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IWWG News & Views

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In this section of the Journal the reader will find information on the IWWG (International Waste Working Group), reports on activities carried out by Task Groups, a list of future events and relevant notes on the think tank elaboration and activities of the association.

In this issue: report from the XIII International Waste Management and Landfill Symposium SARDINIA 2011 and update on the activities of several IWWG Task Groups.

Report from the 13th International Waste Management and Landfill Symposium – Sardinia 2011 (by Roberto Raga, University of Padova, Italy)

The 13th edition of the Sardinia Symposium, organised by the IWWG (International Waste Working Group, www.iwwg.eu), was held in Forte Village, Santa Margherita di Pula, Italy, from October 3rd to 7th.

The event was attended by approximately 800 participants (researchers, technicians, administrators and operators) from 63 different nations with the presentation of 562 scientific papers.

The traditional issues of waste prevention, material and energy recovery, waste treatment and final disposal were addressed in 128 general, specialised and workshop sessions where new ideas and concepts were presented and thoroughly discussed.

The opening lecture of Sardinia 2011 Symposium was given by Prof. Armin Reller (University of Augsburg, Germany) who presented a comprehensive overview on waste of electronics, with focus on the high potential afforded by the recovery of valuable metals from advanced electronic devices.

The production of electronic devices is increasing exponentially and at the same time the product life span becomes shorter and shorter (6–24 months for mobile phones). Moreover, due to technology advances, a larger number of substances are used (up to 60 different elements are present in current laptops or mobile phones). Among these elements, strategic metals (i.e. gold) can be found in advanced electronic devices (i.e. mobile phones) at much higher concentrations than in the original mineral.

According to Prof. Reller, global postconsumer recycling rates for many metals show considerable room for improvement. Considering that the annual global production of raw materials by mining increased from 10 to 15 bil. tons within 25 years, sustainable resource/waste management will be a key issue for future generations and the following criteria should be carefully considered:

- Consistency with the carrying capacity of the planet earth
- Efficiency of use of resources and energy
- Suitability of life style

The theme of waste prevention and recycling was discussed in several sessions during Sardinia 2011. Andreas Bartl (Vienna University of Technology, Austria) pointed out that greater

emphasis should be placed on waste prevention than on recycling. To this goal, the concept of resource management should be considered instead of waste management, in order to cover the complete supply chain of a product from cradle to grave. This holistic approach should take into account any action or policy that results in cycle processes and seems thus to be the proper tool towards the goal of zero waste and sustainable development.

In this framework, an important role is played by the concept of extended producer responsibility (EPR). According to Vera Rotter (Technical University of Berlin, Germany), the main concept of EPR is the integration of social and environmental life cycle costs of a product into the product price in such a way that it reflects the costs for end-of-life treatment and disposal. EPR implies the provision of incentives to producers to ensure that they consider end-of-life aspects in the design phase of products. However, many challenges still have to be faced, among others collection strategies should provide innovative take-back systems that give producers access to their waste and the objectives of waste management need to be redefined: for instance, in many cases targets are quantitative rather than qualitative. An example is provided by the waste of electronics, where the very high mass based recycling quota achieved contrasts with the low recovery of mere traces of strategic metals present.

Although prevention and recycling of waste are increasingly taken into due account and proper measures are adopted in waste management strategies, landfilling will still play a fundamental role in closing the resource cycle for future generations. For this reason, a debate within the waste community has been ongoing for several years in an attempt to define sustainable landfill concept. The IWWG Task Group on Sustainable Landfilling coordinated by Heijo Scharff (NV Afvalzorg Holding, the Netherlands) organized a workshop on landfill aftercare completion on 6 October 2011, which was attended by more than 60 Symposium delegates. The intention of the workshop was to clarify terminology and specify the ultimate goal of aftercare completion and to obtain a shared notion on minimum requirements for completion procedures. It was agreed that in order to be able to release a landfill from aftercare, the potential emissions of relevant elements or compounds in the absence of active control should be within the natural attenuation capacity of the environment. For this reason the remaining emission potential of the waste mass should be properly evaluated and considered. The

majority of delegates agreed that the main challenge is the contradiction between current regulations and sustainability: appropriate regulations should comprise the promotion of active acceleration of waste degradation and stabilization processes in the landfill.

Among the active processes for promoting waste biodegradation in the landfill, in situ aeration is certainly the most promising and its application is becoming increasingly considered worldwide. The IWWG Task Group on Landfill Aeration, coordinated by Marco Ritzkowski (Hamburg University of Technology, Germany), organized a workshop on October 4th, where the following main issues were addressed: how and to what extent might temperatures be controlled during aeration? How does emission behaviour develop in the long term after completion of aeration? Do undesired emissions (such as e.g. heavy metals or N_2O) emerge during aeration? Are nitrogen balances suitable to determine landfill bio-stabilisation? As reported by Marco Ritzkowski,

areas. In the aftermath of a disaster, environment and waste management authorities should adopt an effective and appropriate disaster debris management system; for this reason the use of proper tools to support decision-making should be considered.

The Round Table was coordinated by Prof. Rainer Stegmann from Nanyang Technological University (Singapore) with the following invited participants:

- Muhammed Alamgir (Khulna University of Engineering and Technology, Bangladesh);
- Bernd Bilitewski (University of Dresden, Germany);
- Nagahisa Hirayama (Kyoto University, Japan);
- Mark Milke (University of Canterbury, New Zealand);
- Debra Reinhart (University of Central Florida, USA);
- Takayuki Shimaoka (Kyushu University, Japan);
- Susan Thorneloe (U.S. Environment Protection Agency, USA);
- Hideki Yoshida (Muroran University, Japan).



Participants in the Round Table on “Disaster Waste”, which closed the Sardinia 2011 Symposium.

during the discussion there was a broad consensus on the important role played by temperature control on the success of landfill in situ aeration. Previously, temperature control was deemed necessary to avoid potential landfill fires; nowadays the effects of temperature on bio-chemical processes are taken into account and the effects of temperature variations on the completion of degradation processes and on the release of undesired compounds during the aeration process are being evaluated in lab scale and field tests. Further studies will be required to better understand to what extent temperature control can be carried out by means of the addition of water and/or intermittent aeration in the landfill body.

Numerous other IWWG task group workshops and meetings were devoted to extensive discussion on major controversial and challenging issues such as waste thermal treatment, industrial waste management, WEEE recovery and recycling, mitigation of landfill gas emissions to the atmosphere by means of natural biological processes, prevention of food waste, leaching tests for waste characterization. Reports on the activities of the other IWWG Task Groups are available in the IWWG News and Views pages on this and previous issues of Waste Management.

The final (plenary) session of Sardinia 2011 was on disaster waste and was followed by a round table with participants from areas affected by different kinds of disasters (floods, earthquakes, tsunamis, war). In the wake of these disasters enormous quantities of debris are discharged from collapsed buildings and damaged household goods, producing an impact not only on the waste management system but also on landfill systems in the devastated

Awards

Six awards were assigned during the symposium and were delivered to recipients in occasion of the Gala Dinner. The winners were as follows:

- Kriton Curi Award for the best paper on waste management in developing countries: “Evaluation of contamination potential of sanitary landfill lysimeter using leachate pollution index”, by I.M. Rafizul, M. Alamgir and M.M. Islam (Khulna University of Engineering and Technology, Bangladesh);
- Giovanni Bozzini Award for the best Italian paper: “LCA of integrated municipal solid waste management systems: case studies of Torino and Cuneo (Italy)”, by G.A. Blengini, G. Genon and M. Fantoni (Politecnico di Torino, Italy);
- Luigi Mendia Award for the best paper on waste management policy issues: “The issue of waste in European manufacturing SMEs”, by S. Mitchell, P. O’Dowd A. Dimache and T. Roche (Galway-Mayo Institute of Technology, Galway, Ireland);
- Alberto Rozzi Award for the best paper on anaerobic digestion: “Co-digestion of food waste and sewage sludge by two-stage anaerobic digester for biogas production from high-rise building”, by C. Ratanatamskul, O. Wattanayommanaporn (Chulalongkorn University, Bangkok, Thailand) and K. Yamamoto (University of Tokyo, Japan);
- Award for best poster: “The effect of vegetation on microbial methane oxidation”, by S. Bohn (Darmstadt University of Tech-

nology, Germany), J. Gebert (University of Hamburg, Germany) and J. Jager (Darmstadt University of Technology, Germany).

The recipient of the 7th edition of the “Life for Waste” Award, presented every 2 years to individuals who have made an outstanding contribution to advances in international waste management, was Prof. Héctor Collazos Peñaloza. The award (a sculpted silver statue by the Sardinian artist Antonello Pillittu) was presented by Susan Thorneloe, from the US Environmental Protection Agency.

He also lectured the solid waste course for the Environmental and Sanitary Engineering Programmes of the Universidad de la Salle in Bogotá and for the Universidad Nacional de Colombia in Palmira. He has been a lecturer in practically all the schools of sanitary and environmental engineering of the country.

Social events

As usual, Symposium participants were able to enjoy a detailed social programme throughout the 5 days of the conference: from



Héctor Collazos (left) receives the “A life for waste” award from Susan Thorneloe (right).

Héctor Collazos studied in Colombia and graduated as a topographer in the Universidad del Valle (Cali, Colombia) in 1960. He was a lecturer of topography courses in the Universidad del Valle from 1961 to 1967.

After graduating in Sanitary Engineering at the Universidad del Valle in 1967 he worked as General Manager of Sanitation of the Ministry of Health of Colombia from 1969 until 1979. In this duty he was in charge of providing the general guidelines for environmental sanitation for all the country. In this period of time he supervised the elaboration of the Sanitary National Code (Law 09 of 1979) as representative of the Ministry of Health. He was a member of several national institutes that have relation with the design, construction and system operation for the protection of the environment.

He was the director of the first diagnosis study on the services of urban solid waste of the country from which the National Program of Urban Solid Waste (PRONASU) was formed.

He attended and approved the Basic International Course of Health Planning, in the Universidad de Antioquia, Colombia in 1972.

He was a professor of the National University of Colombia from 1976 up to 1990, 14 years lecturing courses such as Solid Waste for Civil Engineering and Chemical Engineering Programs, as well as for the Master of Science in Environmental Engineering. He also lectured the courses of biostatistics and epidemiology for engineers in the graduate courses of Environmental Engineering and of biostatistics in the master degree courses of Public Health in Faculty of Medicine of the Universidad Nacional de Colombia.

the traditional folk music and dances during the Sardinian Dinner in the “Su Talleri” restaurant to the Gala Dinner that closed the Symposium. Following the huge success of the show in the 2009 edition, another “Sardinia’s Got Talent” evening was organized, where Delegates attending the Symposium came up on the stage and performed singing and playing music. This was, together with the traditional international football match, one of the many opportunities to play sports and have fun even in the highly scientific context of the Sardinia Symposium!

The next edition of the Sardinia Symposium has been scheduled for September 30th–October 4th 2013, once again in the traditional venue of Forte Village Resort. The relevant info will be available in due time at the usual website: <http://www.sardiniasymposium.it/>.

To obtain the proceedings of the Sardinia Symposium (one volume of 1200 pages containing the extended abstracts and one CD-Rom containing all the papers), please contact Eurowaste at: eurowaste@tin.it

IWWG Task Groups activities during the Sardinia 2011 Symposium

Specialized workshops and meetings were organized by the IWWG Task Groups during the Sardinia 2011 Symposium. The following are reports of the different activities undertaken by the Task Groups.

IWWG Task group on Leaching Assessment Methodology and Tools

During the 13th Sardinia Symposium two sessions were held, devoted to leaching of waste and waste derived products. The first session hosted presentations by Andre van Zomeren (Energy Research Centre of the Netherlands) on Emissions from monolithic waste landfills, by Hanna Modin (Lund University, Sweden) on testing of a modern carbon-poor landfill, by Susan Thorneloe (Environmental Protection Agency, USA) on the new Leaching Environmental Assessment Framework and associated testing tools, and by Genevieve Feuillade (University of Limoges, France) on the Stability of MSW in semi-industrial scale pilots. All presentations resulted in good discussions, which covered aspects including data presentation, comparability of test data and the use of simplified testing versus characterization testing. It was identified that the relationships between laboratory and field observations are important to understand, including the role of redox state and preferential flow differences on the release in laboratory tests and field data. Finally, the importance of organic matter characterisation and fractionation was stressed to understand degradation aspects and to understand the consequences of organic matter degradation on the release of substances from degraded organic matter.

The TG Chair Hans van der Sloot (Hans van der Sloot Consultancy, Langedijk, The Netherlands) stated that a limited set of basic characterization leaching tests will suffice to address many questions related to multiple decisions on disposal, treatment and utilization, particularly in view of recent developments in recycling and beneficial use of waste. However, long-term assessment of environmental impact cannot be achieved without modelling and field verification. The End of Waste criteria currently undergoing development and the change from Construction Products Directive to Construction Products Regulation (2013), which emphasizes recycling and End of Life considerations, are associated regulatory developments in need of proper tools. In spite of different standardisation bodies, basically the same tests have been standardized as Technical Specifications for different material types – CEN/TC292 Waste, ISO/TC 190 and CEN/TC 345 Soil, CEN/TC 351 Construction Products. The US-EPA is currently in the process of validating through inter-laboratory comparison studies the same basic methods – pH dependence test, percolation test, monolith leach test, compacted granular leach test – for inclusion in SW 846 (EPA handbook of Standard Methods).

The second session was a Workshop organized by the IWWG Task Group on Leaching Assessment Methodology and Tools, whose main theme was the recent development of a Leaching and composition database for waste management and its potential use for waste and waste derived products. Approximately 40 delegates (of which 15 regular IWWG members and 13 researchers who expressed interest in becoming a member) took part in the Workshop.

The need for a database related to leaching has been discussed at several occasions during IWWG managing board meetings and Task Group meetings. The unified database structure and presentation developed in LeachXS was identified as a good approach. A data viewer, LeachXS Lite™, has been developed to allow users to compare their data with data present in the database. With support of US-EPA, the Lite version of LeachXS is now freely available and includes a database focused on coal combustion residues (see www.Vanderbilt.edu/Leaching).

Over the years, numerous amounts of data have been generated on landfilled waste, leachates, and individual waste streams. The data have found their way into reports, conference proceedings and peer-reviewed publications. However, the accessibility of the information is poor to non-existent, as data are generally incomplete, key background information is missing and data is present in all kinds of formats. Extracting information from pdfs,

even when reasonably complete, is at best very tedious. Aggregated data in terms of averages, minimum, maximum and percentiles are unsuitable for in depth data comparison as the underlying connections between substances are lost. However, this data might be useful for data comparison purposes because of the usually large amount of individual test results that are behind the statistical indicators. In many cases, contact with the party that has generated the data is essential to fill in missing information.

The benefit of bringing data together lies in the fact that information on a given material is more systematic than commonly believed. There are more similarities in release behaviour to be found than individual data owners think as they generally consider their materials to be unique. Part of the problem is that judgment of leaching has been based on single step leaching tests (TCLP, DIN S4, EN 12457), which are too limited to describe release behaviour from materials properly.

Comparison of data from worldwide sources has revealed stunning similarity in release behaviour for municipal solid waste incinerator (MSWI) bottom ashes, which is visibly very heterogeneous. Such behaviour can be captured in statistical terms and marked as a benchmark for comparison purposes. The main advantage of such a benchmark is that true differences in release behaviour can be identified more easily. In addition, benchmarking allows for focus on truly relevant aspects, thus avoiding multiple measurements of substances for which there is already a lot of information.

Through the use of LeachXS Lite™ information on leaching can be accessed from the IWWG Leaching database, which will be provided through the webpage of the Task Group on Leaching Assessment Methodology and Tools on the IWWG website. The database contains leaching information on contaminated soil, sediments, compost, sewage sludge, treated wood, mixed waste, MSW, MSWI bottom ash, stabilized hazardous waste, industrial slag and sludge, that will be of relevance for different IWWG Task groups – Landfill Aeration, Sustainable Landfilling, MSW Incineration Residues (PHOENIX), Compost Quality (HumOr), Waste management in developing countries, Landfill Modelling, Thermal Treatments, Industrial Waste Management and Hospital Waste. This information can either be used in view of changes in release behaviour of MSW due to the treatment, for providing insight in release behaviour prior to testing, to avoid unnecessary testing, for use as source term information for modelling or to assess release for purposes of release from aftercare.

In addition to testing data in the database, case files with geochemical speciation modelling results (e.g. pH dependence test for chemical speciation fingerprints, percolation test prediction, complex scenario descriptions) will be provided for several of the materials listed above. This option is restricted to users of the full version of LeachXS™ (temporary license on request).

In the context of activities performed to bring data together in one database with a uniform format, many different types of results can be placed in perspective to one another leading to insights which would otherwise remain hidden, or at least be much harder to recognize. Sharing data provides an option to remove misconceptions, recognize trends and identify main gaps in our knowledge.

The end of the workshop was used to discuss further steps within the Task Groups. The following goals were identified:

- Stimulate the use of basic characterisation leaching tests in research as opposed to single-step batch tests.
- Facilitate exchange of leaching data by providing an IWWG leaching database. Members will be asked to provide xml files of their detailed (public domain) leaching data using input tools provided for uploading data.

- Identify gaps in available data sources in terms of material types, substances and tests and seek sources to fill such omissions.
- Develop a reference base for leaching data from important waste materials and waste-derived beneficial use materials in the form of aggregated data for comparison purposes.
- Facilitate exchange of knowledge on processes influencing release.
- Facilitate exchange on comparisons between laboratory, lysimeter and field scale data in support of environmental impact assessment and regulatory developments.
- Facilitate chemical speciation modelling of important waste materials by providing chemical speciation fingerprints of specific material types consisting of elemental composition, mineral assemblages, typical content of active surfaces and default parameters.

HumOr – IWWG Task Group on “Compost Quality”

The IWWG Task Group HumOr was established to define quality criteria for compost, to find parameters describing this quality and to determine limit values for low quality, medium quality and high quality composts. HumOr is not concerned with criteria such as heavy metal content, organic pollutants, phytotoxic effects, seeds or impurities, focusing rather on the positive effects of compost. Currently experts from ten European countries (all scientists in the areas of solid waste, soil and plant growth) are involved in HumOr activities.

During the Sardinia 2011 Symposium no Task Group meeting was scheduled, but a training course on “Composting” was organised. During the Training Course participants followed lectures given by the Task Group Co-Chairman Erwin Binner, from the BOKU University of Vienna, Austria (*e-mail*: e.binner@boku.ac.at). The 4-h course provided basic fundamental knowledge on the composting process.

The first part of the course focused on the fundamentals of the aerobic degradation process and means of enhancing the same. The importance of source separate collection of biowastes for compost quality was demonstrated. Possible feedstock materials, pre-treatment requirements, requirements of process control and aspects of compost quality were explained. Subsequently, the course examined the most important process steps: collection, delivery and storage of different biogenic wastes, pre-treatment of feedstock, processing (composting process), how to control the composting process and compost finishing.

In the final part of the course different rotting systems were illustrated. Advantages and disadvantages of open windrow composting systems vs. enclosed reactor systems were discussed. Debate focused on several aspects of forcing the process, possible emissions (e.g. odour, leachate) during composting and influences of processing on compost quality.

During the last workshop at ORBIT 2010 the parameters currently used to assess compost quality and rotting process were presented by the members of the Task Group: organic matter (by loss on ignition (LOI) and/or TOC), nutrient contents (total amounts, plant available amounts), C/N-ratio, respirometric tests (AT_4 , SOUR, etc.), self-heating test, plant germination tests, enzymatic tests,

C-dynamic and N-dynamic after incubation, humification (by humic acid analysis), FTIR-analysis (Fourier Transform Infrared Spectroscopy), and thermogravimetry (coupled with a mass spectrometer). The disadvantages of conventional parameters are well known. Analyzing compost samples to “sum parameters” like LOI, TOC and TN provide information only on the total amounts of organic matter, TOC resp. N. They do not give information about the type (quality) of organic compounds. Nutrient content and C/N-ratio highly are influenced by feedstock materials (availability of nutrients and C/N also by rotting conditions). Respirometric tests, self-heating test and enzymatic tests determine the stabilization-stage resp. microbial activity of composts but not the quality of organic matter. Intensive mineralization leads to high stability but only low content of humic compounds are developed. Plant germination tests allow the evaluation of phytotoxic effects, as well as positive effects on plant growth, but they do not reveal why these effects occur. C-dynamic and N-dynamic incubation tests are highly time-consuming. Analysis of humic acids, which yield a reliable picture of stable organic compounds, is likewise extremely time-consuming.

The advantage of the innovative FTIR-analysis is the obtaining of much more detailed information about the organic and inorganic components of the compost sample. This rapid and highly reproducible method (in Austria this method is already standardized) has been applied to describe changes at a molecular level during the biological treatment of organic wastes. By FTIR it is possible to predict several parameters (LOI, TOC, TN, AT_4 , humic acids contents) by analysing one parameter alone. Therefore, multivariate regression models based on Partial Least Squares Regressions (PLS-R) are used.

Currently, FTIR-analysis is used by two institutes to evaluate compost quality. Two additional institutes have the equipment, but are lacking experience with FTIR-analysis of composts. Since the last TG meeting an exchange of experiences in FTIR analyses has been undertaken. New Experiences with FTIR will be presented during the workshop organised by the Task Group during the ORBIT 2012 Conference (June 12th–15th) in Rennes, France. The aim of this workshop will be to further discuss possible parameters (including methods for analyses) for use in evaluation of compost quality and to define a list of parameters to be used by the members of HumOr for future projects.

The TG-meeting in Rennes will also discuss the need for a matrix of parameters and different purposes of application (same parameters, different limit values), in view of the different aspects of compost quality associated with local situations (i.e. if nutrients are lacking, researchers will have to focus on plant available nutrients in compost; if organic matter is lacking, addition of stable organic matter will be more important).

For further information on IWWG activities, please:

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