LeAF Letter

Number 1, April 2003

With this newsletter Lettinga Associates Foundation aims at informing the reader on her projects, courses and other activities performed in the field of implementation of environmental protection and resource conservation technologies

Inside this issue

About Lettinga Associates Foundation

LeAF Letter No. 1 is the first electronic newsletter of Lettinga Associates Foundation (LeAF). This newsletter informs interested readers in the activities of LeAF and will be issued twice a year starting now on LeAF's birthday.
LeAF was established in April 1997 as the Environmental Protection & Resource Conservation (EP&RC) Foundation. The Foundation changed its name to LeAF on the occasion of the retirement of Prof. Gatze Lettinga from Wageningen University in April 2001, honouring him for his crucial role in the development of the so-called anaerobic high-rate technology.

LeAF stimulates research, implementation, and knowledge exchange in the field of environmental technologies that aim at sustainability both in the communal and industrial setting, i.e., minimising the consumptive use of resources while maximising its reuse. LeAF considers anaerobic treatment systems the core-technology in the foreseen sustainable concepts. In the passed 25 years a lot of scientific research has been conducted to elucidate the microbiological, chemical and technological background of the anaerobic conversion processes. By its activities, LeAF aims at increasing the world-wide acceptance of the anaerobic alternative as well as the number of practical applications.

At present LeAF has 13 employees and its activities are divided in 4 themes:
1. Anaerobic treatment technology
2. Industrial water treatment and reuse
3. Decentralised sanitation and reuse
4. Bio-energy and reduction of greenhouse gases

Obviously, in all themes, the anaerobic conversion process plays a crucial role but the actual setting of the treatment and reuse scenario largely determines the involvement of other disciplines, creating the above themes. LeAF strives to consolidate an internationally recognised knowledge centre on 'Anaerobic Treatment' and co-operates with established companies such as Paques Natural Solutions, Biothane Systems International and Royal Haskoning.

To stimulate ongoing innovations in the field of the anaerobic treatment technology, LeAF and its partners established the Lettinga Award, a prize of 25.000 Euro which will be awarded every three years, coupled to a major anaerobic event in the world, e.g. the IWA world congress on Anaerobic Digestion (see further below). In addition, a fund is established which in future will be used to supply scholarships to scientists from developing countries and countries in transition, who are interested in a short term training related to the multi-disciplinary world of the anaerobic conversion processes.

Photo: LeAF, April 2003

LeAF is a non-governmental, not for profit organisation that does not receive donor funding. The foundation earns its income from projects related to applied research, consultancy tasks, course organisations, etc.

For now I would like to welcome all readers and look forward to continue to work with you in our common field of interest.

Jules van Lier,
Director LeAF

Lettinga Associates Foundation
P.O. Box 500
NL-6700 AM Wageningen
The Netherlands
Tel. +31 (0) 317 482023
Fax +31 (0) 317 482108
Chamber of Commerce Arnhem 4103544
www.lettingaassociatesfoundation.com

LeAF

Only one decade to supply all the poor with adequate sanitation

Despite the disappointing results of the 2003 World Water Forum in Kyoto, we believe that life conditions of all the poor can be substantially improved. Provided that developing countries will be assisted with the implementation of sustainable and plain concepts for protecting their environment from pollution, this can be realised within one decade.

This may look as Utopia, but it is not. The required concepts are in fact already available and find their way to application. The focus of these concepts is on valorisation of waste(water)s, on technological simplicity, on minimisation of transport, and consequently on optimal (de)centralisation. Furthermore, the treatment technologies used are applicable at any scale and at any location. The basis of the concepts LeAF wants to disseminate, consists of biological conversion processes with high rate anaerobic treatment and digestion processes as core method. By integrating these processes in optimal settings with conventional aerobic, micro-aerobic, and anoxic biological conversion processes, but also with physical-chemical processes if desired, virtually all conditions for sustainability and robustness are met. These concepts inherently aim at 'pollution prevention' simply because dilution of concentrated residues e.g. like human excreta will be avoided as much as possible and consequently the waste of costly clean drinking water is minimised. As a result the risk of the distribution of pathogenic organisms over the environment, e.g. in surface water, is significantly reduced. Consequently the quality of the life environment, particularly for the poor, will improve substantially, enabling them to produce safe drinking water by relatively simple means and at very low cost. The poor will become self-sufficient, will also be enabled to start urban agricultural activities, and will not be faced with the huge investments for installing sewerage needed for a Western type of public sanitation.

One of the main objectives of LeAF is to assist developing countries with the proper implementation of these concepts. We will do so via dissemination of knowledge through courses and training and by providing technical assistance. So, instead of being disappointed, we believe there are reasons enough to be optimistic.

Gatze Lettinga

Platform for exchange of expertise on alternative sanitation concepts

LeAF is currently participating in a research project into alternative sanitation that is co-ordinated by Wageningen University and is financed by STOWA (the Dutch Foundation for Applied Water Research), EET (the Dutch Ecology, Economy, Technology programme) and the Dutch Ministries of Economic Affairs and Environment & Spatial Planning. Within this 4-year assignment a description and analysis of European projects with source separation is made. Information on important technical, institutional, legislative, and sociological aspects is collected by means of interviews with local stakeholders. The project includes several seminars to exchange the collected information towards interested participants.

Our current wastewater collection system is characterised by extensive dilution of the waste. Concentrated toilet wastewater, circa 1.5 litre per inhabitant per day, is mixed with flush water of drinking water quality and slightly contaminated grey water (bath, shower, washing machine, etc.) to approximately 125 litre water per inhabitant per day for the Dutch situation. Together with a similar quantity of rainwater it is transported via the sewer system to central wastewater purification facilities.

Figure: Separate water collection at house level

An alternative, source-oriented approach in which wastewater is collected separately at house level can result in a more efficient sanitation system. In this approach part (or possibly all) of the wastewater treatment can be done at local scale. The main starting point for source-oriented sanitation is the separate collection and treatment of toilet wastewater at the house level. Urine and faeces make up over 80% of all nutrients in the household wastewater, but form only 1 to 2 volume percentage of this wastewater flow. Because of its concentrated nature, it is possible to digest this so called black water locally and in addition combine it with organic kitchen wastes.

For more information contact Adriaan Mels, adriaan.mels@wur.nl or visit www.desar.info.

International course on anaerobic sewage treatment, May 19-23, 2003

The challenge to halve the number of people without safe sanitation and drinking water by the year 2015, is an enormous one. At present, in addition to the more than 1 billion people who still lack access to safe water, 2.4 billion lack safe sanitation. Financing the development of modern water infrastructure is one of the biggest hurdles

Lettinga Associates Foundation
P.O. Box 500
NL-6700 AM Wageningen
The Netherlands
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for many developing countries. Conventional aerobic sewage treatment plants require huge investments in sewage collection systems, which enable transport of the waste out of rural areas. Generally, the sewage is disposed off in rivers and surface waters, as after construction of the collection system insufficient funds remain for adequate treatment. Due to the contamination of local ground water and surface water sources, disposal of sewage is a main threat for safe drinking water.

The targets set at the World Water summit in Johannesburg can only be realised by widespread implementation of proper wastewater treatment technology. Anaerobic technology for the treatment of municipal sewage is renowned for its simplicity, reliability and effectiveness. Moreover, anaerobic wastewater treatment plants can be constructed with local materials to treat sewage on-site with recovery of the resources inherent to municipal sewage, i.e. energy, nutrients and water, reducing the overall costs.

Therefore, in co-operation with Wageningen University and IHE Delft, LeAF organises from May 19 – 23, 2003 the international short course on 'Anaerobic sewage treatment'. This course will present scientific knowledge and practical information on the application of anaerobic digestion for the treatment of municipal sewage and the recovery of energy (biogas), nutrients and water. Application of this environmental friendly technology fits in the growing interest in waste management strategies that focus on sustainability, cost-effectiveness, and resource recycling.

For information contact Sjon Kortekaas, Sjon.Kortekaas@wur.nl or visit http://www.ftns.wau.nl/lettinga-associates/courses-p.htm

Towards zero effluent in the textile industry

LeAF participates in a European research project with the overall objective to establish water saving strategies in textile finishing industries. The project 'Towards Effluent Zero' (TOWEF0) is being carried out by a consortium of eight participants from various European industries and research institutes. LeAF's role in the project concerns the characterisation and treatment of single textile processing wastewater streams, and the development of a protocol to handle the various types of water streams within the treatment and reuse scheme of the factory.

The main environmental concern in the textile industry is about the amount and the quality of the water discharged. Wastewater is generated in almost all steps during the processing of textile. The amount and composition of these waters depend on many factors, including the processed fabric and the used process. Some textile companies have already initiated the reduction of water consumption by re-using water from the pre-washing step in the secondary washing process, or by circulating the first washing water several times until the quality of the water is considered too low to reuse.

The increasing application of water re-use strategies will lead to drastic changes in the wastewater strength and composition. Also there will be an increasing need to deal with single process streams instead of mixed effluents. The TOWEF0 project attempts to achieve water saving through treatment and reuse of single textile processing wastewater streams. One of LeAF's tasks focuses on the (on-line) characterisation of these streams before and after treatment, using physical and biological parameters. Another task deals with anaerobic treatment technology as one of the selected treatment options. Finally, LeAF will develop a protocol to handle the various types of used and treated water streams within the reuse scheme of the factory.

Contact Henri Spanjers for more information, Henri.Spanjers@wur.nl

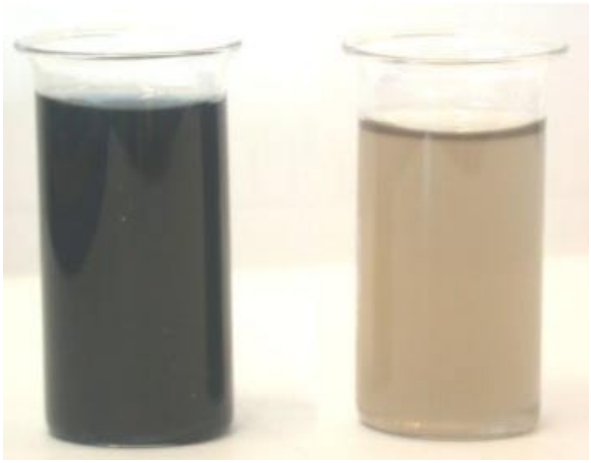

Photo: Textile effluent before (left) and after anaerobic treatment

Appropriate technology for municipal wastewater treatment in Accra, Ghana

November 2002 the wastewater treatment plant treating Accra's municipal wastewater, comprising a upflow anaerobic sludge bed reactor (UASB), trickling filter and final settling tank, was completely handed over to the Ghanaian government. The British company Taylor Woodrow Construction Ltd. constructed the plant and gained a British Consultants & Construction Bureau (BCCB) Award for outstanding work on this international project in 2002. The British and the Ghanaian government financed the whole project.

First involvement of LeAF was in 1997, when a characterisation of the wastewater was demanded for the design of the treatment plant, in order to operate for the coming 20 years. Next involvement comprised the optimisation of the design of the UASB reactor, which consists of six

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cells with a total volume of approximately 6500 m^3. In December 1999, LeAF was involved in the start-up of the plant and commenced to work on location to guide this process.

Photo: Trickling filter and UASB

The UASB was started-up using self-inoculation because of the lack of any anaerobic plants in the area. The development of the sludge bed was successful, and soon a thick black sludge layer developed. It reached its full thickness after about 9 months of operation. In a commissioning trial the plant proved that it could reach final effluent standards of 20 mg/l BOD and 30 mg/l of TSS. The project was closed with a training program for the local staff.

This project contributed to solving part of the wastewater problems in Ghana's capital. The introduced technology is extremely appropriate for conditions in Accra, which ensures long-term operation.

For more information contact Jules van Lier, jules.vanlier@wur.nl or Titia de Mes, former consultant of LeAF, titia.demes@wur.nl.

The Lettinga Award - results of the first winning project

Curious about the possibilities to apply anaerobic treatment processes? Interested in anaerobic details, available courses, or suppliers in this field? Visit www.uasb.org and you will find everything you always wanted to know about the application of anaerobic bioreactor systems for wastewater treatment and sustainable environmental technology.

This website is the result of the first Lettinga Award, granted to Prof. Jim Field and Dr. Reyes Sierra from the University of Arizona, USA. The purpose of this website is focused on transfer of know-how about anaerobic technologies, thereby making it more familiar and accepted to decision makers, engineers and scientists across the world.

The Lettinga Award is intended to stimulate innovation in the field of anaerobic technology for wastewater treatment aiming at cleaner production or recycling, sustainable development and/or resource conservation. The Award was launched at the farewell seminar of Prof. Gatze Lettinga and awarded at the 9th IWA Anaerobic Digestion congress in Antwerp, Belgium, September 2001.
The second Lettinga Award, for which proposals can be submitted, will be awarded during the 10th IWA Anaerobic Digestion congress in Montreal, Canada, September 2004.

For more information contact Marjo Lexmond, marjo.lexmond@wur.nl or visit our website.

Biogas production from algae

The pharmaceutical industry extracts many healing components from algae material. After the extraction, a residue is left. At the request of ECN (Energy research Centre of the Netherlands) LeAF has evaluated the digestion potential of this algae residue.

In lab-scale batch experiments two different types of algae, both before and after extraction, were digested. Based on the results both the digestibility and the anaerobic degradation rate were assessed and a design for a full-scale reactor was made.

The results showed that digestion of the algae residues is very well possible and that energy production easily exceeds the energy consumption that is required to elevate the temperature to improve the digestion rate. The digested material is a well-stabilised slurry with a high nutrient content that can potentially be used in agriculture.

Contact Grietje Zeeman for more information, grietje.zeeman@wur.nl.

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The Netherlands
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Fax +31 (0) 317 482108
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Colophon

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Twice a year Lettinga Associates Foundation will distribute this LeAF Letter amongst its clients, relations, and others interested in environmental technologies for waste and wastewater treatment.

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