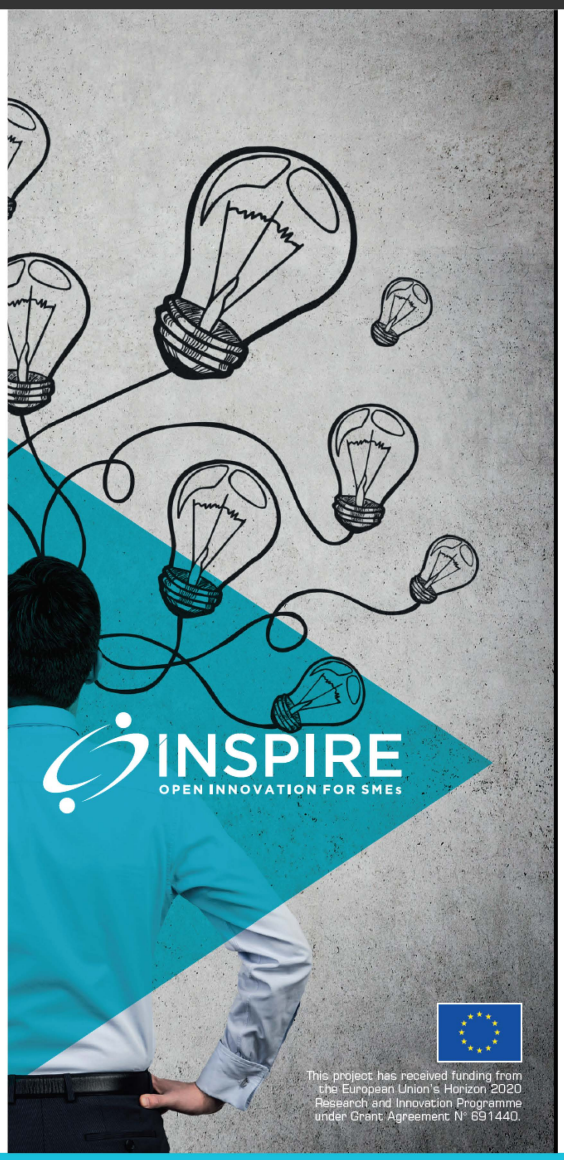


# ENANTIS

Czech Republic, www.enantis.com

In this market push approach a university spin-off company collaborated with a university lab and another small company to bring a biosensor to market. A lack of understanding of the market and the absence of a lead user in the partnership led to a disappointing impact on the business

## Executive Summary

Enantis, a spin-off company from Masaryk University in Brno (Czech Republic), was established to commercialize the university's biotech research results. One of the first projects was EnviroPen, a biosensor for detecting water contamination. The technology was licensed from Masaryk University and the product developed together with Photonic Systems Instruments, a specialist in optics, electronics and software developing innovative, high-end scientific instruments. However, the end user was not involved in the development and it happened that the design was not very convenient, and EnviroPen had to be redesigned. The company later focused on another project in which they tried to avoid the mistakes they had made in commercializing their first product.

CASE N°:EE15

SECTOR: BIOTECHNOLOGY

TECH INTENSITY: HIGH-TECH

LIFE CYCLE STAGE: START-UP

INNOVATION VECTORS: PRODUCT

01 PARTNERS: PSR, OTHER SME

KEYWORDS: Environment, sensor, hazardous substances

- BACKGROUND FRAMEWORK
- INNOVATION CHALLENGE & MARKET OPPORTUNITIES
- OI TRAJECTORY
- BUSINESS IMPACT
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Enantis

# BACKGROUND

Enantis is a Czech R&D company which provides consulting and development services in the field of enzyme technologies and protein engineering for biomedical, environmental, agrochemical and military-defence applications. Enantis manufactures its own products based on dehalogenase enzymes: whole-cell and enzyme catalysts, decontamination kits, biosensors and detection strips, optically pure chemicals and fluorescence probes. Their clients are pharmaceutical, biotechnological and military-defence companies.

The origin of the company is to be found in Loschmidt Laboratories at Masaryk University. In 1994 Loschmidt Laboratories started research on haloalkane dehalogenases. Soon the researchers found that their knowledge could be transferred into practical applications. In 2004 the laboratory received key patents on enzymatic production of optically active substances and the enzymatic detoxification of mustard gas.

In 2006 two researchers, Zbynek Prokop and Jiri Damborsky established Enantis, the first biotech spin-off from Masaryk University to commercialize technologies developed by Loschmidt Laboratories. In 2011 Enantis began working on EnviroPen, the optical biosensor for detecting water contamination. In 2013 the company developed fermentation technology for large-scale production of haloalkane dehalogenases used for decontamination purposes. However, in 2016 Enantis started focusing on the development and marketing of stable fibroblast growth factors (FGFs) for medical, personal care and research use. The shift was stimulated by winning a Horizon 2020 SME Instrument grant {phase I and phase II).

Enantis is working on its SMEi project 'Industrial Production of Stable Fibroblast Growth Factors for Regenerative Medicine' aimed at developing stable fibroblast growth factors, a protein used, for example, in stem cell research. FGFs are currently being tested therapeutically for use in cancer treatment, regenerative medicine, as well as in cosmetics. The expected outcomes of the project will be a universal protein engineering platform for designing stable FGFs and the process for manufacturing them. The added value of the innovation compared to existing solutions will be unprecedented stability, dramatic production cost reductions and the absence of harmful additives.

# INNOVATION CHALLENGE & MARKET OPPORTUNITIES

Enantis was established with a vision of transferring knowledge and technology from science into practical applications and launching modern biotechnologies capable of achieving long-term sustainability. It is a 'science push' approach when technology looks for an application. The key challenge with this approach is understating the market and finding a suitable strategy to enter and address its needs. Finding funding for product development and market entry is also a challenge.

In the case of the EnviroPen project, Enantis relied on scientific excellence and societal needs to have a clean environment. Subsequently, they had only limited success with their EnviroPen on the market.

The researchers at Enantis first saw an opportunity in solving contamination with hazardous substances through monitoring and removal. Czech Republic has a number of sites in need of monitoring, e.g. landfills and contaminated ground. Later it became evident that there were few paying customers in Czech Republic for this kind of service.

# OPEN INNOVATION TRAJECTORY

## Concept development

EnviroPen was designed to detect surface and groundwater contamination and to monitor the progress of bioremediation and wastewater treatment. The concept was based on three premises: (1) Harmful compounds released into the environment represent a significant ecological problem, halogenated hydrocarbons being one of the largest contaminant groups resulting from their extensive use in agriculture and industry. As they are resistant to degradation and have adverse health effects their monitoring is necessary. (2) Traditional methods of collecting samples have disadvantages in that they are not suited for in-situ measurement, are time consuming and expensive and require highly qualified personnel. (3) There is a need for simple

and rapid devices which are capable of automated and more direct analysis.

From a technological point of view, EnviroPen follows a known sensing concept, but offers high sensitivity which is based on specific activity of haloalkane dehalogenase enzymes with a target analyte, coupled to a fluorescence dye indicator immobilized on the biosensor tip.

However, this concept was not validated by potential clients, and the market was not properly researched.

## The development process. IPR and competition strategy

EnviroPen was developed in a collaboration between Enantis, Loschmidt Laboratories, and Photon System Instruments, a hi-tech company located in Brno (Czech Republic). PSI specializes in the design and manufacture of custom-made, high quality instrumentation for research in biological sciences. The development work focused on engineering tasks: the optoelectronic instrumentation part was fine-tuned to be more sensitive and simple, miniature and inexpensive, e.g. the photomultiplier in the sensor was replaced by a photodiode and the optical fibre by a plastic stick.

The development targets included short measurement time, i.e. 1 minute, which is necessary for determining a target analyte and the low cost of the analysis, i.e. €1 per sample. EnviroPen was validated for the detection of several significant halogenated pollutants: 1,2-dibromoethane, 3-chloro-2-(chloromethyl) -1-propene, 1,2,3-trichloropropane and 1,2-dichloroethane.

However, as they did not involve the lead user in the development phase, they had to re-design the instrument later. For example, it turned out that the safety regulations require that the monitoring personnel use special clothing (suit, shoes, mask, gloves), and it was not very comfortable to use the sensor in these conditions.

The open innovation collaboration licensed the patent from Masaryk University.

The USP of the sensor is based on its technical characteristics. EnviroPen is easy to operate under field conditions without requiring the collection and transfer of samples to a laboratory as is usual for standard chromatographic methods. Detection is possible within 1 minute of measurement time. The cost of one analysis is about €1 EUR, which is 100 times lower than for standard methods.

## Commercialization and follow-up

The hardware production of EnviroPen was rolled out by PSI. Enantis focused on biocomponents localized on the tip (engineered enzyme dehalogenase and fluorescence pH indicator). The trademark EnviroPen was registered by Enantis. The sensor was validated in Pancevo, a town near the eastern banks of the river Danube where hazardous substances have been released into the environment. At the petrochemical plant, 2 100 tonnes of 1,2-dichloroethane leaked into the soil and seeped into a wastewater canal that flows into the river Danube.

As a result of this project Enantis does not intend to change its organizational structure; on the other hand they are envisaging arrangements with their partners for manufacturing and sales.

EnviroPen is marketed by Enantis. They offer a product for detecting surface and groundwater contamination and for monitoring progress in remediation and wastewater treatment. It substitutes standard chromatographic methods and has clear advantages, i.e. easy to operate under field conditions without requiring the collection and transfer of samples to a laboratory. Detection is possible within 1 minute of measurement time and the cost of one analysis is roughly €1.

However, the market entry strategy (which targets, when and how) was not clear. The usual promotion channels are through participation in conferences and via their website. There is the potential to use the partners' sales channels, but it seems that this opportunity is not used effectively.

# BUSINESS IMPACT

The major outcome of the OI collaboration has been the registration of the EnviroPen trademark by Enantis.

The company realised that it has to improve its go-to-market strategy, i.e. research the client problem properly and assess whether the solution fits it, assess the market size, obtain access to clients, etc. Theim pact of the project on the business is not known exactly at this stage.

# LESSONS LEARNED

This case is not considered as a success by the company itself – they expected better financial results. There are similar cases where companies (usually university spin-offs) seek to transfer research results to market. Usually the founders are researchers, which can explain their downstream weaknesses (as also demonstrated by this case), i.e. customer knowledge, marketing, distribution, etc. Enantis realized their mistakes and tried to avoid them in their next project.

In the meantime, they have appointed a new CEO. Part of their learning has been to involve the Faculty of Economics of Masaryk University in their market research. Nevertheless, this particular case does not provide insights into some solutions, e.g. how to involve paying customers and how to build the sales channels. The SME managed relatively easily to involve PSI in the development, but failed to use their sales channels (maybe because they have a different target market).

## Main lessons learned:

1. Marketing research is essential before engaging in a commercialization project.
2. Understanding the customer and their problem, other options, etc. is important at the concept phase. The need to understand the customer will come up sooner or later, but it has a cost.
3. The solution (to a customer problem) should be tested at the concept phase.
4. A market entry strategy has to be developed (for example, in their SMEi project Enantis decided that it would be easier to enter the cosmetics market, rather than the medical market).