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THE
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PROJECT

CASE STUDY: CIRCULAR ECONOMY 2

Recycling MDF into new fibre

woodknowledge WALES

Ariennir gan Lywodraeth Cymru
Funded by Welsh Government

MDF RECOVERY (MDFR)

With its sights on creating the world's first circular economy for high-quality recovered wood fibres from waste, MDF Recovery has developed a process to recycle medium density fibreboard (MDF)

INTRODUCTION

With its sights on creating the world's first circular economy for high-quality recovered wood fibres from waste, MDF Recovery has developed an innovative and effective process to recycle medium density fibreboard (MDF). Key industry partnerships helped evolve this bench-scale innovation into a fully functional 'end-to-end' recycling solution for the MDF panel board industry.

Fibreboard is made entirely of virgin wood. Some of this comes in the form of logs which are debarked and chipped onsite, the rest is purchased in chip form e.g. sawmill residues. Virgin wood supplies are under pressure worldwide as demand escalates. The wood processing sector faces formidable challenges due to rising prices, supply uncertainties, and growing demands to preserve forests. In response, recycled fibre (rMDF) derived from waste MDF presents an innovative, energy-efficient, and dependable source of raw material for MDF manufacturers and various high-value applications, such as thermal insulation.end users are helping to contribute to the circular economy. And it means more homes and buildings in Wales are using home-made structural construction materials – materials manufactured closer to their end use, reducing the impact of transportation.

KEY PLAYERS

MDF Recovery

MDF Recovery Ltd has developed an innovative and effective process to recover fibre from waste MDF. Virgin wood supplies are under pressure worldwide as demand escalates and supplies are stretched. Rising prices and uncertainty of supply, combined with increasing pressures to maintain standing forests are challenging every element of the wood processing sector.

"The help I have had from The BioComposites Centre over the years has been invaluable. The pilot scale MDF line allowed me to demonstrate that recovered MDF fibres can successfully be reincorporated not just at lab scale but at pilot scale into new panels. This is the sort of scale that you need demonstrate to potential customers to show that your idea is not just theoretical but potentially commercially viable."
Craig Bartlett, MD, MDFR

BioComposites Centre, Bangor University

The BioComposites Centre (BC) is recognised as a European Centre of Excellence in the forest products sector. BC has a track record in assisting companies to develop new technologies and products for over 30 years. BC and MDFR have been collaborating for over ten years as Research and Development partners. Current activity focuses on the identification and analysis of new potential markets for recycled MDF fibres.

"We worked with Craig in the very early stages when he was setting up his company. A key to this long-term involvement is our technical knowledge on wood-based materials and the capacity we have with both our lab and pilot scale equipment. Access to this knowledge and equipment has helped Craig demonstrate his method for fibre recovery and has shown potential investors what other applications can be developed with his recycled fibres."
Dr Rob Elias, BioComposites Centre

IMAL PAL

PAL Group is a global technology supplier and developer, specialising in the design of technological solutions, machinery and complete production lines for four principal business areas: wood-based panels, pressed wood packaging, pellets and energy and wood recycling and waste treatment.

The partnership between PAL and MDFR provides PAL with exclusive rights to integrate the MDFR process with its own market leading wood cleaning and recycling technologies. For the first time, customers in the panel board industry will be able to specify a complete 'end to end' recycling solution for this challenging waste stream.

"We are delighted to be able to offer our customers around the world the integration of MDFR's unique process with PAL's market leading recycling technology. PAL has a record of providing the wood panel industry with continual innovation. The partnership with MDFR provides new and existing customers with a cost-effective and important answer to material, engineering, financial and market issues that are impacting their businesses."
Antonio Dal Ben, PAL's Vice President and CEO.

W Howard Ltd

W Howard Limited are manufacturers of MDF mouldings with three manufacturing plants in England, Wales & Ireland. Products include skirtings, architraves, window boards, wall panelling, door casings and door linings. The product range consists of over 160 profiles and sizes and finishes in white primed, veneered and laminated. As well as a vast core range offering W Howard also manufacture bespoke products.

"W Howard's commitment and investment in the first production plant using our technology is a significant step forward for MDF Recovery. The market, governments and consumers are all keen to encourage re-use of materials and the circular economy. Waste MDF – either during processing or at end of life – is no longer a problem that has to be dealt with, but a valuable resource of high-quality wood fibres. We look forward to seeing W Howard's loose fill insulation product meeting the needs of house builders and the construction industry across the UK and Ireland."
Craig Bartlett, MD, MDF Recovery

Woodknowledge Wales

Both MDF Recovery and W Howard are members of Woodknowledge Wales. We aim to bring together stakeholders across the timber supply chain. Through facilitated events and community visits, we encourage our stakeholders to share knowledge and progress around innovative developments. Offering the opportunity to meet and establish key partnerships can help take innovation to the next level.

"This is a very exciting collaboration between two Woodknowledge Wales members. Making better use of waste wood is just as important as growing more trees. Added to that, the UK desperately needs domestic production of wood fibre insulation. I'm delighted that this ground-breaking project is combining both insulation production and the upcycling of waste wood and is happening in Wales." **Gary Newman, CEO, Woodknowledge Wales**

NARRATIVE

Craig Bartlett established MDF Recovery (MDFR) to address the growing problem of how to recycle MDF (medium density fibreboard). The building sector uses MDF widely in interior applications such as shop fittings, furniture, and kitchens. However, there has previously been no process to recycle MDF at end of life.

With its sights on creating the world's first circular economy for high-quality recovered wood fibres from waste, MDFR has recently completed a £2.3m fund raise to support the scale-up and deployment of its technology through OEM partnership. The company is applying innovative approaches to develop an energy-efficient and environmentally friendly alternative to landfill and incineration for waste MDF.

THE MDF WASTE STREAM

Furniture and fitting manufacturers generate significant volumes of waste as they convert new MDF boards into products. MDF manufacturing typically creates up to 5% scrap. Then, further material enters the waste stream as these products reach their end of life. Until the advent of a cost-effective MDF recovery technology, manufacturers incinerated or sent far too much of this waste to landfill.

Each year, global production generates around 75 million tonnes of MDF, with around one million tonnes produced in the UK. The vast majority, if not all, of the wood used in production is UK sourced. Overseas sourcing only occurs in exceptional circumstances when it is cost effective. To meet demand, MDF panel production continues to increase by approximately 4.5% annually. As there has been no way to recycle this legacy material, there is already over 40 years' worth of MDF embedded in products and buildings.

RECOVERING MDF

MDF Recovery's proprietary MDF recycling process uses electrical heating technology to effectively separate the fibres from the resin in offcut and other waste MDF panels. The technology provides a closed loop solution which recovers greater value from waste and improves production efficiency in the manufacture of recycled content MDF panels and/or other fibre-based products.

Independent studies have confirmed that the recovered fibres are of the same high quality as virgin wood fibre and are perfectly suited for reintegration back into the MDF production process and as a feedstock to manufacturers of insulation products, peat-replacement products, and formable packing materials.

The technology offers an effective recycling solution for the waste processing industry. It recovers high quality wood fibre from waste MDF. Partner manufacturers will soon be turning these fibres into new MDF and other construction materials such as thermal insulation. These secondary insulation materials offer an eco-friendly alternative to mineral wool, glass fibre and plastics for thermal insulation materials.

By re-integrating recycled fibres into MDF panel production processes, manufacturers can ensure the circularity of renewable sources and reduce their dependence on the supply of virgin fibres. By doing so, they can also offset both the cost of raw product and significantly reduce levels of outgoing waste.

Recycled MDF panel fibres ready for reuse in new MDF panels or wood fibre products such as insulation. Source: MDF Recovery

FROM BENCH TO COMMERCIAL SCALE MDF RECOVERY

Progress from bench scale, through laboratory scale research and development and proof of concept at 150kg/hr, to a fully functional prototype manufacturing plant has been steady and has relied on key collaborative relationships.

MDFR has benefitted from a successful and ongoing relationship with The BioCompsoties Centre (BC) at Bangor University, and the Technology Transfer Centre run by BC at Mona Industrial Park on Anglesey. Then, in September 2023, MDFR formed a global partnership with PAL, part of the Italian multi-national equipment manufacturer IMAL PAL. This partnership will now industrialise the MDFR technology and integrate it into PAL's wood cleaning and recycling technologies to create a complete end-to-end system for fibre recovery from waste MDF . Relocating to new facilities in Wythenshawe, Manchester provided the company with an opportunity to enhance and modernise critical equipment and procedures. In doing so, it was able to reduce energy consumption and improve processing efficiency.

Research and development are progressing rapidly. Current emphasis is on sorting technology for waste and end-of-life MDF, optimisation of feedstock delivery systems, and scaling up production to 2.5t/hour and beyond. The MDF team also continue to investigate advancements in drying technology, and ongoing enhancements to process efficiency. As the company's innovation and development efforts persist, so does its extensive portfolio of patents.

Construction is underway for the UK's inaugural commercial-scale MDF recycling facility, marking a significant milestone. Discussions are currently underway for MDFR to license its technology globally. This technology will enable customers in the panel board industry to specify a complete 'end to end' recycling solution for the MDF waste stream.

REUSING FIBRES TO PRODUCE LOOSE-FILL WOOD FIBRE INSULATION

Natural insulation is one of the fastest growing market sectors in Europe. In a growing market for natural construction materials, wood fibre has many benefits including ease of use, thermal mass, breathability, and appeal to increasingly CO2 conscious house builders and consumers.

In October 2023, W Howard Ltd secured a multi-year license to use the MDFR recycling technology to produce wood fibre insulation in both the UK and Irish markets. A new facility in Newtown Powys will begin production in 2025.

"MDF Recovery's technology is unique, and we are delighted to have obtained the exclusive licence for the production of loose fill insulation in the UK and Ireland. As a company, we are always seeking new and innovative products that fit in our vision of 'products in every home'. The demand for natural building materials is only going to increase and the addition of a recycled wood fibre insulation is an exciting addition to our product portfolio."

Jonathan Grant, Group Chief Executive, W Howard

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