



# ENVIRONMENTAL WASTE MANAGEMENT CASE STUDIES

Waste in the wrong place can be a hazard to human health and nature. Some types of waste materials can be challenging to contain or break down, so innovative solutions are needed to manage waste in a way which prevents any harm to people or the planet and enables the development of a fully functioning circular economy.

The below businesses received funding through the Mid Wales Challenge Led Launchpad programme to progress environmental waste management projects.

## RHIANNON REES, PLANTSEA

### What is PlantSea's product or solution?

PlantSea is developing 100% biodegradable, soil-enriching products to tackle the mounting problem of agricultural plastic waste. The bio-tech start-up is testing a seaweed-based bioplastic to replace agricultural plastic sheets, also known as mulch film, used to increase crop yields.

Currently, most plastic mulch films go to landfill, and although there are some biodegradable films available that are made from starches, unless they are ploughed back into the soil and left for one year, they do not degrade.

Seaweed is a very versatile, sustainable plant, which is readily available in the ocean. It grows 20 times faster than trees and it absorbs huge amounts of carbon so an increase in seaweed farming will benefit the planet too.



### Why is this development important?

A staggering 45,000 tonnes of agricultural plastics were reported to be produced every year in the UK, according to a Department for Environment, Food and Rural Affairs (Defra) 2010 study.

The Environment Agency has highlighted agri-plastic waste as a concern, because much of the 71% of land dedicated to farming in the UK is close to watercourses. An environmentally friendly, biodegradable alternative to agri-plastic could vastly reduce plastic pollution pressures in soils and rivers.

### How have you benefited from the Mid Wales Launchpad funding?

The Mid Wales Challenge Led Launchpad programme has helped us to do more research with our University partners so we can learn develop our polymers.

We also received funding for a research assistant who aided with investigating polymer development and manufacturing systems. This brings us significantly closer to our goal to make seaweed-based bioplastic mulch film readily available to farmers and for it to be competitively priced.

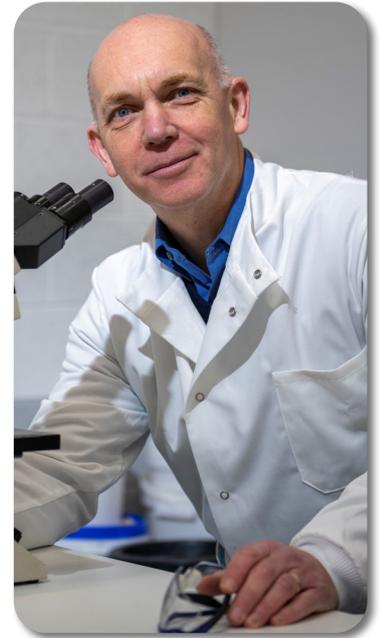


# JONATHAN HUGHES, PENNOTEK

## What is Pennotec's product or solution?

Slurry can be a sustainable fertiliser. However, the liquid component of the slurry presents a pollution risk. Pennotec has developed a way to separate slurry into solid and liquid components using a natural material derived from seafood shells. This reduces the volume of slurry to be stored, making storage until application onto land more manageable for farmers. The fibres present in shells, called chitosan, do not cause any contamination and decompose naturally in the environment.

In addition to the separation technology, Pennotec has developed a way of using seafood shells to absorb nitrates and phosphates from the slurry liquor, which is the liquid portion of the separated slurry. The extracted nutrients can be used as an alternative to phosphate or nitrate manufactured fertiliser, leaving relatively clean water which can re-enter watercourses without causing harm to the environment.



## Why is this development important?

There are narrow time limits placed on farmers as to when slurry can be applied to the land as a natural fertiliser, meaning it needs to be stored on-farm until that time. Although there are chemical methods of separating solid from liquid components of slurry, these can contaminate the solid component reducing the quality of the product as a natural fertiliser and soil enricher.

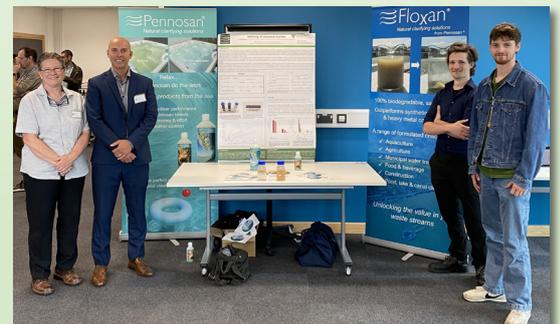
Furthermore, once the components are separated, the slurry liquor is potentially polluting in its raw form, as the nitrates and phosphates can leach into watercourses. By absorbing the nitrates and phosphates onto a shell surface, there is an opportunity to apply these directly to crops as needed, while the cleaned liquid can be released without causing damage via pollution.

## How have you benefited from the Mid Wales Launchpad programme?

The involvement in the programme enabled us to access livestock slurries through cooperation with Aberystwyth University's farm, plus other farms they are working with.

We were concerned that in addition to absorbing the nitrates and phosphates, we might be absorbing other materials from the liquor as well. The funding has allowed us to work with analytical chemists to check what else, if anything, is being absorbed during the process. It also enabled us to recruit and support a skills builder trainee, who was trained to complete some of the analytical work.

I would absolutely encourage others to apply to the programme. It's been invaluable using the funding to facilitate collaboration and the business advisory support has been tailored to our business, enabling skills development in the team.



# CARLOS KAO, LOHAS RECYCLING

## What is Lohas Recycling's product or solution?

Lohas Recycling provides a rapid waste management solution. Enzymes can be used to break down different types of organic matter, whether that's food waste or farmyard manure waste. The Mid Wales Challenge Led Launchpad funding was used to develop our solution for poultry manure upcycling and turning it into high quality fertiliser.

Using the innovative enzymes to break down chicken manure litter is the quickest method to make fertiliser from poultry manure, as it takes just three hours, without any loss of nutritional content. This produces a high-quality fertiliser.



## Why is this development important?

The traditional method of breaking down poultry manure to produce fertiliser – composting – takes four to six months to complete. It requires a large amount of space, releases greenhouse gases throughout the process and leads to loss of valuable nutrients. The rapid waste management solution saves time, space and produces a nutrient-rich fertiliser quickly and relatively cheaply.

Furthermore, poultry manure comes with its own set of challenges. There is a risk of disease spread via pathogens in the manure and it is also very smelly. The three-hour fermentation process kills pathogens and removes the odour, which can make the environment around poultry farms both safer and more pleasant.

## How have you benefited from the Mid Wales Launchpad funding?

The Launchpad programme helped us to scale up our demonstrations. Our original demonstration machine had capacity to recycle 10 kg of waste, which showed the enzymes at work, but farmers are always keen to see the processing machine at the scale they would use on-farm. The funding enabled us to use a 2-tonne machine on the demonstration site. This size of machine can process 15-tonnes of poultry manure a week, which meets the requirements of a poultry farmer keeping 30,000 birds.

We were also able to hire local people for the duration of the project. They were able to conduct market research, support with packaging and product label design and with selling via the local farm network.

Participation in the programme has allowed us to link to the reality of what the market needs, scale up our poultry manure up-cycling demonstration and extend our collaborative network by opening up conversations with local government. I would recommend it to others with an innovative business idea as the support has been integral to bringing our poultry manure waste solution closer to market.



# TONY POWELL, ENVIRO365

## What is Enviro365's product or solution?

The AquaSense device contains sensors for measuring the concentration of nitrates or phosphates in water. The devices can be used to prove whether phosphates or nitrates in a watercourse are coming from an area of land, by placing one upstream and one downstream and assessing the difference in concentrations.

The devices provide an affordable way to monitor nutrient concentrations in water. The Launchpad funding was used to develop a way of continuously monitoring using long range WiFi, called LoRaWAN technology, to transmit the data from the water to a dashboard which can be accessed from anywhere.



## Why is this development important?

Concern around pollution in rivers is preventing planning permission being permitted in areas of Wales. Pollution in rivers is generally accepted to be caused by agricultural run-off and wastewater released into rivers and streams. This can include eroded soil and excess nutrients like nitrate and phosphate.

Currently, there are few tools available to farmers and landowners to measure water quality. Being able to measure nitrate and phosphate concentrations provides farmers with the ability to prove whether nutrients are coming from their farm. For example, sensors can be placed at the top and bottom of a sloping field, to assess whether more nutrients are coming off the field than are entering at the top. Having reliable measurement tools empowers farmers to make changes to prevent run-off, as they can prove they are working.

Likewise, landowners can now receive funding for absorbing nitrates in wetlands. Measurement is essential to validate captured nitrates and allow the nitrate exchange payments to work in practice.

## How have you benefited from the Mid Wales Launchpad funding?

The Launchpad funding enabled us to develop the system for using long range Wifi to show the data in graph form on a dashboard which can be accessed from anywhere. As our devices are not off-the-shelf equipment, this involved significant programming effort, which we were able to complete within the three-month project.

AberInnovation offered us a student, who was able to support with the sales and marketing, allowing us to develop and set a target to at least triple the number of customers by the end of 2022.

The advice on understanding grant funding was invaluable. I'd recommend it to anyone – for us, £25,000 funding to develop a project, with added networking opportunities was a no-brainer.

