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The Impact of the Lettinga Award 2004 on the Anaerobic Wastewater Treatment Sector in Portugal

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Abstract Due to bad experiences in the past, anaerobic treatment got a bad name in Portugal. The Lettinga Award awarded to Madalena Alves in 2004 had a definite positive impact on the Portuguese anaerobic wastewater treatment sector. It initiated a vicious circle of research & development leading to the development of innovative anaerobic technology. Up to now it has resulted in an international patent, two national innovation prizes, one PhD grant, € 75,000 in co-subsidies for the pilot plant construction and a company start-up (AMBISYS, S.A.). The media attention attached to this Award, promoted by the communication office of the University of Minho, resulted in an improved overall image of anaerobic treatment technology in Portugal.

Keywords

INTRODUCTION

Anaerobic treatment technology has had a bad name in Portugal since its introduction. Several industrial anaerobic treatment systems have been started up since the beginning of the eighties. A big part of them have resulted in operational disasters. This was not so much due to bad process design, but more due to bad follow-up after treatment plant erection. Due to incompetence or no operational support from the technology providing companies anaerobic treatment technology gradually got the name of being unreliable in Portugal.

In September 2004 a research group lead by Madalena Alves received the second Lettinga Award for a proposal to build a 1 m³ pilot sequencing batch reactor (SBR) to show the feasibility of anaerobic long chain fatty acid (LCFA) conversion to biogas. The idea was to operate the SBR using real dairy wastewater. The Lettinga Award put Portuguese research on anaerobic wastewater treatment in the spotlight in Portugal itself. Furthermore, the authors think that it started a vicious circle of continuous anaerobic technology development that may put Portugal on the map as a provider of innovative anaerobic technology. This paper is to show that this vicious circle has recently been closed.

THE BEGINNING

The Lettinga Award significantly contributed to the recognition that Madalena Alves' research became better known and as front running in the field of anaerobic LCFA conversion to biogas. Research on the sequential treatment of synthetic dairy wastewater containing high concentrations of LCFA, showed that the actual treatment cycles could be extended without losing treatment efficiency. This was considered as an indication that continuous anaerobic treatment of LCFA containing wastewater was a possibility. In June 2005 this led to a novel reactor concept for the high rate treatment of LCFA containing wastewater. A patent was applied for in November 2005 (**PCT/PT2005/000020**). Furthermore, the research group participated in two main national innovation competitions, namely the Banco Espírito Santo Innovation Award 2005 and the National Environmental Innovation Award 2006. Both ended up in a first prize and extended national media coverage. Consequently, the Environmental Biotechnology Lab at the University of Minho became visible to the private sector. It acknowledged that wastewater treatment competence in general and

anaerobic wastewater treatment competence in specific residues at this lab and could be used to their benefit.

NEW PROJECTS & FUNDS

A new challenge arose: the novel reactor design had to be taken from concept to pilot and finally full-scale. To be able to do this a PhD proposal was set up with this specific goal. Initial tests would be performed on lab scale. The next step would be pilot testing on several kinds of industrial wastewater containing LCFA. Furthermore, the reactor design optimisation would be supported through hydrodynamic characterisation using computer fluid dynamics (CFD).

Through lab-scale experiments the design was considerably improved. The current reactor design will be used for the pilot reactor. The patent application for the novel reactor concept made it possible to apply for Portuguese prototype development funds. This way, € 75,000 became available for the construction of a pilot plant to show the feasibility of the reactor concept. Including the Lettinga award a total budget of € 100,000 was obtained. The funds are currently being used to construct a transportable containerised pilot plant including, besides the 1 m³ anaerobic reactor, a buffer tank for wastewater equalisation, dosing equipment for pH control and nutrient dosing and analytical equipment. This way it is possible easily transport the pilot plant to several industrial sites for on-site testing.

The media attention led to several consultancy projects to provide solutions to industrial wastewater treatment problems. Due to this development and the fact that the reactor development was on its way, a new possible step appeared at the horizon: Company start-up as to professionalise consultancy services and to put the novel reactor on the market.

On the other hand another important project (CEBIO – Centre of Competence on Bioenergy) devoted to promotion of bioenergy in Portugal was funded. Three main areas are concerned in CEBIO: Biofuels, Biogas and Biomass. Promotion of biogas markets in Portugal will be considered in CEBIO and a Brokerage event and an international congress will be organised between 6 and 9 April 2008 in Guimarães, Portugal.

COMPANY START-UP AND JOBS CREATION

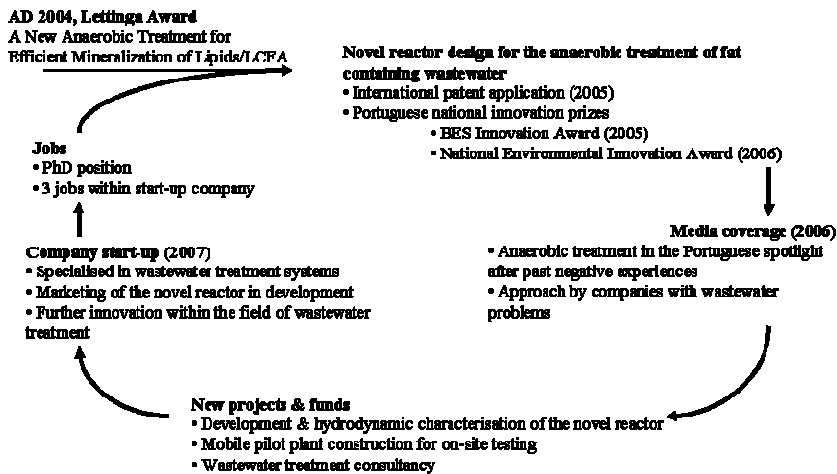
In May 2007 a company was started up. Two main goals were set:

- Provide solutions to wastewater treatment problems within the industry. Preferably the solutions are based on anaerobic technology as to minimise energy use;
- Provide technology for biogas production from organic solid materials, slurries and animal manure.

The name of the company is AMBISYS, S.A. and currently employs 4 people. It will be the sole licensee of the high-rate reactor for LCFA conversion to biogas that is currently being developed. This will require an investment from the company in innovative technology. Consequently, it is essential to the company's survival that innovation will continue. Therefore, there is intensive interaction with the University of Minho. Relationships are also being built with other innovative companies and research institutions. This is Ambisys' way to ensure continuing innovation. Thus the vicious innovation circle initiated by the Lettinga Award is closed. At this moment the first steps are taken for the next patent application.

Figure 1 shows the graphical representation of the vicious circle.

Lettinga Award Impact On Anaerobic Wastewater Treatment R&D in Portugal



CONCLUSIONS

The Lettinga Award initiated a cycle of anaerobic treatment innovation in Portugal. The direct and indirect results of the Lettinga Award had a relevant and positive impact on the biogas acceptance in Portugal.