Technology Collaboration Programme
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Task 36

Integrating Energy Recovery into Solid Waste Management Systems

Triennium 2016-2018

IEA Bioenergy

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IEA Bioenergy

Task 36
Integrating Energy Recovery in to Solid Waste Management Systems

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Introduction

This is the final report for the IEA Bioenergy Agreement Task 36 – Integrating Energy Recovery in to Solid Waste Management Systems for the period 2016-18.

In this period, the Task aimed to examine issues that are important to policy development and implementation of energy recovery systems for solid wastes.

In the period 2016-18 Task 36 aimed to:

- Continue to inform decision makers on issues that are important to their decisions;
- Understand how policy decisions impact on the opportunities for and efficiency of energy recovery; and
- Continue to inform the IEA Bioenergy Executive Committee on progress of the Task.

The objectives of the Task in the period 2016-18 were to:

1. Hold a series of workshops alongside Task 36 meetings centred on topical issues for energy from waste. The proceedings from these workshops have been published on the website.
2. Undertake specific studies in areas of key importance to participating countries, which have been published as summary papers on the website.
3. Work with Task 32, Task 33 and Task 40 on areas of overlapping interest.
4. Seek opportunities to publicise the work of the Task through presentation at national/international events.

This report summarises the work and results of the Task over the 2016-18 triennium, evaluating the work carried out and the significance of the findings.

Background

The proposal of work for the 2016-18 Triennium included four key activities to deliver the aims and objectives of the Task:

- Task meetings, with associated workshops and field trips
- Reports on key topics
- Collaborative work with other Tasks.
- Redesign of the Task's webpage

The Task’s core work was undertaken in newly structured Task meetings, each of which was

accompanied with a themed workshop. The aim of these workshops was to allow Task members to present work on the nature of the issues concerned within their own country; to invite speakers to present work of relevance and to allow discussion of the issues presented. In the triennium of 2016-2018 in total four workshops were arranged.

The workshops held in the 2016-18 triennium were:

1. *A workshop on sustainable waste management in Italy, co hosted with ISWA-Italy. Rome, May 2016*

2. *A workshop on the role of Energy (and WtE) in the Circular economy. Paris, January 2017*

3. *A workshop on alternative/advanced thermal treatment of waste for feedstock recycling. Karlsruhe, December 2017*

4. *A workshop on the production and use of SRF, in association with Task 32, 33 and ERFO (European Recovered Fuels Organisation), organised as an official side event to EUBCE in Copenhagen, May 2018*

In addition to the workshops outlined above, the Task also delivered a topic/scenario report: "Waste Incineration for the future – Swedish scenarios". In addition, two more topic reports are close to finalisation, "Trends in the use of SRF" (anticipated late April 2019) and "Drivers and barriers for advanced thermal treatment for feedstock recycling" (Anticipated May 2019).

The Task has also taken part in the Task 40 report on Transboundary shipments of wood waste and contributed to the Inter-Task project on Fuel pretreatment, coordinated by Task 32.

The work of the Task was also presented at several international conferences and workshops, including:

- Factors Influencing the development of Small-scale EfW, Bioenergy Australia 2016, Brisbane, November 2016

- Waste to Energy: Opportunities and challenges from a Scandinavian perspective, SAARC webinar, June 2018

- International Perspectives of Energy from Waste – challenges and trends. Paper presented at the IRRC Waste-to-Energy conference, Vienna, October 2018

In addition, the Task also contributed with a presentation at the end-of-triennium conference in San Francisco, November 2018

Task objectives and work carried out

This section reports on the Task's objectives and whether or not they have been achieved. In order to do this, the section is divided into a series of sub-sections dedicated to each specific objective, and the programme of work that was delivered as part of meeting the objective.

OBJECTIVE 1: HOLD A SERIES OF WORKSHOPS ALONGSIDE TASK 36 MEETINGS CENTRED ON TOPICAL ISSUES FOR ENERGY FROM WASTE. THE PROCEEDINGS FROM THESE WORKSHOPS WILL BE PUBLISHED ON THE WEB SITE

This objective was met through the delivery of 4 workshops, summarised below. Presentations from all workshops are published on the Task 36 website. The aim for the period was to arrange 5 workshops, however the workshop on production and utilisation of SRF was for practical reasons moved to a late stage from May 2017 to May 2018.

WORKSHOP 1: A joint workshop with ISWA Italia looking at sustainable waste management in Italy, Rome, May 2016

Aims/Content - This workshop was designed to update Task 36 on relevant developments in Italy as well as an overview of the situation in Germany and France. A special focus was around the functionality and outcome from Mechanical Biological treatment plants.

Outcome/Conclusions:

- MBT is not a final treatment method, even though it is often mentioned as such. It is rather an alternative/complement to source separation.
- MBT has played a large role in several countries, however it has quite severe limitations when it comes to the diversion of organic waste from landfills and the interest for new MBT capacity seems to be low. It is also important to realise that there is potential for improvement in the existing MBT plants to decrease the amount of waste going to landfill.
- WtE plays an important role in building sustainable integrated waste management; in Italy there might be some need for additional capacity while in France and Germany the capacity is well balanced with the need.
- Although there can be large differences between different member states in the EU, there might also be very large differences even within a member country, as illustrated by Italy.

WORKSHOP 2: The role of energy in a circular economy, Paris, January 2017

Aims/Content - This workshop discussed different aspects of the circular economy. It ranged from the role of bioenergy/biorefineries/biogas/WtE to the policy framework in Singapore, France, Germany, Italy and Sweden.

Outcomes/Conclusions

WORKSHOP 2: The role of energy in a circular economy, Paris, January 2017

The following conclusions were drawn at the workshop:

- There are large possibilities for bioenergy and energy from organic waste in the Circular economy. There are also large potential benefits with biogas and nutrient recovery that could be realised when the economy moves toward a more circular approach.
- The maturity in policy and legislation in the area is not very high and there is a lot of development happening, both on the EU level as well as on the national levels.
- There will definitely be a role for Waste incineration also in a circular economy; there are still materials that should be removed from the Technosphere and there are also limitations for many materials on how many times they can be recycled.there might also be very large differences even within a member country, as illustrated by Italy.

WORKSHOP 3: A workshop on alternative/advanced thermal treatment of waste or feedstock recycling, Karlsruhe, March 2014

Aims/Content - This workshop was focused on advanced thermal treatment of waste, but not for the primary end purpose of recovering energy but rather to close the material loop further and do chemical recycling.

Outcomes/Conclusions

Key workshop conclusions were:

- There is a lack in incentives today to promote chemical recycling. In many cases there are incentives in place for the generation of green power, but in very few cases for green chemicals or chemically recycled materials.
- There are still significant challenges in getting the technology to work in an economically feasible way.
- Further conclusions will be drawn and included in the upcoming Task report on the subject.

WORKSHOP 4: Production and utilisation of SRF, Copenhagen, May 2018

Aims/Content - The workshop was a joint effort with Task 32, 33 and ERFO and was held as an official side event to EUBCE. The aim was to look at different aspects of solid recovered fuel, both the production and the end use of it.

Outcomes/Conclusions

WORKSHOP 4: Production and utilisation of SRF, Copenhagen, May 2018

- Solid recovered fuels are a recognised segment in Europe, partly depending on there being standards in place for classification and specification of the fuel. There is currently an ongoing work within ISO to raise this to an international level.
- In Europe the cement industry has been quite fast to adapt and use SRF to replace fossil fuels in their process; however there is still a huge potential in the rest of the world.
- There are interesting opportunities in the field to produce liquid fuels from SRF, however there are also large challenges since it will be a complex process. That is also demonstrated by the fact that there are very few commercial installations in the field. Those that exist work with very specific waste fractions.

OBJECTIVE 2: UNDERTAKE SPECIFIC STUDIES IN AREAS OF KEY IMPORTANCE TO PARTICIPATING COUNTRIES, WHICH WILL BE PUBLISHED AS SUMMARY PAPERS ON THE WEB SITE

Since there were only 4 countries participating in the triennium the work programme was limited in this area; however some important topics were identified. These topics included:

1. Transboundary shipments of waste
2. An updated report on the situation regarding solid recovered fuels
3. Advanced thermal treatment for the purpose of liquid fuels or feedstock recycling.

Due to the low budget these objectives have only been partly met; all the topics have been addressed but the reports are heavily delayed. On the other hand an additional report has been published that was not in the original planning.

Transboundary shipments of waste: This subject was explored together with Task 40 and was performed as a master's thesis that was later also reformatted and edited to fit as an IEA Bioenergy report. The subject was narrowed down to look at waste wood flows in Europe. The report was published in the beginning of 2019.

Trends on the use of SRF: a study was undertaken to investigate apparent trends in the use of SRF. This work was aligned with work being done within the standardisation work of ISO TC 300 Solid Recovered Fuels. Unfortunately, it proved to be very hard to get data from many markets, and if there was data available there were a lot of difficulties making the comparisons in a scientific way. However, the resulting report gives a background on terminology and origin and an overview of the market in some countries. The report is anticipated to be published in the end of April 2019.

Waste to Energy for the future: a Swedish case study looked into the potential role of Waste to Energy in Sweden in 2045, assuming that a circular economy has more or less been implemented. The work was financed by the Swedish strategic innovation programme RE:Source together with the trade association Avfall Sverige. Task 36 assisted with the translation and editing into an IEA Bioenergy report. The report was published in March 2019. This report was not within the

originally planned deliverables for 2016-2018.

OBJECTIVE 3: WORK WITH OTHER TASKS ON AREAS OF OVERLAPPING INTEREST.

This objective was achieved through the delivery of both a joint workshop and the publication of a joint report.

- Joint workshop with Task 32, Task 33 and ERFO on the production and utilisation of SRF
- Joint report with Task 40 on the transboundary shipments of waste.
- Speakers from Task 37 and Task 42 in the workshop on circular economy.
- Participation in the Inter-Task project concerning fuel pretreatment

OBJECTIVE 4: REDESIGN OF WEBPAGE

This objective was met when the Task webpage was transferred from the hosting of Ricardo to be integrated in the umbrella of the ieabioenergy.com website. When the webpage and it's content was moved, it was also redesigned to make it more modern. Also in line with this a newsletter template was developed and the first newsletters have been distributed.

Conclusions and recommendations

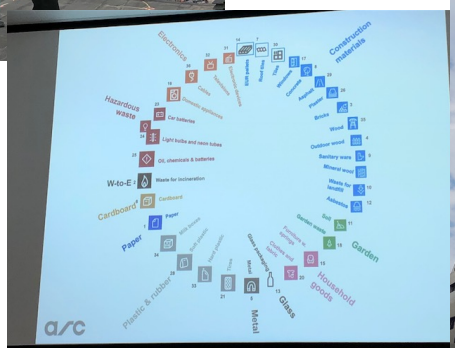
Working with workshops and field trips associated with the Task meetings has been an excellent way to maximise the output of the limited budget of the small Task. The workshops allowed member countries to take ownership of the workshops and their content, and to leverage in additional input from stakeholders within each country, hence maximising the outreach and visibility of the Task.

The attendance of the workshops has varied from around 10 people (Paris) to closer to 50 (Copenhagen)

The major outcomes of the Task are:

- four key priority issues have been explored by the Task through the delivery of workshops
- three topic reports published or anticipated to be published soon
- increased level of stakeholder involvement and co-operation
- redesign of webpage and introduction of newsletter
- working relationships established with ISWA and ERFO

- New work programme for next triennium with a wider support (7 participating countries)



Field trip to the Copenhill WtE plant, Copenhagen 2018

The delivery of Task 36 is always a challenge due to the small number of members and therefore limited budget. However the work with the new work programme has been successful and resulted in 7 members for the new triennium, including representation of 4 continents.

Our conclusions for the Executive Committee of the IEA Bioenergy TCP from this work are as follows:

- The increased focus on circular economy and material valorisation connects to the energy recovery aspects and needs to be considered if the work should be considered as credible. The transformation will also need to be considered to define a new role for energy from waste in that context.

- The development of energy from waste is relevant to the majority of countries in the world. Globally the amount of waste produced is increasing, particularly in areas where there is rapid urbanisation. Increasingly, regulation of waste management takes the nature of the waste into account and aims to maximise resource recycling and to optimise energy recovery from residues. This means that energy from waste is and will remain a key issue globally. Our work in this Triennium leads us to recommend that IEA Bioenergy concentrates its efforts on providing information that allows decision makers to make the right decisions on integration of energy into solid waste management, in particular on the most appropriate technology for their local needs. Also not forgetting material valorisation through recycling when providing that information.

- Related to the above, there are many opportunities to reach out to countries that are not in IEA Bioenergy. This may be done initially by joining forces with other international groups (such as the International Solid Waste Association, ISWA, or Asian international

waste groups). Ultimately the aim of such work should be to draw more countries into the IEA Bioenergy TCP, by demonstrating the advantages of membership.

- In the past triennium there have been a number of important trends that have continued. The transboundary shipment of waste is an important part of some countries waste strategies as well as an important part in the energy system. The closing of the borders of China to plastic waste will increase the demand to develop sustainable solutions for plastic recycling. This might be what is needed for a breakthrough on gasification/chemical recycling. These alternative thermal treatment methods have been receiving a lot of attention in recent years but have still to prove their viability and efficiency compared to traditional waste incineration technologies. Energy from waste is a mature technology and there are many examples of grate combustion worldwide. We covered this area in our end of triennium report in 2009, where we reviewed the current technologies. However, as indicated above, the nature of its application is changing and there are new technologies that could be game changers. We recommend that work supported by the IEA Bioenergy TCP on the integration of energy into solid waste management should aim to provide transparent information on the changing application of energy in solid waste management (such as how it fits into the circular economy); and on the status of new technologies that could be game changers (such as the development stage, costs, efficiencies etc achieved by these new technologies).

- Dissemination of this information remains a problem for the Task. We recommend that more use is made of modern communication methods, but that this is co-ordinated by the ExCo Communication Team to ensure optimal use of funds. For example, greater use of webinars would help reach a wider audience.

- With the experience of working with a very small Task (only 4 countries) we recommend that there are guidelines put in place on how work could be adapted to such a small Task, and also consider if there should be a minimum number of participants to be able to run a specific Task.

- The work on lessening the administrative burden with regard to progress reports and expected participation in ExCo meetings is good and should be continued. In this way the funds for the Tasks are put in work rather than being spent on administration. This is also more important the smaller a Task is.

Attachments

- Participation in major events is included in this report. The presentations at events are published on the website

- Deliverables (conference papers, seminar proceedings, technical notes, newsletters, Industry Days, scientific publications, books, etc.), including website address or reference of the publication. These publications are on the Task 36 website (task36.ieabioenergy.com).

- Co-ordination with other Tasks within IEA Bioenergy – information on co-ordination with other Tasks is included in this report. Reports produced as a result of this co- ordination are on the Task 36 and 40 websites.

- Industry participation: We have discussed co-ordination with industry within this report. Most of this co-ordination was done through our workshops, but we also organised study tours of industrial sites.

Appendix 1 Publications and industrial participation

PUBLICATIONS IN THIS TRIENNIUM

2016

- Summary of the Workshop on sustainable waste management. (http://task36.ieabioenergy.com/publications/proceedings-workshop-towards-sustainable-waste-management-may-17-2016-rome/)

2017

- Paris: Workshop on circular economy. Presentations from the workshop (http://task36.ieabioenergy.com/publications/workshop-circular-economy/)
- Presentations from the workshop on Thermochemical technologies for feedstock recycling of waste

  (http://task36.ieabioenergy.com/publications/presentations-from-workshop-on-thermochemical-technologies-for-feedstock-recycling-of-waste/)

2018

- Presentations from the workshop on production and utilisation of solid recovered fuels. (http://task36.ieabioenergy.com/publications/workshop-on-production-and-utilisation-options-for-solid-recovered-fuels/)

2019

- Transboundary flows of woody biomass waste streams in Europe, (http://task36.ieabioenergy.com/publications/transboundary-flows-woody-biomass-waste-streams-europe/)
- Waste to Energy for the future, (http://task36.ieabioenergy.com/publications/waste-energy-for-the-future/)

INDUSTRIAL PARTICIPATION IN TASK

Name of Body	Industry (association) / International body	Area of focus	Type of collaboration* (existing or planned)
International Solid Waste Association Italia (ISWA and space after paragraph of 1mm.	Waste Management association and space after paragraph of 1mm.	Transition to circular economy, waste-to- energy role in circular economy, revision of the WtE BREF	Co-hosting of the workshop on sustainable waste management.and space after paragraph of 1mm.

Name of Body	Industry (association) / International body	Area of focus	Type of collaboration* (existing or planned)
Amager Resource Centre (ARC)	Waste management consortia/association of municipalities	Waste-to Energy	Field trip to Copenhill WtE plant
Mälarenergi	Operator of WtE plant in Sweden	Waste to energy and distict heating	Technical visit in association with the Task meeting spring 2017
Syctom	Waste management consortia/association of municipalities	Waste management in Paris	Field trip in January 2017
Hermabiente Spa	Waste management company in Italy		Gave a presentation at the workshop in Rome
The National Environmental Agency of Singapore		Waste management in a circular economy	Participated in Task meeting in January 2019
Avfall Sverige – Swedish waste management	Trade association representing municipalities in Sweden regarding waste management	Waste management and the municipal responsibilities	Participated and funded study on Waste to Energy for the future. Representatives for a number of Swedish companies were involved in the study
Ecoloop GmbH	Manufacturer of	Feedstock	Gave a

Name of Body	Industry (association) / International body	Area of focus	Type of collaboration* (existing or planned)
	gasification technology	recycling	presentation at the workshop in Karlsruhe, December 2017
Steinmüller-Babcock Environment GmbH	Manufacturer of gasification technology	Feedstock recycling	Gave a presentation at the workshop in Karlsruhe, December 2017
Heidelberg Cement	Cement manufacturer	SRF	Gave a presentation in the Copenhagen workshop May 2018
NESTE	Vehicle Fuel manufacturer	SRF	Gave a presentation in the Copenhagen workshop May 2018
Institut de l'économie circulaire	Public -private partnership working on circular economy	Circular economy	Gave a presentation in the workshop in Paris, January 2017
Dahlmann renewable technology BV	Manufacturer of gasification technology	SRF/Feedstock recycling	Gave a presentation in the Copenhagen workshop May 2018
European recovered fuels organisation - ERFO	Association for SRF- producers	SRF/RDF	Co-hosted the workshop on production and utilisation of SRF

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Further Information

IEA Bioenergy Website
www.ieabioenergy.com

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