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Production of Solid Sustainable Energy Carriers from Biomass by Means of Torrefaction

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Proceedings of the Workshops

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1 Summary

This deliverable gives an overview about the three workshops executed during SECTOR. The first, held at the EUBC&E in Milan, 2012, was set to provide an overview on the status of torrefaction and its midterm market prospects. As the SECTOR project just started, the organizers initiated discussions with the audience to get feedback from science and industry on developments, opinions and issues on the different aspects of torrefaction. The second workshop at the CEBC in Graz, 2014, concentrated on the technological advancements not only within SECTOR. Here, discussions centred around technical solution but also the way ahead in the market. Finally, the third workshop in Brussels, 2015, broached the issue of framework conditions, their impacts and future developments concerning market implementation and further research. The presentations and discussions for this workshop were based on the combined results of the projects SECTOR and BioBoost.

All three workshops drew large audiences up to almost 100 participants from industry, science and policy, coming from a broad range of countries. As the interest in torrefaction was great, the discussions were lively and the feedback on the presentation positive. Thus, both organizers and participants gained inputs for their further work in the torrefaction sector.

2 1st Workshop at the EUBC&E 2012, Milan (Italy)

2.1 Schedule and venue

Title “Market Implementation of a new Solid Biofuel and its midterm Prospects”

Organizer Deutsches Biomasseforschungszentrum gGmbH (DBFZ)
IEA Bioenergy Task 32

Conference Overview EU BC&E 2012

place: Milan, Italy
date: 18.-22.06.2012
web: www.eubce.com

Workshop Overview

date: 21.06.2012
time: 13:30 - 17:30
audience: ca. 70 international participants from industry and science

Program

Table 1: Program of the 1st workshop, Milan, Italy on 21.06.2012.

No.	Start	Topic	Speaker	Organisation
1	13:30	Scientific and technical development of Torrefaction and the contribution of SECTOR	Anders Nordin	Umeå Universitet, Sweden
	13:55	Question and Answers		
2	14:05	Torrefaction by ECN	Jaap Kiel	ECN, The Netherlands

3	14:30	Topell on Torrefaction	Robin Post van der Burg	Topell Energy BV, The Netherlands
	14:55	Discussion Torrefaction		
	15:05	Coffee break		
4	15:25	Densification Concepts	Wolfgang Stelte/Jonas Dahl	DTI, Denmark
5	15:50	Torrefaction of Biomass - ACB Technology and Overview of Andritz Technologies	Klaus Trattner	Andritz, Austria
	16:15	Discussion Densification		
6	16:25	Torrefaction in North America	Shahab Sokhansanj	Oak Ridge National Laboratory and University of British Columbia
	16:50	Discussion North America		
7	17:00	Final Remarks and SECTOR outlook	Anders Nordin	Umeå Universitet, Sweden
	17:10	End of Workshop		

2.2 Results of the 1st workshop

The workshop presented and discussed the development of the torrefaction technology and its market implementation. It provided an overview about the first steps towards an industrial scale fuel production and the connected on-going research activities to provide appropriate technologies, including suitable densification processes. A first presentation outlined the state of the art of the world-wide torrefaction developments, focusing on the different torrefaction concepts and their suitability for the conversion of various raw materials and end-use requirements (gasification, combustion or co-firing). The densification concepts and their adaptation for the new solid energy carrier play a key role here and were also discussed. Experiences from the first commercially operated torrefaction plant in Europe were integrated. Spanning these topics and also including further vital parts of the value chain, the workshop showed how the SECTOR project aims at advancing the market introduction of torrefied fuels. Furthermore, the workshop showed the parallel research goals and trends outside the European Union emphasizing on the developments and experiences from North America.



3 2nd Workshop at the CEBC 2014, Graz (Austria)

3.1 Schedule and venue

Title "International workshop: Torrefaction of biomass"
Organizer Deutsches Biomasseforschungszentrum gGmbH (DBFZ)
 IEA Bioenergy Task 32 and Task 40

Conference Overview CEBC 2014

place: Graz, Austria
 date: 15.-18.01.2014
 web: <http://www.cebc.at/home/>

Workshop Overview

date: 17.01.2014
 time: 13:30 - 17:50
 audience: ca. 90 international participants from industry and science

Program

Table 2: Program of the 2nd workshop; Graz, Austria on 17.01.2013.

No.	Start	Topic	Speaker	Organisation
1	13:30	Opening	Jaap Koppejan	IEA Bioenergy Task 32, Enschede, The Netherlands
2	13:40	International overall view of developments in the torrefaction sector	Michael Wild	Internat. Biomass Torrefaction Council, Brussels, Belgium
3	14:00	Densification of torrefied materials	Wolfgang Stelte	Danish Technological Institute, Taastrup, Denmark
4	14:20	Characteristics of torrefied products and their dependence on process conditions	Ute Wolfesberger-Schwabl	OFI Technologie & Innovation GmbH, Austria
5	14:40	Advantages and drawbacks for international trade of torrefied products	Mark Beekes	KEMA Nederland BV, Arnhem, Netherlands
6	15:00	First experiences from large-scale combustion and co-firing tests with refined biomass fuels	Nader Padban	Vattenfall, Stockholm, Sweden
	15:20	Coffee Break		
7	15:50	Andritz torrefaction technologies and summary of pilot plant operation in Austria and Denmark	Klaus Trattner	Andritz AG, Graz, Austria
8	16:10	Accelerating the adoption of second generation solid biomass	Andy Piers	River Basin Energy, Highlands Ranch, CO, USA
9	16:30	AREVA's pathway to an industrially-proven torrefaction process	Natacha Kienlen	Areva, Paris, France
10	16:45	Round Table: The way forward for technology suppliers, project developers, consumers		
11	17:40	Closing by Chairperson		

3.2 Results of the 2nd workshop

The workshop aimed in a first step at presenting and discussing the state of the art of the torrefaction related technologies such as torrefaction processes themselves, densification, transport and the conversion of torrefied material in combustion. In a second step, the way forward was addressed in a round table discussion and in an intense exchange with the audience. The interest in the technology was great, its potential continued to be assessed as promising. The progress made was also seen positively. The issue of the time frame of implementation regarding changing market conditions was raised, creating awareness to a possible upcoming challenge.



Photo: DBFZ



Photo: DBFZ



Photo: DBFZ

4 3rd Workshop at the EC, 2015, Brussels (Belgium)

4.1 Schedule and venue

Title “Policy and Technology Workshop on improved bioenergy carriers of the EU-projects BioBoost and SECTOR”

Organizer Deutsches Biomasseforschungszentrum gGmbH (DBFZ)
Karlsruher Institut für Technologie (KIT)
European Commission, DG RTD

Overview Policy Workshop

place: Brussels, DG Research, Belgium
date: 16.-17.06.2015
audience: ca. 50 international participants from industry, science and policy

Program

Table 3: Program of the 3rd workshop, European Commission in Brussels, Belgium from 16.-17.06.2015.

No.	Start	Topic	Speaker	Organisation
Day 1 (16.06.2015) – Policy Session				
1	14:00	Welcome Address	Maria Georgiadou	EC, DG RTD
2	14:15	Bioenergy in the European Context	Paul Verhoef	EC, DG RTD
3	14:45	Perspectives for advanced Bioenergy Carriers	Daniela Thrän	DBFZ/UFZ (SECTOR)
	15:15	Coffee Break		
4	15:45	<u>Panel Discussion:</u> Markets and Regulatory Framework for Bioenergy and Bioproducts	<u>Chair:</u> Hubert Röder Paul Verhoef Daniela Thrän Nicolaus Dahmen Wim Willeboer Marijn Rijkers Ilmari Lastikka	Weihenstephan-Triesdorf University of Applied Sciences, Germany EC, DG RTD DBFZ/UFZ, Germany KIT, Germany Essent, The Netherlands DSM ChemTech BV, The Netherlands Neste Oil, Finland
	18:00	Reception		
Day 2 (17.06.2015) – Technology Session				
1	09:00	Introduction to Projects Background and FP7 goals	Jaap Kiel	ECN, The Netherlands
2	09:10	SECTOR: Goals, Work Programme, Achievements	Daniela Thrän	DBFZ/UFZ, Germany
3	09:20	BioBoost: Goals, Work Programme, Achievements	Nicolaus Dahmen	KIT, Germany
4	09:30	Technology Achievements, Standards and Market Readiness: Fast Pyrolysis, HTC, Catalytic Pyrolysis, Torrefaction, Steam Explosion	Michiel Carbo / Angelos Lappas	ECN, The Netherlands / CPERI/CERTH, Greece
	10:30	Coffee Break		
5	11:00	BioBoost Specials: Tools, Value Chains, Economics and Sustainability	Erik Pitzer	FHOÖ, Austria
6	11:30	SECTOR Specials: Value Chains, Economics and Sustainability	Michiel Carbo / Stefan Majer	ECN, The Netherlands / DBFZ, Germany
7	12:00	<u>Panel Discussion:</u> Obstacles and Solutions for Market Introduction	<u>Chair:</u> Jaap Kiel Kay Schaubach Nicolaus Dahmen Eija Alakangas Michiel Carbo Angelos Lappas	ECN, The Netherlands DBFZ, Germany KIT, Germany VTT, Finland ECN, The Netherlands CPERI/CERTH, Greece
8	12:45	Summary and Recommendations	Jaap Kiel	ECN, The Netherlands

4.2 Results of the 3rd workshop

Key Messages of the Workshop:

Achievements of the projects

- Up-scaling and increase of technology readiness level
- Improvement of products and processes
- Proven sustainability
- Specific properties and quality for trade and treatment
- Intensified R&D and market activities
- Enhanced market strategies

Market barriers to overcome

- Economic crisis caused restrictions to financing possibilities
- Low price for fossil fuels and CO₂-emission certificates
- End user confidence needs to be established to launch end user market
 - needs time and examples (just as for white pellets)
- Initial expectations were set too high, which lead to disappointment
- Policy coherence and stability for reliable European market conditions

Resulting development issues

- Continued technology optimisation, scale-up and cost reduction
- Product quality characterisation, optimisation and standardisation
- Broadening the feedstock base
- Market establishment by setting confidence building examples and business cases



All photos by DBFZ

5 Annexes

Annex 1: Presentations 1st Workshop at the EUBC&E 2012, Milan (Italy)

1. Torrefaction by ECN, by Jaap Kiel (ECN)
2. Topell on Torrefaction, by Post-van-der-Burg (Topell)
3. Densification Concepts for Torrefied Biomass, by Wolfgang Stelte (DTI)
4. Torrefaction of Biomass - ACB Technology and Overview of Andritz Technologies, Klaus Trattner (Andritz)
5. Torrefaction in North America, by Shahab Sokhsansanj (Oak Ridge National Laboratory and University of British Columbia)

Annex 2: Presentations 2nd workshop at the CEBC 2014, Graz (Austria)

1. International overall view of developments in the torrefaction sector, by Michael Wild (IBTC)
2. Densification of torrefied materials, by Wolfgang Stelte (DTI)
3. Characteristics of torrefied products and their dependence on process conditions, by Ute Wolfesberger-Schwabl (OFI)
4. Advantages and drawbacks for international trade of torrefied products, by Mark Beekes (KEMA)
5. First experiences from large-scale combustion and co-firing tests with refined biomass fuels, by Nader Padban (Vattenfall)
6. Andritz torrefaction technologies and summary of pilot plant operation in Austria and Denmark, by Klaus Trattner (Andritz)

Annex 3: Presentations 3rd workshop at the European Commission 2015, Brussels (Belgium)

1. Presentations Day 1 - Policy workshop
 - 1.1. Bioenergy in the European Context, by Paul Verhoef (EC, DG RTD)
 - 1.2. Perspectives for advanced Bioenergy Carriers, by Daniela Thrän (DBFZ)
2. Presentations Day 2 - Technology workshop
 - 2.1. Introduction to Projects Background, by Jaap Kiel (ECN)
 - 2.2. SECTOR: Goals, Work Programme, Achievements, by Daniela Thrän (DBFZ)
 - 2.3. BioBoost: Goals, Work Programme, Achievements, by Nicolaus Dahmen (KIT)
 - 2.4. Technology Achievements SECTOR, by Michiel Carbo (ECN)

- 2.5. Technology Achievements BioBoost by Angelos Lappas (CPERI/CERTH)
- 2.6. BioBoost Specials: Tools, Value Chains, Economics and Sustainability, by Erik Pitzer (FHÖÖ)
- 2.7. SECTOR Specials: Value Chains, Economics and Sustainability, by Michiel Carbo (ECN) and Stefan Majer (DBFZ)