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
• Introduction

• Short review of last year's 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 for measuring tar – tar measurements on woodgas-motor-CHP plants“

~30 participants from Germany and Austria
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
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
bioenergy2020+
ECN Energy research Centre of the Netherlands
68 (signed in) participants from 18 countries
This year

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

Financially supported by:

[Logos and text indicating financial support]

until yesterday: 43 replies
• 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?
Workshop 2011

**Sampling Point**

**Off-line**
- **Accumulation**
  - condensation
  - adsorption (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

**On-line**

- **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)
The presentations are available at:
• 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?
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”
EVUR

Working group

T1(A): Gas extraction & pre treatment

T2A: accumulation offline
Solvents & SPE

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

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

T1B: Sample transport, Volume metering

T2B: „online“ detection systems
Basics

T3B: analytical procedure:
Detection and Quantification
Calibration-reference
T1(A): Gas extraction & pre-treatment

- Solvents: Type, temp., stages, bottles(?), Flow/unit
- SPE: Type, temp., length
- WATER?

T1(B): Sample transport, Volume metering

- Treatment, drying, solvent vapours, pumping, flow-control, 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

Online: cyclic
- Cycle time, Pretreatment
- #-Parameters

Online: live
- T90, #-Parameters

Pretreatment
- Selectivity
- Hard-standard
- "Gas"-standard
- Co-influence/interference

Concentration
- Normalisation

Reference on?
- Guideline?

SOP
- Wastes & harmful matter
- FAQ
- Common errors
- What went wrong?
<table>
<thead>
<tr>
<th>No.</th>
<th>Institution; incl. address</th>
<th>Sci. representative; incl. email</th>
<th>Techn. representative; incl. email</th>
<th>Main focus task</th>
<th>Methods in use (current state)</th>
<th>Chems. (T2A), T3</th>
<th>Chems. (T2B), T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fraunhofer UMSICHT</td>
<td>Christoph Unger</td>
<td>Anna Fastabend</td>
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<td></td>
<td>Oberhausen</td>
<td><a href="mailto:christoph.unger@umsicht.fraunhofer.de">christoph.unger@umsicht.fraunhofer.de</a></td>
<td></td>
<td>X</td>
<td>PAH, BTX</td>
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<td>Osterfelder Str. 3,</td>
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<td>GC/MS, “D”-standards, HPLC/MS</td>
<td>onlineMS, RTN, Naphthalin</td>
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<td>46047 Oberhausen</td>
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<tr>
<td>2</td>
<td>Bioenergy2020+ GmbH</td>
<td>Markus Kleinhappl</td>
<td>Johannes Zeisler</td>
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<tr>
<td></td>
<td>SK GRAZ</td>
<td><a href="mailto:markus.kleinhappl@bioenergy2020.eu">markus.kleinhappl@bioenergy2020.eu</a></td>
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<td>X</td>
<td>PAH, BTX, Wasser</td>
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<td></td>
<td>Inffeldgasse 21b,</td>
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<td>HPLC, Grav.; GC-FID (estim.)</td>
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<td>A-8010 Graz</td>
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<td>Offline NH₃, H₂S, Tracers</td>
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<tr>
<td>3</td>
<td>TU Berlin</td>
<td>York Neubauer</td>
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<tr>
<td></td>
<td>Institut für Energietechnik, PG Energierverfahrenstechnik und Umwandlungstechniken regenerativer Energien (EVUR) Fasanenstr. 89 10623 Berlin</td>
<td><a href="mailto:york.neubauer@tu-berlin.de">york.neubauer@tu-berlin.de</a></td>
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<td>n. n.</td>
<td>PAH, BTX</td>
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<td>GC/MS, GC/FID, CON-TAR</td>
<td>CON-TAR (Fluorescence)</td>
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<td>4</td>
<td>CNRS Nancy</td>
<td>Anthony Dufour</td>
<td>Eric Masson</td>
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<td>SPA and impingers for</td>
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<tr>
<td></td>
<td>Laboratory of Reactions and Process Engineering, ENSIC, 1 rue Grandville, 54000 Nancy, France</td>
<td><a href="mailto:anthony.dufour@ensi.inpl-nancy.fr">anthony.dufour@ensi.inpl-nancy.fr</a></td>
<td><a href="mailto:enric.mason@cribois.net">enric.mason@cribois.net</a></td>
<td>n. n.</td>
<td>secondary and tertiary tars. Impingers for primary tars.</td>
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<td>heated loop or liquid injection coupled to GC*GC; (heart-coupling)</td>
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<td>thermal desorption coupled to GC*MS; MS; (MS)</td>
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<td>name of institution</td>
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<td>address</td>
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</table>
• 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
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
<table>
<thead>
<tr>
<th>Begin</th>
<th>End</th>
<th>Speaker</th>
<th>Title of subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:45</td>
<td>10:00</td>
<td>Y. Neubauer</td>
<td>Welcome; Introduction; TASK-organisations, online/offline; timetable</td>
</tr>
<tr>
<td>10:00</td>
<td></td>
<td></td>
<td>Guideline (liquid) &lt;-&gt; SPA/SPE (solid)</td>
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<tr>
<td>10:05</td>
<td>10:20</td>
<td>U. Wolfesberger-Schwabel</td>
<td>Comparison of Solvent IPA and Toluene (TUV/BE2020+); trad. Guideline at steam gasification</td>
</tr>
<tr>
<td>10:20</td>
<td>10:35</td>
<td>J. Zeisler</td>
<td>Test of BTX and PAH capture with liquid coloums, Testgasgenerators</td>
</tr>
<tr>
<td>10:35</td>
<td>10:50</td>
<td>Import Q. to be answered</td>
<td>short question for fast response, others in discussion, starting 12:10h.</td>
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<tr>
<td>10:50</td>
<td>11:05</td>
<td>T. Liljedahl</td>
<td>The general FUNDAMENTALS &amp; application of the SPA/SPE-method for tar sampling and analysis</td>
</tr>
<tr>
<td>11:05</td>
<td>11:20</td>
<td>A. Dufour</td>
<td>SPA tar sampling and thermal desorption of analytes</td>
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<tr>
<td>11:20</td>
<td>11:35</td>
<td>S. Grootjes</td>
<td>Experience report about SPA-Application; ECN</td>
</tr>
<tr>
<td>11:40</td>
<td>11:50</td>
<td>Import Q. to be answered</td>
<td>short question for fast response, others in discussion, starting 12:10h.</td>
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<tr>
<td>11:50</td>
<td>12:10</td>
<td>BREAK</td>
<td>coffee</td>
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<tr>
<td>12:10</td>
<td>13:00</td>
<td>Discussion</td>
<td>Discussion of SPA/SPE-Application, compareability against acc. Guideline EN 15439, required future work</td>
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</tbody>
</table>
### T2.4, 2DO.5 13:30 – 15.00
Tar analysis and tar reforming in gasification systems

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>13:30</td>
<td>T2.4, 2DO.5</td>
<td>Tar analysis &amp; Reforming in gasification systems</td>
</tr>
<tr>
<td>13:30</td>
<td>2DO.5.1: J. Zeisler</td>
<td>The Actual Need of a Guideline for Sampling and Analysis of Chemical Matter (Not Tars) from Product Gas, Pyrolysis Gas and Synthesis Gas</td>
</tr>
<tr>
<td>14:00</td>
<td>2DO.5.3: F. Defoort</td>
<td>Do All Biomasses Exhibit the Same Alkali Release Behaviour During Steam Gasification?</td>
</tr>
<tr>
<td>14:15</td>
<td>2DO.5.4: Panopoulos</td>
<td>Activated Carbon’s Adsorption Potential of Tar Species from Syngas in Warm Conditions</td>
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<tr>
<td>14:30</td>
<td>2DO.5.5: Trippe</td>
<td>Techno-economic Assessment of Process Parameter Variations in Entrained Flow Gasification as a Process Step within Biomass-to-liquid (BtL) Production</td>
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## Workshop program – part II

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td>15:30</td>
<td>Presentations of selected methods and application matrix for chemical parameters, action plan</td>
</tr>
<tr>
<td>15:35</td>
<td>S. Biollaz Introduction; description of needs (Parameters, application, type of task)</td>
</tr>
<tr>
<td>15:45</td>
<td>S. Biollaz PSI-Toolbox regarding trace elements: chem. Parameters /S/metals</td>
</tr>
<tr>
<td>16:00</td>
<td>S. Grootjes Chem. Parameters via SPA-Application; ECN</td>
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<tr>
<td>16:15</td>
<td>H. Egsgaard (DTU) Different analytical approach for SPA-Samples Analysis</td>
</tr>
<tr>
<td>16:25</td>
<td>J. Zeisler accumulative approach for chem. parameters, the application matrix</td>
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<tr>
<td>16:30</td>
<td>Discussion Discussion (gen. Questions from Session 2DO.5), Task-chem needs of a guideline or methods library for chemical parameters, action plan</td>
</tr>
<tr>
<td>17:00</td>
<td>Y. Neubauer Stat.results questionnaire, PLANNED: reports, webinars, round robins, Future activities; Summary. Next event.</td>
</tr>
<tr>
<td>17:30</td>
<td>Official end</td>
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</tbody>
</table>

End official end

17:30 18:30 after session, secondary discussion, soft end
I wish all of us a pleasant, informative and inspiring workshop.