

# Development of an Innovative Biofilter based on Industrial Ecology Concepts

Managing Emissions – Reduction Strategies and Control  
A&WMA Ontario Section  
15<sup>th</sup> November 2018  
Guelph, Ontario



PRODUCTIVITÉ



COMPÉTITIVITÉ



EXPORTATION



ENVIRONNEMENT

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## Presentation overview

- Partners
- Background and objectives
- Methodology
- Main Results
- Next Step



# A CRIQ snapshot

A Québec government corporation reporting to the Minister of the Economy, Science and Innovation; CRIQ will celebrate its 50th anniversary in 2019



HELPING COMPANIES TRANSITION TO INNOVATIVE  
MANUFACTURING



200 EMPLOYEES



3,000 PROJECTS – 2,000 CLIENTS



> 93% OF CLIENTS SATISFIED



LOCATIONS IN QUÉBEC CITY (HEAD OFFICE) AND MONTRÉAL



ANNUAL BUDGET ~ \$ 30 MILLION  
SELF-FINANCING RATIO: 53%



\$ 107 MILLION IN ECONOMIC BENEFITS (2012–2015)



Sophie D'Amours,  
Chair of the Board of Directors  
Rector of Université Laval

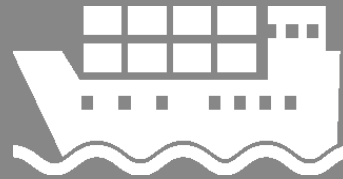
# TO BE AN INNOVATIVE MANUFACTURER



## SMART FACTORY

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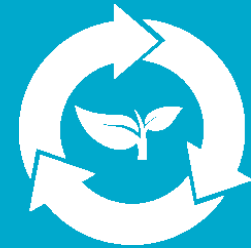
USING ADVANCED TECHNOLOGIES  
TO ACHIEVE SMART PRODUCTION



## EXPORT PRODUCT COMPLIANCE

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EXPANDING MARKETS WITH  
COMPLIANT PRODUCTS



## SUSTAINABLE PRODUCTIVITY

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ENSURING YOUR COMPANY'S  
LONG-TERM SUCCESS IN AN  
INCREASINGLY REGULATED  
INDUSTRIAL ENVIRONMENT

## At the forefront of service and innovation

From Sanimax's 17 locations in Canada, the U.S, Brazil and Colombia Sanimax serve customers across continents and around the globe.

The roots of Sanimax lie in rendering, one of the world's oldest methods of recycling. More than a century later, it continues to be a central part of our business, but we've also taken the underlying philosophy of rendering – **reclaiming** material, **renewing** it, and **returning** it to the market – and extended it in new directions.

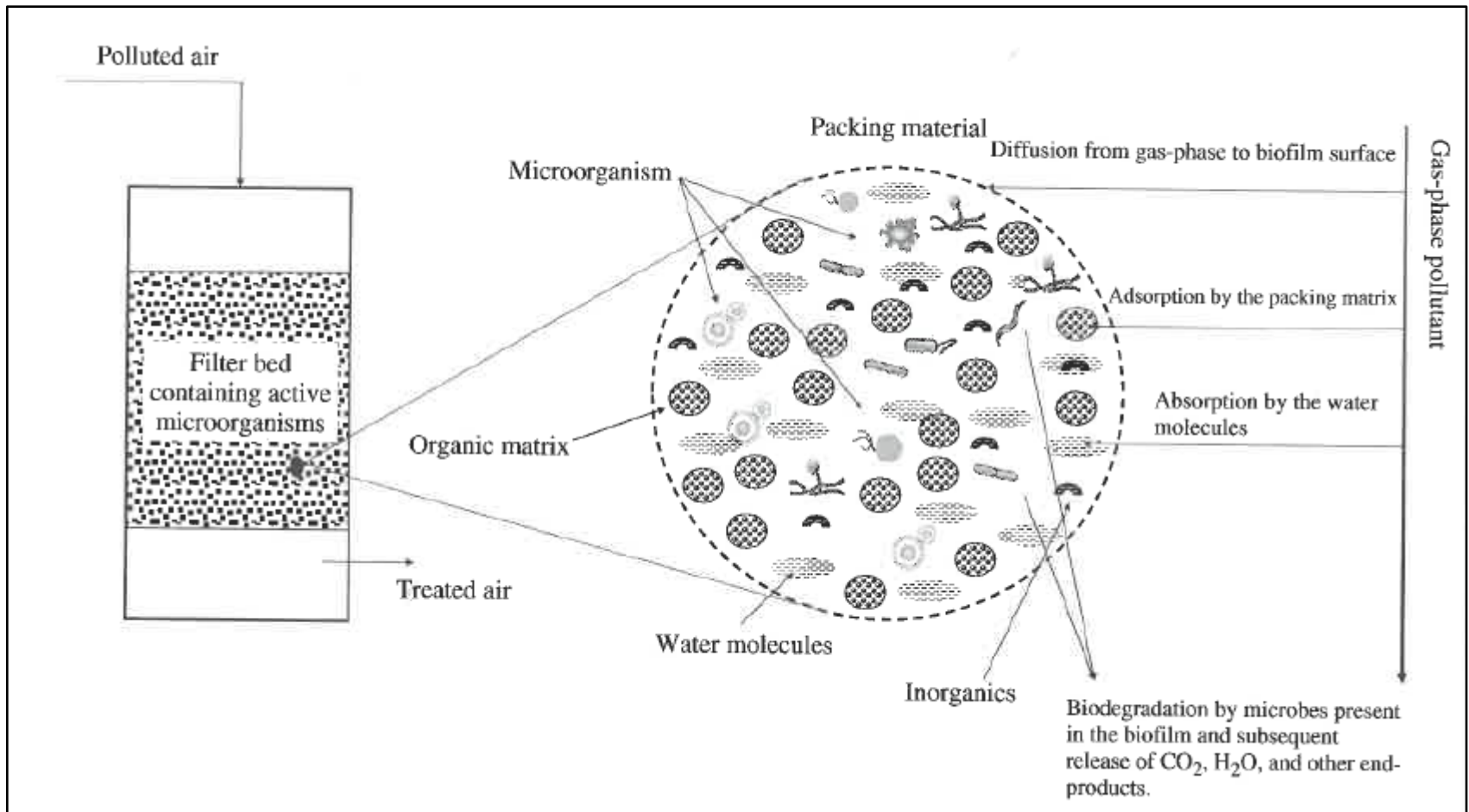
Today, Sanimax offer a range of by-product collection services, as well as specialized maintenance for the restaurant industry. We're a leading supplier of ingredients for agriculture and animal nutrition and a globally respected source for hides and skins.



# Sanimax aci inc (Lévis, Québec)



# Principe of biofiltration



# Main Characteristics of Biofilter Media

PARAMÈTRE	COMPOST	PEAT MOSS	SOIL	ARTIVATED CARBON	SYNTHETIC MATERIALS
Indigenous microorganisms density	+++	++	+++	-	-
Specific area	++	+++	+	+++	+++
Permeability (air)	++	+++	-	++	+++
Nutrients Content	+++	++	+++	-	-
Pollutant sorption capacity	++	++	++	+++	- to +++
Lifespan (Y)	2-4	2-4	> 30	> 5	> 15
Cost	\$	\$	\$	\$\$ - \$\$\$	\$\$\$
General applicability	Easy, affordable	Medium, requires moisture control	Easy, low activity biofilter, requires large areas	Need nutrients, High OPEX	Biotrickling filters



## Objective

Develop and test new biofiltration filter bed having technical-economic characteristics equal to or better than Biosor<sup>®</sup> technology used by SANIMAX ACI for more than ten years for the control of industrial atmospheric emissions (odor)

- Removal Efficiency = or ↑
- Longer duration (Lifetime > 5y)
- Cost (Opex + Capex) ↓
- Industrial Ecology

## Methodology

- Research and choice of residual materials that may act as structural stabilizers and pH regulators in a filter bed.
- Work conducted in collaboration with **ctt*éi*** CENTRE DE TRANSFERT TECHNOLOGIQUE EN ÉCOLOGIE INDUSTRIELLE

- Identified = 37
- Selected = 10
- Chosen for testing = 3



Crushed concrete residue



Treated wood chips

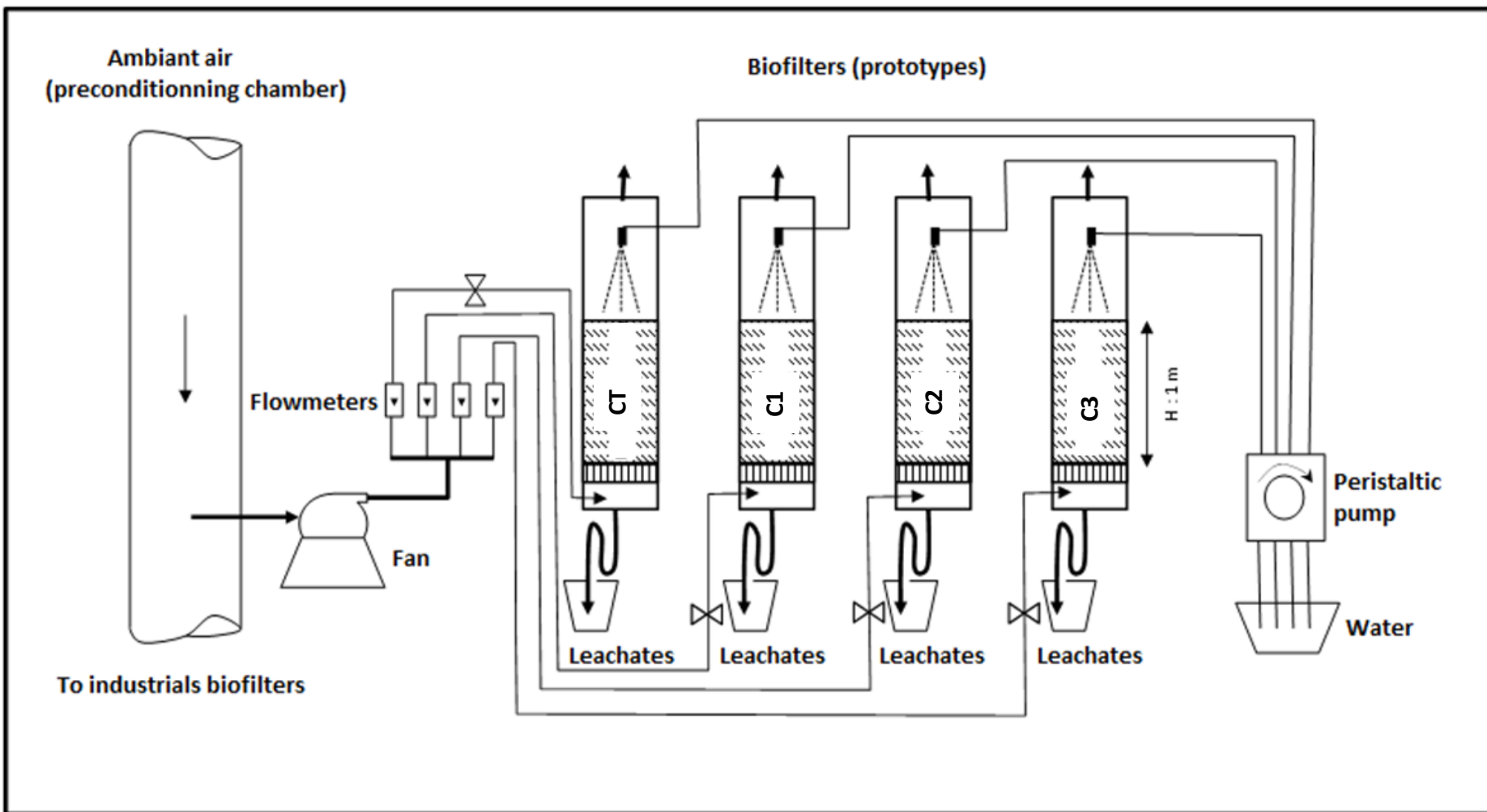


Steatite stone residue

## Experimental setup (pilot biofilters) Sanimax



# Experimental setup diagram (pilot biofilters)



# Formulation of the Filter beds



## Biofilm

(layer of active microorganisms)

+

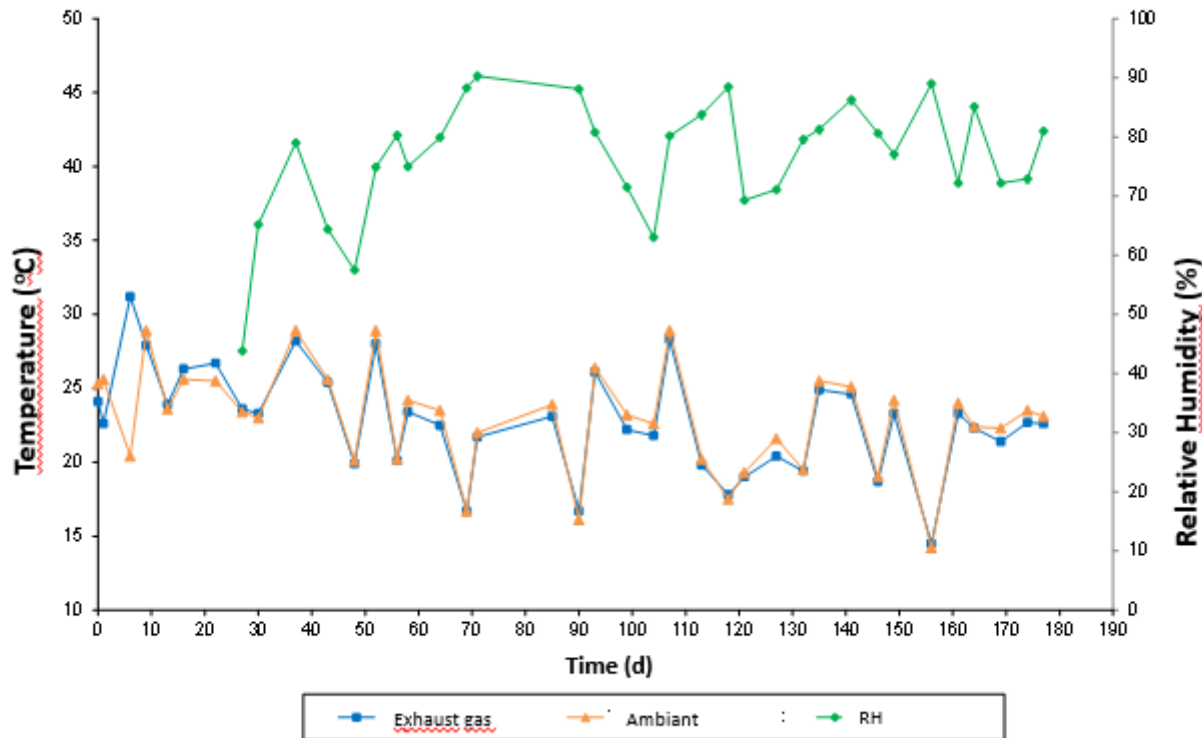
## Residual materials

(Structural stabilizers & pH regulators)



**Compare to Biosor™**

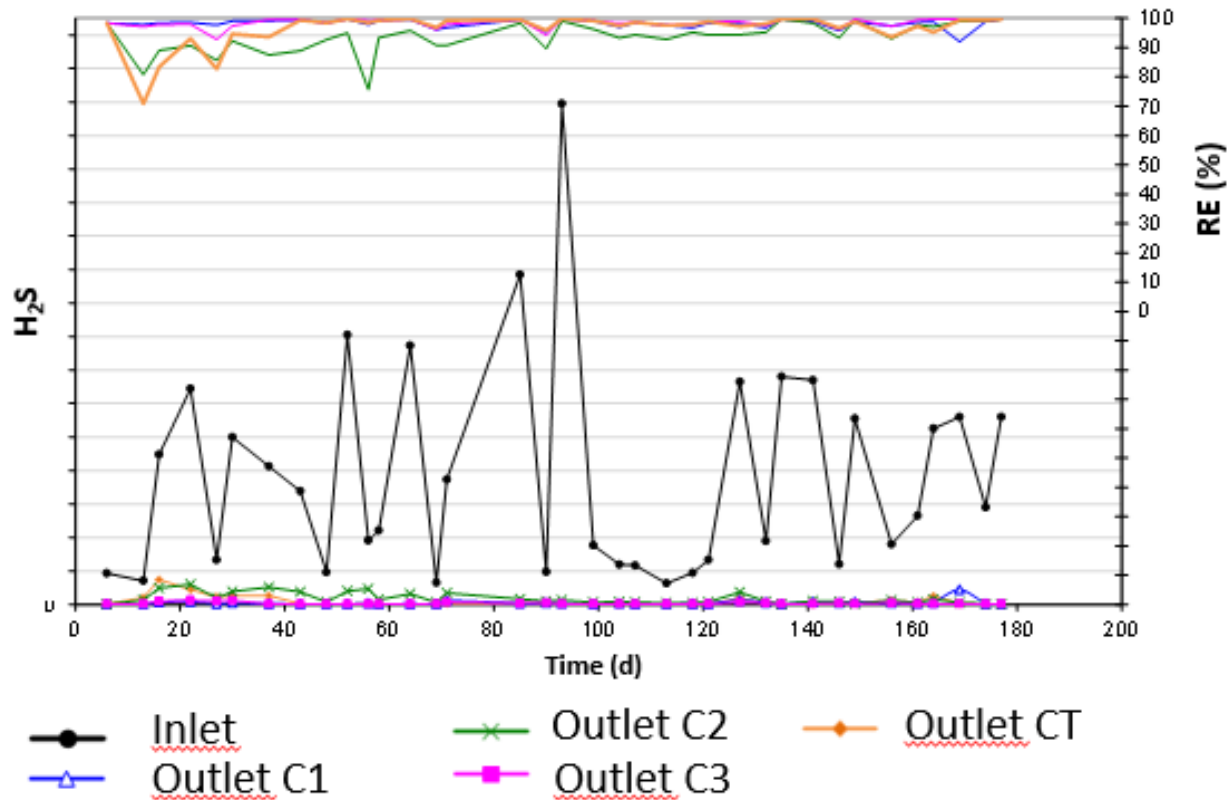
# Main Results : Temperature and RH





Jerome - Model 631-X  
Gold Film Hydrogen Sulfide Analyzer

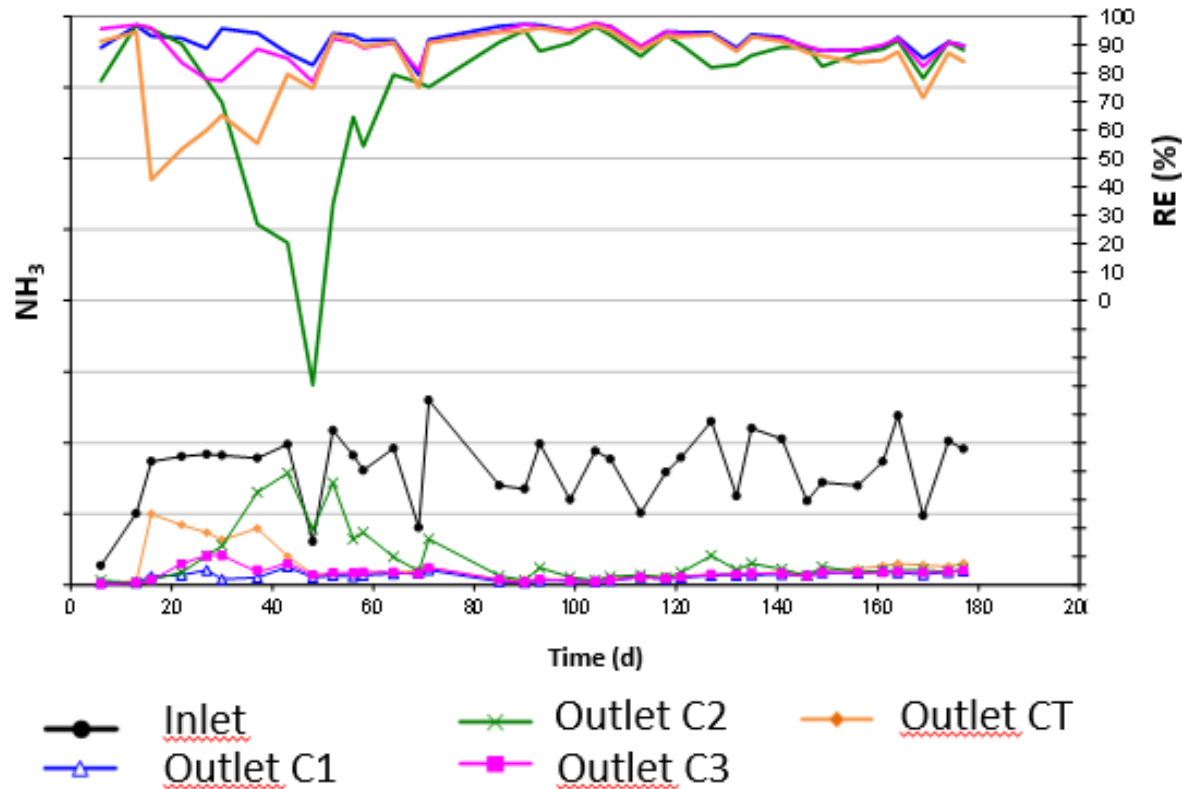
# H<sub>2</sub>S Elimination





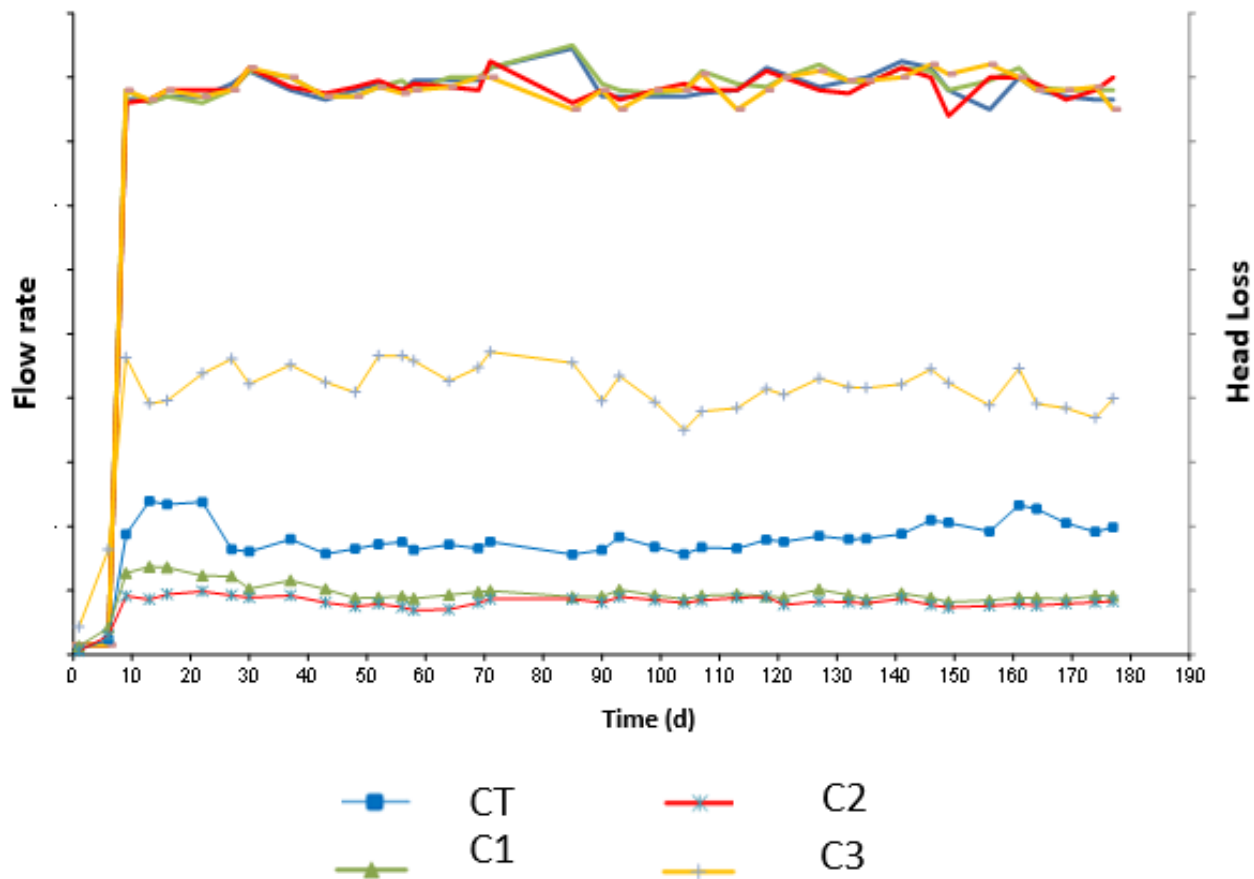
FT-IR Gasmet DX4015

# NH<sub>3</sub> Elimination





# Head Loss



## Comparison of the removal efficiency (RE) vs. BIOSOR™ filter media

Parameter	C1	C2	C3
H <sub>2</sub> S	1,9%	-2,9%	2,2%
NH <sub>3</sub>	9,0%	-8,6%	7,1%
Odor intensity	2,2%	-29,2%	-2,2%
Odor concentration (EN13725)	5,4%	-11,9%	8,8%
Odor nuisance index	3,7%	-26,3%	-6,3%

Positive : Filter media is more effective than standard filter media

Negative : Filter media is less effective than standard filter media

## Next step



Full Scale Demonstration Project at Sanimax aci (Québec)

Potential Economy for Sanimax aci (With 7 biofilters 625 m<sup>2</sup> each) : **~ 100 k\$/y**

**PASSEPORT INNOVATION**

**ENSEMBLE**    
*on fait avancer le Québec*

*Économie, Science  
et Innovation*  
**Québec** 

**Thank you!**

**Questions?**

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ACE 2019

JUNE 25-28  
JUIN Ville de **QUÉBEC** City

Air & Waste Management Association's 112<sup>th</sup> Annual Conference & Exhibition

**WINDS OF CHANGE**  
Environment, Energy & Health

**VENTS DE CHANGEMENT**  
Environnement, Énergie & Santé

**Bienvenue – Welcome !**