



CASE STUDY

Practical help for businesses

Velorim



European Union
European Regional
Development Fund

THERE ARE 27.5 MILLION BICYCLES IN THE UK^[1]



**44,000 TONNES OF CYCLE TYRES AND
INNER TUBES GO TO LANDFILL EVERY
YEAR IN THE UK^[2]**

**That's the equivalent of 30.5 million cycle
tyres and 150 million inner tubes**

**This waste, when recycled offers a
number of commercial opportunities, as
well as environmental benefits**

The cycling industry is flourishing. Ever-increasingly more of us are embracing the merits of pedal pushing, not only for our health and fitness, but for the benefit of our local environment and climate. As the sales of cycles rise so does the volume of punctured and worn tyres and inner-tubes.

This bicycle-related waste, when recycled can be developed into useful and valuable products, such as fuel, insulation, road surface material, as well as building and construction materials.



An innovative way of recycling waste bicycle tyres and inner tubes is a thermal conversion process known as pyrolysis.

This involves heating the waste material in a reactor vessel containing an oxygen-free atmosphere and converting it into liquid, solid and gas by-products which offer numerous industrial applications. For instance, carbon black, a material achieved through pyrolysis can be put to good use in the chemical industry.

Case Study

The cycling industry is not being complacent. Retailers, service engineers, hire schemes and third sector groups are all working together to bring an end to the scrapping of tyres and inner tubes, once and for all.

A shining example of this proactivity is an initiative formed by forward-thinking Russ Taylor, based in Cannock, Staffordshire and his business partner Richard Lawrence.

In 2016, having spent many years in the ICT Management Consultancy sector designing telecom networks, Russ decided to branch out into a completely new area - setting up and running a charity to refurbish bicycles.

While running this new adventure, it soon became evident to Russ that nowhere in the UK were cycle tyres being recycled and the vast majority of them ended up in landfill. This drove him to form his next initiative - a commercial enterprise called Velorim Ltd, whose main motto and primary purpose is to 'make cycling green'.



Russ Taylor, co-founder of Velorim - the UK's first cycle tyre recycling scheme.

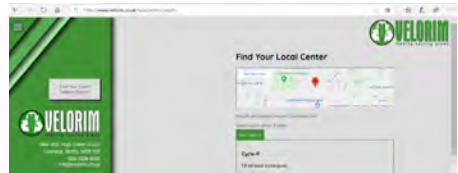
Velorim - making cycling green

During the past two years, Russ and the Velorim team have developed a pilot collection and recycling scheme that enables cyclists to drop off old tyres and inner tubes at their local Velorim Centre.

There are currently 100+ organisations participating in this scheme around the UK, and this figure is expected to grow at a rapid rate as awareness increases amongst environmentally-focused cycle enthusiasts.



Cyclists can visit the Velorim website www.velorim.co.uk to find their local recycling point.



Value from waste

Bicycle-related waste when recycled into new value-added products could benefit both the economy and the environment.

After having launched the Velorim collection scheme, Russ Taylor is proactively forging links with commercial partners who could help with the transformation of the waste on a large scale, including through thermal conversion processes such as pyrolysis.

In order to help him bring his pyrolysis ideas to fruition, Russ sought expert advice in how this innovative process can transform tyre rubber and other materials into new useful products.



Support from EBRI

New product feasibility, Staffordshire, West Midlands

Innovative and forward-thinking founder of Velorim, Russ Taylor first connected with the Energy & Bioproducts Research Institute (EBRI), Aston University when he attended one of its highly acclaimed 'Value from Waste' Master Classes held at West Bromwich in the West Midlands.

During the two-day course he discovered how new commercial

opportunities and supply chain benefits can be developed from a whole host of different waste streams, including that from manufacturing, agricultural, food and drink processes. Not only that, he gained a full insight into the various thermal conversion technologies and processes that could help Velorim and its main mission of putting cycle waste to good use.



Help to explore new market opportunities

Since this event, the EBRI team provided additional support to Russ, specifically around the potential use of bicycle tyres being used as a fuel in the cement industry as well as other industrial processes. Although waste tyres are already used in this highly energy-intensive industrial sector, the current process of incineration is extremely challenging, and meeting all the regulatory standards assuring environmental and human protection is expensive.

EBRI's team of knowledge exchange associates undertook a programme of research to provide Russ with a detailed overview of the tyre material composition and properties, as well as appropriate processing technologies.

Whilst investigating the use of tyre by-products as fuel, they also investigated other commercial uses for this material.



The cement industry is one of the greatest consumers of waste tyres and has traditionally used them as an alternative fuel combusted together with coal.

Findings and recommendations

A detailed report was provided to Russ, summarising the analysis and conclusions of EBRI's research. It highlighted the use of tyres as fuel for the cement production process is highly regulated and an option of last resort. Pyrolysis offered a far better option than traditional incineration, as it can convert the tyres into solid, liquid and gaseous products which can subsequently be combusted generating lower carbon emissions than the method utilising fossil fuels.

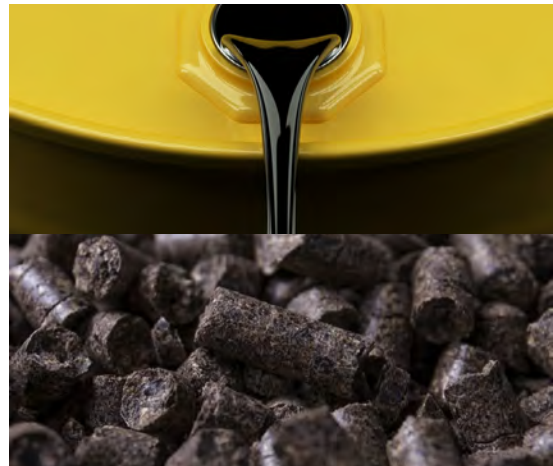
Another advantage of pyrolysis is that it produces an oil, known as bio-oil, rich in compounds such as benzene, toluene, xylenes, styrene and limonene, which have high commercial value in the chemical industry.

The EBRI team highlighted that the energy obtained from the combustion of the tyre pyrolytic gas is enough not only to perform the pyrolysis process, but it can also be utilized for other

applications e.g. burners, boilers and internal combustion engines.

Pyrolysis of tyres also produces a solid, known as char, a sustainable form of charcoal which can be used for water and air purification, as well as for treatment of industrial effluents.

Bio-oil and tyre char are two valuable products produced as a result of the thermal conversion process of pyrolysis.



I was really impressed with their breadth of expertise in pyrolysis, and their ability to engage with businesses, especially start-ups to explore what is possible."

Russ Taylor
Director and Founder



EBRI's input was fundamental in changing the direction of the business away from the use of tyres as fuel, and using pyrolysis as a means to extract valuable chemicals that are in high demand for use in industrial processes.

EBRI's summary of findings and recommendations provided Russ with a full understanding of the potential benefits that his tyre recycling scheme could bring industry, the wider economy and the environment.

Outcome

As a result of EBRI's help and advice, the Velorim team has ceased interaction with the cement industry and is already in discussions with several pyrolysis companies to evaluate the potential of this process to extract valuable materials from waste tyres.

Russ Taylor and his business partner Richard Lawrence are continuing to explore the merits that their forward-thinking scheme can bring to both the environment and the circular economy. For instance, they produce a new rubber material from redundant inner tubes of tyres which can be developed into new, waterproof membrane products such as gaskets, pond liners and roofing material.

EBRI's research has provided the business duo with invaluable data that has helped them make key decisions about the future strategy and mission of their company.

Following on from this, Velorim are pro-actively seeking partners to help develop the technology required to process the bicycle tyre waste and its associated operating costs, and would welcome discussions with interested parties.



The circular economy could benefit in many ways from Velorim's ideas and proactivity in uniting cycling with recycling.



EBRI's support has exceeded our expectations. Without them we wouldn't have a business.

Their research and findings have empowered us to drive our vision and mission of 'making cycling green' to full fruition.

**Russ Taylor
Director and Founder**



The Energy & Bioproducts Research Institute (EBRI) at Aston University provides practical solutions for businesses to explore the growing bioenergy, Energy-from-Waste (EfW) and bioproduct markets, and the opportunities they offer. Companies can benefit from specialist support, cutting-edge technologies and bespoke events to stimulate business start-up and growth, plus the development of new low carbon products and services.

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[1] www.bikes.org.uk
[2] research by Velorim Ltd

