



## DeBugger

# Green Energy from Farmyard Manure and Human Waste?

Using farmyard manure and human waste as an energy source for fuel or as a supplement to wind and solar energy and at the same time as a fertiliser in agriculture may sound like science fiction, but DeBugger aims to do just that. The DeBugger project was launched in 2013 and is being carried out by Outotec Sweden and Germany as well as the University of Stuttgart. They are working on how the energy and nutrients extracted from currently-unused human and animal biomass can best be put to purpose, while recycling the plant nutrients, nitrogen and phosphates for controlled fertilisation in agriculture. Science fiction? By the end of 2015 it may have become reality as by then DeBugger plans to have completed an extensive pilot project in Sweden. The future may be far closer than we think!

### About KIC InnoEnergy

KIC InnoEnergy is a European company dedicated to promoting innovation, entrepreneurship and education in the sustainable energy field by bringing together academics, businesses and research institutes. Our goal is to make a positive impact on sustainable energy in Europe. We do this by creating future game changers with a different mind-set, and bringing innovative products, services and successful companies to life. KIC InnoEnergy is one of the first Knowledge and Innovation Communities (KICs) fostered by the EIT. We are a commercial company with 28 shareholders that include top ranking industries, research centres and universities, all of which are key players in the energy field. More than 150 additional partners contribute to our activities to form a first class and dynamic network that is always open to new entrants and furthers our pursuit of excellence. Although we are profit-oriented, we have a "not for dividend" financial strategy, reinvesting any profits we generate back into our activities.

#### **Making an impact**

If we take 100 as the cost of any goods produced or consumed in Europe, 27% accounts for energy costs. That means that a mere 1% reduction of this cost will save €20 billion, which contributes to the sustainability and competitiveness of the European energy market.

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The team behind the DeBugger Project (from left to right): Heiko Dieter, Tanja Schaaf, Ludwig Hermann, Robert Johansson and Daniel Schweitzer



Photo by: Ewald Schnug

Thanks to the technology developed in the DeBugger project, the excessive growth of algae in waters, like in this case, could be abated

**The difficulties of using human and animal biowaste.** “I’ve worked in the fields of nutrient recycling and recovery of critical substances in the human and animal nutrient chain for over a decade,” explains project manager, Ludwig Hermann. Working for Outotec, he started developing DeBugger (Demonstration of efficient Biomass Use for Generation of Green Energy and Recovery of nutrients) in 2012. Human and animal biowaste derived from urban sewer systems and agricultural waste is usually inefficiently utilised. The reason for this is that biomass waste is more than 90 per cent water and so its energy is barely useable.

Alternatively, spreading excessive amounts of manure on fields, results in overfertilisation of soils and eutrophication (over-nutrition) of water. The direct consequence of elevated phosphate and nitrogen concentrations in inland and coastal waters is algal blooms.

### Concentrated know-how through the KIC InnoEnergy network

“At the beginning of 2013, Outotec entered into a partnership with KIC InnoEnergy. The advantages of being a member of the KIC InnoEnergy community were immediately clear to us in that we benefit from a highly specialised network, in which our partners are working on similar topics as we are,” says Hermann. Thanks to KIC InnoEnergy, Outotec and the University of Stuttgart were able to form a collaboration. Furthermore, KIC InnoEnergy’s financial support enables the project stakeholders to further develop this innovative idea into a marketable solution.

### More efficient drying systems

Engineers and researchers have met with several challenges in this project. Biomass waste that may serve as an energy source is also suitable for the recovery of the phosphates contained within it. For this purpose, a multi-level recovery chain has been developed where, in the first stage, a centrifuge or a filter press is used to mechanically separate a large part of water from the waste. The first innovation of the DeBugger project, a closed-loop

steam dryer, developed mainly by Outotec’s Swedish researchers, is designed to save at least half the energy that was previously required to evaporate the water contained in the biomass. A gasification plant represents DeBugger engineers’ second innovation. It converts dried biomass into a fuel gas, which can then be used to produce electricity or transport fuels.

“A very important step has been the development of highly-efficient drying systems. Drying is important because it makes it more feasible that waste can be easily transported or processed further. Currently, a drying plant requires 800 kWh to evaporate a tonne of water. We want to develop a system that, by intelligent use of the energy contained in the off-gas streams, requires less than half the amount of energy,” explains Hermann. DeBugger engineers plan to have the first drying machine finished and tested by the end of 2014. It is planned that a pilot plant with a capacity of several hundred kilograms per hour will go into operation at a waste-water treatment plant in Skelleftea, Sweden as early as the end of 2015. “This will be the world’s first high-efficiency drying machine for sewage sludge, farmyard manure and biomass slurries, so this stage in the project is an exciting one for all of us,” says Hermann.