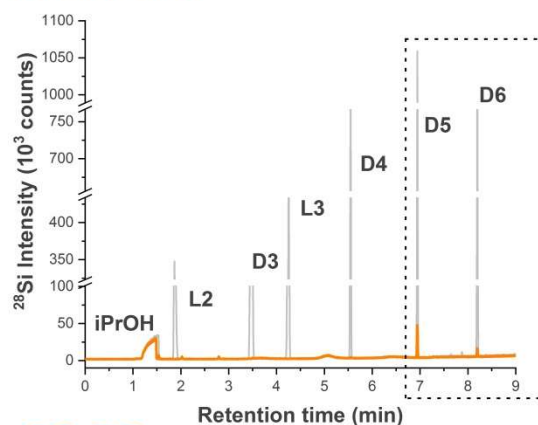
Project focus:

Best practice and needs in measuring siloxanes and Sulphur containing compounds in biogas

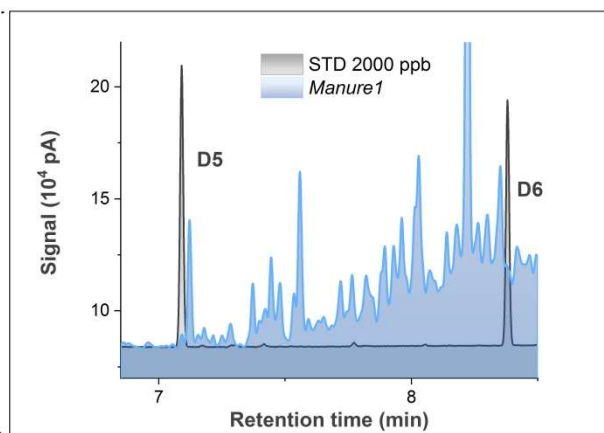
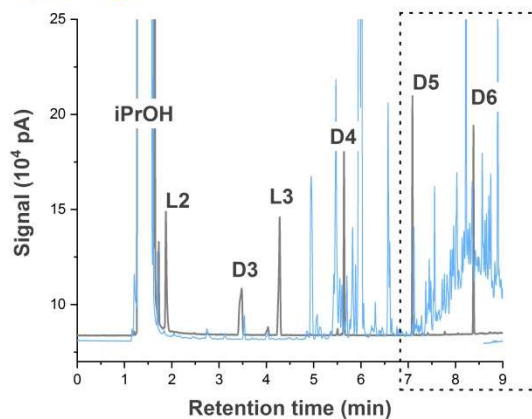


Outlook biogas: Siloxane analysis in biogases with GC-X @ PSI

GC-ICP-MS



GC-FID





Outlook pyrolysis: Not yet discussed



» Participate

Join our work in pyrolysis and liquefaction today!

You are an important part of achieving substantial bioenergy contribution to future global energy demands.

Feature your research by contributing an article to the next issue of PyNe:

Email: axel.funke@kit.edu

Contact your country representative to find out where you can get involved

Collaborate by contacting colleagues featured in PyNe that align with your research interests

Participate in the next Round Robin by contacting your country representative or the task lead.

We need colleagues in:

- o Analytical method development for Bio-oils, Bio-crudes, and separated chemical products
- o Organizations with collaborative research testing of pyrolysis, hydrothermal liquefaction, solvent liquefaction, and other direct thermochemical utilization of biomass
- o Industrial and regulatory stakeholders interested in biomass contribution to future global energy needs.





Summary and Outlook

Public visibility and status of analytical techniques

- [Website](#) and a public [Wiki](#)

Structure and manage current work tasks in topical working and user group's

- [Online Polls](#) and Virtual Task Boards ([VTB](#)) and [Wikis](#)

Sharing information and experience and working together via internet and in person

- [Webinars](#) and [Workshops](#)
- [Working together in joint measurement campaigns](#) to gain and deepen specific knowledge and intensify direct personal exchange ([host site](#)).



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“Coming together is a beginning,
Keeping together is progress.
Working together is success.”

*- Henry Ford
Founder, Ford Motor Company*





Discussion on next step: IEA report “Gas analysis in gasification of biomass & waste”



The WEB-conference format “200-20-2-2”

2.2 Measurement of permanent gases	24
2.3 Measurement of water content	32
2.4 BTX (Benzene, toluene and xylenes)	34
2.5 Tar compounds	37
2.6 Sulphur compounds	45
2.7 Nitrogen compounds	56
2.8 Chlorine and halogenated compounds	65
2.9 Alkali compounds	68
2.10 Trace elements	73
2.11 Silica compounds – siloxanes	76
2.12 Particulate matter	77

Please send your comments, feedback via this e-mail address:

uge1mi88u1bplu23hgbt@boards.trello.com