Collaborating with BEACON
Adding Value to your Business
From plants to products
BEACON is funded through the European Regional Development Fund (ERDF) by the Welsh European Funding Office (WEFO), part of the Welsh Government, under the Convergence programme for West Wales and the Valleys.

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BEACON is a biorefining initiative led by Aberystwyth University’s Institute of Biological, Environmental and Rural Sciences (IBERS) in collaboration with partners at Bangor and Swansea Universities, which aims to help Welsh businesses and develop the Welsh bioeconomy. It is backed with nearly £8 million from the European Regional Development Fund through the Welsh Government. Biorefining is the sustainable processing of biomass into a spectrum of marketable products and energy. It contributes to decreasing greenhouse gas emissions, reducing waste and combatting climate change.

BEACON is building on research already underway at Aberystwyth University’s Institute of Biological Environmental and Rural Sciences (IBERS) to produce fuels from energy crops, including high-sugar grasses such as rye. Bangor University continues to develop new materials and chemicals from plants which can be used to develop innovative products. BEACON also enables Swansea University to focus on developing their expertise in using bacteria and fungi to digest or ferment plant matter within the biorefining process.

BEACON helps Welsh businesses develop products and services that assist in the transition to a low carbon economy with an overall objective of mitigating the impact of climate change.

**BEACON seeks to:**

- Establish links between the business community and academia within Wales and the UK
- Develop new approaches to the processing and conversion of different biomass feedstocks for the development of innovative products
- Help de-risk the development and scale-up of innovative ideas from dynamic Welsh businesses
- Create a new skill base and help the bio-economy grow within Wales
- Support inward investment
- Promote science excellence from Wales

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**What is BEACON?**

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- Support inward investment
- Promote science excellence from Wales
Core Activities

BEACON has a number of core strategic research activities and these include initiatives focused on:

- Understanding how to efficiently process wet biomass using mechanical and physicochemical technologies
- Conversion of lignocellulosic biomass into biofuels
- Conversion of wet biomass into platform chemicals and fine chemicals
- Developing and enhancing enzymes and microbial systems for the production of products including fine chemicals and food products
- Isolating commercially important molecules using membrane technologies and advanced separation systems
- Production of bioplastics from biomass
- Production of biobased packaging from biomass
- Optimization of pyrolysis and biochar processes for the development of new products and environmental applications
- Evaluation of processing routes from biomass to products and developing the associated environmental and economic modelling

The opportunity to return to the use of plants as the major resource for fuel, fibre and chemicals using modern science and technology represents not only a greener alternative to fossil fuel use but also provides enormous potential for economic growth and job creation as well as revolutionising traditional manufacturing. As part of a circular economy, wastes need to be considered as resources. BEACON aims to assist Welsh companies interested in biorefining and industrial biotechnology to generate products and services for the future biobased economy.
Primary Processing

In many cases we cannot use the plants directly, so to improve our ability to access key molecules and compounds, a number of processes must be used. The initial phase can comprise mechanical and physicochemical approaches such as chopping, maceration, pelleting, juicing, pyrolysis and steam explosion.

Secondary Processing

Following initial processing, biological and chemical methods can then be used to convert the raw material into high value end products. In many cases enzymes and microorganisms are used to help turn complex molecules from the plants into simple building blocks such as sugars. These are then converted into chemicals using microorganisms such as bacteria, yeasts and fungi. These molecules may then be further isolated using technologies such as super-critical fluid extraction, centrifugation and membrane systems.

Product Range

Many of the products that we see around us can be made from compounds originating from plants, including:

- Biocomposites and plastics, including packaging
- Food/pharma ingredients/additives, including flavours and colours
- Oligosaccharides and polysaccharides
- Charcoal and activated charcoal
- Waxes and novel lipids
- Proteins and enzymes
- Construction products
- Fuels
The BEACON biorefining facility on Gogerddan campus at Aberystwyth University features a flexible plug and play, multi-feedstock pilot processing plant. The unit houses a range of key equipment and associated expertise to facilitate collaboration with industrial partners to develop and demonstrate scale-up processes, taking laboratory research to economically viable industrial applications.

The Pilot Plant includes a primary processing area and a secondary processing pilot laboratory, both within a short walk of the National Plant Phenomics Centre and plant breeding research facilities.

Capabilities

Primary Processing

- An integrated wet biomass processing line including static forage chopper, screw presses and cooled holding tanks
- Novel Batch Slow Pyrolysis Biochar Production Plant
- Large and small scale animal feed and biomass pellet press

Secondary Processing

- Continuous centrifugation systems for solid-liquid separation up to a scale of 1000 litres
- Steam in Place Fermentation Units (max 250 litres)
- Pasteurisation
- Steam Explosion Pilot Facility
- Membrane Filtration (Microfiltration to Reverse Osmosis)
- Rotary Evaporation (50 litres)

Analytical Support

- Automated Methane Potential System
- Chromatographic/spectrophotometric (HPLC/MS, GCMS, FTIR etc)
- Atmospheric mass spectrometry
- Automated liquid-liquid separation (HPCCC)
Bangor Facilities

Facilities

The BioComposites Centre at Bangor University offers a pressurised refining and pilot scale facility, while the School of Chemistry offers full chemical and analytical support.

Capabilities—BioComposites Centre

The Pilot Plant facilities are located at the purpose-built Biorefining Technology Transfer Centre (BTTC) at Mona on Anglesey, where new processes and technologies are developed and tested for commercial viability. They offer:

- Pressurised refining line for the production of plant fibre based biocomposite materials for the construction industry
- Extrusion and film forming equipment for the evaluation of biobased plastics for the packaging sector
- Equipment for the isolation of botanical extracts for use in the cosmetics and healthcare sectors
- Organic synthesis/chemical modification of a range of plant chemicals
- Pulp moulding equipment for the preparation of plant fibre based packaging
- Wet biomass fractionation line for the production of functional food ingredients

Capabilities—School of Chemistry

Full chemical-physical characterization and biological screening for a wide range of complex matrices including:

- Chromatographic techniques (HPLC-MS, LC, GCMS, Ion Chromatography)
- Isolation and purification (SPE, Flash Chromatography)
- Biological screening (large molecular weight and proteins using MALDI-TOF)
- Nuclear Magnetic Resonance for chemical structure elucidation
- Elemental analysis and sample characterization using ICP-OES, GFAAS and XRF
- Mineral composition via XRD
Swansea Facilities

Facilities

The BEACON capability at Swansea University is centred on the microbiology facilities in the Institute of Life Science (ILS), the purpose-built medical research facility of Swansea University Medical School.

The ILS laboratories house state-of-the-art equipment, and offer access to world-leading researchers with a wealth of experience working with industrial partners in the chemical, agrochemical, pharmaceutical and food fields, as well as international companies and local SMEs.

Capabilities

- Process optimization
- Microbial natural product discovery and novel chemical entities for medicine
- Metabolic engineering in microbes
- Monooxygenase biotransformation of lipophilic chemicals in biorefinery
Developing sustainable, low carbon, biobased products and technologies is a key aim of the BEACON Biorefining Centre of Excellence. Central to this is a robust environmental assessment capability to run in tandem with the physical and chemical R&D work undertaken through the project.

Life Cycle Assessment (LCA) is the most established and comprehensive of these assessment frameworks. It considers environmental impact across the full lifetime of a product and across a wide range of impact categories. It is defined by the international standards ISO 14040 & 14044. As a result, LCA is increasingly seen as an important aspect of corporate product R&D programmes, eco-design and environmental benchmarking. It allows for the identification of environmental ‘hotspots’ within the production chain and can form the basis of public declarations, such as eco-labels, certified environmental claims and EPDs (Environmental Product Declarations).

At BEACON, our LCA expertise includes access to all the largest and most academically respected LCA databases as well as market-leading LCA modelling software. Nearly all our pre-treatment and pilot scale processing equipment has hard-wired energy monitoring equipment fitted, allowing for detailed process energy usage analysis and process optimization work.

If you would like to know more about Life Cycle Assessment at BEACON, please email lca@bangor.ac.uk

Benefits to your organisation:
- Environmental product benchmarking
- Product improvement insights
- Identification of process and supply chain ‘hotspots’
- Green marketing and communications opportunities
- Brand differentiation and enhancement
- Environmental management planning insights
- Transparent and credible environmental claims
BioPilotsUK is an alliance of open access biorefining centres across England, Scotland and Wales, of which BEACON is a founder member. BioPilotsUK was launched in October 2016 with the aim of positioning the UK as a world leader in biobased product manufacture and biorefining technology development. BioPilotsUK recognises the importance of partnerships and collaboration to develop UK biobased value chains, and works to de-risk the commercialisation of biobased products and processes.

As an alliance, the BioPilotsUK partners combine world-class expertise, knowledge and facilities to provide a diverse range of biorefining capabilities at laboratory and pilot scale, in addition to analytical and modelling technologies and assessments. With a mission to provide a cost-effective pilot and process development service with connections to the Higher Education (HE) sector for the benefit of biobased industries, BioPilotsUK supports the growth of supply chains within a high value bioeconomy. This enables companies and organisations to significantly de-risk their biobased projects by developing and trialling new technologies in one or more of BioPilotsUK’s open access scale-up facilities. BioPilotsUK can also assist in the search for research and innovation funding opportunities. BEACON’s involvement in BioPilotsUK will help Welsh companies access facilities and expertise beyond Wales and build links with other companies across supply chains.

“As one of the founders of BEACON and recognising its potential to transform life sciences in Wales, I am delighted that the movement is going pan-UK, as I cannot see any other way that we can have an edge over competitors.”

Sir Roger Jones
BioMonde

“What we are all about is supporting the transition away from fossil resources by making the best use of biorenewable materials and unavoidable wastes. As an alliance, we can significantly de-risk the innovation process for anyone exploring a biobased idea.”

Adam Charlton
BEACON

For further information:
www.biopilotsuk.com
BEACON offers businesses with interests in biorefining and industrial biotechnology access to the facilities, research and expertise in Welsh Universities. Our work spans a number of industrial sectors and we work with companies to:

- Develop new microbial and enzyme systems and technologies for the processing of biomass
- Produce new biocomposite materials for the construction, packaging and manufacturing industries
- Develop eco-construction products
- Diversify feedstock supply for the chemical industry to allow them to develop greener chemicals
- Stimulate rural development based on making use of Welsh natural resources, including non-food crops
- Develop green fuels for the low carbon economy

Small and medium sized enterprises (SMEs) in the Convergence region of Wales can work with BEACON at no financial cost. We also work with other businesses, and can advise on funding sources, partnerships and processes that enable collaborative R&D projects to take place with businesses across the UK.

Please contact one of our Business Development Managers for more information:

**Collaborating with BEACON**

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Adding Value to your Business

A Selection of Companies Collaborating with BEACON
Blue Sky Botanics

Company Profile

Blue Sky Botanics is a leading UK manufacturer of botanical extracts. The company sources fresh, frozen and dried plant material from all over the world, and also grows a wide range of herbs on its 200 acre organic farm. Blue Sky Botanics places a strong emphasis on the origin and ethical standard of the botanicals used. The compounds are extracted on site using a variety of solvents and techniques. The on-site facility operates to a very high technical and hygiene standard, enabling Blue Sky Botanics to sell its extracts to a variety of global brands for incorporation into cosmetics, drinks and herbal supplement products.

Collaboration with BEACON

An important objective for Blue Sky Botanics is to produce natural clear extracts that are strong in flavour and/or enriched with bioactives to meet the demands of the industry. In addition the company are seeking to gain a greater market share by reducing overall production costs. Blue Sky Botanics have had a number of interactions with BEACON aimed at improving their current processes to improve both efficiency and quality of end products. Collaboration with BEACON has allowed the company the opportunity to trial potential alternative (natural) approaches to their existing extraction processes at pilot scale, and to test the commercial viability and economic benefits of producing concentrated extracts.
BEACON and Blue Sky Botanics worked together to identify a new sustainable process for the clarification of botanical extracts based on membrane separation technology. BEACON identified an appropriate membrane type and demonstrated that nanofiltration methods could be applied to remove colour from botanical extracts whilst retaining bioactives in the purified preparations. This led to a more detailed project on process development, funded through the BBSRC NIBB programme.

Blue Sky Botanics has benefitted from the business innovation voucher scheme promoted by Innovate UK, which enables SMEs and start-up companies to obtain funding towards the cost of obtaining specialist, expert advice to help grow their businesses. Blue Sky Botanics are now also collaborating with another Welsh company via their link with BEACON.

“Working with BEACON has enabled us to access equipment and methods that we could not trial anywhere else. This is vital as we can test whether a process works for our products before we invest in the equipment.”

James Lambe
Managing Director

Blue Sky Botanics

For further information:
www.blueskybotanics.com
Company Profile

Boss Brewing was established in 2014 in Swansea Enterprise Park. They have since moved into larger premises and expanded to eight staff, and after initially supplying beer and lager within the Swansea area, now sell to Asda, Co-op, Morrisons and Wetherspoons nationwide. The brewery have won numerous awards, including Champion Beer of Wales awards in 2016 and 2017, Great Taste award in 2017, and SIBA gold award and overall trophy winner in 2018. Co-founder Sarah John also won Young Business Person of the Year at Swansea Bay Business Awards in 2017.

Collaboration with BEACON

Having first met at a BEACON workshop on “Launching a Microbrewery”, BEACON scientists subsequently provided Boss Brewing with expertise on growing, storing and analysing yeast fermentations. Practical assistance and training was provided to Boss staff in BEACON laboratories, with the techniques then transferred to the Boss Brewing processes. This has allowed Boss Brewing to undertake better monitoring of quality control factors such as dissolved oxygen, pH and bitterness.

“The support we’ve had from the BEACON team was invaluable and they really helped with their knowledge of yeast and fermentations. They showed us how to greatly improve process control and also lent us equipment at a time we were starting up and funds were extremely tight.”

Roy Allkin
Director

For further information:
www.bossbrewing.co.uk
Branston

Company Profile

Branston are one of Britain’s largest developers, growers and processors of potatoes, handling around 350,000 tonnes of potatoes a year. They supply fresh and ready prepared potatoes to retail, wholesale and food manufacturing customers throughout the UK.

Collaboration with BEACON

Through a joint collaboration with Phytoquest, a project with BEACON was initiated to look at the potential for the valorisation of the rejected potatoes from the Branston packing process. At that time the overall rejection rate was approximately 10%. Through the use of the equipment and capabilities available at BEACON a complete plug-and-play process scenario was demonstrated at pilot scale with the aim of isolating two target compounds identified as being of high value to Branston, which are intended for the food industry as an ingredient/preservative. Since the project with BEACON, B-Hive Innovations has been established to conduct R&D activities that improve sustainability and efficiency in the fresh produce industry. This has led to an exciting new Innovate UK project being approved which will build on the previous BEACON project, with Quorn, IBERS, Phytoquest, Campden-BRI, B-Hive, and Membranology as partners.

“Due to the collaborative project with BEACON and Phytoquest we have been able to identify challenges and opportunities that can be focused on during future projects.”

Alison Wright
R&D Project Manager

For further information:
www.branston.com
www.b-hiveinnovations.co.uk
Eco-Sphere

Company Profile

Eco-Sphere Worldwide is a Bridgend-based company with interests and activities in the environmental, educational and socio-economic sectors. Eco-Sphere are particularly interested in reducing waste to landfill through a variety of approaches and in the valorisation of different waste streams. Through close collaboration with BEACON, Eco-Sphere aims to deliver significant environmental, social and economic benefits to the Welsh economy by securing Intellectual Property (IP) and through the development of new products and processes.

Collaboration with BEACON

Eco-Sphere has been working with manufacturers of food waste processing machines in Wales, together with a UK importer of similar equipment, and is interested in appraising this method of handling food waste at both domestic and industrial catering scale. Eco-Sphere would like to establish this method of on-site handling/management as the preferred option for food waste to provide an environmentally sound and microbiologically safe alternative to the existing domestic and commercial bin system. Parent company Eco-Sphere Intelligent Technologies will act as the main distributor of the food waste machines.

In the UK there are currently two standard methods for treating food waste, namely aerobic composting (after pasteurisation to neutralise pathogens), and Anaerobic Digestion (AD). However, the Eco-BioDry machines are capable of providing a point-of-production system to process food waste into a dehydrated flowable solid crumb and separate sterile condensate water with very low dissolved solids. BEACON worked with Eco-Sphere to trial a catering-scale food waste processing machine and valorise its output. The initial project aimed to assess whether the nutrient-rich dry output could be used as a compost or fertiliser. In-house and external testing (PAS100) demonstrated that while it has good properties as a fertiliser (diluted), further processing (composting) would be needed for it to be used as a plant growth medium.
A second BEACON project aimed to determine whether the dehydration process adversely affected the waste with regard to its use as a feed into AD systems. When samples of untreated and Eco-Sphere processed food waste were compared, the Eco-Sphere processed food waste produced similar levels of methane (see figure left). The results demonstrate that the Eco-Sphere system could be incorporated as a key part of the current strategy for taking food waste to AD. The process has the potential to significantly reduce haulage and handling charges for larger producers and provide AD plant operators with stabilised feedstock that could be used to provide buffer variations in feedstock supply and methane production.

Eco-Sphere are also looking to develop the first fully compostable disposable nappy and hygiene products using material grown and sourced in Wales. The company already produces a disposable nappy made from bamboo, but a further collaborative project was developed to examine the feasibility of using Miscanthus developed at IBERS, Aberystwyth University, as a more sustainable alternative to bamboo. BEACON scientists tested several varieties of Miscanthus, and found that a number of these produced fibres which would provide a suitable and sustainable alternative to bamboo for the manufacture of these hygiene products.

"Without the support and expertise afforded to my company and myself by the specialist BEACON team and my own determination to secure compliance in my endeavours to secure a front-end on-site food waste management process that supports AD in the field of energy2waste and energy2resource projects, crucial credibility would have been lacking on all fronts."

Jenny Lewis
Director
Fiberight

Company Profile
Fiberight are a Pontypool-based company operating in both the UK and the US, who have developed a novel recovery process to generate added value from mixed residual waste. At present the by-products are biomethane gas and an engineered fuel product.

Collaboration with BEACON
Fiberight worked with BEACON’s Life Cycle Assessment analyst to update and better understand the carbon footprint of their novel waste recovery process. Working with the company’s proposed process flow and mass and energy balance calculations, the LCA analyst was able to calculate carbon emissions associated with two potential product pathways: one prioritising biogas production (produced from organic matter within the waste stream) and the other modelling a combined biogas and sugar product stream. The study demonstrated that both scenarios were preferable in terms of carbon balance to simply landfilling or incinerating mixed sanitary waste for energy recovery, and also that changes which were made to Fiberight’s process following on from a previous study had resulted in an improved carbon balance.

In a second collaboration, fibres from the company’s waste recovery process were pre-processed by milling, then dried in readiness for off-site compositional analysis and testing for use in stone mastic asphalt applications, such as road surfaces. The aim is to demonstrate conformance with the EU BSEN1269 standard, which covers properties of textile floor surfaces.

“Working with the BEACON project has helped Fiberight explore new market opportunities for the products that we are now generating from municipal solid waste.

Without this assistance Fiberight would not have been able to access some of these markets!”

Nick Thompson
Managing Director

For further information:
www.fiberight.co.uk
GreenSeas Resources

Company Profile

GreenSeas Resources is a newly-established company within the marine aquaculture sector. Based in Pembroke Dock on the Milford Haven waterway, they are concerned about the increasingly large volumes of ‘opportunistic’ green seaweeds growing there. Partially due to increased nitrogen run-off from farming intensification, these mats of floating ‘weed’ detrimentally impact important recreational amenities such as boating, swimming and fishing within the estuary. GreenSeas Resources are investigating the business potential of removing the seaweed from the estuary, and using it to generate saleable products, whilst simultaneously improving the water quality.

Collaborating with BEACON

BEACON’s pilot-scale facility is ideally suited to processing large quantities of the mixed green seaweeds and was used in a collaborative R&D project to investigate the potential of pressing the algae with a screw-press prior to downstream processing.

Reducing the moisture content improves transport efficiencies and processing the liquid fraction allows extraction of water soluble compounds. The intention of the collaboration was to develop a new process for the company and to identify compounds within the fractions which could become new products or open up new markets. BEACON’s screwpress was used to process the seaweed and trials showed excellent release of liquid from the seaweed following pressing. Dried samples of the solid and liquid fractions were also analysed by liquid chromatography mass spectrometry to identify the high value compounds.

For further information: www.greenseas.co.uk
present which could be targeted for future extractions and markets.

As an outcome of this collaboration, GreenSeas Resources are currently purchasing a screwpress for their own processing purposes. Interactions with BEACON staff have also led to the submission of two KESS PhD studentships between GreenSeas Resources and IBERS. One will develop the seaweed downstream processing, looking at separation technologies and marketable compounds. The other will look at the ecological aspects of removing the seaweed at scale, identifying and quantifying the beneficial impact this will have on the waterway, its users and the environment. If funded, the results from these projects will assist GreenSeas Resources in delivering remediation services and sustainably sourcing seaweed and converting it through a range of viable processes to marketable products.

“Working with BEACON has helped our business develop new processes and has generated research projects that will enable us to operate profitably and sustainably.”

Joseph Kidd
Development Director
Hybu Cig Cymru—Meat Promotion Wales

Company Profile

Hybu Cig Cymru - Meat Promotion Wales (HCC) is the industry-led organisation responsible for the development, promotion and marketing of Welsh red meat.

HCC undertakes research and development, shares information and supports training relevant to each part of the supply chain, to ensure the Welsh red meat industry is in a position to improve quality, increase cost-effectiveness and add value to Welsh red meat products across the whole of the industry.

Collaborating with BEACON

HCC approached BEACON with the aim of bringing together academia and industry in order to address the problem of waste streams from abattoirs. A joint workshop was held in March 2018 at IBERS, Aberystwyth University, where delegates discussed the use of new technology to turn animal by-products into useful commodities that could be marketed, therefore potentially adding value to the red meat supply chain.

The workshop heard from companies which had achieved success in reducing their use of water and energy, and discussed the latest Anaerobic Digestion (AD) technology, which turns organic waste into electricity, fuels and other saleable commodities.

A key industry statistic is that a typical 650kg beef animal will produce 345kg of meat, so the challenge is how best to use the remainder of the carcass, including blood, skin and bones, especially since the market for hides is now less profitable than it used to be. Being able to utilise this waste successfully would be a win-win situation for the industry, since turning animal by-products into useful commodities not only helps increase profitability, but reduces waste at the same time.

For further information: www.hccmpw.org.uk
A wide range of Welsh processors were represented at the workshop, including both large and small abattoirs. Speakers included world-leading experts on waste reduction and the valorisation of by-products, and included BEACON multi-disciplinary scientist and expert analytical chemist, Dr Mike Morris; BEACON biochemist Dr David Bryant; waste management and manufacturing specialist Chris Morris; and Anaerobic Digestion expert Professor Sandra Esteves.

Following the workshop, a number of potential opportunities have been identified for the valorisation of abattoir waste. HCC will continue to collaborate with BEACON over the coming months to work with industry in developing these by-products.

“It was fascinating to hear about BEACON’s work in helping companies to extract valuable commodities that can be used in a wide variety of contexts, from renewable energy to pharmaceuticals. Many of the processors shared interesting data on how they reduced waste and utilised by-products, and emerging anaerobic digestion technology is clearly an avenue to be explored further.”

Kirstie Jones
HCC Market Development Officer
Company Profile

International Gums and Oils Ltd (IGO) is a plant product company that supplies raw material to the nutraceutical, fragrance and cosmetics industries. The company currently imports premium botanical compounds, including frankincense, myrrh and henna from Asia and the “Horn of Africa”, principally Somalia, Ethiopia and Oman.

Collaborating with BEACON

It is well known that certain plants contain naturally occurring biochemical compounds with anti-retroviral, anti-malarial and anti-inflammatory properties. BEACON is working with IGO to identify high value compounds for the health and beauty industry. BEACON initially undertook a literature review surrounding particular plant components to better understand the potential for extracting actives. IGO are now interested in isolating and formulating such compounds for use in facemasks and as a skin cleanser for the personal care sector.

A collaborative R&D project between BEACON and IGO focused on solvent extraction and purification at laboratory scale, followed by scale-up. In addition, the Accelerated Solvent Extraction (ASE) system was used to try to screen the leafy powdered material for any other value added molecules. The initial analytical work produced encouraging results, and showed interesting and long-lasting additional functional properties of the leafy powder for natural cosmetics applications. Further development work to provide a better understanding of this functionality is underway. BEACON researchers have also undertaken a chemical analysis on the plant oil extract using Mass Spectrometry. The potential of the oil to counteract the yeast pathogen associated with skin conditions such as dandruff (Malassezia) was also investigated.

“Working with BEACON has enabled our company to use alternative techniques and larger scale equipment to extract the high value compounds we are interested in for their commercial potential in the cosmetics and personal care sectors.

Dr Ahmed Ali
Research Director
Company Profile

Moleculomics is a spin-out company from the Institute of Life Science (ILS) at Swansea University. They have developed powerful computer techniques to produce structural models of proteins and the changes that occur when they interact with molecules. This allows them to use computer models to predict the activity of a potential new drug with its target protein, and critically also to predict whether or not a drug will interact with other proteins, which might lead to toxicity or other unwanted effects. Given that there are several million potential interactions, undertaking this work using computers significantly reduces the time taken for R&D, in addition to helping reduce the use of animals in experiments and allowing companies to predict any adverse effects of potential new drugs.

Collaboration with BEACON

BEACON has worked with Moleculomics on a number of projects, including undertaking laboratory work to test computer predictions of molecule-protein interactions. Comparison of laboratory results with computer predictions allows the approach to be validated and refined, which in turn provides underpinning evidence allowing Moleculomics to attract more customers. BEACON scientists have also worked with Moleculomics to better understand the ways in which fungi become resistant to antimicrobial compounds, with the aim of developing improved fungicidal products.

“Having support from the world-class experimental scientists in BEACON has allowed a synergistic approach for the bioinformatic products offered by Moleculomics, with examples of the research appearing in leading peer-reviewed journals. This not only builds external confidence in the company, but it allows real world testing of molecular predictions.”

Jonathan Mullins
CEO

For further information:
www.moleculomics.com
Company Profile

NappiCycle is a trading division of Natural UK, the largest independent washroom services and clinical waste collection company in Wales, dealing in hygiene and sanitary waste (e.g. nappies and incontinence pads from nursing and residential homes). BEACON initially contacted the Ammanford-based company to learn more about their unique and innovative process and discuss potential opportunities for new markets and applications for the company’s cellulose fibre waste stream.

Collaboration with BEACON

The safe disposal of offensive municipal waste is a widespread problem, with much of it currently being sent to landfill. However NappiCycle uses a novel hydro-recovery process to recover the plastics and cellulose material from the sanitary waste that would previously have been sent to landfill. Part of the absorbent hygiene and incontinence pads contain Rayon, which is made from wood pulp or cotton, a naturally occurring cellulose-based raw material. After processing, a clean and hygienic fraction is produced which can be re-used for new product development. Potential uses include:

- A prototype Medium-Density fibreboard (MDF) board
- A product to absorb industrial liquid spills
- Acoustic/insulation boards
- Pulp-moulded “single use” products for the healthcare sector
The initial R&D project focused on the production and evaluation of MDF boards using the fibre cellulose fraction for potential applications in the construction industry. Boards were produced using 100% recovered Nappicycle material, 50:50 recovered Nappicycle/standard MDF fibre (made from spruce chips), and control boards made from 100% MDF. The prototype samples then underwent mechanical testing to determine their dimensional stability, bending/rupture propensity and internal bond strength. The test data is still being assessed, but already the dimensional stability of the Nappicycle samples is proving favourable.

The initial response from the company on receiving the prototype sample boards has been positive and they are generating interest with potential development partners. The feedback was that the boards produced by BEACON looked more engineered and robust compared to the boards that had been produced for the company elsewhere. There are ongoing discussions with the company to progress the work. With BEACON assisting the company in their commercialisation of new products, NappiCycle will be more informed of the commercial opportunity which can help them evaluate their future investment decisions.

“Development of markets for NappiCycle’s innovative recycled materials is particularly challenging for a new company with limited R&D resources. BEACON’s independent technical assistance and appraisal of products utilising these new materials has provided an essential part of our development.”

Richard Jones
Projects Manager

For further information:
www.nappicycle.co.uk
Company Profile

Pennotec, the trading name of Pennog Ltd, is a leading industrial biotech innovator in the UK, based in Pwllheli in North Wales. The company aims to extract maximum value from biomass resources, especially waste streams, through the development of innovative, low carbon processes and technologies, and close collaboration with university scientists. Waste biomass typically accumulates as a result of numerous manufacturing activities from a variety of industries including agriculture, food and beverages, chemicals, pharmaceuticals, fuels and biofuels. Pennotec aims to convert manufacturing by-products into added value functional products whilst reducing waste to landfill cost and benefiting the environment. Pennotec have successfully delivered a number of innovative collaborative projects that address significant challenges in the bioeconomy, through successful funding, and access to scientific support and pilot scale equipment.

Collaboration with BEACON

Pennotec has collaborated with BEACON on a number of different projects over the last few years, and has gone on to win numerous innovation grant awards, which have enabled them to grow the business and create highly skilled employment opportunities in Wales. Pennotec are now collaborating with a major UK water treatment company on a project supported by the SMART Cymru programme through ERDF to develop new and sustainable water clarification products from waste for use in municipal and industrial wastewater streams. Pennotec has been also awarded an SBRI (Small Business Research Initiative) for a collaborative project to produce novel functional food fibres from surplus fruit and vegetables, which can be used to replace high calorie ingredients such as fat in children’s school meals in Wales to reduce obesity.

“With access to specialist facilities and expert support, Pennotec has been able to develop innovative processes that add value to waste and better understand the nature of the bio-materials we produce.”

Jonathan Hughes
Managing Director

For further information:
www.pennotec.com
Company Profile

Quorn is a well-known global food brand offering a nutritious alternative to meat. Quorn products are made from mycoprotein, which is derived from a fermentation process, using wheat-derived glucose. The company’s vision addresses several issues such as the reduction of meat consumption, and the promotion of healthier diets and weight management through a range of protein-based products, which enable consumers to enjoy healthier versions of their favourite everyday meals. Quorn’s carbon footprint is 90% lower than that of beef, making it a sustainable food source.

Collaboration with BEACON

Quorn were initially introduced to BEACON by way of projects undertaken with a Wales-based partner, who demonstrated to Quorn the potential value of working with BEACON and accessing the capabilities available within the biorefining pilot facility. BEACON has since worked with Quorn on a number of collaborative projects (using NIBB proof of concept funds), primarily looking at valorising their process liquor. The preliminary projects have all helped towards the development of an Innovate UK project led by Quorn, which includes BEACON and a wide range of additional partners. The project focuses on the production of a flavour-enhancing final product which would allow salt levels to be reduced in processed meals and snack foods.

“The BEACON biorefining pilot facility has provided excellent process facilities and support that has allowed us to investigate alternative process options for realising lost value in our waste streams.

Collaboration with the BEACON team has led to a number of successful grant applications and helped build great links with key research partners.”

Muyiwa Akintoye
Head of R&D

For further information:
www.quorn.co.uk