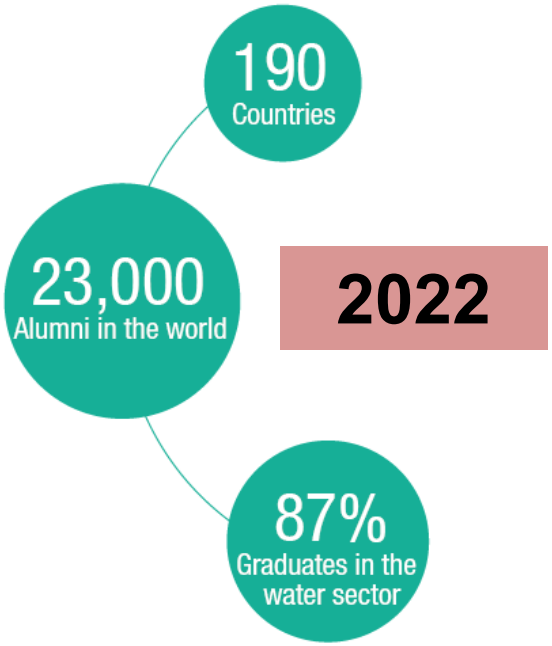
UNESCO IHE DELFT

SUSTAINABLE DEVELOPMENT GOALS

IHE Delft - Ekoinwentyka sp. z o.o. collaboration and research in gas treatment

Eldon R. Rene | IHE Delft Institute for Water Education





2022

IHE Delft Institute for Water Education is the largest international graduate education institute in the field of water. The institute confers fully accredited MSc degrees and PhDs.

Since 1957 the Institute has provided education to more than 23,000 water professionals from over 190 countries, the vast majority from the developing world.

103 PhD fellows* are currently enrolled in water-related research. The Institute carries out numerous research and capacity development projects throughout the world.

Core activities

Education & Training

IHE Delft offers a wide range of flexible, high quality, specialized educational programmes to respond to the needs of diverse clients from the water sector. These include MSc and PhD programmes, along with online and short courses.

Research & Innovation

With over 212 academic staff and 103 PhD fellows active in water-related, problem-focused and solution oriented research on development issues, IHE Delft has a vibrant multicultural and multidisciplinary research atmosphere.

Institutional Strengthening

IHE Delft strives to strengthen the programmes of universities and research institutes as well as the knowledge and capacity base of ministries and other water sector organizations.

Capacity development

*PhD fellows active per 31-12-2020 including staff

Tailor-made Advice and Training (TMAT)

In 2022, 25 tailor-made advice and training courses were conducted both in Delft and in participants' home country. 400 participants were trained in 2022.

Examples

- 1 week training on Environmental Monitoring of Heavy Metals in Barbados
- 3 weeks (2-weeks in The Netherlands and 1 week in Indonesia) training on Lowland Drainage and Coastal Protection
- 1 month training on Groundwater Modelling in the Netherlands

4 steps to request a TMAT:
STEP 1 Contact us (tmat@un-ihe.org)
STEP 2 Prepare the draft programme and budget
STEP 3 Contract agreement
STEP 4 Training implementation

Collaboration between IHE Delft and Ekoinwentyka sp. z o.o. collaboration in the SANEPAR odour control project

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Goals of the project

(i) Development of acclimated biocatalysts

(ii) Testing different bioreactor configurations (biofilter and biotrickling filter), for the treatment of odors and volatile organic compound (VOC) mixture

(iii) Pilot-scale demonstration of a biotrickling filter for odor and VOC control

Tasks involved in this project

Task 1) Fabrication of the bioreactors

Task 2) Inoculum selection

Task 3) Description of pilot-scale reactors and comparison of reactor performances under field conditions

Task 4) Cost and benefit analysis

The working team

UNESCO-IHE, The Netherlands:

Eldon R. Rene

Damian Kasperczyk

Piet N. L. Lens

SANEPAR, Brasil:

Fernanda Janaina Oliveira Gomes da Costa

Gustavo Rafael Collere Possetti

Research student(s) (with fellowship from HidroEx)

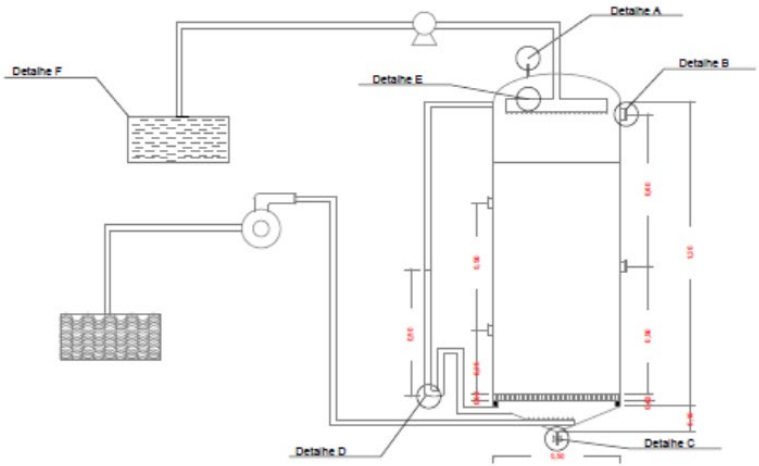
Tomaz Gregori Kipnis (with partial tuition support)

Schedule of activities

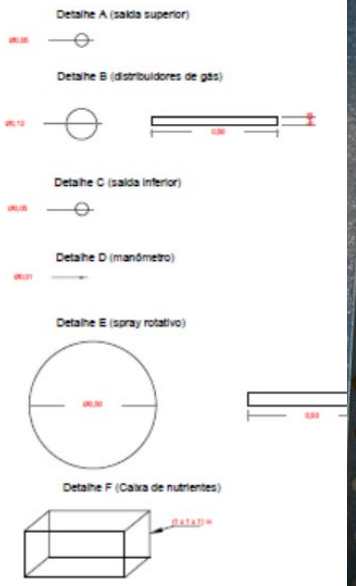
Tasks I and II	Time required to complete and report the different tasks and sub-tasks							
M refers to month	1-4 M	5-6 M	7-9 M	10-12 M	13-15 M	16-18 M	19-21 M	22-24 M
a) Procurement of bioreactors and accessories								
b) Selecting the inoculum								
d) Fabrication of pilot-scale facility								
e) Experiments from lab-scale bioreactors (++)								
f) Experiments from Pilot-scale facility								
g) Report writing								
h) Joint publication(s)								
j) Technical exchange meeting at UNESCO				**12M**				**24 M**
k) Technical exchange meeting at SANEPAR		**6 M**				**18 M**		
l) Final report submission								**25 M**

Note: ++ - Will be done in Delft. One regular MSc student / IMETE student at UNESCO-IHE will be alloted a project on H_2S removal, using the same inoculum that is used to inoculate the bioreactors at SANEPARs STPs, and that student will be performing lab-scale studies related to the project. These results can be used to support some of the observations made from field trials. There is no budget for this work, as the student will have his/her own fellowships.

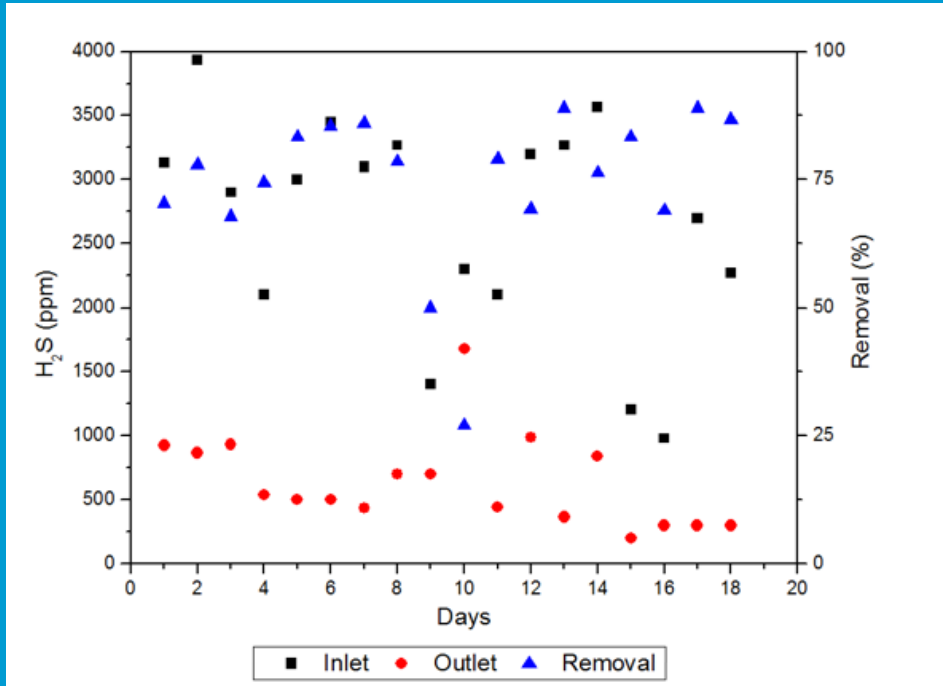
Design of the reactors



Biofiltro - Piloto
Capacidade 200 L.



Removal of H_2S



Performance of the BTF to remove H_2S

Important conclusions from this project

- A total of 27 odour causing compounds were detected in this study: toluene and 4-bromofluorobenzene exceeded 20 µg/L.
- The BTF did not require long start up times to remove odorous pollutants present in the effluent of the wastewater treatment plant.
- During the 61 days of continuous BTF operation, the average removal efficiencies for toluene, benzene, H_2S and CH_4 were, 66%, 3%, 70% and 81%, respectively.
- Oxygen intrusion in the BTF was ascertained by an increase in the oxygen levels between the inlet and the out of the BTF, i.e. from 1 to ~17%.

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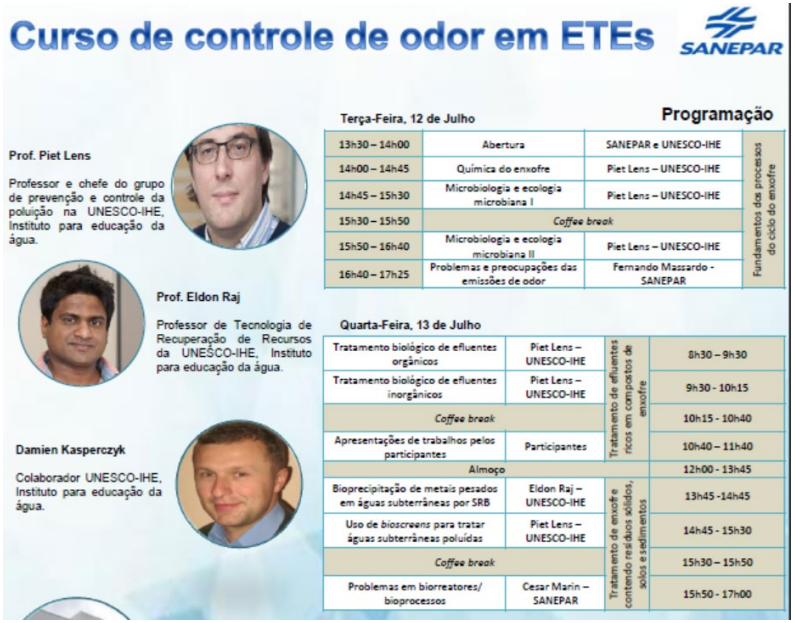
Odor course at SANEPAR



Curso de controle de odor em ETEs

SANEPAR

Prof. Piet Lens

Professor e chefe do grupo de prevenção e controle da poluição na UNESCO-IHE, Instituto para educação da água.

Prof. Eldon Raj

Professor de Tecnologia de Recuperação de Recursos da UNESCO-IHE, Instituto para educação da água.

Damien Kasperczyk

Colaborador UNESCO-IHE, Instituto para educação da água.

Programação

Terça-Feira, 12 de Julho

13h30 – 14h00	Abertura	SANEPAR e UNESCO-IHE	Fundamentos dos processos do ciclo do enxofre
14h00 – 14h45	Química do enxofre	Piet Lens – UNESCO-IHE	
14h45 – 15h30	Microbiologia e ecologia microbiana I	Piet Lens – UNESCO-IHE	
15h30 – 15h50	*Coffee break*		
15h50 – 16h40	Microbiologia e ecologia microbiana II	Piet Lens – UNESCO-IHE	
16h40 – 17h25	Problemas e preocupações das emissões de odor	Fernando Massardo - SANEPAR	

Quarta-Feira, 13 de Julho

Tratamento biológico de efluentes orgânicos	Piet Lens – UNESCO-IHE	Tratamento de efluentes ricos em compostos de enxofre	8h30 – 9h30
Tratamento biológico de efluentes inorgânicos	Piet Lens – UNESCO-IHE		9h30 - 10h15
Coffee break			10h15 - 10h40
Apresentações de trabalhos pelos participantes	Participantes		10h40 – 11h40
Almoço			12h00 - 13h45
Bioprecipitação de metais pesados em águas subterrâneas por SRB	Eldon Raj – UNESCO-IHE	Tratamento de enxofre contendo resíduos sólidos, solos e sedimentos	13h45 -14h45
Uso de *bioscreens* para tratar águas subterrâneas poluídas	Piet Lens – UNESCO-IHE		14h45 - 15h30
Coffee break			15h30 – 15h50
Problemas em biorreatores/ bioprocessos	Cesar Marin – SANEPAR		15h50 - 17h00

JULY 2016

- attended by ~35 SANEPAR employees

Local: Centro de treinamento sala Rio Iraí.
Endereço: Rua Engenheiro Rebouças, 1376, Rebouças - Curitiba

Quinta-Feira, 14 de Julho

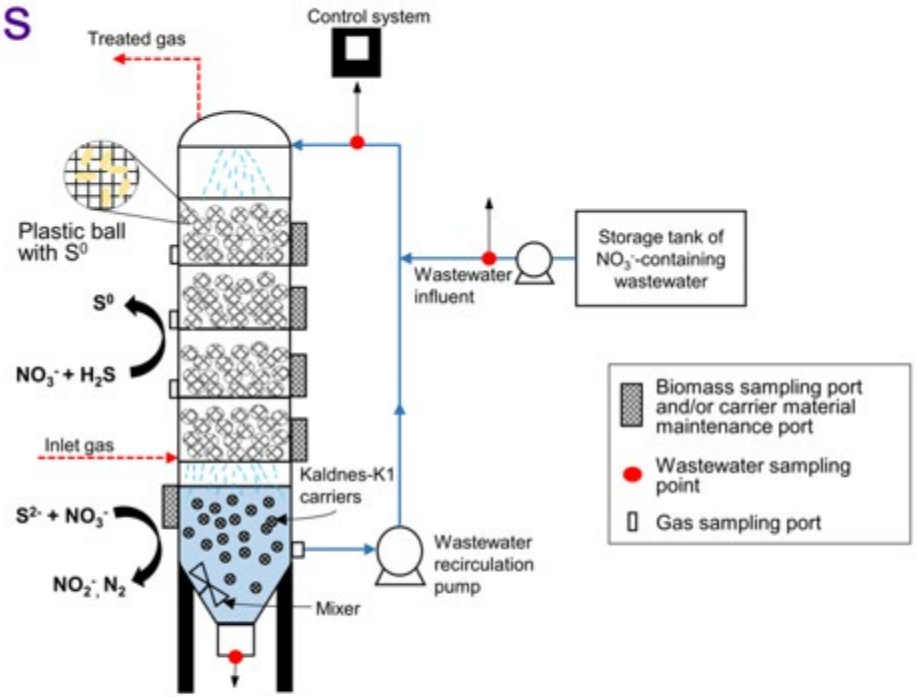
8h30 - 10h00	Tratamento de biogás contendo enxofre contaminado	Resumo dos processos de remoção de H_2S e SO_2	Eldon Raj – UNESCO-IHE
10h00 - 10h20		*Coffee break*	
10h20 - 11h10		Abatimento de compostos de enxofre orgânicos voláteis na emissão de odores a partir de bio-indústrias	Eldon Raj – UNESCO-IHE
11h10 - 12h00		Apresentações de trabalhos pelos participantes	Participantes
12h00 - 13h45		Almoço	
13h45 -14h40	Interações do ciclo do enxofre com receptores de elétrons alternativos	Estudo de caso	Damien Kasperczyk - UNESCO-IHE
14h40 - 15h30		Estudo de caso	Damien Kasperczyk - UNESCO-IHE
15h30-16h00		*Coffee break*	
16h00 – 17h00		Desenvolvimento de processos para controle de odor	Fernanda Janaína Costa - SANEPAR
17h00 – 17h30		Discussão e encaminhamentos sobre odor na Sanepar	

A palestra será ministrada em inglês, com o auxílio de tradução simultânea.
Para maiores informações entrar em contado com Fernanda Janaína:

E-mail:
janainaogc@sanepar.com.br
Telefone:
(41) 3777-7261

Practical insights

- Novel bioprocesses for H_2S and NO_3^- removal from waste streams



- Advanced biofilm bioreactor analyses
  - Fluid dynamics
  - Microbial ecology

Internship collaboration with Ekoinwentyka Sp. z. o. o

- Ekoinwentyka provides internship opportunities for our ERASMUS IMETE MSc students
- Specialization in air pollution control
- Collaboration since 2018-2019

http://ekoinwentyka.pl/en/author/ekoinwentyka/

Learning objectives of the IMETE internship

- To acquire practical knowledge and skills in relation to the aims and objectives of the IMETE programme
- To expose students to the industrial environment and apply theoretical knowledge in field
- Experience engineering problems and develop systematic approaches to solving them

Learning opportunities at Ekoinwentyka

- Treatment of VOCs/VICs
- Biotrickling filters and their modifications
- New industrial settings
- Field experience
- Lab skills and data analysis
- Potential MSc thesis work

http://ekoinwentyka.pl/en/category/implementations/

Conclusion and future opportunities

- Strengthened partnership, in terms of collaborative projects with Ekoinwentyka
- Possibility of students carrying out their thesis in the company
- Testing innovative CTBB in different industrial settings: Experimental and modelling

http://ekoinwentyka.pl/wp-content/uploads/2020/10/IMG_20200731_115300.jpg

Acknowledgements

Thank you for the opportunity

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eko inwentyka
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enterprise europe network
Wsparcie dla biznesu w zasięgu ręki
MARTECH PLUS GRUPA MARTECH