Efficiency Technologies

Efficiency Technologies (EFT) is a venture created by a group of experienced Clean Project professionals. Using networks and technologies from a range of global Carbon and Alternative energy projects EFT aims to solve environmental issues by implementing technologies that create value in the fields of industrial process efficiency, energy production and waste processing.

Background

The burning of coal for the production of electricity supplies around 37% of the UK electricity. Coal fired power generation will be necessary for many years to come and future years the development of clean coal power stations with carbon capture would still lead to the production of ash.

Ash is the result of burning coal. In a typical coal fired power station there are two types of ash produced, Pulverised Fuel Ash (PFA)(fly ash), and Furnace Bottom Ash (FBA). A 500MW power station produces in the region of 100-200,000 metric tonnes of waste ash per annum. In addition to existing power stations there are large landfills from old sites.

Waste Ash from power stations is a problem in terms of disposal. It is generally disposed into landfill, - it can be used as a land filler and stabiliser or added to cement manufacture as a filler.

Approximately half of the annual production of PFA is being land filled. It is estimated there is some 55 million tonnes of fly ash readily available and a further 60 million tonnes that may be accessible from storage and landfill. (Source UKQAA).

PFA consists of a range of useful compounds that have a wide range of economic uses; traditional methods have not been able to extract this compounds and materials in an economically viable way.

Waste Ash Reprocessing - Project Summary

This project proposes to use a combination of proven technologies to process waste ash into valuable materials instead of an environmental problem.

The EFT Waste Ash processing plant will take 100% of the ash and reprocess it into its constituent parts. The largest volumes (about 90%) are aluminium oxide, silicon dioxide and a smaller amount of iron oxide and carbon, the remaining 10% are minor, higher value metals, which can also be separated and sold.

With regard to the product disposal, Al_2O_3 (aluminium oxide) has a large market demand and is a higher grade product than bauxite for aluminium manufacture. Price varies depending on long term pricing but typically 80% purity sells for over 200 USD/Tonne. The SiO_2 (silicon dioxide) at 80% purity sells around 135 USD/MT. Other metals available are high value - for example Titanium dioxide is 2100 USD/MT. This is available at approx 1% concentration (according to the UKQAA guidelines on a typical UK Ash sample). In 100,000 MT this individual component would generate approx 1.9 mil USD revenue. Any surplus carbon can be recycled for combustion.

From a 100,000 MT plant these components alone equate to operating revenue of 15 million USD per annum. There is also a significant saving in terms of landfill disposal costs for the Ash, and a significant benefit environmentally – 98% of the ash is completely reprocessed in Phase 1, leaving

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less than 2% of minor metals material for reprocessing in the second phase of the project, where all components are reprocessed.

There is sufficient global demand to absorb these products and the unit cost is cheaper than mineral mining. In the case of bauxite (Aluminium production feedstock) there is already a global shortage and heated competition over Al_2O_3 supply to western industrial nations.

The Al_2O_3 and SiO_2 can additionally be reprocessed into even higher value products such as aluminium metasilicate (mullite) for use in glass and refractory product manufacture. We have a range of output products that can be produced depending on market demands and ash content. The inclusion of value added products ensure we are able to continue to increase the volume of ash processed whilst maintaining profit margins and avoid saturation of the market.

The quality of the products produced will be higher than those used in the example at greater than 80% purity, additionally we will have the full range of high value minor metals. Surplus metals can be stockpiled as the net volume is smaller, or placed into metal warehousing as assets.

Timescales

The factory for processing ash with productivity of 100,000 metric tons can be completed within 12 months from closing of financing subject to all permissions and contracts.

On tests and acceptance to the designed capacity it requires 2-3 months, after the ending of installation for any fine tuning adjusting. There may be a small amount of time required for certification of products, tests at consumers.

In the short term EFT will identify key strategic partners and begin technical exercises looking at the specific chemical composition of ash samples from suitable candidate power stations for a project. We will then produce a technical and economic analysis and provide a specific footprint size, and economic assumptions.

Requirements

EFT requires all supporting legal structure specifically including - planning and environmental permissions, take off contracts before the closing of financing.

Site to include warehousing for hermetically sealed unit, standing areas for lorries, storage for ash and processed products. The final size is subject to the final configuration, local land characteristics, and orientation for handling product, transport arrangements and connections. The core equipment fits to a medium size warehouse unit.

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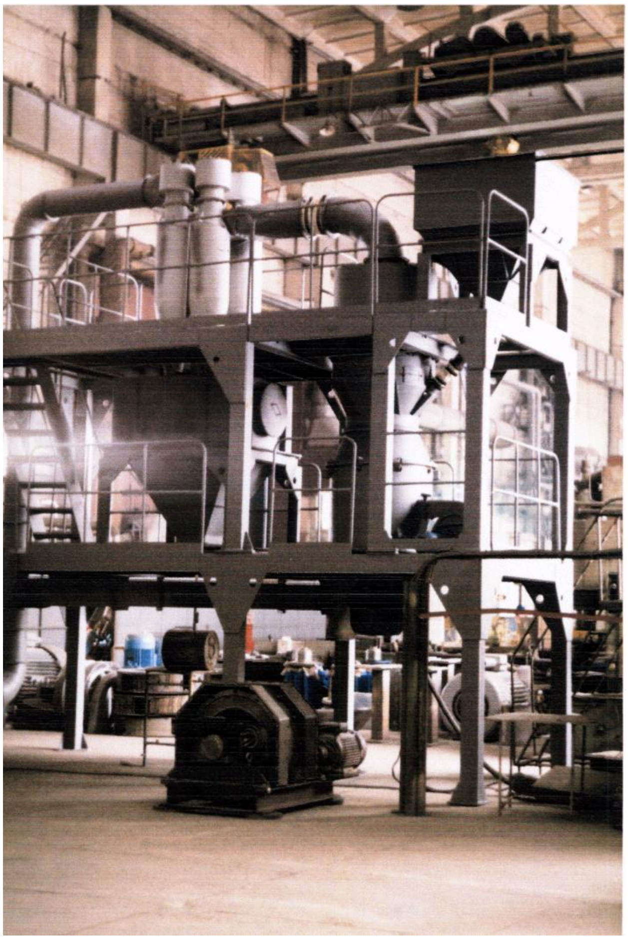
Chemical composition of ash formed after burning of anthracite on power station

Na_2O	1.12%	CaO	2.13 %
MgO	1.48 %	TiO_2	1.24 %
Al_2O_3	43.74 %	Fe_2O_3	0.66 %
SiO_2	42.43 %	NiO	0.07 %
P_2O_5	0.16 %	CuO	0.12 %
SO_3	0.28 %	ZrO_2	0.11 %
K_2O	0.39 %		

Solid phase trace element Analysis – Typical ranges from UK sources of PFA

Element	Content in mg/kg	Element	Content in mg/kg
Antimony	1 to 325	Lead	<1* to 976
Arsenic	4 to 109	Manganese	103 to 1,555
Barium	0 to 36,000	Mercury	<0.01* to 0.61
Boron	5 to 310	Molybdenum	3 to 81
Cadmium	<1.0* to 4	Nickel	108 to 583
Chloride	0 to 2,990	Phosphorus	372 to 2,818
Chromium	97 to 192	Selenium	4 to 162
Cobalt	2 to 115	Tin	933 to 1,847
Copper	119 to 474	Vanadium	292 to 1,339
Fluoride	0 to 200	Zinc	148 to 918

* Indicates below the limit of detection



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