



LeAF Letter

Number 10, January 2009

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

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Dear Readers,

First of all and on behalf of all my colleagues at LeAF, I wish you all the best for this New Year. For whatever the economic crisis might bring us, there is plenty of work and lots of opportunities that can make 2009 an interesting and challenging year.

Apart from informing you on a selection of our projects, this LeAF Letter will also address some personnel changes within our organization.

As some of you may already know, Jules van Lier left Wageningen University to accept as of January 1st 2009 onwards a full time position as professor in Environmental Engineering & Wastewater Treatment at the Section of Sanitary Engineering, Department of Water Management at Delft University, the Netherlands. Jules will remain actively involved in the LeAF projects through his (new) position in our board and of course as our scientific advisor. We regret the fact that he left Wageningen, for we highly appreciated Jules as colleague, but we welcome the new possibilities that we expect to arise from his new, more civil engineering like, environment. We wish Jules all the best in Delft and look forward to continuing our cooperation. Please also read Jules' words at the end of this LeAF Letter.

In addition, Gabi Stiebe, who served LeAF as analyst in hundreds of experiments, left LeAF and found herself a new position at the department of Environmental Technology. We thank Gabi for her dedication and we hope her new position brings her some ease.

Jana Bartackova, who had a temporary employment with LeAF a year ago, is now again employed as successor of Gabi. With Jana, we welcome an enthusiastic and highly skilled colleague who is eager to tackle the sometimes complex experimental projects.

We are happy to announce that Els Schuman, recently graduated in Environmental Technology at Wageningen University, has accepted a full time employment as researcher/consultant. Els will be involved in projects within both the anaerobic technology (AnTech) group and the decentralized sanitation and reuse (Desar) group. Given her outstanding performance as MSc student (which, in my position as study advisor of Wageningen University, I was able to monitor) we expect Els to quickly develop into a very valuable colleague.

We are also very pleased that Katarzyna Kujawa accepted a part-time job as project leader in the Desar group which she combines with a part time job at the Department of Environmental Technology. Katarzyna has built up a long track record in the area of wastewater and sanitation technologies during her cooperation with our Desar frontrunner Grietje Zeeman.

We would like to complete our team with a (full time) Dutch speaking project leader Decentralized Sanitation, for the number of projects and opportunities in this area is still growing. Please check our website for the text of the vacancy (in Dutch, due to the projects with Dutch Water Boards and other clients) or contact me for further information (marjo.lexmond@wur.nl).

Marjo Lexmond
Managing director

NEWEN – Cooperation and capacity building in the Balkan

LeAF has successfully initiated and is now the coordinator of the NEWEN program. The main focus of the program is the development of a network of universities in the Western Balkan region to contribute to environmental capacity building at these universities and to strengthen the cooperation between Western Balkan and Dutch universities.

This program is carried out within the framework of the *Regional program on Environment Western Balkan* of the Embassy of the Kingdom of the Netherlands in Belgrade.

Universities from Bosnia Herzegovina, Serbia, Montenegro, Albania, Kosovo and Macedonia are participating in the program. The Dutch partners, besides LeAF are Wageningen University, Unesco-IHE Delft and VU Amsterdam.



The Western Balkan region suffers from environmental problems like heavily contaminated sites as a result of industrial and mining activities, a serious lack of appropriate wastewater treatment facilities and insufficient quantity and quality of potable water. The majority of these problems is caused by outdated industrial facilities and the lack of an integrated approach to solve the problems. Also, events in the recent history of the region and the complex social-political situation determine the environmental degradation. Currently, there is not enough capacity to address these problems.

The main objectives of the NEWEN program are to:

- Contribute to environmental capacity building at the universities in the Western Balkan through training of university staff, curriculum improvements, and via MSc scholarships for BSc-graduates of the universities.
- Improve information exchange and cooperation between the project partners
- Develop future research and training programs
- Analyze problems on a few selected hot spots and to develop strategies and policies for these hot spots.

LeAF also coordinates the work package dealing with the regional networking and capacity building. The program has started in October 2008 and will run until the end of May 2011. The total budget of the NEWEN program is 2.5 million Euros.

For more information send an e-mail to Darja Kragic (darja.kragic@wur.nl) or check the NEWEN-website: www.newenproject.org.

Anaerobic course held in Merida, Mexico November 2008

A four-day international course on the design, operation and maintenance of anaerobic upflow reactors was held in Merida, Mexico, in the period of 10-13 November 2008. It was organised by José Collí Misset from the Mexican company CITRA, who invited LeAF to come to Mexico. From the side of LeAF it was Henri Spanjers who was involved in the organisation, and Jules van Lier and Lemke Bisschops who gave the course. The course, titled "Curso internacional de diseño, operación y mantenimiento de reactores anaerobios de flujo ascendente" was held in Spanish and was attended by around 20 participants, mainly from Mexico, but also from Colombia and Costa Rica.

Many different topics were discussed, ranging from biochemical and microbial background information on anaerobic digestion processes to practical examples of operation and problem solving. Reactor technology, design and start-up were also important aspects, and a practical design exercise was included. The focus was on

industrial wastewater treatment (with special attention for the food industry), but elements specific to domestic sewage treatment were included as well. The participants were very enthusiastic and pleasant to work with, and because they were from quite a broad range of professional backgrounds, topics were analysed with different views.



On the last course day, the company DAICOS facilitated a field trip in Merida to visit different anaerobic treatment systems of their design. It was good to see that anaerobic treatment is increasingly applied in Mexico, also for the treatment of domestic sewage. Hopefully this course contributed to stimulating the application of anaerobic technologies and to improving the experiences with existing installations. Because of the good experience in Merida, CITRA and LeAF are going to look at the possibilities of organising a second course in the second half of this year, again in Mexico and completely in Spanish.



For more information on the courses LeAF can provide, please contact Henri Spanjers (henri.spanjers@wur.nl).

Manufacturing fertilizer from human urine in the Betuwe

Pregnant women and (portable) toilet pillars ("plaszuielen") are the first sources of the enormous amount of urine that will be converted into fertilizer in Tiel, The Netherlands. Waterboard Rivierenland in Tiel and GMB are carrying out a pilot scale test in Tiel to evaluate the possibilities of harvesting fertilizing compounds from urine. The system is designed to treat up to 1 million liters of human urine in six to nine months. This is the first time that the treatment of urine with the aim of regaining the nutrients is applied at this scale. The urine is hydrolysed and then the fertilizers are formed through physicochemical processes. The project aims to evaluate whether

such a plant is energetically and economically feasible at such a large scale. LeAF and STOWA are involved in the project as research and knowledge partners.

Urine only makes up for 1 % of the total urban wastewater volume, but it contains approximately 80% of the total amount of nitrogen and 50% of the total amount of phosphorous in urban wastewater. Separation at the source makes the recovery of these nutrients more efficient. Normally, we dilute our urine (around 1.5 litres a day) while flushing our toilet. The recovery of these nutrients is all the more important since natural sources for phosphate are running out quickly. The nitrogen and phosphorous are recovered as struvite and ammoniumsulfate. Both compounds are starting materials for artificial fertilizers.



Portable toilet in the Netherlands

(Source: www.wikipedia.org; picture by Guus Bosman)

Floating water treatment systems in surface water bodies

Approximately two years ago Bright Water Company (BWC) in Huizen asked LeAF to assist them in the development of a new floating water treatment system for closed or semi closed surface water bodies. LeAF advised BWC on possible ways to operate systems in order to meet the demands for surface water quality. The small scale systems may be linked to form bigger units. They have been tested in existing surface waters (swimming pool and marina) last summer and the results were very promising.

The floating water treatment systems are filled with marsh plants and carrier material. The pump that is used to pass water through the system may be powered by solar energy. Excess nutrients and small particles are removed from the surface water via a combination of biological and physicochemical processes. The biological removal of nutrients is induced by the plants, bacteria in the treatment system and bacteria naturally present in the surface water that settle in the system. Different combinations of filling material take care of the sorption of nutrients. LeAF has carried out laboratory tests to evaluate the efficiency of different filling materials for the removal of nutrients.



Floating water treatment system

Picture courtesy of BWC

For now a large part of the urine that is ultimately (at least partially) transformed in what is now called "Betuwse Kunstmest" is delivered by Schering-Plough (Moeders voor Moeders) in Oss. This company extracts the fertility hormone HCG from the urine of pregnant women and thereafter the urine is put at the disposal of the project in Tiel where nitrogen and phosphorous are removed from this "waste"stream. Normally Schering-Plough would dispose of the waste urine through the normal (wastewater treatment) channels.

At a later stage also other N- and P-containing waste streams will be treated, e.g. hospital wastewater. In that case the fate of medicines and hormones has to be assessed first.

The results of the project will become available to the public by the end of 2009.

More information: Miriam van Eekert (miriam.vaneekert@wur.nl)

Recently, BWC sold two filters to waterboard "De Dommel". They will be testing the systems in two ponds that suffer from excess nutrients resulting in the presence of blue-green algae. The treatment systems will be monitored during the summer of 2009. LeAF was involved in setting up the monitoring plan for the wastewater treatment systems and will assist BWC in the evaluation of the results.

More information: Miriam van Eekert (miriam.vaneekert@wur.nl)

LeAF- the lab

Laboratory testing is one of the specialities of LeAF. Results of these tests are used to evaluate the performance of waste or wastewater treatment plants and as part of the decision-making process for the selection and design of

the most appropriate technologies for treatment of a specific waste or wastewater stream.

In the past years LeAF has carried out a wide variety of these laboratory tests. We like to think along with the client and always try to define the best laboratory set-up to obtain high quality results. Most of the time this means that the testing is really tailor-made. The tests may be carried out at different scales varying from 100 milliliter to almost 10 litres, and different modes of operation. Both batch tests and dynamic reactor tests are possible. Due to the close collaboration with the sub-department of Environmental Technology we have the capacity for the analysis of a wide variety of parameters and access to microscopes.



Continuously Stirred Tank Reactors

Examples of tests that we recently carried out are given below:

- The assessment of the stability of digestate from digestors.
Often the digestate still contains valuable energy which is released in the form of methane when the appropriate conditions are applied. LeAF is currently developing a quality system for these digestates. In this way we can provide our clients with information on the performance of their digester.
- Biodegradability of wastewater from industries.
Wastewaters may be valuable sources of energy provided the right conditions are applied. LeAF is able to assess the biodegradability of wastewater constituents under a variety of conditions. These studies may be combined with a desk study.
- Biogas production from solid waste or wastewater.
What is the maximum amount of biogas (and/or methane) that is produced from a certain waste stream, e.g. from a prospective cosubstrate for the digestion with manure. LeAF uses a standard inoculum for these tests that will render a maximum production of gas.
- Activity tests
How active is the anaerobic or aerobic sludge or how active are specific groups of bacteria in the sludge?
- Toxicity tests
Anaerobic bacteria are in general more sensitive towards toxic compounds. With a

standard anaerobic sludge or with any sludge that the client would like to evaluate the toxicity of wastewaters or specific constituents in a wastewater can be evaluated.

- The biodegradation of xenobiotic compounds in contaminated soil.
To evaluate the possibilities of in situ biological remediation of contaminated soils and/or groundwater we can assess the biodegradation of specific compounds in soil.

Please contact Miriam van Eekert (miriam.vaneekert@wur.nl) or Iemke Bisschops (iemke.bisschops@wur.nl) for more information on any of the tests mentioned above or for other laboratory work you may require.

Hybrid Distance Learning in Ethiopia

In many countries there is a shortage of trained staff in the water sector. This is also the case in Ethiopia. The problem with the training lies mainly in the difficulties that people experience when they want to take a course. In most cases they have to leave their job, which is often problematic especially in remote areas. Taking a course that is (partially) provided through the internet with assistance of capable staff via the internet, e-mail or through group meetings in the area could be a solution. By setting up these kind of courses a contribution to an increase in water sector capacity could be achieved also in remote areas, where qualified staff is needed the most.

A consortium of Metameta, IRC and LeAF developed training modules on "Water Quality" and "Urban Sanitation and Introduction to Waste Water Treatment" through Distance Learning in cooperation with the University of Addis Ababa. The project was sponsored by Partners for Water and carried out in cooperation with Addis Ababa University in developing, organizing and testing the two distance learning modules. The courses were set up for the internet, but because of the limited access to the internet, the content of the courses with reference material was also made available on CD-ROM.

The courses were set up and tailor-made to fit the situation in the Ethiopian water sector. Thereafter, local trainers were trained to get acquainted with the course contents, pedagogic methods and tools to reach possible participants in the distance learning courses. LeAF was happy that Look Hulshoff Pol was able to train the local trainers in Ethiopia. The courses are now implemented in the Ethiopian water sector.

Information:

Darja Kragic-Kok (darja.kragic@wur.nl)
Miriam van Eekert (miriam.vaneekert@wur.nl)



Jules van Lier departs from WU - ETE

Dear colleagues and friends,
I recently left the sub-department of Environmental Technology (ETE) for taking a new position as full professor at Delft University of Technology. This change is relatively short after my appointment as extraordinary professor in the field of Anaerobic Treatment for Reuse and Irrigation which was effective from 1-10-2005. This 0.4 extraordinary professor position was mediated by LeAF and financially supported by the companies Paques, Biothane-Veolia, Royal Haskoning and Shell. But my involvement and dedication to WU-ETE dates back some 20 years from now. In the year 1985 I entered the department as MSc student and after a first thesis research I fulfilled a local internship at Grontmij (starting up a UASB reactor at a controlled landfill) and a foreign internship in Colombia (1986-1987). In fact, these first years have fully determined my (scientific) career and revealed to me the necessity of international cooperation. It was and is extremely intriguing to me to use and apply 'biology' for environmental protection and energy production. It is so simple, so efficient, so fascinating and so useful that I really wanted to know each and every corner of this technology, from the microbiological aspects to the large scale applications. After a second MSc thesis in the field of microbiology I eagerly started my PhD under supervision of Gatzke Lettinga. Of course it was anaerobic and of course it was 'hot'. After getting my PhD (and 3 children...) and a postdoc position I started to set up various national and international cooperative projects with anaerobic technology playing a key-role. Projects varied from industrial loop closure to treatment & agricultural reuse of municipal wastewaters. Integrating 'anaerobics' into a chain requires knowledge of adjacent fields of science and technology, making it even more interesting!!

Worldwide exists a huge demand on efficient, robust and low-cost technologies to clean up the environment and in the worst case to alleviate poverty. I'm determined to spend all my energy on this. Our planet is incredibly beautiful and everybody has the right to experience this! In 1997, Gatzke and I, therefore, established the current LeAF foundation, with the objective to enhance the development and implementation of the technology in which we put all our confidence. LeAF as a consultancy company has

seen several ups and downs, but is presently a recognized knowledge firm with a sound base. I'm proud that I had the opportunity to make the start of this and to contribute to the successes now.

In April this year a unique opportunity arose at TU Delft when they decided to upgrade the vacant chair of prof. Jaap van der Graaf from a 0.3 position to a 1.0 position with redirection to environmental/wastewater engineering. The chair includes a 0.2 input at Unesco-IHE Delft. The chair is embedded in the Faculty of Civil Engineering, Department of Water management, section of sanitary engineering. The offered combination is ideal for me to further develop my field of expertise in a new environment with the objective to really change the Civil Engineering mindset worldwide. I only hope that I won't end as Don Quichotte.

Though logic, the decision was not easily made: 20 years of professional life really bound me to "Wageningen", a place that I always will cherish. But I'm now convinced that I made the right choice and this is the way go forward: the vision of "Wageningen" will be further spread. I will continue my cooperation with LeAF as actively cooperating board member. With the sub-department of Environmental Technology and the other groups at WU I aim for a continuation of our cooperation for the related fields of science and technology are so large that we easily can work at complementary tasks in good cooperation.

I will remain responsible for the various WUR-PhD students who will try to receive their WU graduation in the coming years. Now, as part of TU-Delft, I hope to contribute in bridging the two most prominent research groups on wastewater treatment in The Netherlands.

Dear colleagues and friends, I had a great time in Wageningen and I'm extremely thankful for the opportunities I have had. I do hope we will be able to proceed our pleasant cooperation despite the physical separation that will now logically occur.

With the very best and warm regards,

Jules





LeAF publication list 2008

Reports

Bisschops I., van Eekert M. (2008) Inventarisatie van het risico van transmissie van pathogenen uit biogas - Van biogas naar Groen Gas. In opdracht van SenterNovem.

→ This report (with English summary) is freely accessible at:

http://www.senternovem.nl/duurzameenergie/publicaties/publicaties_bio-energie/inventarisatie_van_het_risico_van_transmissie_van_pathogenen_uit_biogas.asp

Mels A. (2008) Nieuwe Nuts: Duurzaam ontlasten – Naar lokaal gebruik van afvalwater. In opdracht van Innovatie-Netwerk.

→ This report is freely accessible at: <http://www.innovatienetwerk.org/nl/bibliotheek/>

Mels A., Bisschops I., Swart B. (2008) Zware metalen in meststoffen: vergelijking van urine en zwart water met in Nederland toegepaste meststoffen. In opdracht van STOWA.

Articles

Maas R.H.W., Bakker R.R., Boersma A.R., Bisschops I., Pels J.R., de Jong E., Weusthuis R.A., Reith H. (2008) Pilot-scale conversion of lime-treated wheat straw into bioethanol: quality assessment of bioethanol and valorization of side streams by anaerobic digestion and combustion. *Biotechnology for Biofuels* 1:14.

→ The article is freely accessible at: <http://www.biotechnologyforbiofuels.com/content/1/1/14>

Nielsen A.M., Spanjers H., Volcke E.I.P. (2008) Calculating pH in pig manure taking into account ionic strength. *Water Science & Technology* 57 (11) p. 1785-1790

van Lier J.B. (2008) High-rate anaerobic wastewater treatment: diversifying from end-of-the-pipe treatment to resource-oriented conversion techniques. *Water Science & Technology* 57 (8) p. 1137-1148

Zeeman G., Kujawa K., de Mes T., Hernandez L., de Graaff M., Abu-Ghunmi L., Mels A., Meulman B., Temmink H., Buisman C., Lier J., Lettinga G. (2008) Anaerobic treatment as a core technology for energy, nutrients and water recovery from source-separated domestic waste(water). *Water Science & Technology* 57 (8) p. 1207-1212

Van Vliet B., van Eekert M., Zeeman G., Mels A. (2008) Verslag van de 'Sanitation Challenge': an international conference on new sanitation concepts and models of governance. *Afvalwaterwetenschap* 7 (3) p. 200-2003

Van Vliet B., van Eekert M., Zeeman G., Mels A. (2008) Sanitation Challenge 2008: voorbij de heilige huisjes? *H2O* 41 (13) p. 20-21

Conference contributions

Castellano D., Mels A., Braadbaart O., Veenstra S., Dijkstra I., Meulman B., Singels A., Wilsenach J.A. (2008) Sanitation services for the informal settlements of Cape Town, South Africa. Millennium Development Goals on Sanitation, Aquatech International Congress, Amsterdam RAI, The Netherlands. 30th September – 1 October 2008.

Kujawa-Roeleveld K., Schuman E., Grotenhuis T., Kragić D., Mels A., Zeeman G. (2008) Biodegradability of human pharmaceutically active compounds (PhAC) in biological systems treating source separated wastewater streams. Proceedings of the IWA international conference Sanitation Challenge, 19-21 May 2008, Wageningen, The Netherlands

Other publication types

Sanitation Challenge: New Sanitation Concepts and Models of Governance. Proceedings of the International IWA Conference. 19-21 May 2008. Wageningen, The Netherlands

Colophon

LeAF (Lettinga Associates Foundation) is an independent knowledge centre working on the development and implementation of sustainable environmental protection technologies with the aim of (re-)utilisation of valuable compounds in waste and wastewater and the improvement of the quality of life of people living in countries in transition. LeAF has close ties with Wageningen University and one of its aims is to bridge the gap between research and practical application. LeAF does not receive donor funding and earns its income from projects related to applied research, consultancy tasks, organisation of courses, biological tests, etc.

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

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