Integrated Utilisation of Biomass Ashes and Waste Water Sludge

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Background

• Power Minerals Limited (PML) is the leading ash marketing company in the UK with responsibility for around 60% of total UK coal ash sales.
• PML is a 100% owned subsidiary of STEAG Power Minerals GmbH in Germany.
• Responding to the growing use of biomass for electricity generation in the UK, PML is identifying beneficial utilisation options for biomass ashes.
• PML recently acquired the Intellectual Property of Biolite Technologies Limited (BTL) and is currently developing technologies with a view to establishing a long-term utilisation option for biomass ashes and other industrial co-products.
• This paper outlines the current UK power generation market position with particular reference to coal and biomass, whilst describing the work being carried out on the use of biomass ashes as a constituent of agri-products.
The Impact of Biomass in the UK

A number of factors are combining to create a decline in UK EN450 Fly Ash production. These are mainly associated with the replacement of coal with Biomass for electricity generation and the increasingly stringent Environmental Regulations which are forcing the closure of older coal-fired power stations without SO$_2$ and NO$_x$ abatement equipment.
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In addition to the conversion of coal-fired generating units a significant number of new power stations have been commissioned. Many more biomass power stations are under construction or planned.
Overview

Biolite Technologies Ltd has achieved a sustainable system for the recycling of co-products from the power and water industries, together with a range of secondary materials from other industries.

The innovative new technology - Global Enrichment - adds value by processing these outputs into agri-products with considerable advantages over traditional fertiliser production.

After four years of development and testing, the patent pending process is ready to step up to pilot plant and full scale commercial production.
Working with the Power and Water Industries Towards a Cleaner, Safer and More Sustainable World
Evolution in the Power and Water Industries

The technology behind the Global Enrichment process addresses key utility sector needs.

**Power Industry shift from fossil fuels to biomass**
The burning of biomass fuels is reducing emissions to meet legislation. This shift in fuels creates the need to address the use and application of biomass ash.

**Water industry desire to maximise use of co-products:**
Incinerated Sewage Sludge Ash (ISSA) and anaerobically digested sewage sludge
Social, environmental and economic considerations are driving the need for new, creative products which maximise the beneficial use of the industry’s co-products.

**Full utilisation - “no waste” agri-products**
As a result of Biolite’s comprehensive Global Enrichment process the power and water sectors can utilise co-products, converting them into valuable nutrients with no waste; diverting materials from landfill.

**Socially and environmentally innovative and ecologically sound**
Biolite’s Global Enrichment process is modelled around local positioning of low impact, low energy production plants with the social and environmental benefit of a reduced carbon footprint.

**A globally sustainable future**
This technological opportunity can benefit the world now and sustainably into the future.
A Sustainable Solution for Utility Co-Products

Patent pending technology for utility co-product utilisation
The patent pending covers the utilisation of a wide range of utility co-products and raw materials through a detoxification process to produce a variety of self curing finished products.

Addresses disposal issues in power and water sectors
The technology offers an alternative route for these co-products, eliminating the need to landfill.

Enrichment produces agri-products and other potential end uses
Biolite’s Global Enrichment technology produces beneficial and commercially viable nutrient enriched products with applications in agriculture and other sectors.

Low production cost with global trading opportunities
The process utilises co-products requiring no external heat and results in both capital expenditure and production costs below those of conventional agri-products, giving competitive global trading opportunities.
Delivering Sustainability and a Light Touch

Current fertiliser production is energy intensive
Conventional production of fertilisers is energy intensive.

Fertilisers leach into ground and surface water: Ecological problem - financial loss
Traditional fertilisers can potentially leach and contaminate groundwater, becoming an ecological problem and representing a financial loss to users as well as being an environmental issue.

Mining of raw materials overseas is costly and unsustainable
Raw materials in current fertiliser production typically originate from costly mining operations in distant, frequently politically unstable, parts of the world.

The Global Enrichment process
Biolite’s Global Enrichment process utilises primarily locally sourced co-products with commoditised chemicals as required, giving greater raw material security.

Careful selection of co-products creates an exothermic reaction, resulting in a process with low environmental impact and minimal energy input, producing a slow nutrient release agri-product.
Recycling of Co-Products Through Conversion to Sustainable Commodities

The Biolite process recycles a range of co-products from diverse industrial sectors to which other raw materials are added; meeting the objective of sustainability.

The process currently utilises two classes of primary co-products, biomass ashes from the power sector and ISSA (Incinerated Sewage Sludge Ash) from the water sector together with anaerobically digested sewage sludge.

Biomass ash consists of virgin or waste wood ash, together with ashes from miscanthus, oat and peanut husk, etc. Certain biomass fuels - waste wood for example - produce heavily contaminated residues which require detoxification prior to safe co-product utilisation.

These two types of ash are not only rich in nutrients, specifically potash, but are also important in forming the granular matrix.

ISSA and anaerobically digested sewage sludge - each being rich in phosphorus and also nitrogen in the case of the sewage sludge - can both be usefully employed in making nutrient enriched products.

### BENEFITS

- Reduced landfill
- Reduced CO₂ footprint
- Reduced heavy metal accumulation

### POTENTIAL FEED STOCKS

- Anaerobically digested sewage sludge
- Biomass ash - includes waste & virgin wood
- Other industrial co-products
- ISSA
- Other biomass ashes
- Cement Kiln Dust
- Digestates
The Innovative Technology: Exothermic Redox Process

Biolite combines carefully selected ingredients to create a vigorous exothermic reaction.

**Chromium (vi) reduction to chromium (iii)**
An environment is generated to reduce carcinogenic chromium (vi) to chromium (iii).

**Dioxins destroyed**
Simultaneously the process starts to destroy carcinogenic dioxins. The process is altered, to create an oxidising environment to complete the destruction of the activated dioxins.

**Bound phosphates transformed to become bio available**
As a consequence of the reactive environment insoluble phosphates are changed to a more soluble bio available form.

**Slow release achieving leachate control**
The inorganic matrix so produced inhibits the quick release of significant amounts of nutrients, reducing leachate.

**Self curing granule - zero thermal input**
Heat from the vigorous reaction continues setting the granule with no additional thermal input.

**Instigating a pivotal and forced shift in global fertiliser manufacture**
Considering these advantages, it is believed that the Biolite process instigates a pivotal and forced shift in global fertiliser manufacture.
The Seed is Sown...
Approach to the UK Market

New concept and therefore relatively slow uptake from zero
Biolite takes an innovative new approach and plans for a number of small plants initially serving local markets. As the market grows, a major plant will be constructed to supply finished products nationally.

Incorporation of anaerobically digested sewage sludge into a compound granular product increases potential UK fertiliser market
Sewage sludge has traditionally been applied directly onto land. The Biolite process is innovative, enabling this material to be granulated and thus applied in a more acceptable form.

The Biolite system incorporates anaerobically digested sewage sludge and other co-products, resulting in a slow release agri-product that achieves leachate control and increases the potential UK market for compound granular fertiliser.

Agri-products contain significant levels of secondary nutrients and are low in chloride
Biolite agri-products are not manufactured from purely refined chemicals, so contain significant levels of secondary nutrients such as sulphur and trace metals; valuable additional fertiliser components.
Additionally they are low in chloride, increasing their usefulness, especially where plants are chloride intolerant.
Delivering to Market

Utilisation of recycled co-products
The building of Biolite's Global Enrichment pilot plant commences before the end of 2015.

Product trials
In partnership with leading specialists, growing trials and research are being carried out at several locations over the next 12 months.

Product presentation
The product presentation and packaging have been prepared to meet high volume as well as niche market needs, featuring different particle sizes, characteristics, performance and compositions.
A Unique Innovation

Biolite Technologies Ltd has been on a journey over the past four years; identifying a commercial need, researching and developing an innovative technology and gaining IP and patent pending to bring ideas to market-ready stage.

We believe we have developed a pivotal change in the way industrial co-products are handled, adding value to everyone in the chain whilst creating a forced shift in fertiliser manufacture.

We look forward to delivering commercial and environmental rewards with our innovative Global Enrichment co-product recycling technology.
Global Enrichment, Global Potential

A World of Opportunity