

Tempus158989-Tempus-1-2009-1-BE-Tempus-JPHES  
Creation of university-enterprise cooperation networks for education on  
sustainable technologies

# Retraining and updating of PC universities staff in GE

10 – 16 October 2010.



Tempus158989-Tempus-1-2009-1-BE-Tempus-JPHES  
**Creation of university-enterprise cooperation networks  
for education on sustainable technologies**

Retraining and updating of PC universities staff in GE  
10<sup>th</sup> - 16<sup>th</sup> October 2010.

List of participants from WB PC

**Serbia**

University of Novi Sad, Faculty of Technology  
Novi Sad

1. Zoltan Zavargo
2. Mile Klašnja
3. Aleksandar Jokić

Chamber of Economy of Vojvodina  
Novi Sad

4. Jovan Vujičić

Sugar factory  
Senta

5. Vanda Došen

University of Niš, Faculty of Technology  
Leskovac

6. Milorad Cakić
7. Vlada Veljković
8. Olivera Stamenković

DCP Hemigal  
Leskovac

9. Igor Denić

**Bosnia and Herzegovina**

**University of East Sarajevo**

Faculty of Technology  
Zvornik

10. Radoslav Grujić
11. Milorad Tomić
12. Vladan Mičić

**Birać**

Zvornik

13. Radislav Filipović

**Tuzla University**

Faculty of Technology

Tuzla

14. Midgat Jašić
15. Amel Selimović
16. Dijana Miličević

The chamber of Economy of Tuzla Canton

Tuzla

17. Suad Selimović

**The former Yugoslav Republic of Macedonia**

**University Ss Cyril and Methodius**

Faculty of Technology and Metallurgy

Skopje

18. Emilija Fidancevska
19. Kiril Lisickov
20. Vojo Jovanov

**BOMEX**

Skopje

21. Dragan Milovski

University Goce Delcev  
Faculty of Technology  
Štip

22. Vineta Srebrenkoska  
23. Sanja Spasova  
24. Silvana Krsteva

**Eurokompozit  
Prilep**

25. Dijana Capeska Bogationska

## MINUTES OF THE MEETING

**Sunday 10<sup>th</sup> October 2010.**

Arrival of participants in Birkenfeld

**Monday 11<sup>th</sup> October 2010.**

Zero-Emission Campus Birkenfeld (ECB)  
Institute for Applied Material flow Management (IfaS)

**The Meeting was attended by  
Institute for Applied Material flow Management**

Katrin Mueller-Hansen  
Michael Knaus  
Katharina Schlegel

24 participants from WB PC

1. **Welcome by Head of International Department**  
Michael Knaus
2. **Introduction**  
Michael Knaus
3. **Zero emission concept**  
Material Flow Management  
Circular Economy  
Michael Knaus

Zero emission campus Birkenfeld, material flow management (MFM), circular economy and sustainable development as well as several case studies selected from IfaS projects were the main topics of this presentation.

**Ecological campus Birkenfeld** was presented as a concept of: zero-emission heat and energy, active and passive utilization of solar energy, energy efficient building concept. A new approach of zero-emission water concept was introduced. The projects in the frame of the IfaS were mainly oriented to the MFM and it was presented as a tool for green business development. **Circular economy** with MFM approach allows the activation of potentials i.e. the regional added value follows by activation of regional resources. So, MFM enhance regional added value. The MFM methodology was explained through the definition of material and energy flows in a system which has to be analyzed and optimized; material flow analysis; identification of the major efficiency, sufficiency and optimization potentials; identification of regional key stakeholders and decision makers, etc. The waste management concept Merga - Merga, Chile was used as a sample of a project where the ultimate goal was to establish a sustainable resource management system based on **Circular Economy** principles. This project was a sample for energy efficiency through material recycling and climate protection through waste treatment, and finally resource centre was proposed instead of land field. The vision for MEDA low-energy house, sustainable buildings as energy producer of the future and circular economy city planning were discussed as topics particularly interesting for the future sustainable development.

**Zero emission (ZE)** was defined as a systemic, interdisciplinary optimization approach with elements of sufficiency, efficiency and substitution. ZE consists of: different approaches and definitions, management-and marketing approach, continuous improvement process, CO<sub>2</sub>equ.neutrality of systems and sustainable utilization of „waste water and waste“.

#### 4. On-site visit: Zero=Emission Campus and Applied Technologies

Lunch

ECB Student Restaurant

#### Company visits

The Visits were attended by

Institute for Applied Material flow Management

Andrea Bader, student assistant

OIE AG

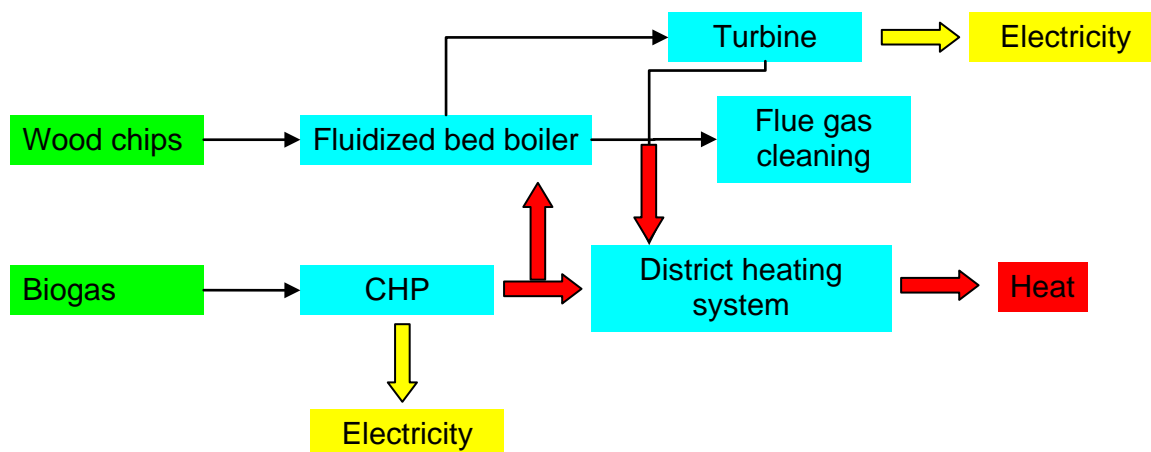
Mr. Schiffmann

24 participants from WB

##### 1. Biomass CHP Plant of OIE in Neubruecke

With base in Idar-Oberstein and its field offices in the region, OIE AG maintains an extensive network of service facilities. In essence, OIE AG limits itself to its traditional territory and therefore the individual needs of region are most responsive, too. The liberalization of the electricity market has put the new challenges onto OIE AG as the company in energy industry. Competition, efficiency and future-oriented actions in the interests of consumers are the goals which they are focused on.

Biomass heat and power plant (Biomass CHP) located in Neubrücke, has the development concept based on the regenerative use of wood fuels and biogas in cogeneration plant (wood chips: 29 MW thermal and 8.3 MW electric energy; biogas from anaerobic digestion: 430 kW thermal and 2 X 310 kW electric). The investment was completed in 2003 and the cost was 15 million euros. The basic scheme of Biomass CHP plant is given at the following picture and its concept is biomass combined process B2 (wood and biogas).



By connecting the existing OIE's heating, network heat extraction was doubled and thus an active contribution to reduction of CO<sub>2</sub> emissions. This concept is thermodynamically optimized process with an efficiency of 28%. Fluidized bed combustion was implemented in boiler construction for high efficiencies; steam flow was 37.5 t/h, at pressure of 60 bars, temperature of 450°C and with the efficiency higher than 91%. Open floor nozzle drive constant total gas volume for optimum fluidization. Allocation of fresh air / recirculation gas to bed is set to stoichiometric conversion of the fuel while residual oxygen content in the exhaust is about 3% (wet). Feed water to boiler is preheated to increase thermal optimization. Wood demand per year: 60,000 t, different types of wood (quality A I to A IV) but not contaminated one. Biogas feed is about 220 Nm<sup>3</sup>/h.

Flue gas cleaning: SNCR process with ammonia water (25%), ash sorption with hydrated lime and lignite coke and bag filters based on PTFE. In water preparation complete desalination is used (conductivity: <0.1 uS / cm) with advantage of Chemical-free desalination using EDI technology (Elektrodendeionisation). As it can be seen from the following table, all emissions (MW) are beneath allowed emissions values.

Emissions (Continuous measurements)	MW	HW	TM
Dust mg/Nm <sup>3</sup>	1	30	10
NOx mg/Nm <sup>3</sup>	150	400	200
CO mg/Nm <sup>3</sup>	4	100	50
SO2 mg/Nm <sup>3</sup>	8	200	50
HCL mg/Nm <sup>3</sup>	6	60	10
C sat. mg/Nm <sup>3</sup>	2	20	10
Hg mg/Nm <sup>3</sup>	0.01	0.05	0.03
MW = measured value, typically HM = Half-hourly average value TM = daily average			

**Dinner**  
*Restaurant Angels am Fruchtmarkt*  
*St. Wendel*

**Tuesday 12<sup>th</sup> October 2010.**  
**Zero-Emission Campus Birkenfeld (ECB)**  
**Institute for Applied Material flow Management (IfaS)**

**The Meeting was attended by**  
**Institute for Applied Material flow Management**  
Michael Knaus  
Katrin Mueller-Hansen  
Katharina Schlegel, assistant

24 participants from WB PC

**1. Industrial Material Flow Management**  
**Michael Knaus**

The Global Experiences from a leading German Non-Profit Research Institute was presented for this occasion. The zero emission approach was explained and its development through the end-of-pipe as well as the cleaner production. The following topics were in the focus of the training:

- Different System Borders for Material Flow Management (MFM) and the General Goals of Enterprises
- Core elements of Industrial MFM where particular attention was paid to the Life Cycle Analysis, Eco-Efficiency, Cleaner Production and ECO-Profit as well as Environmental Management

BASF sustainability tools: Eco-Efficiency Analysis and SEEBALANCE were presented as a sample for sustainability approaches. Also, the key elements of eco-efficiency: re-engineer processes, re-valorize by-products, re-design products and re-think markets were discussed.

Regional district heating concept was presented as an example for a company internal MFM and regional MFM paying attention on stakeholder management, biomass potential, analysis heat energy demand, logistics and supply concept as well as technology concept.

Sustainable education or education for sustainability realized in the frame of the educational courses at the Institute for applied material flow management (IfaS) was part of the presentation. The key ideas of IFAS, for example, interdisciplinary education for sustainable development, training in zero emission system design and applied research for sustainability are realized through the IMAT programs:

- German - Japanese Dual Degree Program together with Ritsumeikan Asia Pacific University, Beppu
- German - Turkish Dual Degree Program together with Akdeniz University, Antalya
- German - Brazilian Dual Degree program together with Universidade Positivo, Curitiba
- German MSc Program

In this programs students will provide knowledge for material flow management, ecological economics, clean technologies / environmental technologies, understanding of holistic and complex material and ecological systems, project and change management, intercultural communication / networking, financing, environmental management.

**Lunch**  
*ECB Student Restaurant*

## Company visit

### The Visit were attended by

Institute for Applied Material flow Management

Katrin Mullee-Hansen

Cle-Anne Gabriel, student assistant

Liu Ye, student assistant

### Juwi

Peter Glasstetter

24 participants from WB PC

#### 1. Juwi Zero-Emission Company

During the visit to "JUWI" company, we were introduced with the concept of zero-emission technology. The company's business strategy is based mainly on the utilization of solar and wind power energy. We visited the areas where they installed solar panels and windmills to generate electricity. In Germany, among others, this company has installed over 400 wind turbines that produce over 600 MW of energy. They use solar energy with 1,400 PV installations, and installed capacity more than 600 megawatts. This means, that annual CO<sub>2</sub> savings is approximately 325,000 tons. They also produce biogas and biomass from dried pellets and apply it for heat energies production as well as electricity power generation.

## Wednesday 13<sup>th</sup> October 2010

Institute for Applied Material flow Management

Katrin Mullee-Hansen

Thorsten Klaes

Angel Avradi

L.e.e. s.à.r.l.

Thomas Keller

24 participants from WB PC

#### 1. Financing of R&D projects in the Clean Technologies Sector Thorsten Klaus

In the lecture of *Financing of R&D projects in the Clean Technologies Sector* the company LEE sàrl CFO had the presentation about their business services, success and future plans. This company was founded in 2000 with the number of 12 employees. This company is a service-oriented with high core competence in the fields of planning, development, construction and support for agricultural and industrial biogas plants which are deployed within a wider concept. With experience in 100 projects in Europe, Canada and China, they offer a global and energetic business view of region all over the world. Today they extend their competences in the area of solid biomasses.

The company L.e.e. s.à.r.l presented some of their projects:

1. ProGrass (2005 - 2008) - they implemented a new technique of grass valorization into an existing Biogas plant in Redange. With this technique they produced buildings insulation by using grass fibers. Also they used vegetable proteins for cattle feeding.

2. Enercom (2008-2011) - they demonstrate high-efficient polygeneration of electricity, heat, solid fuels and high-value compost/ fertilizers from sewage sludge and greenery waste mixed to biomass residues, thereby offering a new, safe, environmentally friendly and cost-effective path for the disposal of sewage sludge, maximizing energy output, greenhouse gas reduction and cost-effectiveness.

3. *Bioprofarm (2005-2007)* - they showed us how to increase the valorization of the agricultural biomass to generate energy. In the project *Energattert (2002-2004)*, they demonstrated how to optimize the biomethanisation of all organic matter resulting from agricultural activity (liquid manure, manure, grass) to produce energy for an average unit cost of less than 0.05 euro/kWh.

4. *Biocycla (2009-2011)* - they use software for management of biogas plants to the market to improve their environmental and economic performance.

5. *Inergpro I (2003-2005), Inergpro II (2005-2007)* - to improve the cooperation between industry and vocational training and the realization of European structures for cooperation in the scope of renewable energies.

The company L.e.e.s.à.r.l. collaborates with experienced team of multi-sector consultants in the field of European funded projects, like 4EUROPE, and their future plans are to make them a long term partner.

## 2. Carbon Footprinting

Angel Avadi  
Thomas Keller

In the lecture of Carbon Footprint we got knowledge about the most powerful software tool for modeling, calculating and analyzing carbon footprint of products and companies. Carbon footprinting (CFP) is a term used to describe the amount of greenhouse gas emissions caused by a particular activity or entity. It is a measure of the impact our activity has on the environment, and in particular climate change. It relates to the amount of greenhouse gases produced in our day-to-day lives through burning fossil fuels for electricity, heating, transportation etc.

It is intended for industries with material- and cost-intensive production, such as the chemical, semiconductor, waste management and printing industries.

New 'Umberto for Carbon Footprint' uses the latest software technology and users benefit from almost 20 years of experience and know-how in software development for material and energy flow analysis and life cycle assessment (LCA). Carbon footprint helps to introduce first life cycle thinking, better understanding of own processes, possibility to optimize processes or chose among alternative processes, give a possibility to optimize sourcing, providers, supply chain, etc.

**Lunch**

*ECB Student Restaurant*

Sightseeing Saarbrücken city

## Thursday 14<sup>th</sup> October 2010

### 2. Experience with enterprise-university cooperation

areal Company  
Dr. Bruch

24 participants from WB PC

Areal is a corporation for sustainable water management.

Clear, clean water stands for nature and health, while fertile earth is the foundation for growth and life. Areal considers the preservation of these precious goods, not only as a question of the consequent utilization of modern technical means, but also one of ecological imagination and long experience.

Areal has a long experience and is at the forefront of science and technology in the area of:

1. decentralized, natural waste water treatment (reed bed filters) for household and community sewage, commercial and special burdened waste water (e.g. vinicultural waste water)
2. research concerning sustainable water management concepts (part of material flow management)
3. producing artificial soils (sewage sludge humification, terra preta)

As a system-provider areal offers complete packages or individual services according to the wishes of the clients in:

- Project development;
- Planning;
- Documentation;
- Professional implementation;
- Business management and
- Installation maintenance.

**Lunch**

*ECB Student Restaurant*

## Site - visit

### Energy Landscape Morbach

#### The Visit were attended by

Institute for Applied Material flow Management

Katrin Mullee-Hansen

Michael Grehl

24 participants from WB PC

Energy landscape Morbach is an example of shaping a future. Biomass, wind power and photovoltaic are here for business, research and citizens. The energy landscape Morbach is a unique concept for the intelligent use of local resources to save costs and resources in the region Morbach.

On the grounds of the former U.S. ammunition depot Rappaerath/Morbach the park for producing renewable energy was built. The produced electricity is fed into a grid; the produced heat is used to supply heat demands. Biogas and wood pellets are produced. The electricity is produced from wind power and photovoltaic.

#### Dinner

*Restaurant Alt Birkenfeld*

### Friday 15<sup>th</sup> October 2010.

Institute for Applied Material flow Management

Katrin Mullee-Hansen

Thomas Keller

#### ZAK

Mrs. Gantner

24 participants from WB PC

### Company visit

#### ZAK

#### Waste treatment

#### Sorting and treatment station for all kinds of waste

On October 15, 2010, the TEMPUS participants visited the Waste Management Centre ZAK, Kaiserslautern - Mehlingen, a joint venture of the city and county (Landkreis) of Kaiserslautern. ZAK occupies 88 ha and has 77 employees. Its total asset in 2008 was about 93 million euros. All kinds of waste from the neighbor area (about 250.000 habitants) are sorted, recovered and treated. The waste is subjected to 200 bar pressure to remove any liquids and to compress the remaining solid trash into compact, highly combustible blocks with caloric output. ZAK uses about half of the trash to produce electricity via an incineration process, while the remaining half sends to another heating & power plant for processing. The landfill for unused solid waste occupies about 21 ha or 5.6 million m<sup>3</sup>. It had been built from 1976 to 1978 and is planning to be closed in 2016. It accepts currently about 400,000 tons of mineral waste per year. The biogenic liquids from the compression are put into a reactor where the methane gas is produced. This methane gas is burned together with shredded wood (obtained from old furniture and pallets and natural wood) in a biomass power plant which produces electricity that goes back into the power grid and heat (20 million kWh of electricity and 4 million kWh of heat per year). The energy comes also from three wind turbines located there. If the same amount of energy is produced from coal, it will emit 20,000 tons of CO<sub>2</sub> annually. The biological wastes are composted to produce fertilizer. ZAK also accepts both hazardous waste and other small amounts of household waste (oil, paint, acids, fungicides, fertilizer, glue and spray cans, etc.) or yard waste, which is then sorted and disposed. In ZAK's Environmental Education Center more than 500 children and young people have been taught through environmental experience every year since 1998.

#### Lunch

*ECB Student Restaurant*

Institute for Applied Material flow Management

Peter Heck

Katrin Mullee-Hansen

Clo-Anne Gabriel, student assistant

24 participants from WB PC



1. **Summary**  
Discussion of course schedules  
Peter Heck  
Zavargo Zoltan

2. **Individual talks**

Sightseeing Trier

**Saturday 15<sup>th</sup> October 2010.**  
Departure