

picture left for an example).

The clay-rich mineral-based C&D waste filter cake is extruded and then pelleted using automated equipment at the University. Cement and polymers are added comprising 10% and 0.75% respectively of the end product.

Tight particle packing has led to load bearing measurements of the dry product at around 10-15MPa. There is still work to do, Lupo told *MQR*, but even at this early stage of development it is looking good.

"This cement/silt/polymer system is novel and has many potential applications in addition to the one we're developing at the moment. Up until now we have concentrated on wastes from soil-washing sites but there are other applications.

"Silts from virgin aggregate washing, reservoir sediment and even silt recovered from wheel-washing water could potentially be converted into aggregates. And even at this stage of the project we have a process-cost approaching the sale price of aggregate and we've still got avenues to explore to bring those costs down," he said.

WRAP technical adviser John Barritt believes the research could hold the key to a 100% recycling solution for many waste sites across the UK as well as offering a lightweight aggregate replacement.

"The load bearing measurement suggests it could work well as a replacement for lighter aggregates, such as pumice, that fill up space. It certainly seems to be heading in the right direction," he told *MQR*.

However, he pointed out it all depends on processing costs and being able to produce enough filter cake to make it viable as a business opportunity. Then there is the investment in, and the availability of, plant.

Lab size extruders are more modestly priced but for a high tonnage operation the cost is around £200,000. Othos Engineering told *MQR* that every time they have been approached by the waste or recycling industry for plant it has always ended up a non-starter.

"Every so often an entrepreneur gets an idea but the sums tend not to add up. Mind you, one London recycling firm ended up making their own after seeing one of our models. Also there are often cheaper equivalents in the agricultural field," an Othos engineer told *MQR*.

But as Lupo says, it is early days. Even so, the product has an Aggregate Crushing Value far in excess of strengths that aggregates see in service, he says, and after enhancing the standard test method to reflect compression and service loads, trial work showed that the aggregates have more than adequate strength for general low-load applications such as trench back fill and sub-base.

"This means that virgin aggregate can be reserved for applications where its strength is better suited, as in high strength structural applications. The test results currently cover 6-10mm but we could produce any size of end material. It all looks very promising," he told *MQR*.

But while the dry product is proving promising, the

strength of the wet aggregate needs to be improved. Something on which Lupo is hoping to work. With a 4MPa reading it does not offer the density necessary for even a lightweight aggregate replacement. And Lupo has a range of other plans in the pipeline.

"We are working to reduce the manufacturing

costs and we are exploring waste derived cement systems and sustainably produced polymers to replace the additives currently used. These will not only reduce the costs but make the process altogether more sustainable," he says.

He envisages the process being used in a wide variety of applications and wants to

test it on other waste streams such as wheel-washer silt as well as on materials from virgin aggregates. He also wants to carry out longer term testing and upgrade to commercial size equipment.

However, funding runs out next March and so he is looking for industrial collaborators. It would be a shame if he didn't find them

because it is a system with promise, even if it does not offer immediate gains. If you fancy getting involved the numbers are below.

Richard Lupo: 020 7594 6018

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Duo Equipment: 0845 2222386

Orthos Engineering: 01858 464246



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