"Turning waste into a resource through innovative technologies, processes and services" (7th Framework Programme)

CoLaBATS+−

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this issue

Editorial:

A warm welcome to the CoLaBATS group for Nabil Bencheikh from CEDRAT Technologies, who has taken over from Timothée Forissier.

Project Update:

Development of the CoLaBATS demonstration plant is underway and it is speedily taking shape. The structural frame, solvent extraction baths and DES syntheses are near completion and the final solvent extraction parameters are being optimised.

The development of the demonstrator posed a challenge on its own, primarily because of the DES and ILs used. The presence of these chemicals requires baths, tubing and filter presses to be sourced from alternative media (other than metal). Despite this unique challenge, construction of the demonstrator is moving forward, with the intention to begin 'make-like-production' trials shortly.

Leading on from the trials will be the economic and environmental assessment of the process, to demonstrate the sustainable capabilities of the innovation, and the benefits associated with exploiting this novel technology. As the demand for critical materials grows, so too will the need for efficient recycling techniques, like CoLaBATS.

It has been decided that the demonstrator unit will be housed at C-Tech Innovation Ltd in the UK, where a final workshop will also be held. The consortium will take the opportunity to disseminate the outcome of the project to the recycling community, regulators and other stakeholders. It is intended that the technology implemented in this project will be exploited for recycling batteries, as well as used for other cross-cutting applications (refining).

CoLaBATS Consortium Members

aprofitament assessoramen ambiental, s.l.

CEDRAT TECHNOLOGIES Innovation in Mechatronics

Solvionic

CHALMERS

TU WIEN

University of Leicester

Env- Aqua Solutions

C-Tech INNOVATION

tecnalia Inspiring Business

2015 in Review:

Last year saw a number of changes in the battery recycling industry:

- elimination of exemptions for button cells.
- public waste authorities to regulate portable batteries from WEEE.
- calculation of recycling efficiencies outlined by the EU.

Additionally, the cost of battery recycling in the UK has been estimated to increase. This is because of the way batteries have been categorised in the past, which was not in line with other EU member states. For the CoLaBATS project this is a benefit, making the exploitation of the technology more economically viable in the UK.

The Common Denominator: Money; Pricing Environmental Benefits

Tools for Appraising Environmental Assets

ISO 26000: 2010 Social Responsibility

Guidance document for companies to contribute to the health and welfare of society through sustainable development.

http://www.iso.org/iso/iso26000

OECD Sustainable Manufacturing Indicators

18 of the most important and commonly applicable indicators for defining, tracking and improving performance.

http://www.oecd.org/innovation/green/toolkit/oecdsustainablemanufacturingindicators.htm

What is a cynic? A man who knows the price of everything and the value of nothing.

Oscar Wilde

Trying to put a price on the environment, ecosystems, and their health/ quality is a challenge because of the entangled reliance of each key parameter. The complex relationship between ecosystems, resources and quality is little understood yet, often, a single price will be used to represent them all.

The economic price of nature is a controversial topic. Attaining the 'true value' of an ecosystem asset is nigh on impossible, as the natural world is a trans-boundary system, and the change or loss of a single ecosystem asset has a knock on effect.

An example of this issue is the UK Government's fascination with neonicotinoides (an EU banned biocide) used to preserve agricultural efficiencies in the UK at a cost to the health of the environment. Whilst the UK agricultural industry contributed over EUR 200 billion in 2014 to the EU, UK bee colonies and local aquatic health do not contribute directly to the economy. This indirect relationship has lead to associated environmental parameters being overlooked for the direct benefit of the economy. However, if we could quantify the value of a bee colony based upon the effect of its pollination, preservation of wild environments, and the benefits we gain from nature, would the value of bees surpass that of agricultural profits?

Similarly, the importance of the reliance humans have on nature is poorly understood. For example, it has been shown that children regularly exposed to woodland environments are less likely to develop asthma. Yet we continue to densely populate cities, remove open land, trees and plants from the urban environment, and shut ourselves away in sterile homes and offices for the majority of the day, reducing contact with nature and natural environments. This attitude and behaviour further supports the case that the interaction between humans and nature, and the implicit reliance the human race has on nature, is not understood.

If we are not yet aware of the complex interaction we need with nature to provide a healthy environment, how are we able to quantify its 'true value'?

The Common Denominator continued

The same issues apply when trying to compare a conventional technology with innovation. Whilst it can be straight forward to determine the operating and production costs of the technology, how can we quantify the resourcefulness, air quality, water consumption, sustainability and other impacts to the environment and related ecosystems using a single parameter?

To address the impacts of an innovative process compared to conventional methods, we can perform side by side comparisons. We build boxes around systems and processes and determine environmental parameters normalised to current state-of-play. But this does not give us a true indication of the environmental impact of a technology, the lasting legacy it will have on the ecosystem, or the irreversible impact of the damage it will cause.

Sustainable development is a positive step towards improving and protecting the environments we have, quantifying the improvements we make through life cycle assessments (LCAs) and environmental impact assessments. However, we use life cycle assessments (LCA) to compare and normalise new and old processes, to scrutinize which is better in terms of CO_2 or energy consumption, yet these values are still dissociated from the true impact they have on the environment.

If human toxicity emissions are reduced in a novel process by 10% what impact does this have on the local community? Are we adding days to the lifespan of an individual, or reducing the number of incidents of children developing asthma? What is the true benefit of reducing CO_2 emissions by 1000 tonnes? Are we sparing a community a flood, caused by the erratic nature of extreme weather linked to global warming?

We congratulate ourselves for reducing these figures without a true understanding of their effect and scale of impact on the environment and the world we live in. Understanding the true impact of these defined parameters on our standard of living, quality of life and health are still decoupled. An example of this decoupling can be observed by using the Happy Planet Index (HPI) (pictured right) which is a ranking of countries, across the globe, based upon their life expectancy and happiness per unit of environmental output (happyplanetindex.org). Interestingly, for the EU, the ecological footprint is given a bad rating (red), whilst experienced well-being is moderate to high (orange to green). Europe contains countries with some of the highest GDP per capita in the world, yet none have been able to contribute their wealth to the ecological wellbeing of their environment, a clear indication of the decoupled relationship between economy and environment.

Quantifying and costing the value of an ecosystem or its assets can provide a way of generating a revenue for its protection. But the 'true value' of nature and the environment will not be realised until it is lost.

Happy Planet Index (HPI) ratings for Europe: life expectancy is 78.5 yrs (green), perceived well being 6.2/10 (moderate; range: 4.8 (BG) to 7.8 (DK)), ecological footprint is all bad (red), and brings the HPI rankings down to bad (dark orange) leading to a moderate to bad 'overall happiness'.

*Abdallah S, Michaelson J, Shah S, Stoll L, Marks N (2012) The Happy Planet Index: 2012 Report. A global index of sustainable well-being (**nef:** London)*

Michael Green Consulting

April 2016 Michael Green

Taking Account of Legislation

Legislative impacts and compliance may sit at the less glamorous end of scientific research, but such considerations are nonetheless a vital part of the development of successful and compliant recycling processes. For the CoLaBATS project, G&P Batteries' internal consultant, Michael Green, has been looking at the legislative environment for waste batteries, including targets that are required to be met when recycling waste batteries, as well as how current legislation has shaped the market that any company operating a battery recycling process has to operate in commercially.

One key piece of legislation is the European Batteries and Accumulators Directive (2006/EC/66), which, amongst other things, sets a Recycling Efficiency target for all collected waste batteries that go through a recovery process. Basically, the Recycling Efficiency is a measure of how much material is recovered from the waste batteries that is then made available as a raw material for the same or other purposes.

For the waste Li-Ion and Nickel Metal Hydride batteries that CoLaBATS is working on, the Recycling Efficiency target set in the Batteries Directive is 50%. Effectively therefore, 50% by weight, of the batteries entering a recycling process must be recovered as "useful material". However, the detailed calculation method required to arrive at a Recycling Efficiency figure is complex, and there are concerns in the waste battery industry that in this complexity and the way different European Member States set about collecting the data prescribed by the Directive are leading to inaccuracies and market distortions, such that the recycling playing field is not a level one across the EU.

A recent "fitness check" of several European Waste Directives, including the Batteries Directive, concluded that the relatively new batteries legislation was broadly working well, although it did identify a few areas that could be improved. It noted that setting a target (e.g. of 50%) for Recycling Efficiency may be too broad and blunt an instrument, as for some battery chemistries it is not currently commercially possible to achieve the target, and also that for other battery types recyclers are achieving the required efficiency, whilst allowing some critical, valuable and hazardous materials to be lost.

In December 2015, the European Commission published its proposals for a Circular Economy, which included proposed amendments to several waste Directives, most crucially for CoLaBATS including the Waste Framework Directive, and the Batteries Directive. The proposals for a Circular Economy seem to support several beneficial proposals for recycling – encouraging efforts to recover critical materials, for example, as well as placing more importance on re-use, re-manufacture and backing greater use of recycled substances as raw materials in other processes.

It would seem that for the Batteries Directive, changes will not be radical, but we can expect to see relatively minor changes to try to level out the playing field across all EU Member States in the medium term. Further change will then come from the Circular Economy proposals, when they make their journey through the European Commission's procedures. One thing does seem certain, and that is that however these more far-reaching proposals are enacted, change will not be quick, and recyclers and those developing new recycling processes will need to live with the existing regulations and how they shape the commercial landscape of battery recycling across Europe for quite some years to come.

Michael Green Consulting

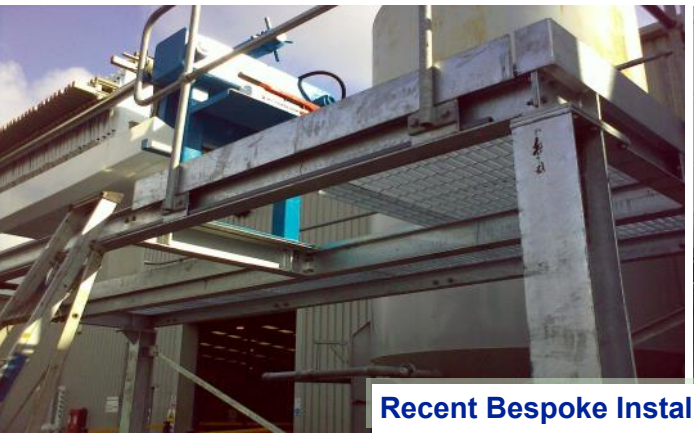
Michael Green was Managing Director of G&P Batteries Ltd for 18 years. In 2015 he left G&P to become an independent consultant to the waste battery industry. He retains close links with G&P and its parent company, Ecobat Technologies Ltd, and they remain key clients for whom he is working on a number of projects, including being G&P's main contributor to CoLaBATS.

In addition to project work covering topics such as Battery, Hazardous Waste and Transport legislation and the remanufacture of Electric Vehicle batteries, Michael has also recently undertaken consultancy work both in the UK and further afield. Such work has included research work into attitudes towards legislation, and a detailed analysis of legal shipment methods for lithium-Ion batteries and the ADR regulations. He is also a member of the Steering Committee of the International Congress for Battery Recycling, a conference held annually in Europe.

Env-Aqua Solutions

Env-Aqua Solutions is an SME specialising in industrial end-of-life, waste treatment and pollution control, and has been instrumental in the design, installation and promotion of waste minimisation and resource recovery systems and programmes with a global industrial client base.

The company's ethos is to support industrial symbiosis, resourcefulness and generate circular economies within industry. Recovery of materials from waste products and effluents is a key business area for Env-Aqua Solutions. The company designs and installs, on a turnkey basis, waste treatment and recovery based plant and equipment.



Recent Bespoke Installations

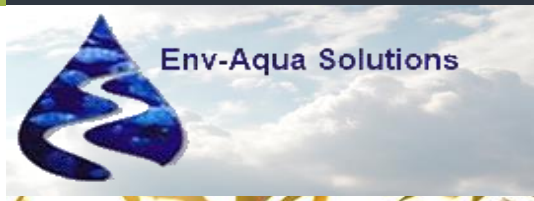
Recent projects and installations have included PGM recovery systems from aqueous effluents, recovery systems based on 5 ppm concentrations in complex effluents and organics management for PCB manufacturers.

The company has assisted with recent government developments and managed and installed on site complete effluent treatment units. In the past, the company has also produced effluent treatment systems for printed circuit board facilities, surface finishing companies, chemical manufacturers and others, using ion exchange resins, biomaterials and various novel treatment methods.

The company also offers consultancy support to clients on technology transfer and exploitation strategy. Env-Aqua has extensive experience within the electronics, chemicals, surface engineering and recycling sectors, with the latter embracing both materials and energy recovery.

It has undertaken numerous best-practice and dissemination activities on behalf of the UK Environment Agency and Envirowise on energy efficiency, materials recovery, utility recycling and green chemistry. The company has helped with the implementation of the WEEE regulations in the UK and the End-of-Life Vehicles (ELV) Directive.

Continued fields of interest and expertise extend into the low carbon emission vehicles market and associated end-of-life material recovery, synergistic use of waste materials for new applications, sustainable and lean manufacturing technologies to optimise energy efficiency, limiting waste production and delivering improved results using industrially competitive new and established processes.



Env-Aqua Installations

Other Recycling Projects:

REEcover

This is an EU project, that was funded through the same call as CoLaBATS. The project has been addressing rare earth elements recovery from magnetic waste in the WEEE recycling industry and tailings from the iron ore industry.

www. REEcover.eu

EU training network for

DEMETER EU MSCA-ETN

the design and recycling of rare-earth permanent magnet motors and generators in hybrid and full electric vehicles. This project is funding 15 PhD positions, with 2 positions still open.

www.etn-demeter.eu

Env-Aqua Solutions

Upcoming Milestones & Events:

CoLaBATS

Milestones

MS 4 Scale-Up Prototype On-going

MS 5 Demonstrator—The demonstrator unit is to be housed at C-Tech Innovation

Events -

9 –11th May 2016	20th Zinc and its Markets Seminar
11—12th May 2016	Circular Materials Conference, Chalmers—Gothenburg www.circularmaterialsconference.se
7 –9th June 2016	8th International Conference on Waste Management, Valencia www.wessex.ac.uk/conferences/2016/waste-management-2016
13 -15th Sept. 2016	Resource Efficiency and Waste Management Solutions, Birmingham www.rwmexhibiition.com
TBD	Demonstration and final CoLaBATS workshop—C-Tech, UK

Useful Links:

CoLaBATS	www.colabats.eu
EIONET	EU Environment Info & Observation Network www.eionet.europa.eu
EPBA	European Portable Batteries Association www.EPBA.org
BBMA	British Battery Manufacturing Association www.BBMA.co.uk
AIBOLG	The Agencies & Batteries Observation Liason Group http://npwd.environment-agency.gov.uk/Public/Batteries/PublishedReports.aspx

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