A transformation of MSW into recyclable materials and refined renewable biomass fuel using MARSS technology - a solution for local authorities in Greece
MARSS opportunities for countries without access to Incineration and depending on landfilling

Source: T. Pretz
Naples 15 April 2015
The MARSS drivers and opportunities

• EU landfill directive to reduce landfilling of organic waste
• MBT is a very common technology throughout Europe
• Waste incineration brings higher end costs to consumers and can provoke high consumer resistance! Italy for example.
• MARSS offers a technical solution to separate a Refined Renewable Biomass Fuel from MBT treated MSW, using well known and proved off the shelf technical hardware in flexible modules.
MARSS Partners and project funding

EU Life Demonstration Project:
- Start date: September 2012
- End date: December 2015
- Total budget: €4,154,933.00
- EC contribution: €2,073,727.00
Technological options

- The Bio-Mechanical-Drying and sorting Plant and location of MARSS Demo plant – RegEnt GmbH
Alternative potential for Europe

• “One size fits all”

One bin
One drying
One Sorting
Several Recycling processes (material/thermal)

Source: Dr. M Monzel, RegEnt GmbH,
Plant operator RegEnt, Mertesdorf, Germany:

- Founded as a waste disposal Company „Regionale Entsorgungsgesellschaft mbH“ in 2006
- Area of collection/activity: 4.923 km²
- Inhabitants: 532.000
- Plus 2.2 millions tourists, 7.2 millions guest-nights
- Capacity of plant: 220.000 tons/year
- Full operating: since September 2007
Drying in the “Rot-box”
MARSS Demo Plant
Input and output materials

Input - MMSW

Output fuel - RRBF
Test CHP plant at Fraunhofer Institute, Germany

- Combustion testing unit (fluidised bed technology)
- 500 kW Unit
- Materials already tested include untreated wood, demolition wood, chipboard, sewage sludge, car tyres and pre-treated MSW, RRBF from MARSS plant
Results of fuel tests on MARSS RRBF product

- Continuous feeding of the MARSS RRBF fuel into the test unit successful due to good material properties of the fuel.
- Combustion at constant temperature of 900 degrees C demonstrated.
- Heating value RRBF >12 MJ/kg.
- Carbon about 35%, Volatiles about 66%.
- Ash content of about 25%.
- Phosphorus levels about 2300 ppm.
- Purity of RRBF most likely > 98 Ma.-%.
- Combustion tests plus material characterisation to end 2015.
The RRBF opportunities

• Social acceptance for renewable energy recovery is much higher than for energy recovery from waste

• Even small-scaled renewable energy power plants can be driven economically, which offers opportunities for regional energy supply solutions

• RRBF is a designed biomass fuel and can be adapted to the technical demands of different chamber systems

• **Outlook:** A 100,000 t/a MBT plant, working for 300,000 inhabitants, could supply about 11,000 households with electricity (based on about 4000kW/a consumption per household)
Added Value!

- RRBF separated from MSW reduces the total mass of landfilled waste minimising landfill capacity demand and landfill emissions
- RRBF as CO\(_2\) neutral fuel is highly valued in competition with fossil fuels – Renewable Energy credits
- The option to produce RRBF by adding modular technologies to existing or mandatory MSW treatment plants offers economically attractive opportunities
- We are looking forward to find additional utilisations e.g. combined with sewage sludge treatment and phosphorus recycling

*How can we transform opportunities into reality and implementation by the local authorities responsible for waste management in Greece?*
Decision support tool for local authorities

1. Technological options
2. Stakeholder consultancy
3. Impacts & Burdens
4. Multi-criteria complex analyses
5. Psychological/cross-cultural approaches

1st level Decision

6. Second stage consultancy
7. Analysis of additional conflicts

8. Quality check of decisions

1st level Decision

9. Testing of toolkit

Final Decision

- Identifying possible waste management solutions, full technical transparency
- Identifying formal and informal institutions and legislations

* Identification of relevant stakeholders involved
* Definition of values, aims and preferences of the involved stakeholders
* Concerns, knowledge levels, awareness, willingness to pay etc
* Evaluate preferences of the involved stakeholders
* Identification of risks for conflicts, negotiations margins etc

- Identification of suitable performance indicators
- Environmental impacts/burdens of technical options (LCA)

- Understanding balance between desirability and feasibility
- Identification of relevant criteria
- Multi-criteria assessments (MuSIASEM)

- Emotional, social, cultural aspects, irrationality, fears etc

1st level Decision

• Obtaining approval for 1st level decision from stakeholders
• Possible provision of more information through steps 1 to 4.

• Bringing in additional tools such as NAIAD (Novel Approach to Imprecise Assessment and Decision Environments) to help with additional conflicts

• Robustness of decision: discussion of final results with stakeholders/experts

Final Decision

• Applicability & testing of the toolkit to other new developments and and countries
Real case feasibility study – Naples

CASE STUDY AREA

Municipality of Naples

Area: 111.27 kmq
Residents: 1 million inhabitants
Population Density: 8180 inhs/kmq
Municipal Solid Waste Production: 517000 tons/yr* (2011)

More than 60% of MSW is sent to landfill

Naples waste “emergency” situation still not resolved

*all data are provided by regional authority
Results of stakeholder consultancy in Naples

Stakeholder groups responses:
Local authorities (29%), local waste authorities (26%), academics (24%), local general public (15%), others (6%)

Q? What do you believe is the main reason for the current emergency in Naples and Campania Region?
• 59% believed the institutions/government were to blame.
• 5% believed that the choice of technology was to blame.
• 35% said social and cultural factors were to blame.
• 1% said that economics were a factor.

Q? Level of acceptance to MARSS technology
• 98% in favour
• 2% against

Q? How likely is MARSS technology able to definitely solve the problem of waste management and emergency in Naples and in Campania Region?
• 69% Yes
• 29% Maybe
• 2% No
Greek stakeholder consultancy

- Action A2: MARSS: Cross-cultural Stake-holder consultancy questionnaire

- Δράση Α2: MARSS: Διαπολιτιστικό ερωτηματολόγιο συμβουλευτικών υπηρεσιών προς τα ενδιαφερόμενα μέρη

- Greek expert in charge: Prof. Maria Loizidou, NTUA

- Action co-ordinator: Prof. Ingo Romey
Invitation to join the International surveys

We invite everyone to take part in our international on-line survey!

Local authorities
Waste management companies
General public
Government bodies
Academic institutions etc

Questionnaires for Greece available on-line at: www.marss.rwth-aachen.de

Or please contact me directly for an interview during the conference.
Thank you!

For more information
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Winner of MARSS art competition – Lara aged 9 years