

**LABORATORY OF WATER AND WASTEWATER TECHNOLOGY  
DEPARTMENT OF FOOD TECHNOLOGY  
SCHOOL OF FOOD TECHNOLOGY AND NUTRITION**

**Associate Professor Petros Samaras  
P.O. Box 141, 57400 Sindos, Thessaloniki, GREECE  
Tel. +302310013474, Fax +302310791380, e-mail: [samaras@food.teithe.gr](mailto:samaras@food.teithe.gr)**

**TECHNOLOGICAL  
EDUCATIONAL  
INSTITUTE OF  
THESSALONIKI**



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**Short term seminar:  
Implementation of C2C issues in Energy/Waste**

**Alexander Technological Educational Institution of Thessaloniki**

**10/06/2013**

- |             |   |
|-------------|---|
| 9.00-9.30   | Registration                                |
| 9.30-10.00  | Welcome-short presentation                  |
| 10.00-13.00 | The C2C concept: Why, What and How!         |
| 13.00-13.30 | Coffee break                                |
| 13.30-15.30 | Waste: Is it a matter of production design? |
| 15.30-16.00 | Lunch break                                 |
| 16.00-16.45 | Industrial symbiosis - Pilot installations  |
| 16.45-17.00 | Close of the first day                      |

**11/06/2013**

- |             |   |
|-------------|---|
| 9.00-11.00  | Energy: demands and sources                             |
| 11.00-12.00 | Biological cycle, Technical cycle, Energy               |
| 12.00-12.30 | Coffee break  |
| 12.30-13.00 | Supply chain management (Farming-Environment-Logistics) |
| 13.00-14.00 | Presentation of the C2C game                            |
| 14.00-14.30 | Lunch Break   |
| 14.30-16.00 | C2C game  |
| 16.00-17.00 | Discussion-Conclusions                                  |

## Activities report form

Activities: Training of engineering Scientists in C2C concept: the engineer's approach.

Date: 10-11/06/2013

Place: TEITHE

### Activities (description of workshops, lectures, work etc.)

Training workshops using interactive presentation of Cradle to Cradle concept.

The program includes detailed approach of C2C from an engineering point of view. Waste is one of the main issues to be addressed in order a company to get licence to operate. Thus waste management plan has to be submitted prior to anything else. Also energy comprises a big portion of production cost. C2C approach involves both above mentioned factors.

The program contained:

#### Day 1

- Presentation of C2C concept
- Circular economy
- Waste
- Industrial symbiosis

#### Day 2

- Energy
- Biological, Technical cycles and Energy
- Supply chain management
- Simply Cycle Game (presentation and play)
- Open discussion – Suggestion for future work

### Results (contacts, action plans, documents etc.)

All participants were introduced to a new perspective. The trainers effort was focused on presenting the fact that there are no such things as "waste" but there are only procedures to be upgraded and useful products to turn bi-products into.

Conventional industry following the linear economy has a starting point or an input, and a finishing point or an output where products are produced as well as waste is produced also.

*Industrial symbiosis was agreed to be the practical solution for the waste problem. So there should be industrial parks where companies that used other companies waste as first material should be situated one next to the other and material flow should be easy and cost free in terms of logistics and management.*

Energy amounts produced from renewable sources should be increased.

Related document: [Waste-Energy suggestions report](#).

### Learning outcomes (what input has been delivered for your organisation and for yourself)

The waste management and energy experts have indicated the fact that both factors are of critical significance for the success of a company in the competitive environment especially in the EU. Environmental performance in terms of energy and waste production and management is inseparable from economic viability and competitiveness. The only way for a company to be competitive is the development and implementation of innovation in operational procedures and

the cost reduction in energy and waste management. Considering the current economic crisis situation cost minimization with parallel benefits from waste utilization is one way solution. Cradle to cradle approach is an interesting concept and can affect industry in positive way promoting viability and ensuring its future prosperity.

Agreements (what have all parties present agreed upon)

All recognize that waste is food or at least waste cost food, and so does energy. All attendees agreed on future involvement at pilot projects regarding C2C implementation in companies they support and consult. They have all agreed to communicate C2C to their clients. It is common sense that C2C has not been adequately communicated although it is a very sound concept which can contribute to both economic and environmental performance of a company. All of them want to learn more about C2C and be actively involved in implementation. However all recognize the need for further technical training.

Contribution (description of own contribution to the activities)

The trainers have attempted to transfer the knowledge, inspire the attendants and give them the appropriate initiatives and triggers so that the training would be more interactive and the trainees would contribute the best of themselves in terms of knowledge and enthusiasm. Training was done by using case studies and examples by their own activities and they could see the connections of C2C concept with actually applied practices. All their reactions and contribution to work was concentrated, processed and is recorded in **Waste Energy suggestions report**

Remarks

It is obvious that engineers are the most mature of all trainees for rapid implementation of C2C in large scale implementation projects. They have recognized the fact that linear economy is creating nowadays more problems than it solves and cannot guarantee future prospects for companies. There are issues to be solved in terms of technical solutions and legislation, however it seems that the next big step is C2C adoption as "Good Industrial Practice" or even "Best Industrial Practice".

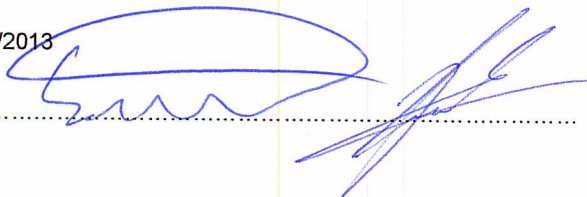
Name: Petros Samaras, Ilias Kalfas

Organisation TEITHE

Place Thessaloniki

Date 17/06/2013

Signature .....



## Energy-Waste suggestions report

This report contains the suggestions that have been made by the C2C training attendees concerning the cradle to cradle implementation, problems and perspectives.

Waste: Is it a matter of production design?

Although there has been great progress in food industry during the latest decades this almost always concerned the improvement of applied methodologies for the production of the same products. C2C approach however demands for redesign of production process taking into account waste produced and trying to incorporate this “waste” in other production processes of the same or other industries.

Industrial symbiosis - Pilot installations

The most successful model worldwide is the Industrial symbiosis i.e. the co-existence of several industries the waste or by-products of one are the first materials of the other. Such examples are Kalundborg (Denmark), ecologic industrial parks (USA), Styria (Austria) and Zero Emission Research Initiative.

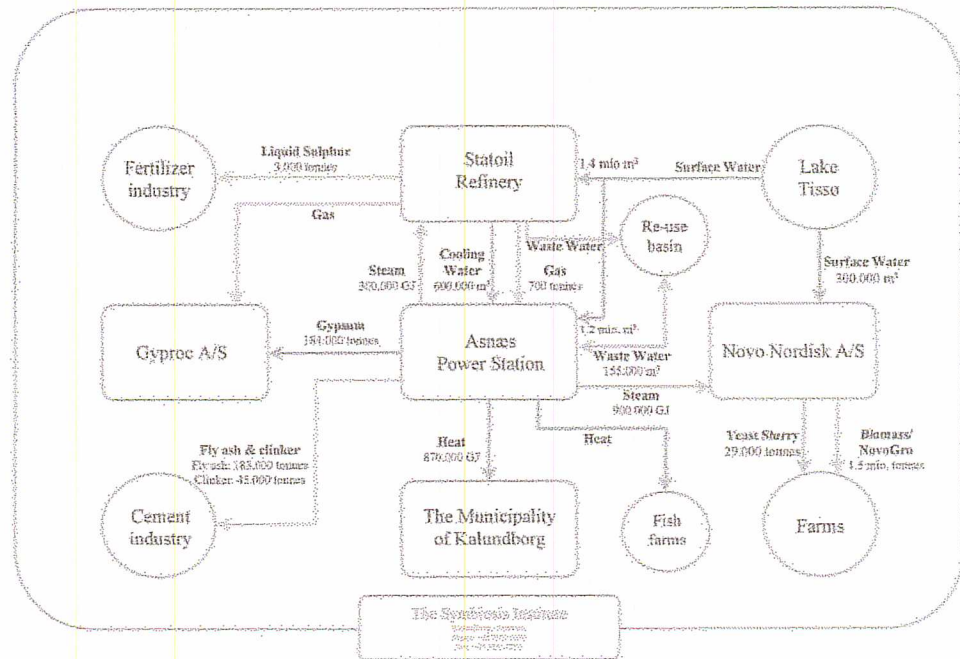


Figure 1. Kalundborg is a typical example of industrial symbiosis.

Energy: demands and sources

In industry one critical production factor is energy. Traditionally energy comes from electric network and fossil fuels. However nowadays there are a lot of alternatives for renewable energy sources such as photovoltaic and wind generators. Also thermal energy can be provided by pellets made from agricultural plant particles. The problem that arises is that there is no stable policy at least for the photovoltaic panels. “Green development” has been supported 3-4 years ago but now there is a lot of taxation and also the prices of energy have decreased to low rates. As a result

the investment in photovoltaic energy is uneconomic. Of course the production of electricity to cover own needs has a lot of advantages for a company such as independence, no bills etc.

#### Biological cycle, Technical cycle, Energy

Biological cycle is easy to implement. All organic material that remains after the production process is suitable for the biological cycle. However this does not mean that all of it should be addressed to that cycle. Only organic material that cannot be further used for the production of other products should end to biological cycle.

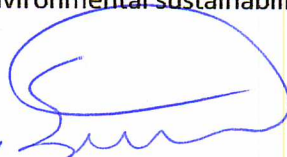
The technical cycle is of great importance. Usually non organic materials are those that create costs and also are those that are more difficult to reclaim and re-use. This happens mainly due to the fact that a viable solution for further utilization is not readily available. The best solution for this is to redesign the production processes trying to avoid any materials or ingredients that are not absolutely necessary for the realization of the products. After this design is done industry symbiosis will be the tool for entering the technical cycle. Industries that are closely located can use other industries waste or by-products for the production of their own products. So the benefit is multiple: there is no waste management cost, there is no environmental cost or damage, there are cheap first materials for the industry etc.

As about energy nowadays there are technological solutions for the production of renewable energy from PV, wind, biodiesel, biomass etc. The best solution may vary from industry to industry and from area to area as depends to a lot of parameters. However there is solution for everyone no matter the activity or geography.

#### Supply chain management (Farming-Environment-Logistics)

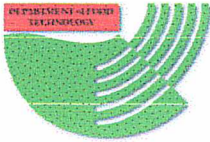
Entire supply chain management is the solution for C2C implementation in food industry. The use of degradable pesticides, fertilizers, water and energy is of great importance. Biofertilizers and biopesticides can replace conventional agricultural inputs. Energy production from waste and environmentally responsible activity in terms of emissions are essential part of C2C. All companies that decide to implement C2C should be governed by responsible behavior and control, legitimacy and Economic and environmental sustainability

As. Prof. Petros Samaras



Dr. Ilias Kalfas





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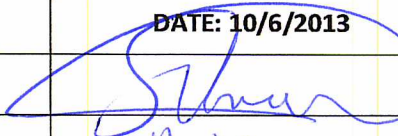
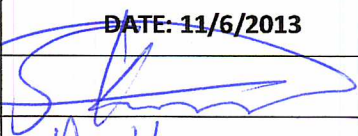
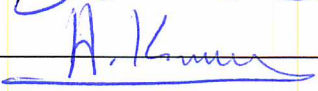

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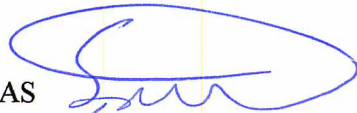
**Short term seminar: Implementation of C2C**  
Seminar Attendance Form

Place: TEITHE

NAME	DATE: 10/6/2013	DATE: 11/6/2013
ATHANASIOS SFIKAS		
LEFTERIS KARAGIANNIDIS		

Trainer(s):

PETROS SAMARAS



ILIAS KALFAS

