



Reviving waste coffee grounds



Summary

Revive is a multi-award winning waste rejuvenation eco-prise, specialising in the collection and recycling of Used Coffee Grounds (UCGs) to create a range of environmentally-beneficial products. UCGs contain many useful natural bio-oils that have applications across numerous industries. Revive is working in partnership with the internationally renowned research institute, Fraunhofer, to commercially extract these oils for sale into high-value markets such as the cosmetics industry. Revive has also developed markets for the by-product, converting the residual grounds into a bio-fertiliser. This case study explains the processes this early-stage innovator is going through in order to commercialise its food waste valorisation business.

For more information visit [this link](#)



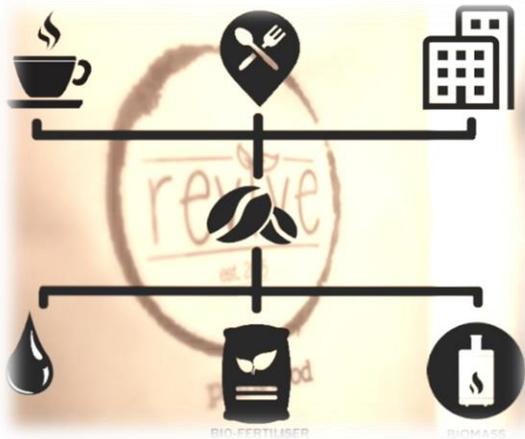
Key Facts

- Recycling used coffee grounds
- High-value markets for natural bio-oil products
- Valuable markets for secondary bio-fertiliser and biofuel products
- Four key stages of growth over five years to fully commercialise
- Growth enhanced through strategic partnerships

What is Revive?

Revive is a multi-award winning waste rejuvenation eco-prise, specialising in the collection and recycling of Used Coffee Grounds (UCGs) to create a range of environmentally-beneficial products.

Revive's business mission is to: *“accelerate the transition to a Circular Economy through creating a scalable and sustainable business by deriving high-value products from used coffee grounds; delivering environmental and economic benefits to the people, communities and businesses we serve.”*



Revive is focused on four principal goals:

1. Reducing the volume of waste to landfill.
2. Reducing the greenhouse gas emissions associated with coffee waste in landfill.
3. Creating innovative products which provide high quality environmentally-friendly alternatives.
4. Persuading the Scottish public that all waste has a value.

The Revive business model involves a UCG collection service, charging a small collection fee per kg, or a £15/tonne gate fee. At an industrial scale, the UCGs will then be recycled to initially extract high-value bio-chemicals. From the residual grounds, Revive will create bio-fertiliser and biomass pellets for sustainable energy. The business is still in the early stages of commercial development having successfully collected,

processed and sold UCGs to create a bio-fertiliser. Revive is now developing high value natural bio-oils from the grounds.

Value added products

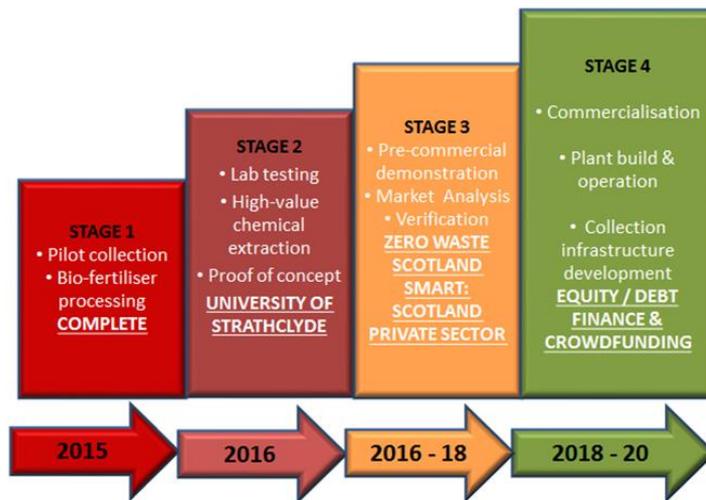
Around 500,000 tonnes of UCG waste is created every year in the UK. UCGs contain many useful natural bio-oils that have uses in numerous industries. Revive is working in partnership with the internationally renowned research institute, Fraunhofer, to finalise a unique process enabling the extraction of these bio-oils through clean and efficient methods. Revive has established a number of key customer groups for the oils, including cosmetics manufacturers and biodiesel producers. The estimated cost of converting this waste in bio-oil products is £50 to £75 per tonne, generating a highly valuable output.

Once the bio-oil has been extracted the residual UCGs are ready for use as bio-fertiliser. No further processing is required. The bio-fertiliser produced is a 100% natural soil improver. The main source of demand is through the agricultural sector. There is no additional processing cost.

The biomass pellets, also produced from the residual grounds, generate substantially less emissions than fossil fuels and the biochar left behind after burning can be used as a fertiliser. The Revive process will ensure that the pellets are hydrophobic. This means that, unlike other biomass pellets, the product will not have to be stored under very dry conditions, making storage far easier and cheaper. Revive does not have processing costs for biomass production at this stage.

What inspired Revive?

There were two key factors leading to the creation of the business: a passion for creating social and environmental value, and a clear opportunity to utilise an increasingly prevalent and potentially high-value resource in UCGs.



The co-founders initially developed the concept of Revive aged 19 whilst studying at the Hunter Centre for Entrepreneurship at the University of Strathclyde, where they were tasked to create a socially beneficial business concept. The trio then continued to develop the business idea after graduating in June 2015.

The stages of growth

As a small start-up business, taking a food waste valorisation concept through to commercialisation requires time. Having started out in 2015, Revive is now nearly halfway through a four stage business commercialisation strategy, due for completion in 2020.

Stage 1 - Pre-concept trial

Revive completed a pre-concept trial in 2016, trialling the collection and processing of UCGs to create a bio-fertiliser, which was sold in seven stores in major UK cities.



Around 300kg of UCGs were collected from cafes, with 75% used for chemistry testing, and 25% processed to create 250g bags of bio-fertiliser product. Around 150 bags of fertiliser were sold across various retailers in a month, generating revenues of over £500. The pilot evidenced demand for both a

coffee waste collection service and for a coffee-derived fertiliser and enabled Revive to accurately gauge UCG production on a café-by-café basis.

Stage 2 - Proof of concept

In the next stage, Revive undertook pre-commercial research and testing into the oil extraction and bio-fertiliser products. The oils were tested and analysed by the Institute of Pharmacy and Biomedical Sciences at the University of Strathclyde. This testing involved the extraction of the fatty acids from the waste coffee using a Soxhlet extraction to analyse the various components held within the grounds. Further testing is ongoing to identify and isolate more valuable compounds. Chrysalis, a major cosmetic manufacturer, is now working to identify the most valuable applications for the coffee-derived oils within the cosmetics industry.

Stage 3 - Pre-commercial demonstration

Revive is currently working to establish its first pilot bio-refinery in Glasgow that will process UCGs on a far larger scale. Revive has developed a partnership with Glasgow's top coffee roasters in order to develop a robust UCG collection service. One roaster alone has over 4,000 customers including M&S, Sainsbury's and Waitrose cafes, producing around 1,900 tonnes of coffee p/a. Each tonne of coffee sold creates nearly 2 tonnes of waste. A partnership has been established with a waste management

firm, Helistrat, for the collection of the UCGs. Back haulage will also be used for cafes which have deliveries from large roasters returning with empty vans.

Grounds will be processed and natural bio-oils extracted, using an advanced piece of machinery developed by Fraunhofer, a world-renowned German research institute, that have been brought on board as a delivery partner. This innovative technology allows the oils to be extracted using only heat and water, unlike competitors whose processes use petrochemicals. The residual grounds left over after the oil is extracted will then be used to create the bio-fertiliser.



Stage 4 - Commercialisation

Once the pre-commercial trial has proven that the collection, processing and markets can be sustained and scaled up, Revive will seek to commercialise the process. This will require an investor, which can provide financing, but also expertise in strategic

sales and marketing. Revive has calculated that a fully commercialised plant will cost close to £1million to produce all 3 products.

Networks and partners

Revive has won a number of awards including the Shell LiveWIRE Smarter Futures Award. It has also qualified for support through the Government funded body Zero Waste Scotland (ZWS). The support from ZWS and Shell LiveWIRE has helped the Revive to adapt its business model, make new partnerships and conduct further testing. This progression has put Revive in a position where they are now ready to launch their pilot plant with a far more innovative process than previously anticipated.

“We know that we have a scalable business and aim to expand Revive across many countries, which would allow us to create a real impact in terms of both recycling and green consumerism.”

Scott Kennedy - Co-Founder, Revive



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