FAQs

01

Who is O·C·O Technology?

O·C·O Technology was originally formed in 2010. Its ambition was to commercialise the Accelerated Carbonation Technology process for the treatment and recycling of thermal wastes and to then manufacture an aggregate which could be used by the construction industry.

Grundon Waste Management Ltd (Grundon) became an investment partner in 2011 and through several rounds of significant investment now own 90% of O·C·O Technology.

The business of O·C·O Technology can be categorised as :

1. Treatment and recycling of thermal wastes (particularly APCr – see question 4)

2. Permanent Carbon Capture

3. Manufacture of aggregate

Its production plants are in Brandon (Suffolk), Avonmouth (Bristol), and Leeds. The business has doubled in size in each successive year, now managing over 130,000 tonnes of waste per year.

02

What is the O·C·O Technology process?

The process is split into five stages:

Stage 1 – The wastes are blended in carefully controlled proportions

Stage 2 – The blended wastes are mixed with precise levels of water and CO_2

Stage 3 – The treated waste is then mixed with various binders and fillers

Stage 4 – The mixture is pelletised to form a rounded shape

Stage 5 – The pelletised product is then cured

03

What is the Accelerated Carbonation Technology process - how does it work?

Carbonation is a naturally occurring process where atmospheric carbon dioxide (CO_2) binds with minerals to form solid carbonates. Due to the low concentration of CO_2 in the atmosphere, the process can take decades or centuries. Accelerated Carbonation Technology (ACT) uses concentrated carbon dioxide (CO_2) to rapidly treat a wide range of industrial wastes in just a few minutes. It was developed as a result of 18 years of research at Imperial College London and the University of Greenwich resulting in a number of academic papers and several worldwide patents. Over the years ACT has become a well-known and respected process.

Many thermal process wastes exhibit a natural reaction with carbon dioxide. Under controlled conditions, CO_2 is permanently captured as it is converted into a solid that binds neighbouring grains together resulting in the formation of manufactured limestone (calcium carbonate).

FAQs (continued)

04

What is Air Pollution Control Residue (APCr)?

APCr is a waste material arising from the treatment of flue gasses from an Energy from Waste (EfW) plant. It is a fine-grained dry powder and is classified as hazardous primarily due to its high alkalinity.

Whilst the composition of APCr from plant to plant is broadly similar, its density can vary significantly from 350 – 1200 kg/m^3. The reasons for this range are not exactly known but it is believed that it is a result of the various EfW technologies, rather than from the type of waste being combusted. Traditionally APCr has been sent to landfill.

05

How does the ACT process treat the APCr?

Various chemical alterations occur with in the material which, stabilise and immobilise the hazardous components:

- In the untreated APCr, heavy metals are present which as oxides and hydroxides, are readily soluble in water and therefore very mobile. The treatment converts these to their carbonate compound equivalents which are very insoluble
- Formation of solid solutions within the calcium carbonate formed by the reaction. Solid solutions are akin to liquid solutions, where a solid is 'dissolved' into another
- Sorption onto newly formed calcium carbonate crystals. Sorption is a process by which a substance becomes physically and/or chemically attached to another
- Physical containment through mass calcium carbonate formation. The contaminants effectively become locked up and isolated from external factors
- Highly alkaline-free lime present in the untreated APCr is converted to neutral calcium carbonate, therefore lowering heavy metal solubility.

06

What does O·C·O Technolocy manufacture from the treated APCr?

The APCr is treated through the ACT process to form a manufactured limestone aggregate (M-LS).

07

O·C·O holds "End of Waste" (EoW) for APCr. What does this mean?

To achieve EoW, it is necessary to demonstrate to the Environment Agency that:

1. The waste has been converted into a distinct and marketable product
2. The processed substance can be used in exactly the same way as a non-waste virgin material
3. The processed substance can be stored and used with no worse environmental effects than a comparative virgin material

O·C·O Technology achieved End of Waste status in 2011. It was the first company in the UK to achieve this for the recycling of APCr.

FAQs (continued)

08

To achieve End of Waste (EoW), how was MLS tested?

To demonstrate the three primary requirements for End of Waste were met, an extensive suite of testing over many years was carried out.

In order to establish that M-LS was not a risk to either the natural or human environment, testing of substance leaching was carried out according to the leaching method specified in BS EN 12457. The results were compared with regulatory standards (landfill Waste Acceptance Criteria) and with the behaviours of traditionally used materials (such as crushed brick and concrete, furnace bottom ash etc.)

M-LS was also compared and modelled against various virgin aggregates, both in use and in open storage. Further testing was carried out to examine the life cycle of M-LS and end of life scenarios.

To show that the product was fit for purpose, testing according to all the relevant British Standards for aggregates; BS EN 13055 (lightweight aggregates for concrete), BS EN 1097 (mechanical and physical properties of aggregates), BS EN 1744 (chemical properties of aggregates), BS EN 1367 (weathering and thermal properties of aggregates), BS EN 933 (geometrical properties of aggregates), BS EN 932 (general properties of aggregates). Bulk samples were delivered to potential customers to produce finished products (concrete blocks), which were tested to the relevant British Standards; BS EN 771 (specification for masonry units), BS EN 772 (tests for masonry units).

The market for M-LS was firmly established by the successful trials carried out by the block-makers with the bulk samples provided.

09

Is the O·C·O Technology process simply dilution?

No. Dilution is one of the key aspects that the Environment Agency examine when looking at End of Waste submissions. O·C·O Technology undertook a suite of tests to clearly prove and demonstrate that the APCr had been treated and that its composition had both chemically and physically changed. It was also proved that the addition of various binders and fillers was required purely to manufacture an aggregate product with the treated APCr.

10

Is the treatment process reversible, can the APCr ever revert to its original state?

The chemical reactions that take place during the treatment process produce highly stable reaction products which are effectively irreversible. The product is essentially as stable as natural limestone aggregate.

11

Does the process do anything for chlorides?

The ACT stabilisation process attenuates the release of chlorides but does not chemically bind them. M-LS is formulated to ensure that the chloride levels are within specified limits and are detailed within the aggregate specifications.

12

Was the life cycle of M-LS considered?

The full life cycle of M-LS was examined as part of the End of Waste assessment. ACT is a stabilisation process which is effectively irreversible. Therefore, the material remains stabilised, and will not start to release contaminants. Contaminant mobility was rigorously tested and determined that M-LS was comparable to many commonly used secondary materials, urban soil and even some primary aggregates.

FAQs (continued)

13

Does M-LS contain dioxins and furans?

Dioxins are ubiquitous in the environment and are found in air, water and soil in all areas of the world. Dioxins and furans arise from the combustion of fossil fuels, car emissions, uncontrolled burning of waste, and are found in trace amounts in some paper products. An individual is primarily exposed to dioxins through the consumption of food. Exposure is elevated through activities such as burning fuel or smoking. Dioxin levels in M-LS are measured in nanograms (or one million millionth) per kilogram of material. A nanogram is roughly equal to the weight of a single cell in your body. Consideration was given to the cutting and drilling of blocks which found the exposure levels to dioxins were well below the World Health Organisation daily limits. Individuals are subject to uncontrolled exposure to dioxins in daily life through car emissions, smoking, consumption of food etc. Worst-case scenario exposure (drilling into blocks made from M-LS for eight hours continuously with no mask), would result in exposure to dioxin levels an order of magnitude below the World Health Organisation daily limit. In layman terms this would be less than standing in front of a BBQ for 15 minutes.

14

What would happen if the End of Waste was ever withdrawn?

The End of Waste mechanism is an important component of the circular economy and has allowed many materials traditionally regarded as waste to be effectively reused. The portfolio upon which the End of Waste was approved is robust in that the data was obtained through established methodologies and compared against regulatory standards. Hence, the conclusion is that the product is fit for purpose, irrespective of End of Waste. This will be the robust basis for self-declaration, which is commonly employed.

15

What standards does M-LS comply with?

M-LS is tested to a number of standards relative to end use. Primarily it is tested and fully complies with BS EN 13055-1:2002 (lightweight aggregates for concrete) and BS EN 13242 (Aggregates for unbound and hydraulically bound materials) M-LS is CE marked.

16

How is the quality of M-LS maintained?

A strict product specification has been set, with a rigid QA system established to characterise all incoming wastes, ensure rigorous production control and finished product testing to British Standards. Every delivery of APCr is tested in the on-site laboratory to determine key physical and chemical properties which are used to control the process and ensure a consistent product.

17

How is M-LS defined under REACH?

M-LS is defined as an article under REACH. Within its components, there are no substances of very high concern (SVHC). Please refer to the product MSDS for further information.

18

Can M-LS be used as any other recycled aggregate?

In short yes although O·C·O Technology will assess and verify each application and provide the necessary technical guidance as appropriate..

19

How should M-LS be stored and handled?

Like any other recycled aggregates, detailed guidance is provided on the product MSDS. Product datasheets are available to make appropriate assessments.

FAQs (continued)

20

What is the long-term risk of the use of M-LS in the UK market to the extent that it could represent a significant portion of some sectors and therefore result in elevated exposure to some individuals and possibly elevated health risk?

If all available APCr in the UK was converted into M-LS, this would represent no more than 3% of the aggregate used in construction blocks. We are confident that there is no short or long-term risk to individuals or the environment through the use of M-LS.

21

What happens if the block makers do not take it?

O·C·O Technology supplies aggregate for multiple applications. Whilst masonry is a high value market, the aggregate can be sold for alternative uses.

22

What are the concentration levels of the volatile metals from the EfW process, such as Zn, Cu, Hg, Pb, and Cd, in M-LS?

These volatile metals are rendered immobile in M-LS. If one was to look at totals rather than mobility through leaching, then the combined total concentration of these metals is typically less than 1% in the raw untreated APCr. Once manufactured, M-LS would contain less than 0.4%. Block makers typically use 20% or less of M-LS in a block mix. Thus, the total level of immobile metals in a block from M-LS is less than 0.1%. Clearly if one was to look at mobility levels, it would almost be untraceable.

23

What happens if a batch of M-LS fails the specification?

O·C·O Technology have a rigorous quality control system which involves testing every consignment of APCr arriving at the facility, and regular production control testing. In the unlikely event that a batch of M-LS fails the specification, a clearly laid out procedure exists for the quarantine, testing, and reprocessing/disposal of the material.

24

What is the carbon footprint of M-LS and how is it calculated?

M-LS is a carbon negative product. That is to say that more carbon dioxide is permanently bound in the product than is generated through the manufacturing process. Typically, M-LS has a carbon footprint of -44kg/tonne. The methodology follows PAS2050 (specification for the assessment of the life cycle greenhouse gas emissions of goods and services) and has been independently assessed and approved by White Young and Green. The footprint is a cradle-to-gate calculation, which factors in the transport of raw materials to site, the footprint for the manufacture of the raw materials, the energy used in production, the formulation used to produce M-LS, and the CO_2 consumed.

25

Why do O·C·O Technology require an inward specification for the APCr?

The O·C·O Technology treatment process can be tailored to suit a wide range of thermal wastes. An increasing amount of CO_2 is required to effectively treat more ‘challenging’ wastes. These wastes are therefore costlier to process.

For example, O·C·O Technology plants are designed to handle a defined range of material densities. If the density falls outside of this range, then it may take longer to process the material and thus cost more.

FAQs (continued)

26

Are there any APCrs which the ACT process cannot effectively treat?

The process can be adapted to suit a wide variety of thermal residues. Each material must be analysed in our main R&D laboratory to determine its chemical composition, and to determine the optimum formulations and process parameters for effective processing through our plants.

27

What risk do the EfW operators have in contracting O·C·O Technology to process their APCr?

Risk and title pass to O·C·O Technology once the APCr has arrived on site and has been tested to the inward specification. O·C·O Technology invite all current and potential customers to conduct full due diligence and on-going compliance audits at any time for EfW operators to meet their producer obligations.

O·C·O Technology has a robust testing regime to ensure the aggregate it produces meets its specification.

As the O·C·O Technology process irreversibly chemically and physically changes the APCr, there is less legacy risk to the producer than landfill / disposal where leakage or dispersion could occur particularly if the disposal site was not well operated.

28

What waste is produced by the process?

None. All the material arriving on site is processed into M-LS product.

29

What trade bodies does O·C·O Technology belong to?

O·C·O Technology is a member of the Mineral Products Association (MPA), the Concrete Block Association (CBA), the British Aggregate Association (BAA), the British Precast Association (PCA), and the Environmental Services Association (ESA).

30

Is the aggregate traceable to the APCr?

O·C·O Technology has rigorous quality control standards to ensure M-LS is consistent and meets the specification. However, there is also full traceability from input material to product in fulfilment of the requirements of ISO 9001:2015

31

To what standards do O·C·O Technology operate?

O·C·O Technology operate to ISO 9001:2015, ISO 14001:2015, OHSAS 18001, and is independently audited against these standards.

FAQs (continued)

32

What is the risk of the metal carbonates being classified as hazardous in the future which could result in the process being interpreted as dilution rather than treatment?

O·C·O Technology holds a database for thousands of APCr samples from dozens of EfWs around the world. These have been rigorously characterised using a range of analytical techniques. O·C·O Technology sits on the ESA, the MPA, the BPA, the BAA, and CBA, and are involved in the Waste Incineration Directive (WID), Available Techniques Reference Documents (BREF), and the European Federation for Waste Management and Environmental Services (FEAD) process, thus is well attuned to changing legislation. In our view, the risk is exceedingly low. ACT is extremely efficient in dealing with the metals present in APCr. In addition to the initial chemical stabilisation, the process requires the addition of binders and fillers which have a synergistic effect with the treated APCr to enhance fixation.

The bigger challenge for the industry would the potential impact this would have on the classification and / or 'use' with bottom ash arisings.

33

What wastes can O·C·O Technology treat?

Many waste materials are reactive with carbon dioxide, particularly those derived from industrial thermal processes, e.g. incineration ashes, steel slags, sewage sludge ash, biomass ash, metal drosses, and cement wastes. In addition, a wide range of non-hazardous and inert wastes can also be incorporated.

34

Where does the CO_2 come from?

The carbon dioxide utilised in the process is food-grade which is itself a by-product from an industrial process e.g. fertiliser manufacture.

35

Can other forms of CO_2 such as industrial grade be used?

Yes. The process does not require ultra-pure CO_2.

A purity in excess of 70% will have little effect upon the rate of reaction.

36

Can flue gasses be used as a source of CO_2?

Yes. The use of flue gas has been demonstrated at pilot scale and is currently under further development.

ISO 9001
ISO 14001
OHSAS 18001
Certificate Number 11259

For more information contact O.C.O Technology at

Norfolk House, High Street, Brandon, Suffolk IP27 0AX
+44 (0)1842 812229 - info@oco.co.uk - oco.co.uk