Workshop on Sampling, Detection and Quantification of Impurities in Gases from Thermochemical Biomass Conversion Processes - "Gas Analysis Workshop"

International Workshop

June 21st 2012 at 20th EU Biomass Conference and Exhibition, 09.45 – 18.00, MiCo, Milano, Yellow Hall 1

Welcome and Introduction

York Neubauer, TU Berlin, Institute of Energy Engineering, Berlin, Germany
Markus Kleinhappl, Bioenergy2020+, Graz, Austria
Serge Biollaz, Paul Scherrer Institute (PSI), Villigen, Switzerland

EVUR outline

- Introduction
- Short review of last years workshop
- What happened after the workshop in Berlin?
- Scope of today and what will or shall happen next?
- Program of today and start?

Previous workshops

Workshop zum Messen von Teer - Teermessung an Holzvergasungs-Motor-BHKW - 12.04.2010, Berlin

„Workshop for measuring tar – tar measurements on woodgas-motor-CHP plants“

~30 participants from Germany and Austria

Previous workshops

Measurement, Analysis and Monitoring of Condensable Gas Components (especially Tar) in Product-Gases from Biomass Gasification and Pyrolysis

International Workshop

June 8th 2011 at 19th EU BC+E, 10.00 – 16.30, ICC Berlin, **room 42, (2nd level)**

Financially supported by:

Biomass for energy

funding program

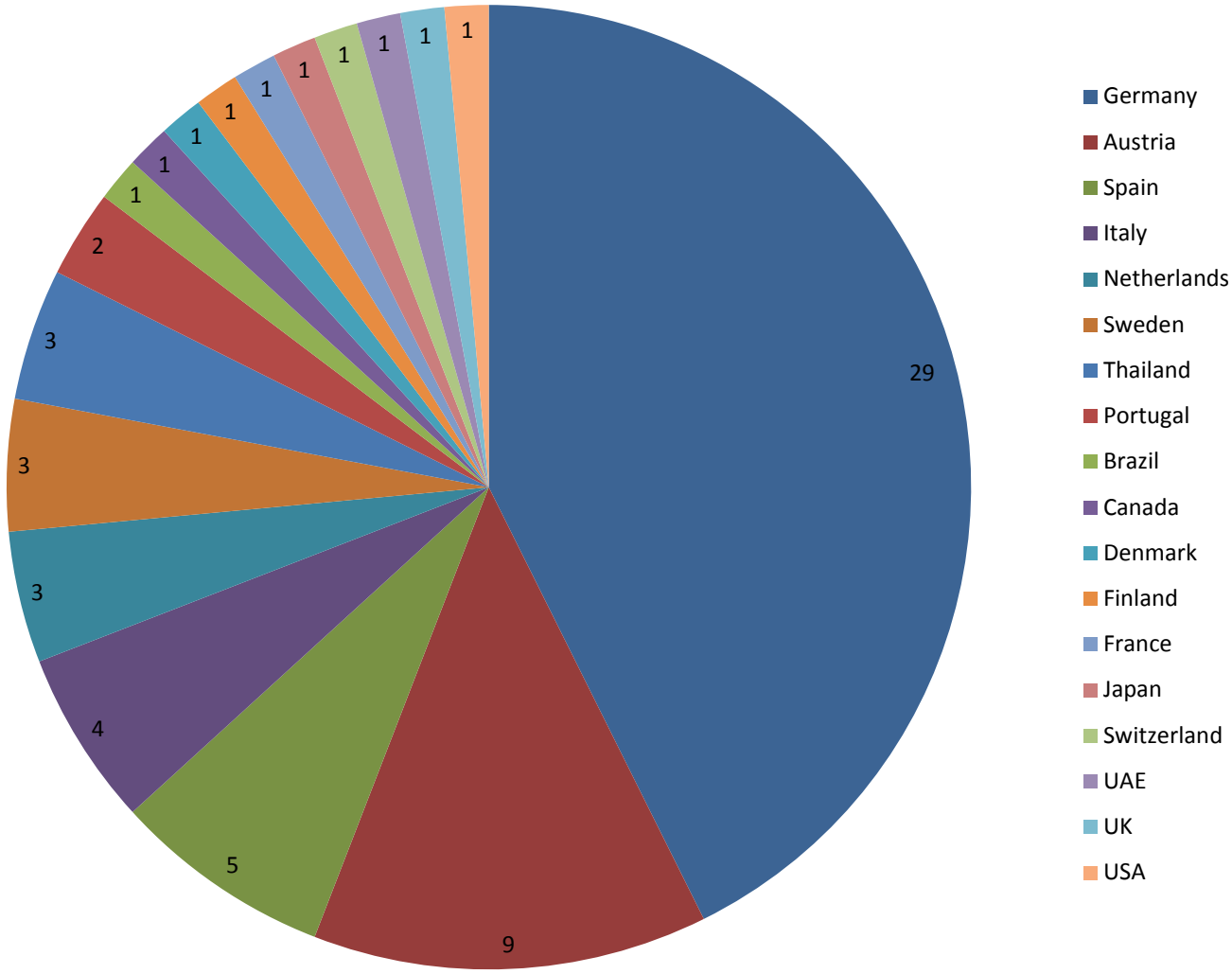
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

funded by

bioenergy2020+

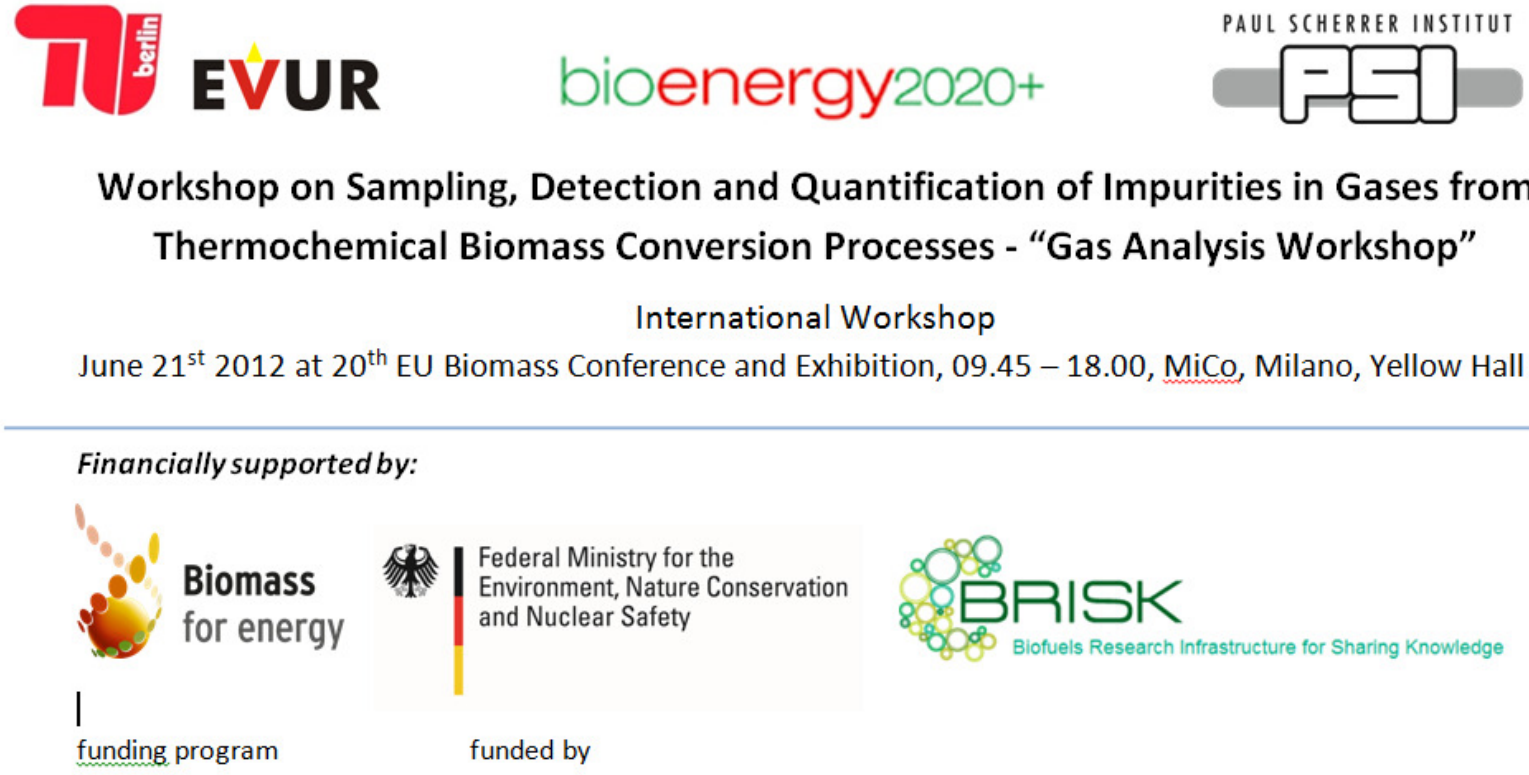
ECN Energy research Centre of the Netherlands

Participants 2011



68 (signed in) participants from 18 countries

This year



until yesterday: 43 replies

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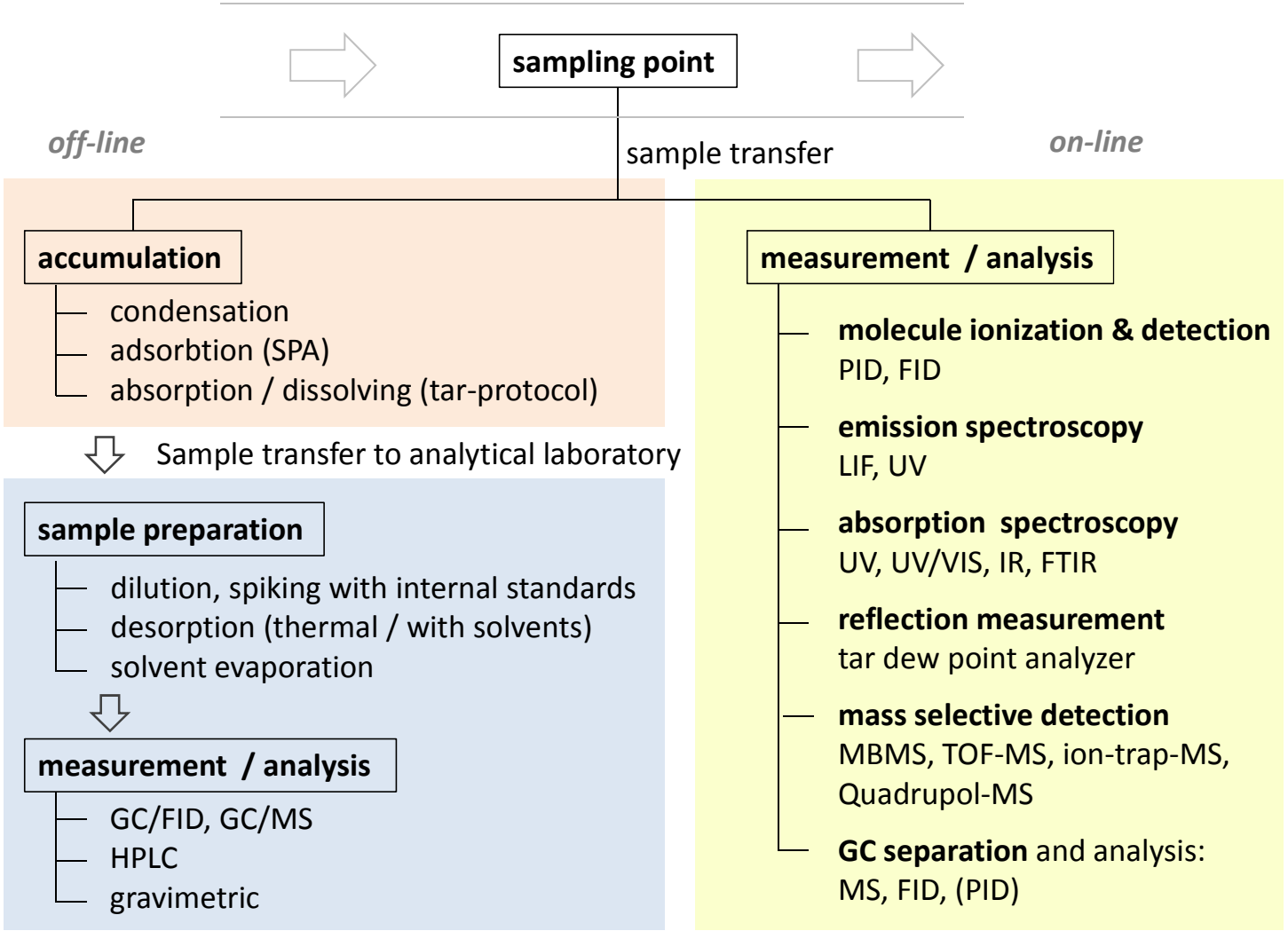
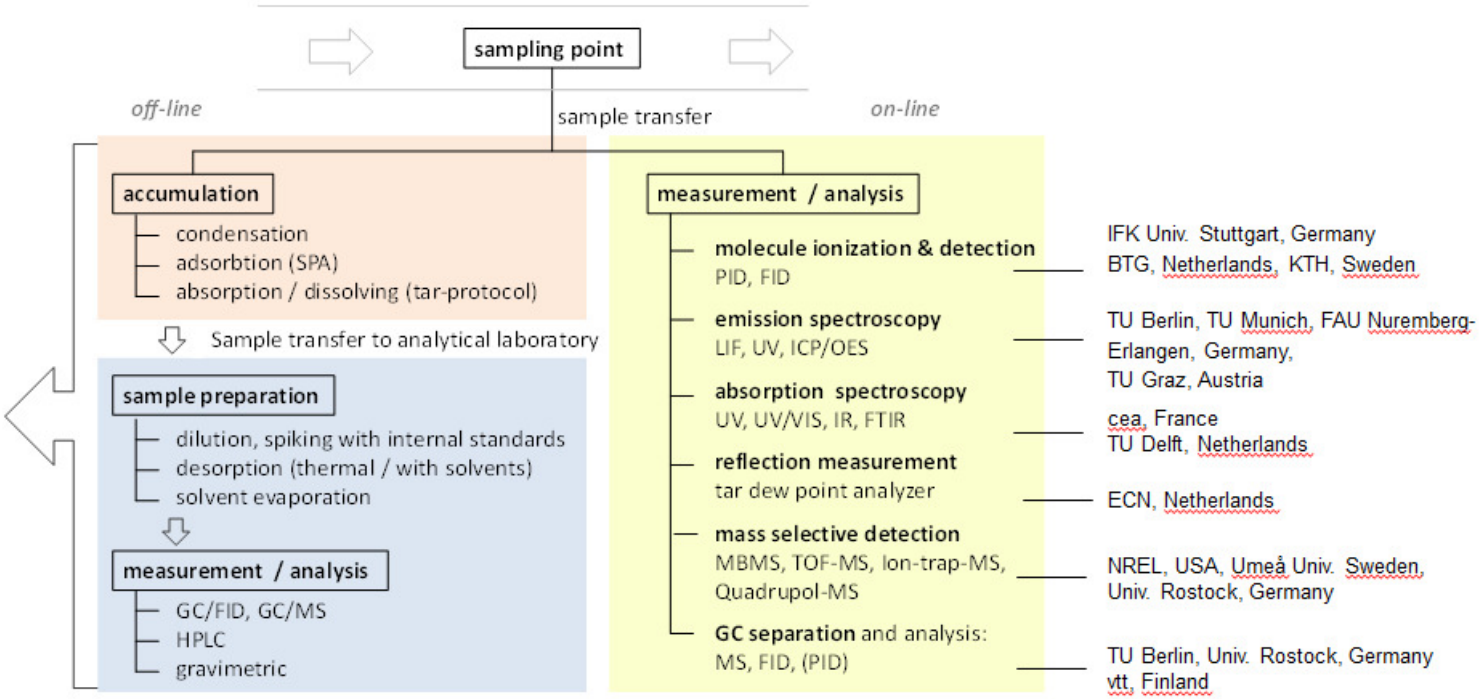

sampling point
off-line
sample transfer
on-line
accumulation
condensation
adsorbtion (SPA)
absorption / dissolving (tar-protocol)
Sample transfer to analytical laboratory
sample preparation
dilution, spiking with internal standards
desorption (thermal / with solvents)
solvent evaporation
measurement / analysis
GC/FID, GC/MS
HPLC
gravimetric
measurement / analysis
molecule ionization & detection
PID, FID
emission spectroscopy
LIF, UV
absorption spectroscopy
UV, UV/VIS, IR, FTIR
reflection measurement
tar dew point analyzer
mass selective detection
MBMS, TOF-MS, ion-trap-MS, Quadrupol-MS
GC separation and analysis:
MS, FID, (PID)

EVUR Workshop 2011



The presentations are available at:
http://www.evur.tu-berlin.de/menue/forschung/veranstaltungen/tar_workshop/parameter/en/

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After workshop Berlin 2011

Idea discussed at end of Berlin workshop:

- **Create review paper/Report/wiki for determining the current status of analytical techniques and for its dissemination**
- **have another workshop**

Idea brought up by M. Kleinhappl to form international working group:

"Setup of a working group to optimize the basis of knowledge about sampling, analysis and evaluation of impurities in product gases from thermochemical gasification, pyrolysis gases and conditioned synthesis gases"

Working group

T1(A): Gas extraction & pre treatment

T1B: Sample transport, Volume metering

T2A: accumulation offline Solvents & SPE

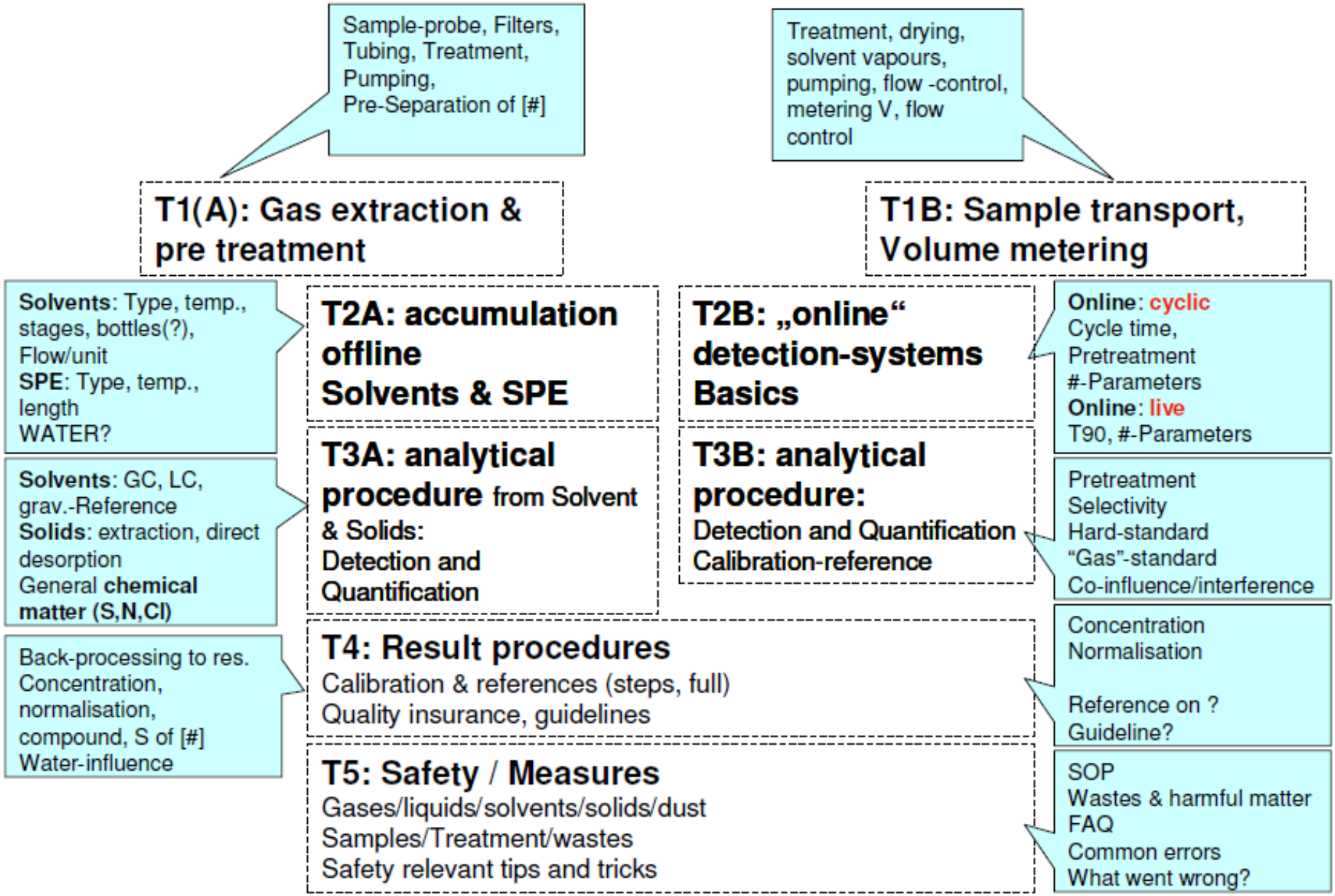
T2B: „online“ detection-systems Basics

T3A: analytical procedure from Solvent & Solids: Detection and Quantification

T3B: analytical procedure: Detection and Quantification Calibration-reference

T4: Result procedures
Calibration & references (steps, full)
Quality insurance, guidelines

T5: Safety / Measures
Gases/liquids/solvents/solids/dust
Samples/Treatment/wastes
Safety relevant tips and tricks


Sample-probe, Filters, Tubing, Treatment, Pumping, Pre-Separation of [#]
Treatment, drying, solvent vapours, pumping, flow -control, metering V, flow control
T1(A): Gas extraction & pre treatment
T1B: Sample transport, Volume metering
Solvents: Type, temp., stages, bottles(?), Flow/unit
SPE: Type, temp., length
WATER?
T2A: accumulation offline
Solvents & SPE
T2B: „online“ detection-systems
Basics
Online: cyclic
Cycle time,
Pretreatment
#-Parameters
Online: live
T90, #-Parameters
Solvents: GC, LC, grav.-Reference
Solids: extraction, direct desorption
General chemical matter (S,N,Cl)
T3A: analytical procedure from Solvent & Solids:
Detection and Quantification
T3B: analytical procedure:
Detection and Quantification
Calibration-reference
Pretreatment
Selectivity
Hard-standard
“Gas”-standard
Co-influence/interference
Back-processing to res.
Concentration,
normalisation,
compound, S of [#]
Water-influence
T4: Result procedures
Calibration & references (steps, full)
Quality insurance, guidelines
Concentration
Normalisation
Reference on ?
Guideline?
T5: Safety / Measures
Gases/liquids/solvents/solids/dust
Samples/Treatment/wastes
Safety relevant tips and tricks
SOP
Wastes & harmful matter
FAQ
Common errors
What went wrong?

EVUR questionnaire

No.	Institution; incl. address	Sci. representative; incl. email	Techn. representative; incl. email	Main focus task [1]					Methods in use (current state) [2]					
				T1	T2	T3	T4	T5	T2A Guideline	T3A	T2B	T3B	Chem. (T2A), T3	Chem. (T2B), T3
1	**Fraunhofer UMSICHT** Oberhausen Osterfelder Str. 3, 46047 Oberhausen	**Christoph Unger** christoph.unger@ umsicht.fraunhofer.de **Anna Fastabend**			X	X	X	(X)	PAH BTX	GC MS "D"-standards HPLC/ MS	onlineMS Benzol Naphthalin	-	Offline NH_3 inorg Tracers ICP/AES	Online H_2S
2	**Bioenergy2020+ GmbH** IK GRAZ Inffeldgasse 21b, A-8010 Graz	**Markus Kleinhappl** markus.kleinhappl@ bioenergy2020.eu	**Johannes Zeisler**		X	X	X		PAH BTX Wasser	HPLC, Grav.; (GC-FID; extern)	-	-	HCN, H_2S, NH_3, org. S.	H_2S
3	**TU Berlin** Institut für Energietechnik, FG Energieverfahrenstechnik und Umwandlungstechniken regenrativer Energien (EVUR) Fasanenstr. 89 10623 Berlin	**York Neubauer**, york.neubauer@ tu-berlin.de	n. n.	X	X	X	X	X	PAH BTX	GC/MS; GC/FID	CON-TAR (Fluorescence)	GC/MS (optional: Laser-Ionisation)	-	-
4	**CNRS Nancy** Laboratory of Reactions and Process Engineering, ENSIC, 1 rue Grandville, 54000 Nancy, France	**Anthony Dufour** anthony.dufour@ensic.inpl-nancy.fr **Eric Masson** eric.masson@cribois.net		X	X	X	X		SPA and impingers for secondary and tertiary tars. Impingers for pirmary tars.	heated loop or liquid injection coupled to GC*GC (heart cutting)/MS-FID; thermal desorption coupled to GC/MS*MS; LC/MS-UV-RI.	On progress. Strong interest for on-line analysis (different methods of ionisation to be tested)	idem T3A.	ICP/MS, ICP/AES, ionic chromatography available at the lab. but not yet used in this field.	
5	**name of institution** address	**name of representative** e-mail												

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EVUR scope

- **How to get started actually working together?**
- **How can this brought into a continuous process, except from meeting once a year?**
- **What are our aim and how do we want to reach them:**

Ideas:

1. We will have a third international workshop next year
2. Webinars starting in September (every 2 weeks on selected topics
3. round robins (use e.g. possibilities offered by BRISK); creation of status reports

Workshop program – part I

	Begin	End	Speaker	Title of subject
Workshop part I	**09:45**	10:00	Y. Neubauer	Welcome; Introduction; TASK-organisations, online/offline; timetable
	10:00			**Guideline (liquid) <--> SPA/SPE (solid)**
				Presentations to guideline; diff. approaches on same target
	10:05	10:20	*U. Wolfesberger-Schwabel*	*Comparison of Solvent IPA and Toluene (TUV/BE2020+); trad. Guideline at steam gasification*
	10:20	10:35	*J. Zeisler*	*Test of BTX and PAH capture with liquid coloums, Testgasgenerators*
	10:35	10:50	*Import Q. to be answered*	*short question for fast response, others in discussion, starting 12:10h.*
				Presentations: Function, test and approach of SPE-procedure incl. analytics
	10:50	11:05	*T. Liljedahl*	*The general FUNDAMENTALS & application of the SPA/SPE-method for tar sampling and analysis*
	11:05	11:20	*A. Dufour*	*SPA tar sampling and thermal desorption of analytes*
	11:20	11:35	*S. Grootjes*	*Experience report about SPA-Application; ECN*
	11:40	11:50	*Import Q. to be answered*	short question for fast response, others in discussion, starting 12:10h.
	11:50	12:10	BREAK	coffee
	12:10	**13:00**	Discussion	Discussion of SPA/SPE-Application, compareability against acc. Guideline EN 15439, required future work

Break for conference session

T2.4, 2DO.5 13:30 – 15.00
Tar analysis and tar reforming in gasification systems

13:30	15:00	T2.4, 2DO.5	Tar analysis & Reforming in gasification systems
13:30	13:45	2DO.5.1: J. Zeisler	The Actual Need of a Guideline for Sampling and Analysis of Chemical Matter (Not Tars) from Product Gas, Pyrolysis Gas and Synthesis Gas
13:45	14:00	2DO.5.2: S. Biollaz	Sulphur Diagnostics in Product Gases from Biomass at High and Very Low Concentrations: A Status Report 2012
14:00	14:15	2DO.5.3: F. Defoort	Do All Biomasses Exhibit the Same Alkali Release Behaviour During Steam Gasification?
14:15	14:30	2DO.5.4: Panopoulos	Activated Carbon's Adsorption Potential of Tar Species from Syngas in Warm Conditions
14:30	14:45	2DO.5.5: Trippe	Techno-economic Assessment of Process Parameter Variations in Entrained Flow Gasification as a Process Step within Biomass-to-liquid (BtL) Production

Workshop program – part II

Workshop part II	**15:30**	16:30		**Presentations of selected methods and application matrix for chemical parameters, action plan**
	15:35	15:45	S. Biollaz	Introduction; description of needs (Parameters, application, type of task)
	15:45	16:00	S. Biollaz	PSI-Toolbox regarding trace elements: chem. Parameters /S/metals
	16:00	16:15	S. Grootjes	Chem. Parameters via SPA-Application; ECN
	16:15	16:25	H. Egsgaard (DTU)	Different analytical approach for SPA-Samples Analysis
	16:25	16:40	J. Zeisler	accumulative approach for chem. parameters, the application matrix
	16:30	17:00	Discussion	Discussion (gen. Questions from Session 2DO.5) , Task-chem needs of a guideline or methods library for chemical parameters, action plan
	17:00	17:30	Y.Neubauer	**Stat.results questionare**, PLANNED: reports, webinars, round robins, Future activities; Summary. Next event.
	17:30		End	official end
	17:30	18:30		after scession, secondary discussion, soft end

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I wish all of us a pleasant, informative and inspiring workshop.