SUMMER 2025 | VOLUME 21

INFLUENTS

OFFICIAL PUBLICATION OF THE WATER ENVIRONMENT ASSOCIATION OF ONTARIO

Water Environment Association of Ontario

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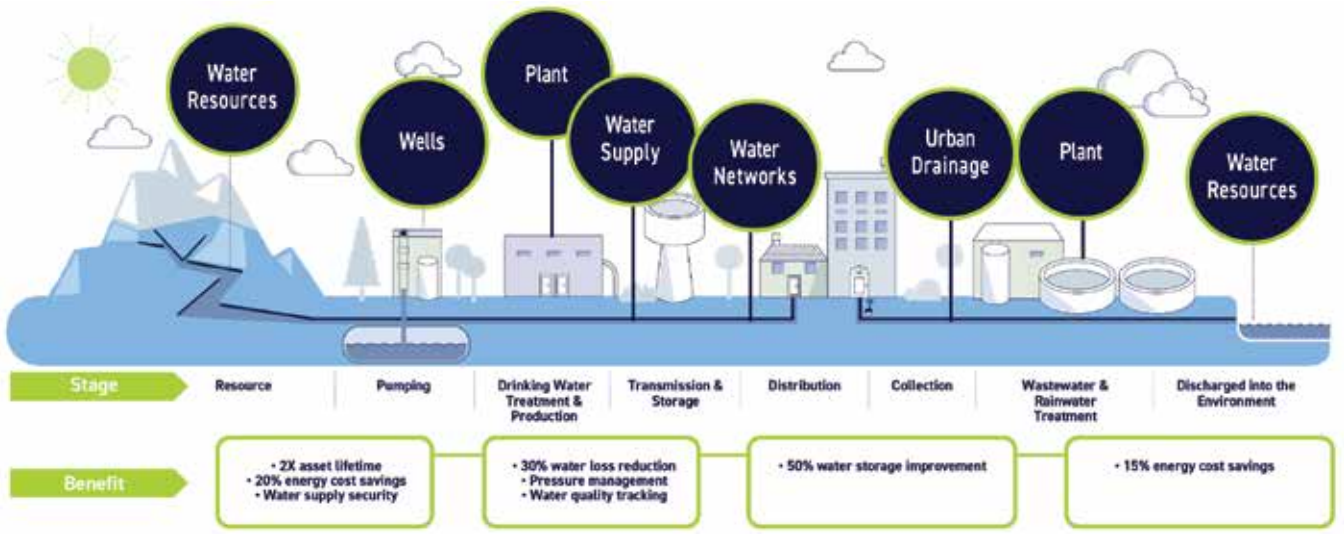

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FEATURES

DEPARTMENTS

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Happy Summer, 'Influents' Readers!

Before we delve into the particulars of this publication, we would like to extend our congratulations to the winners of the Author of the Year Award, Bill Barber, for his article titled "Post-Digestion Thermal Hydrolysis Drives Down Operating Costs and Risk Associated with Biosolids Management", and our young professional, Jonathan Rudyk, for his article "YPs Represent Canada at WEF/AWWA YP Summit".

We received outstanding submissions addressing this issue's theme: "Innovative Solutions in Water and Wastewater Treatment, Plant Monitoring and Kinetic Studies".

Data plays a critical role in supporting operators, technicians, researchers, and engineers to design, operate, and troubleshoot, and wastewater treatment facilities and technologies to protect the population and natural resources while meeting current and future regulatory guidelines.

We hope you enjoy the articles featured in this issue which explore ways to optimize moving-bed biofilm reactor technology and an introduction to a method for estimating nitrifier oxygen sensitivity.

This issue also includes a recap of the 2025 WEAO Conference, held in the beautiful City of London. The event featured engaging sessions, valuable presentations, competitions, an interactive workshop, a facility tour, and impactful keynotes – all of which are covered briefly herein. It was particularly exciting to witness operators participating in the Ops Challenge this year.

Further to that, with Hany Jadaa on the Committee, we have been discussing ideas for a new addition to *Influents* specific to operators. The goal is to provide a platform for their insights, challenges, and experiences to be shared with our readers. Stay tuned!

Stay Connected to 'Influents'

The theme for the Fall 2025 issue of *Influents* is Innovative Energy Conservation Methods/Technologies in Water and Wastewater Sectors for Moving Towards Net-Zero. The submission deadline for this issue is **July 14, 2025**.

The Magazine Committee welcomes your comments or suggestions on the content you find within the pages of *Influents* for ways to improve the magazine. You can always contact us, and submit your articles, or article concepts, through *influents@weaocommittee.org*, or by hitting the "Contribute" button in the WEAO website under "Trade Magazine", you can also use the direct email address below.

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Carrie Brunet, President

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As we reflect on another successful conference and look ahead to the coming year, I'm filled with a deep sense of pride and optimism – not only for our sector, but for our association. The wastewater industry has long been defined by resilience, innovation, and quiet strength – and the WEAO community exemplifies that spirit.

Every day, our members work behind the scenes to protect public health, safeguard the environment, and help our communities thrive. You are truly the unsung heroes. Whether navigating complex regulations, embracing new technologies, or mentoring the next generation of professionals, you are the heartbeat of Ontario's wastewater sector.

This year, WEAO is doubling down on what matters most: people, progress, and purpose. Our strategic initiatives focus on empowering members, elevating the value of our profession, and expanding our networks.

At our AGM on April 13, we welcomed two new members to the Board of Directors: Sumant Patel from the City of Guelph and Amber Klassen from Aquafy Water Technologies. We're excited to gain their perspectives as we work to raise our profile with government agencies, demonstrate the value of membership, and create new opportunities for professional growth.

We're also committed to ensuring our sector reflects the diversity of the communities we serve. Equity, inclusion, and representation are not just buzzwords – they are essential ingredients for building a more innovative and resilient industry.

As we prepare for another exciting year, I encourage each of you to stay connected and stay curious. Join a committee, attend a local event, mentor a student, or simply reach out to a colleague. The strength of WEAO lies in the collective power of its members – and together, there's no limit to what we can achieve.

Thank you for the incredible work you do. It's an honour to serve as your President.

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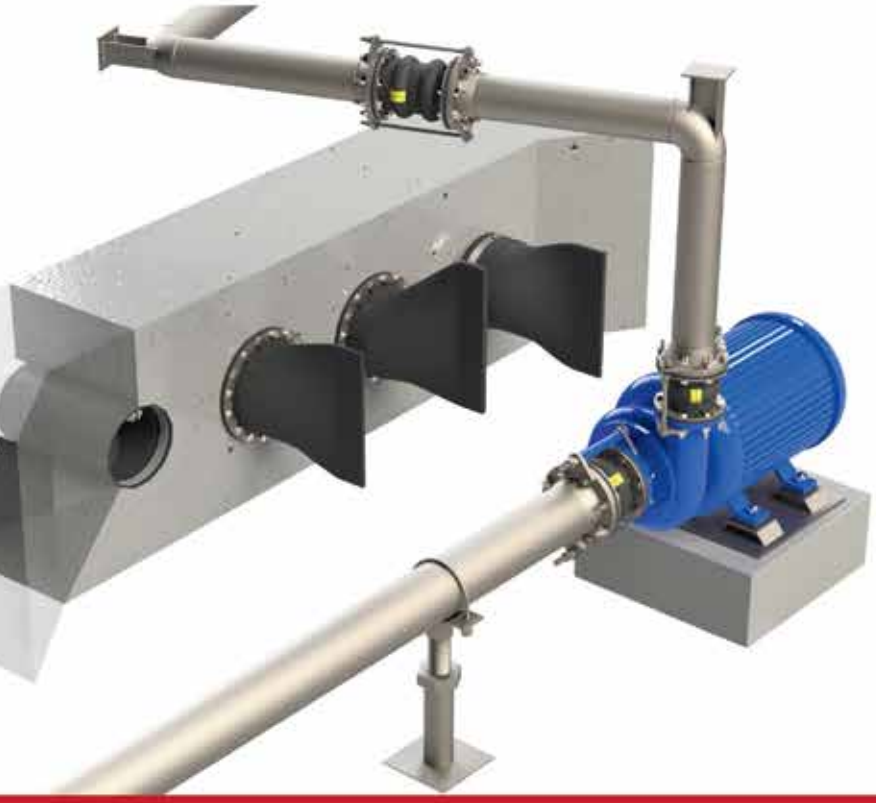

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Innovative Solutions in Water and Wastewater Treatment, Plant Monitoring and Kinetic Studies

Novel Biofilm Moving-Bed System Achieves Simultaneous Carbon Removal and Nitrification in Municipal Wastewater Treatment

Fernando Morgan-Sagastume, P. Eng., Maria Piculell, Henrique Sánchez, Per Magnusson, Daniel Lamarre, Sofia Lind, Christian Rosen, Veolia Water Technologies

Introduction

The moving-bed biofilm reactor (MBBR) is a mature technology for biological wastewater treatment that relies on microbial biofilms growing on free-moving carriers retained inside a reactor. MBBRs provide compact and robust treatment of both municipal and industrial wastewaters with flexible implementation and operation for carbon (C) and nitrogen (N) removal.

For maximum carbon recovery and minimum use of electrical energy, the capture of carbon in the biomass should be maximised, while the aerobic oxidation of carbon to the atmosphere should be minimised. Compared to conventional treatment based on activated sludge, which typically operates with a highly stabilised sludge, MBBR processes have shown to yield effluent solids with a high fraction of recoverable carbon as biogas (Carlsson et. al, 2016).

In conventional continuous MBBR processes, reactors are staged in series to enable different microbial processes along the treatment line. However, a biofilm can harbour various synergistic microbial processes; and therefore, MBBRs can also be operated to achieve the biological treatment of C, N and phosphorus (P) with a single biofilm, as shown so far in sequencing batch MBBRs (Humbert et al., 2018).

The objective of this study was to evaluate if a recent development of the moving-bed biofilm technology (Cella™, Veolia Water Technologies) would enable efficient, simultaneous removal of C and nitrification in continuous operation. The Cella technology utilises a new biofilm support material made of renewable, recycled biomass. The properties of this material differ significantly from plastic carriers of traditional MBBRs (e.g., material, size, geometry, density). The new support material allows the development of an active, external biofilm whose surface area increases with increasing biofilm thickness, thereby improving mass transfer and supporting simultaneous microbial processes.

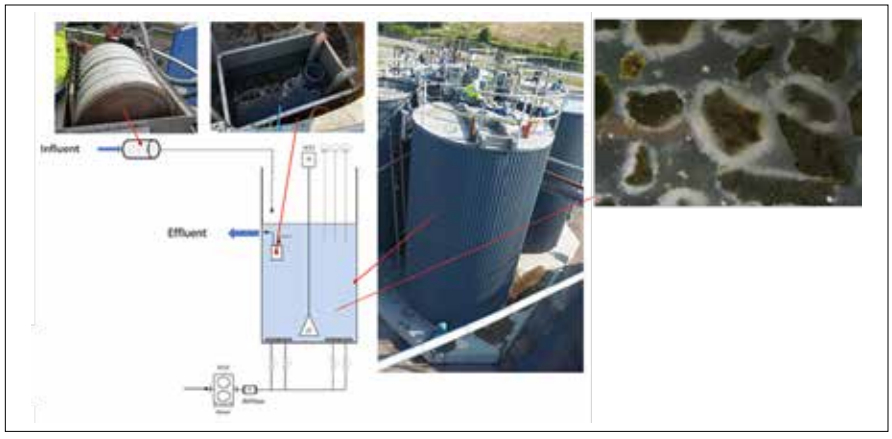

Figure 1: Overview of the Cella reactor operated at Sjölunda WWTP (Malmö, Sweden) with pictures (from left to right) of the pre-screening, AnoxK™ Separator, reactor tank, and AnoxK™ C support material with initial biofilm growth on day 15.

SMALL, FULL-SCALE REACTOR OPERATED ON SITE AT A MUNICIPAL WASTEWATER TREATMENT PLANT (WWTP) IN SWEDEN

A biofilm reactor (45 m^3 operating volume) was operated at Sjölunda municipal WWTP (Malmö, Sweden) from late 2020 to mid-2024 (1,310 days or 3.5 years) (Figure 1). The reactor was equipped with fine-bubble air diffusers and an AnoxK™ hyperboloid mixer. A total of 1,800 kg of a novel biofilm support material made from recycled biomass (AnoxK™ C) was used. An AnoxK™ Separator (gravity-driven, self-cleaning) retained the support material while allowing continuous discharge of suspended solids in the treated effluent. Under continuous aeration, the reactor maintained average DO levels of 6-7 mg/L.

The reactor received municipal wastewater from the main WWTP following coarse screening, grit removal, and primary settling with Fe^{3+}-based P precipitation. Due to the maintenance of the WWTP's sludge line, particularly in the first operational year, the test reactor experienced high and variable loading rates (Table 1). Primary-treatment P precipitation occasionally resulted in very low influent phosphate levels. To stabilize wastewater influent characteristics, a Hydrotech drum filter (1,000 µm mesh) was installed for pre-screening and phosphoric acid supplementation began on day 185 to prevent P limitation. Reactor flow rates were fixed and periodically adjusted.

Temperature, DO, and pH were monitored online. Influent and effluent samples (grab samples for first 170 d, followed by 24h composite samples) were analyzed for chemical oxygen demand (COD), nitrogen (Total N, NH_4^+-N, NO_3^--N, NO_2^--N), phosphorus (Total P, PO_4^{3-}-P), and TSS. The bed volume of biofilm support material was determined by collecting mid-depth reactor samples and measuring their volume fraction after 30 seconds settling in graduated cylinders (100-mL or 1-L). Between days 300 and 900, biofilm nitrification capacity was evaluated through batch tests. Support material samples were rinsed and transferred to a 1-L bench-scale reactor, maintaining equivalent bed volumes to the test reactor. The batch reactor was aerated using an

air-N_2 mixture, with DO maintained at 4 mg/L through gas-flow ratio control. The batch tests were conducted using a nutrient solution containing buffer, ammonium (initial concentration of 50 mgNH_4^+-N/L), phosphate, and micro-nutrients. The experiments ran for 1-1.5 hours at 20°C (thermostatic bath), with pH maintained at 7.5 using 0.5M H_2SO_4. Seven liquid-phase samples were collected per trial, filtered, and analysed for ammonium, nitrate, and nitrite concentrations. Nitrification rates were calculated as ammonium removal over time (kgN/m^3d).

OVERALL OPERATION OF THE REACTOR

The reactor operation was divided into six phases. Phases 1-2 (first 239 days) focused on C removal and the reactor was operated with hydraulic retention times (HRT) of 2-3h. Subsequently, the HRT was increased to 7.5h for combined C removal and nitrification (Phases 3-6). Figure 2 shows temperature variations throughout the operation period, and Table 1 presents the influent characteristics and applied loads per phase.

Phase 1 comprised equipment commissioning and hydraulic capacity testing, followed by Phase 2 (days 160-239) in which C removal under stable conditions was evaluated. Phase 3 (days 240-399) saw increased nitrification following HRT extension. In Phase 4 (days 400-649), stable C removal and nitrification performance was achieved. In Phase 5 (days 650-939), operational disruptions (e.g., blower failure, influent supply issues, control system malfunctions) were experienced. Phase 5 also included extra support material addition (day 841) for biofilm development studies, making it unsuitable for system capacity assessment. In Phase 6 (days 940-1310), long-term C removal and nitrification performance was evaluated and achieved for over a year.

BIOFILM DEVELOPMENT

Biofilm formed on the support material within a week (Figure 1) and persisted throughout operation. Despite various operational disturbances, the support material remained inside the reactor and intact, and biofilm regrew within days after each disruption. Biofilm thickness and appearance fluctuated

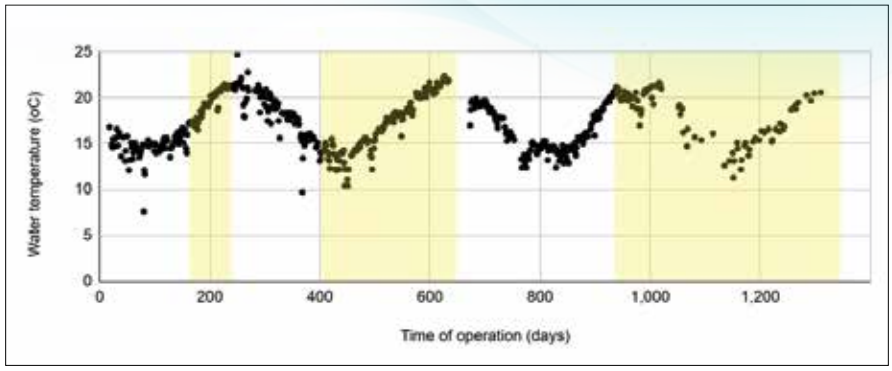

Figure 2: Recorded liquid temperature in the reactor over time (Phases 2, 4 and 6 are highlighted)

Table 1: Operation and influent characteristics during the six operational phases of the study

	Phase	1. Start-up C			2. Stable C			3. Transition to CNit		
	unit	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max
Period	d	1-159			160-239			240-399		
HRT	h	2-3			3			4.5-7.5		
COD load	kg/m^3.d	8.4	1.5	27	10	3.3	28	3.9	0.8	10
TN load	kg/m^3.d	0.6	0.2	1.4	0.7	0.3	1.5	0.3	0.1	0.6
TSS in	mg/L	600	83	2,300	900	180	2,800	630	120	1,500
COD in	mg/L	940	190	2,800	1,300	410	3,500	890	250	2,000
SCOD in	mg/L	170	54	280	160	94	270	120	51	290
TN in	mg/L	68	22	140	90	44	190	70	36	130
NH_4+-N in	mg/L	31	13	51	33	20	41	30	14	41
	Phase	4. Stable CNit 1			5. Unstable phase			6. Stable CNit 2		
	unit	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max
Period	d	400-649			650-939			940-1310		
HRT	h	7.5			7.5/11			7.5		
COD load	kg/m^3.d	2.0	0.5	5	1.4	0.6	4.6	1.4	0.6	5.4
TN load	kg/m^3.d	0.2	0.1	0.6	0.2	0.1	0.4	0.1	0.1	0.3
TSS in	mg/L	430	46	1,100	320	79	1,100	290	110	1,400
COD in	mg/L	630	150	1,600	480	180	1,400	450	190	1,700
SCOD in	mg/L	75	39	110	81	36	240	98	47	190
TN in	mg/L	58	32	180	51	23	120	44	25	110
NH_4+-N in	mg/L	28	11	42	30	15	71	25	12	46

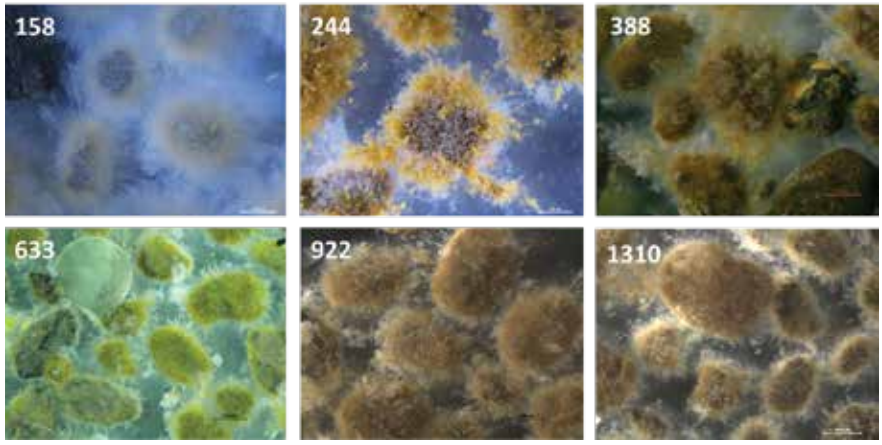

Figure 3: Biofilm appearance on the biofilm support material towards the end of each operation phase. The days of imaging are displayed on each picture.

with load and temperature changes, as shown in Figure 3 for each operational phase. During the first year (Phases 1-3), biofilm thickness and bed volumes varied considerably due to highly variable loads. As loading rates decreased in Phase 3 and stabilized during Phases 4-6, biofilm thickness decreased and the bed volume remained around 10% of the reactor's volume.

CARBON REMOVAL PERFORMANCE

C removal began within the first week of operation (Figure 4). During stable operation at an HRT=3h in Phase 2 (days 160-239), effluent soluble COD (SCOD) averaged 58 mgCOD/L. Organic loading rates varied during the first year due to WWTP maintenance, while concentration fluctuations in the first 170 days reflected the grab sampling approach. Despite varying influent COD concentrations (Table 1), the Cella reactor's SCOD removal at 3h HRT was comparable to the WWTP's activated sludge process, which achieved 41 mgSCOD/L with an HRT=11h (days 143-213). This indicates that most of the biodegradable SCOD was removed in the Cella reactor. At HRT=7.5h (Phases 4 and 6), effluent SCOD matched activated sludge performance.

NITRIFICATION PERFORMANCE

Initial nitrification activity, evidenced by nitrate and nitrite production (Figure 5), started at HRT=3h near the end of Phase 2 (before day 200). Complete nitrification was achieved in Phase 4, with effluent ammonium averaging 2 mgNH_4^+-N/L and negligible nitrite levels. Temporary disruptions from faulty aeration and power supply during Phase 5 caused effluent ammonium spikes, but nitrification capacity recovered quickly. Phase 6 demonstrated stable simultaneous C removal and nitrification, maintaining effluent ammonium below 1 mgNH_4^+-N/L for over a year, while influent ammonium concentrations ranged between 12 and 46 mgNH_4^+-N/L at an average COD load of 1.4 1.4 kgCOD/m^3d.

The Cella reactor achieved ammonium removal rates of 0.05-0.1 kgN/m^3d, while the batch tests conducted between days 300-900 consistently showed nitrification rates above 0.2 kgN/m^3d with biofilm support material collected from the Cella reactor when operating at COD loads of 1.4 kgCOD/m^3d. During Phase 6, nitrification rates remained stable with COD loads up to 5.4 kgCOD/m^3d. The lower nitrification rates in the Cella reactor likely resulted from oxygen competition between nitrifying and heterotrophic bacteria, as batch tests used pure ammonium substrate without COD. Additionally, the Cella reactor operated at lower temperatures than the 20˚C used in the batch tests, although the Cella rates should also reflect the higher DO levels and N assimilation in the reactor, which was absent in batch tests.

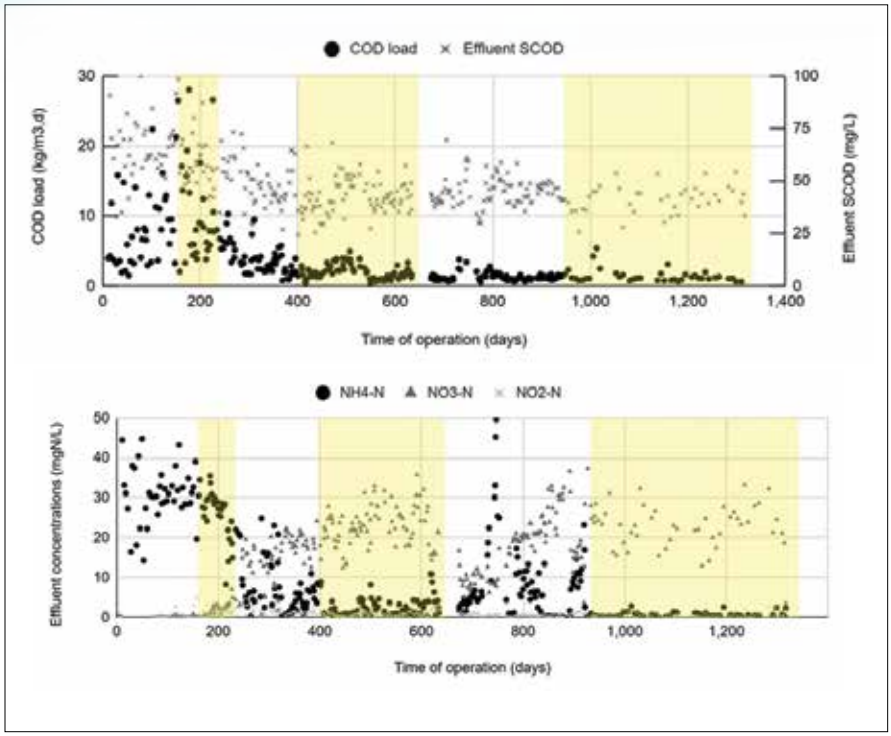

Figure 4: (A) C removal performance at varying loads with effluent soluble COD (SCOD) and total COD concentrations, and (B) Effluent ammonium-, nitrate- and nitrite-nitrogen concentrations from the Cella reactor over time (Phases 2, 4 and 6 are highlighted)

Table 2: Effluent concentrations of SCOD and NH_4+-N for each operation phase

	Days	HRT (h)	SCOD (mg/L)			NH4+-N (mg/L)		
			Average	Min	Max	Average	Min	Max
Phase 2	160-239	3	58	42	87	26	8.2	36
Phase 4	400-649	7.5	43	24	68	2.2	0.1	11
Phase 6	940-1310	7.5	41	26	54	0.8	0.1	2.8

CONCLUSIONS & PERSPECTIVES

Long-term, stable and simultaneous C and nitrification were achieved in a single Cella™ reactor operated continuously as a biofilm moving bed using a new bio-based biofilm support material. These first findings establish groundwork for implementing the Cella technology as an integrated solution for biological CNP (carbon, nitrogen, and phosphorus) removal. Ongoing pilot-scale studies in Sweden are evaluating CNP removal at wastewater temperatures comparable to those in major Canadian urban centres.

ACKNOWLEDGEMENT

Financial funding from the Swedish Energy Agency (Energimyndigheten) for this project is kindly acknowledged. The authors are thankful for the support from VA-Syd and Sjölunda WWTP in Malmö while operating the Cella reactor on site.

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A Method for Estimating **Nitrifier Oxygen Sensitivity**

Gillian Burger M.ASc., P.Eng.[1], Christopher Bye Ph.D., P.Eng., Peter Dold Ph.D., EnviroSim Associates, Hamilton Ontario Canada, *burger@envirosim.com*

INTRODUCTION

In an effort to improve energy efficiency, wastewater treatment plants (WWTPs) have been implementing new process control and operational approaches to lower aeration requirements. Operating at lower than traditional dissolved oxygen (DO) setpoints in the activated sludge reactors has successfully lowered energy demands without compromising nitrification performance or overall capacity (Jimenez et al., 2025). Nitrifying biomass has been shown to adapt to low DO concentrations and showed no significant reduction in nitrification rates after long-term exposure to low DO conditions. Low DO generally refers to operating at DO lower than 0.5 mg/L, while high DO refers to levels of 2 mg/L or higher.

The nitrifier maximum growth rates (μ_{MAX}) and dissolved oxygen sensitivity coefficients (K_{DO}) are kinetic parameters that are used in models and design equations to predict nitrification performance. Accurate measurement of these parameters is important to predict performance and for design, particularly for low DO nitrifying systems. Previous research has provided measurement methods for μ_{MAX} (WERF, 2003); however, K_{DO} has not received as much attention. To address this, EnviroSim has developed a stepped DO method for measuring the K_{DO} for nitrifiers. This research is part of the Water Research Foundation (WRF) 5083 project on advancing low-energy biological nitrogen and phosphorus removal. EnviroSim has demonstrated measurement of K_{DO} values for ammonia oxidizing biomass (AOB) and nitrite oxidizing biomass (NOB) in activated sludge obtained from nitrifying plants located in Ontario, Alberta, and Texas, while also estimating the nitrifier μ_{MAX} at some of these facilities.

Measuring the AOB and NOB K_{DO} values for a nitrifying activated sludge addresses a number of issues in operation and design, including:

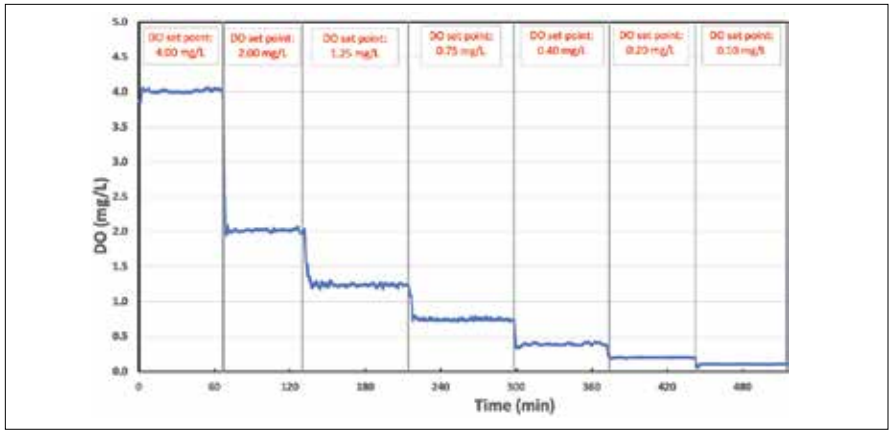

Figure 1: Stepped-DO Test to Estimate Nitrifier K_{DO}, Dec. 19, 2022.

- Whether the AOB K_{DO} value is higher or lower than the NOB K_{DO} value;
- Whether the nitrifier K_{DO} coefficients depend on the operating DO levels in the WWTP;
- Exploring the impacts of the measured nitrifier K_{DO} values on required DO levels for efficient operation.

BACKGROUND

Nitrification is modelled as a two-step process whereby AOB convert ammonia to nitrite and NOB convert nitrite to nitrate. Each type of bacteria has a unique set of kinetic and stoichiometric parameters, including a maximum specific growth rate, μ_{AOB} and μ_{NOB}. Many activated sludge models apply a DO switching function in the form of a half-saturation expression to decrease the aerobic nitrifier growth rate as DO decreases:

$$\mu=\mu_{MAX}.....(DO/(K_{DO}+DO))$$

The K_{DO} value in the half-saturation function is the DO concentration at which the biomass growth rate is half the maximum rate.

For simplicity, only the partial nitrifier growth rate expression is shown above. The full AOB and NOB growth rate expressions include many other terms to quantify the growth rate dependence on other factors such as substrate concentration, pH, liquid temperature, etc. In the method presented here, the operating conditions are carefully controlled to ensure substrate is non-limiting, pH is optimal, temperature is held constant, etc. Measured changes in the AOB and NOB growth rates during each test are therefore solely attributed to changes in DO concentration.

METHOD FOR ESTIMATING AOB AND NOB K_{DO}

The stepped-DO method to estimate the AOB and NOB K_{DO} coefficients essentially involves a sequence of specific nitrification rate (SNR) batch tests on mixed liquor from a full-scale plant over a range of DO concentrations. The methodology of the traditional SNR test at a single DO setpoint is provided in the WERF (2003) manual. Estimating the AOB and NOB K_{DO} coefficients for a particular mixed liquor involves aerating a lab-scale reactor containing the mixed liquor over a range of stepped DO concentrations, and measuring the specific rates at each DO. Figure 1 shows an example of this stepped-DO approach conducted on December 19, 2022. The concept is that the highest DO should result in AOB and NOB activities at the maximum rates (i.e., no DO limitation).

At each DO setpoint, with an excess of ammonia, the nitrifier activity is tracked by monitoring the change in ammonia, nitrite and nitrate concentrations with time to determine the linear rate of removal or production. Figure 2 shows the concentrations of ammonia, nitrite and nitrate measured during the stepped-DO batch test conducted on an Ontario WWTP. In this test ammonia was supplemented three times.

At each DO setpoint in Figure 2, there is a distinct ammonia removal rate and distinct production rates for nitrate and NO_X. Linear regression analysis is used to estimate the ammonia removal rate (NH_3RR), nitrite production rate (NO_2PR), nitrate production rate (NO_3PR) and NO_X production rate (NO_XPR) at each of the seven DO setpoints. Dividing the NH_3RR, NO_2PR, NO_3PR and NO_XPR by the batch volatile suspended solids (VSS) concentration yields the specific ammonia removal rate (SNH_3RR), specific nitrite production rate (SNO_2PR), specific nitrate production rate (SNO_3PR), and the specific NO_X production rate (SNO_XPR).

Plots of SNO_XPR vs. DO concentration, SNH_3RR vs. DO concentration, and SNO_3PR vs. DO concentration are presented in Figure 3 below. A Monod-type half-saturation equation (solid line) is used to fit the measured data (points). The AOB K_{DO} coefficient is estimated from the equation fitted to either plot (i.e., SNO_XPR vs. DO or SNH_3RR vs. DO) since AOB oxidize ammonia to NO_2. Nitrite is generated from ammonia and converted to nitrate simultaneously, so the overall nitrite production rate (NO_2PR) equals the NO_X production rate (NO_XPR) (Dold et al., 2015). The NOB K_{DO} coefficient is estimated from the Monod Equation fitted to the plot of SNO_3PR vs. DO in Figure 3 since NOB oxidize NO_2 to NO_3. In all of the charts shown in Figure 3, the K_{DO} estimate is represented by the vertical line intersecting the DO concentration axis.

In addition to the test described above where the reactor is spiked with ammonia and operated over a range of DO setpoints, separate tests can be conducted to estimate the NOB K_{DO} coefficient alone.

In those tests, the reactor is spiked with nitrite and operated over a range of DO setpoints. The SNO_2PR and SNO_3PR are estimated at each DO setpoint. Separate plots of SNO_2PR vs. DO concentration and SNO_3PR vs. DO concentration are generated and the NOB K_{DO} coefficient is estimated from either of these two plots.

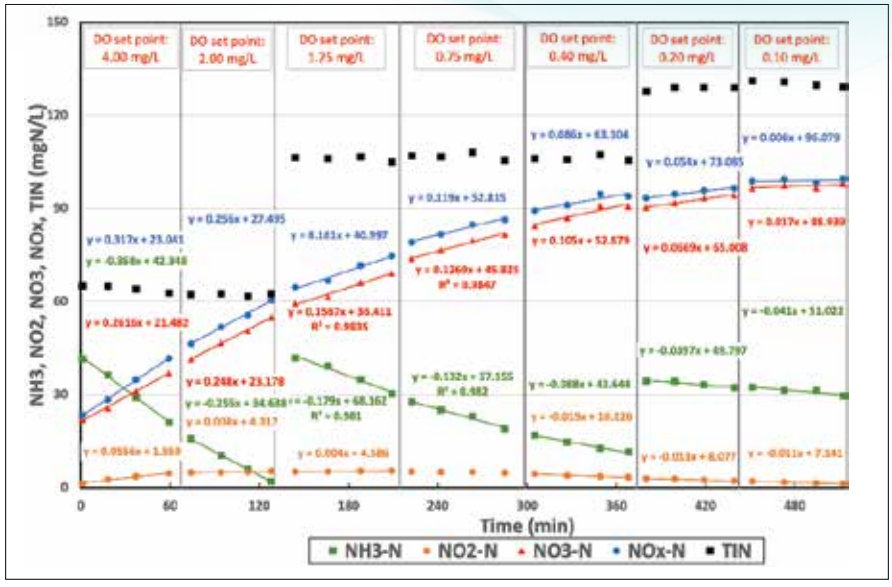

Figure 2: Measured NH_3, NO_2, NO_3, NO_X and TIN Concentrations in Stepped-DO Test to Estimate Nitrifier K_{DO} for an Ontario plant.

TEST SETUP

The setup for the stepped-DO batch test is shown in Figure 4 below. Aquarium air pumps bubbled air into the reactor via tubing capped with diffuser stones. The airflow rate is controlled by a Masterflex mass flow controller (MFC). A DO probe (Firesting O2) is used to measure the DO concentration in the batch test. An overhead propeller provides constant mixing at 400 rpm.

RESULTS

The following table shows results from nine stepped-DO nitrifier K_{DO} experiments. Both of the Ontario plants are fully-aerated at high DO concentration (above 4 mg/L) year-round. The Alberta and Texas #5 plants are operated at more traditional DO concentrations of 2 to 3 mg/L, and the Texas #4 plant is operated at DO in the 0.3 to 0.5 mg/L range.

The AOB K_{DO} value generally is higher than the NOB K_{DO} value. More importantly, the AOB and NOB K_{DO} values at the Ontario plants operated at high DO are higher than respective K_{DO} values at the Alberta and Texas plants. These results suggest that

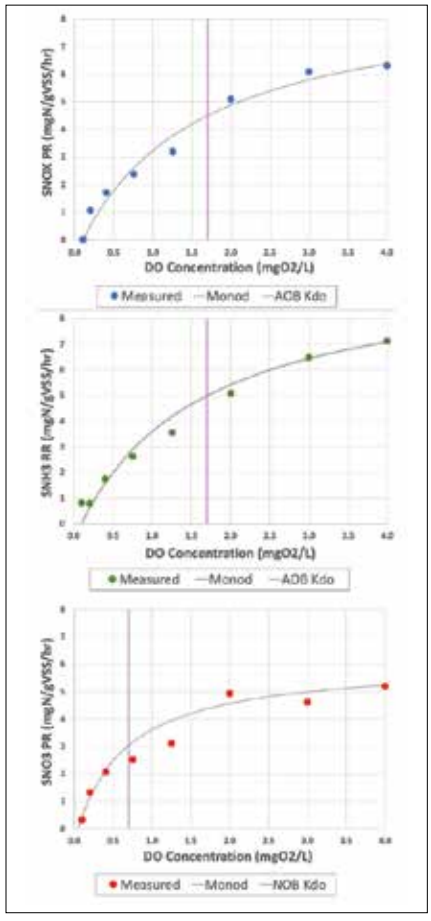

Figure 3: Monod Curve Fitted to Measured SNO_XPR vs. DO (Top), SNH_3RR vs. DO (Middle), and SNO_3PR vs. DO (Bottom), Stepped-DO Test to Estimate Nitrifier K_{DO} values for an Ontario WWTP.

Plant and Location	Process	SRT (days)	Plant DO (mg/L)	Test No.	Date	Max SNH3RR	Max SNOXPR	AOB K_{DO} (mg/L)	Max NO2RR	Max NO3PR	NOB K_{DO} (mg/L)
Confidential #1, ON, Canada	Aerobic	15	>4.0	1	5/15/18	6.5	6.5	0.9		4.5	0.5
				2	11/29/22	3.5	3.5	1.2		2.8	0.8
				3	12/6/22				4.0	4.0	0.6
Confidential #2, ON, Canada	Anoxic/ Aerobic	15	>4.0	4	12/19/22	10.0	9.0	1.7		6.1	0.7
				5	12/22/22				8.7	8.7	0.7
				6	5/17/23	10.0	9.6	1.9		7.5	1.0
Confidential #3, AB, Canada	A^2O	23	1.0–3.0	7	7/9/23	6.3	6.3	0.7		5.5	0.7
Confidential #4, Texas, USA	Aerobic	7	0.3–0.5	8	3/4/24	3.1	3.3	0.4		3.1	0.3
Confidential #5, Texas, USA	Anoxic/ Aerobic	10.5	~ 2	9	3/5/24	4.9	4.9	0.65		3.4	0.65

operating a plant long-term at lower DO results in lower AOB and NOB K_{DO} coefficients. Consequently, reduced DO operation impacts nitrification rates less, and low DO plants achieve comparable performance to high DO plants. Data from the testing also indicates an apparent shift in the nitrifier community structure with comammox (CMX) organisms possibly being selected over AOB. It is hypothesized that CMX are more tolerant of low-DO conditions (Jimenez et al., 2025). This is of interest because CMX oxidize ammonia directly to nitrate in a single step. Further work is being conducted to investigate the impacts of low-DO operation on microbial community dynamics.

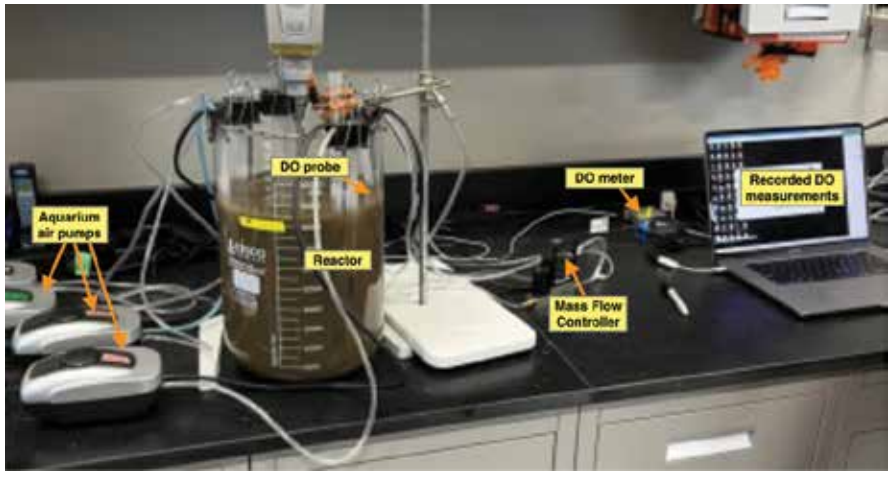

Figure 4: Experimental Set Up for Stepped-DO Test to Estimate Nitrifier K_{DO}. The tests are based on using 8 litres of mixed liquor at a MLVSS in the range of 2,000 to 2,600 mg/L in a 10 L glass cylindrical beaker. Before starting each test, the concentrations of nitrite, nitrate and ammonia are measured in the mixed liquor to verify that the plant is nitrifying well.

CONCLUSIONS

Improving energy efficiency of WWTPs often involves pushing the traditional boundaries of operation. To do this with confidence, good information on nitrification kinetic parameters such as μ_{MAX} and K_{DO} is required. Until recently, K_{DO} has not received much attention. The stepped-DO method developed by EnviroSim addresses this knowledge gap. Important findings to date include:

- The AOB K_{DO} is typically higher than the NOB K_{DO} for a given nitrifying activated sludge.
- The estimated nitrifier K_{DO} coefficients at plants operated at high DO levels (> 4 mg/L) are higher than respective nitrifier K_{DO} values at plants operated at lower DO levels (0.5 to 3 mg/L). These results suggest that long-term lower DO operation at the plant:
  a) increases the oxygen affinity of AOB and NOB; and/or
  b) possibly selects CMX over AOB, with CMX being more tolerant of low-DO conditions compared to AOB and NOB. Further work is being conducted to investigate the impacts of low-DO operation on microbial community dynamics.

The stepped-DO method for measuring nitrifier K_{DO} values provides very useful insights into nitrification behaviour, and the benefits of low DO operation.

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- **Mixers –** Anoxic & Swing Zones, Sludge Holding, Digester; Mechanical, Hydraulic and Gas Bubble
- **Tank Components –** Covers, Fabric Baffles, Troughs, Weirs, Scum Baffles, Skimmers, Decanters, Swivel Joints, Telescoping Valves, Density Current Baffles, Launder Covers, Watertight Doors
- **Clarifiers –** Primary & Secondary, Circular, Chain & Flight, Inclined Plate Settlers, Weir Washing
- **Biological –** SBR, MBR, RBC, MBBR, MABR, Oxidation Ditch, BioMag, CoMag
- **Polymer –** Liquid and Dry Systems
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- **Tertiary Filters –** Travelling Bridge, Disk, Membrane
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53RD WEAO Technical SYMPOSIUM and OPCEA Exhibition RECAP

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Packed House, Powerful Message: Three Days of Innovation, Inspiration, and Connection

Benjamin Beelen (GHD) and Amy Seymour (CIMA+),

What happens when you mix 890 attendees, 111 exhibitors, 24 technical sessions, and eight Ops Challenge teams in London, Ontario for three days? You get a terrific conference! This year, the Water Environment Association of Ontario (WEAO) and Ontario Pollution Control Equipment Association (OPCEA) rocked the RBC Place from April 13-15 with a jam-packed schedule of learning, business, and fun.

The 2025 conference also introduced several changes based on board recommendations to reduce the event's carbon impact. Attendees may have noticed some of these changes, such as a significant reduction in beef purchased, additional registration questions about transportation, more walking-distance events, and a more sustainable speaker gift. If you attended our icebreaker event, you experienced a wide variety of food choices – all selected with sustainability in mind – and it was a big hit!

Our keynote speaker posed a compelling question: Can you imagine life without a toilet? It's something almost unimaginable for most WEAO attendees, yet for one in five people in developing countries, it's a daily reality. In a powerful address, Valerie Jenkinson spotlighted Operators Without Borders (OWB) and left the audience deeply inspired by the organization's mission and impact. She shared OWB's journey – from its first deployment in Dominica after Hurricane Maria to delivering ICS training in Ukraine. Valerie's message was clear: every contribution matters. Whether donating, joining as a member, or offering expertise virtually or in the field, every effort helps move OWB's work forward. Learn more and get involved at Operators Without Borders.

We also had some excellent events this year. The OPCEA reception on the trade show floor was once again a hit – learning about new equipment and services is thirsty work, and OPCEA knows how to keep the crowd happy! The Young Professionals (YP) hosted a fantastic networking meet-up at Poacher's Arms, complete with good food, great company, and some unforgettable karaoke. With over 50 YPs registered, it was one of the best-attended events of the week – and yes, karaoke went late into the night!

Our closing celebration highlighted this year's Ops Challenge teams, including the winning crew, and featured refreshments and light eats. Be sure to check out the Ops Challenge section for more details!

A huge thank you to all our sponsors, volunteers, and WEAO staff who made the 2025 WEAO Technical Symposium and OPCEA Exhibition a success. This is just a brief summary of the action – keep reading for more great highlights from the event!

CONFERENCE HIGHLIGHTS

CONFERENCE COMMITTEE

Amy Seymour	CIMA+	**Rob Anderson**	C&M Environmental Technologies
Chantelle Bazowsky	C&M Environmental Technologies	**Benjamin Beelen**	GHD
Sabrina Chang	CIMA+	**Linda Cooke-Weaver**	Wolseley Canada
John Devlin	Aquafy	**Rasha Faraj**	Jacobs
Gary Fricke	FWS Canada	**Laura Guerra Reyes**	Jacobs
Natasha Jansen	City of Ottawa	**Erin Longworth**	Associated Engineering
Susan Liver	Stantec	**Kris Montgomery**	Flow Point Systems
Guillian Morgan	Black and Veatch	**Max Rao**	Aquafy
Aby Sabzwari	GHD	**Richard Szigeti**	City of Toronto
Krista Thomas	City of Peterborough	**Dodge Yu**	CIMA+
Yvonne Zhang	AECOM		

WEAO Staff:	
Mary Beth Holmes	Jennifer Morales

Celebrating 30 Years of Collaboration

Kris Montgomery (Flowpoint Environmental Systems)

On behalf of the OPCEA Board of Directors and OPCEA's 126 members, we would like to thank WEAO and all Symposium attendees for making the 2025 Exhibition so successful. Returning to the RBC Place venue in London marks the 30-year anniversary of our WEAO Conference and OPCEA Exhibition collaboration. Once again, everyone enjoyed and benefited from more than 100 OPCEA members showcasing the most innovative and forward-thinking wastewater, water, and stormwater treatment technologies the industry has to offer. Ontario's water and wastewater systems continue to provide their communities with best-in-the-world service, thanks in part to the connections and networking between passionate industry professionals across both Associations.

Thank you for attending, and thank you for your continued OPCEA and WEAO support moving forward.

Nitrous Oxide Measurement Knowledge Exchange

Benjamin Beelen (GHD)

For the second year in a row, the Climate Change Committee hosted a pre-conference Sunday workshop. This year's session, titled "Nitrous Oxide Measurement Knowledge Exchange," featured inspiring talks highlighting Ontario's leadership in researching and monitoring emissions from wastewater facilities. Facilitated by Jeremy Kraemer of GHD, the workshop emphasized that Ontario is a global hotspot for wastewater nitrous oxide measurement and research.

The first portion of the workshop focused on academic research. Amr Ismail presented on behalf of Professor Elsayed Elbeshbishy from Toronto Metropolitan University, while Professor Wayne Parker from the University of Waterloo shared insights into nitrous oxide emissions from wastewater treatment and MABR technologies. Emma Shen from Jacobs presented the objectives and methodologies behind their Water Research Foundation (WRF) project, Advancing the Understanding of Nitrous Oxide Emissions Through Enhanced Whole-Plant Monitoring and Quantification.

Next, Joe Green from the Region of Durham and Lizanne Pharand from Halton Region shared operational insights from using Unisense dissolved nitrous oxide sensors at their respective facilities. Amber Klassen from Aquafy also spoke about operating the Unisense sensors, including tips on maintenance and installation. Jose Porro from Cobalt Water presented a data-driven perspective, summarizing real-world applications of machine learning and soft sensors for mitigation.

The workshop concluded with an open networking session and demo stations. John Devlin and Amber Klassen showcased the Unisense sensors; Jose Porro demonstrated the Cobalt Water N2ORisk platform; Michelle Samuel represented Xylem's predictive control system; and Steve Kestel introduced the Neuros MPC+N2O control platform.

> "ONTARIO IS A GLOBAL HOTSPOT FOR WASTEWATER NITROUS OXIDE MEASUREMENT AND RESEARCH.

Touring Innovation Below Ground – 2025 PWO Tour Visits Dingman Pumping Station

Gary Burrows, City of London

Thanks to KSB Pumps for sponsoring the 2025 PWO Tour. This year, more than 30 attendees toured the newly constructed Dingman Pumping Station in London. This wastewater sewage pumping station was built to replace the original Dingman Pumping Station, which was constructed as a temporary facility in the 1960s and decommissioned in 2010. The new station was developed in response to industrial growth in the city's southeast end and is unique among all of London's other pumping stations.

The facility features both low-lift and high-lift pumping operations, complete with control systems, chemical systems for odour control, high-level alarm systems, level transmitters, discharge piping, a ventilation system, valves, a standby power generator, and other appurtenances. It can discharge to either the Greenway Wastewater Treatment Plant via a 750-millimetre forcemain on Dingman Drive or to the Wonderland Pumping Station via a 1,500-millimetre gravity sewer. Under high-flow conditions, excess flows are directed to the existing Dingman Creek Storage Facility.

The Dingman Pumping Station is equipped with:

- A low-lift pumping station consisting of two low-lift Archimedes screw pumps, each with a peak flow rated capacity of 579 litres per second (50 megalitres per day), with space for a future third pump;
- Two channel screens and related wash presses, each rated at 50 megalitres per day;
- One grit removal tank rated at 100 megalitres per day, with space for a second future tank to allow an ultimate flow-through capacity of 150 megalitres per day, along with related grit pumps and a grit classifier;
- A high-lift pumping station consisting of two wet wells equipped with three raw sewage dry-pit submersible high-lift pumps, each with a rated capacity of 395 litres per second, and a firm capacity of 578 litres per second (50 megalitres per day).

Attendees walked through the facility and engaged with manufacturer representatives on site to learn more about the equipment. Special thanks to KSB Pumps for sponsoring the event, to bus volunteer Hany Jadaa, and to City of London staff Liam Laird and Lin Qin for their support.

Technical Program Delivers Insight Across the Sector

This year's technical program once again delivered industry-leading content on water and wastewater research, technologies, equipment, and management, with 24 sessions spread across learning-packed days. Topics ranged from nitrous oxide measurement and greenhouse gas reduction to anaerobic digester optimization, utility management strategies, and public engagement – offering something of value for every attendee.

2025 WEAO Award Winners

Special thanks to Natasha Jansen (City of Ottawa) for arranging this section.

Congratulations to all the winners!

Awards presented by WEAO President Carrie Brunet

William D. Hatfield Award
Sam Sianas, OCWA

Golden Maintenance Hole Award
Steven Forester, City of Guelph

Geoffrey T.G. Scott Award
Peter Takaoka
Gail Scott presents the Geoffrey T.G. Scott Memorial Award to Peter Takaoka.

Outstanding Young Professional
Jonathan Rudyk, R.V. Anderson Associated Ltd.

OWWA/WEAO Climate Action Award – Mitigation Category
York Region's GHG Management Study
Kelly Spitzig (York Region) and Jeremy Kraemer (GHD) accept the award on behalf of York Region.

Author of the Year
Bill Barber, Cambi
Presented for the article "Post-Digestion Thermal Hydrolysis Drives Down Operating Costs and Risk Associated with Biosolids Management".

2025 WEAO AWARD WINNERS

Awards presented by WEAO President Carrie Brunet

Author of the Year – Young Professional
Jonathan Rudyk, R.V. Anderson Associated Ltd.
Presented for the article the article "YPs Represent Canada at WEF/AWWA YP Summit".

Intelligent Water Systems Challenge
Jacobs Engineering Group, for the project "Hybrid Modelling and Diagnosis to Reduce Nitrous Oxide Emissions at Water Resource Recovery Facilities"
"From Jacobs Engineering: Emma Shen, Jesus Flores, Leiv Rieger, not pictured, Lucas Molleta, Ivan Miletić, not pictured. From the Region of Durham: Joe Green

WEAO Service Awards presented by WEAO President Carrie Brunet

Asset Management
Dillon Occleston, Greatario

Conference Committee
Amy Seymour, CIMA+

Operations Challenge
Krista Thomas, City of Peterborough

Residuals and Biosolids
Lisa Ross

2025 WEAO AWARD WINNERS

WEAO Service Awards presented by WEAO President Carrie Brunet

Utility Management
Sumant Patel, City of Guelph

Young Professionals and WEAO Board of Directors
Jonathan Rudyk, R.V. Anderson Associated Ltd.

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WEAO Service Awards presented by WEAO President Carrie Brunet

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Water Environment Association of Ontario

5S Inductees presented by Cordell Samuels

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5S Inductees
Danielle Anders, GEI Consultants, Inc.

5S Inductees
Chantelle Bazowsky, C&M Environmental Technologies, Inc.

5S Inductees
Robert Haller, CWWA

2025 WEAO AWARD WINNERS

5S Inductees presented by Cordell Samuels

5S Inductees
Tracy Ekola, WEF Board of Trustees

5S Inductees
Inductees pose with the Golden Shovel, assisted by Cordell Samuels and Peter Takaoka.

Awards presented by WEF Representative Tracy Ekola

Arthur Sidney Bedell Award
Nancy Afonso, City of Toronto

WEF Delegate Service Award
Richard Szigeti, Toronto Water

WEAO BOARD OF DIRECTORS

Special thanks to Natasha Jansen (City of Ottawa) and Mary Beth Holmes (WEAO) for arranging this section.

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Past President: Chandra Baker, Halton Region
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- Max Rao, Aquafy Water Technologies, Inc. – Director 2023-2026
- Sangeeta Chopra, Ontario Clean Water Agency – Director 2024-2027
- Peter Davey, *Environmental Science and Engineering* Magazine – Director 2024-2027
- Amber Klassen, Aquafy Water Technologies, Inc. – Director 2025-2028
- Sumant Patel, City of Guelph – Director 2025-2028

Delegates

- **WEF Delegate 2020-2026:** Erin Longworth, Associated Engineering
- **WEF Delegate 2024-2027:** Nancy Afonso, City of Toronto

Representatives

- **CWWA Representative:** Dean Iamarino, Halton Region
- **PWO Representative:** Jeff Van Andel, Toronto Water
- **WEAO Young Professionals:** Nathaly Villada, Toronto Water (YP Chair)

Back row (L-to-R): Erin Longworth (Associated Engineering), Shadab Sayeed, (Vahn-Tech International, Inc.), Sumant Patel (City of Guelph), Dean Iamarino (Halton Region), Peter Davey, *(Environmental Science and Engineering* magazine), Max Rao (Aquafy Water Technologies, Inc.), Anthony Abbruscato (Rapid Assessment Technology Services Inc. – RATS), Aleah Henry (Veolia WTS), Nancy Afonso (City of Toronto)
Front Row (L-to-R): Chandra Baker (Halton Region), Amber Klassen (Aquafy Water Technologies, Inc.), Carrie Brunet (Niagara Region), Nathaly Villada, (Toronto Water), Linda Cooke-Weaver (Wolseley Canada, Inc.)

- **WEAO Young Professionals:** Shadab Sayeed, Vahn-Tech International, Inc. (YP Vice Chair)
- **OWWA Representative:** Angelika Masotti, Regional Municipality of York
- **OPCEA Representative:** Amr Melligy, Wolseley Canada, Inc.
- **OMWA Representative:** Justin Pulleybank, ENWIN Utilities Ltd.

Big Support, Big Impact at WEAO 2025

Yvonne Zhang, AECOM

The WEAO Water For People Committee was thrilled to participate in the WEAO 2025 Annual Conference, held April 13-15, 2025. Water For People received outstanding support from conference attendees, OPCEA exhibitors, our Gold sponsors, WEAO staff, fellow Young Professionals, and a representative from the Water For People Canada Board. We are pleased to announce that the Committee raised a total of **$3,030**, and we are excited to keep this positive momentum going throughout the rest of the year.

We also want to highlight the various fundraising events and express our gratitude to everyone who supported Water For People – Canada:

Silent Auction

Our annual charity event took a new form this year. We received fantastic gift donations from sponsors, including a coffee machine, Bluetooth speaker, and even a camping wagon. The auction table is an important part of our outreach, as it allows us to share details about Water For People's work in person, encourage donations, recruit new volunteers, and build awareness by word of mouth.

OPCEA Beer Reception

The OPCEA Beer Reception was a big hit again this year. Conference attendees lined up to purchase drinks, with all proceeds going to Water For People. Guests were also encouraged to make additional donations at their discretion. This event alone raised over **$2,152**! We thank OPCEA for their continued support and for including us in this valuable, crowd-favourite tradition.

WFP Social Night – Crabby Joe's Bar · Grill

We wrapped up Day 2 with a well-attended social night at Crabby Joe's Bar · Grill, featuring appetizers and a variety of beverages. Industry professionals came out to support Water For People and learn more about our Everyone Forever model.

A special thank you to our sponsors who helped make the evening a success:

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Thank you to everyone who supported Water For People at the 2025 WEAO Annual Conference! Keep an eye out for our upcoming fall events and new opportunities to get involved. If you're interested in learning more or volunteering, please contact James Arambarri at *james.arambarri@azuraassociates.com.*

WEAO's 34th Operations Challenge Delivers Show-Stopping Return

Krista Thomas, City of Peterborough

London, Ontario – April 14–15, 2025

This year we were excited to have eight teams competing, with two teams, The London Loggers and the City of Toronto Humber Hosers, returning after a hiatus. Competition was fierce, with the Durham Sludgehammers trying to maintain their first-place overall standing. New this year was the first inaugural Sewer Saw Showdown where we found out which competitor would become the King or Queen of the Table and who would take the Holey Fast Saw title.

This year was my third and final year of chairing the Operations Challenge Committee. Being involved in this committee has been such a rewarding experience. I have watched teams hone their skills and rise in the standings. The camaraderie between teams is great to see – whether it is more experienced teams helping newer teams, or just operators sharing stories and having fun between competitions. However, the best thing is all the connections that I have made and the opportunity that I have had to increase the exposure of the Operations Challenge and highlight the importance of our Operations Challenge teams to the wastewater community. Next year, we welcome Tammy Gerus of the City of Toronto as the incoming chair. I know she will do a great job!

The Ops Challenge started off with the Process Event on Monday afternoon. This year, our new Process Event Coordinator, Anna Lacourt, teamed up with Hany Jadaa and Spencer Snowling to create a written exam and process simulations. The 30-minute exam challenged each team to answer as many wastewater plant operations questions correctly as possible within the time limit given. The focus of the questions this year was biological and chemical nutrient removal. Each team worked through a variety of questions – from multiple choice to more complex process scenario calculations and models – they all put their minds together to solve the toughest questions we could throw at them! The teams did not disappoint and everyone gave an impressive performance. Huge congratulations to the podium finishers: in 1st place, the Durham Sludgehammers; in 2nd place, the York Weir Wolves; and in 3rd place, the Highland Creek Rabble Rousers! Thank you to Cesar Miranda for judging assistance and to Hatch for the simulator laptops.

Following the Process Event, the first inaugural Sewer Saw Showdown was run by Ian Kristman of York Region. Trey Hughes, from the Highland Creek Rabble Rousers, had an impressive pipe cut and won the King of the Table award. Sparks flew as competitors used their hole saws, but Cole Warnica of York Region came out on top, claiming the title of Holey Fast Saw.

In Jeff Johnson, Maintenance Event Coordinator's words, "Practice makes perfect. That goes in life, as well as the Operations Challenge. However, it is not just a week or month of practice that makes it in the pump event. It takes many years.

Every year I participate in Operations Challenge, I am impressed with the dedication of the teams to each and every event. They work hard to get here and work even harder to compete. This year was no different. Looking at the scores, I see each team getting better each year. I have watched the York team go from rookie beginners, many years ago, to where they are now. I have also watched the newer teams this year do better once again. It is continuous improvement."

This year's winners of the Pump Maintenance Event are: 1st Place – York Weir Wolves, 2nd – Durham Sludgehammers, 3rd – Highland Creek Rabble Rousers.

Thanks to our judges George Pelzowski, John Brunet, Stefan Fediw, and Gerry Atkinson.

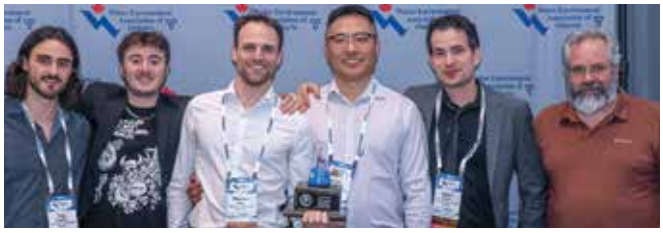
Also, as always, thanks to the management of these municipalities for encouraging and supporting these teams. I can say, as I travel the province, I usually deal with senior management or supervisors only to discover they were involved in Operations Challenge at one point in their journey.

It is also with mixed feelings that I will be stepping down as the coordinator of the Pump Event after 16 years. I am very pleased to find

someone who is both willing and enthusiastic to take over the reins, and that is Mr. Gerry Atkinson from Centre Wellington. I will still be involved as I train Gerry and will probably be at next year's conference, just in a less involved capacity.

Event Coordinator Tammy Gerus, from the City of Toronto, was ready to run the high-octane crowd favourite, the Collection Event. The convention floor buzzed with anticipation – engineers, operators, and spectators packed around the competition floor as the WEAO Collection Event kicked off in a blur of tools, tech, and tenacity. Stopwatch ticking, teams sprang into action. This wasn't just about speed – it was strategy, skill, and sheer guts. As each team competed in the event it was clear that it wasn't just about pipes and pressure. It was pride, passion, and the relentless pulse of professionals proving they're the best in the business.

Congratulations to the York Region Weir Wolves, who are the winners of the 2025 Collection Event! 2nd place was the Durham Region Sludgehammers and in 3rd place was the Highland Creek Rabble Rousers. Many thanks to our judges: David Fulton, Ian Kristman, Brent Playter, and Dave Tarascio.



Lab Event Coordinator, Kent Keeling, put the pressure on the teams by introducing an all-new Lab Event for 2025. Teams had to prepare and analyze standards for orthophosphate and total residual chlorine. Precision and accuracy were key for this event as teams were judged not only on their lab technique, but also on the results that they produced. All eight teams adapted well to the new event with many adopting innovative sample swirling techniques to mix their samples. In 1st place for the Lab Event was the Highland Creek Rabble Rousers; 2nd – the Durham Sludgehammers; and 3rd – the London Loggers. Thanks to our lab judges Janet Hoffer, Leaha Kane, Tara Magee, Chris Sullivan, and Nalin Thillanayagam.

The Safety Event, led by new Event Coordinator Jeff Van Andel, kicked off Tuesday's events on the trade show floor. This event tests the competitors' abilities in confined space entry and rescue, as well as their competency with confined space equipment. The teams are tasked with entering a manhole, retrieving a downed worker, and performing repairs on a piping system. The safety practices of the competitors are of particular attention throughout the event and subject to intense ridicule from the event judges. Throughout the day it became clear the level of competitiveness at play from the teams. The margins were slim, but the Durham Sludgehammers prevailed. In a close second were the Highland Creek Rabble Rousers, followed by the York Weir Wolves in third. Congratulations to all the teams that competed this year. Their efforts highlight their commitment to their trade and showcase their abilities to our industry.

A special shout-out to the judges – Barry Hughes, Ray Davis, Mike Pelzowski, Shane Blakely, and Lucas Tays – for their commitment and support of the Safety Event, as well as all the volunteers that helped support the event.

The 2025 overall champions of the Operations Challenge were once again the Durham Sludgehammers! Followed by the York Weir Wolves in second place and the Highland Creek Rabble Rousers in third. Thanks to all of our sponsors and the rest of my committee, who spend hours of their own time preparing for this event. Hope to see everyone next year in Niagara Falls!

Fierce Competition and Fun at WEAO 2025

What WEAO conference is complete without the Totally Wasted Gameshow! This year's show was a fierce battle, with no one able to hold onto the top spot. When the dust settled, Nancy Afonso (City of Toronto) took 1st place, followed by Erin Longworth (Associated Engineering) in 2nd place, while 3rd place went to Andrew Nimetz (City of London), and just beside the podium was Peter Davey (*ES&E Magazine*) in 4th place.

Special thanks to Daryl Stevenson (SPD Sales Ltd.), and Nathaly Villada (ECS Water Treatment) for running the show!

Celebrating Service and Commitment – 2025 5S Inductees and Geoffrey T.G. Scott Award Honouree Announced

Rosanna DiLabio, Senior Manager, Environmental Affairs, ERCO Worldwide, LP
5S Executive Chair, Ontario Chapter

Although I was unable to attend, I hear the 2025 WEAO Annual Conference was, once again, a success. On behalf of the Select Society of Sanitary Sludge Shovelers (5S) Ontario Chapter members, I want to extend our congratulations and thanks to the many volunteers and staff who put countless hours into organizing the event. The Chapter is busy planning for the annual 5S Luncheon, where the new members, who received their plastic shovels at this conference, will be inducted. I am always so impressed with the selected inductees and their accomplishments.

Chantelle Bazowsky is an Inside Sales Associate with C&M Environmental Technologies, Inc. and has been a WEAO member since 2014. She did not waste any time volunteering with the organization, serving as Young Professionals Committee Social Events Sub-Committee Lead from 2014-2017. I first met Chantelle at one of WEAO's strategic planning sessions shortly after she joined, and I was extremely impressed by her contributions to the outcomes of that session. Chantelle has also served as WEAO YP Steering Committee Vice Chair in 2016, WEAO YP Chair & Past Chair/WEAO Board Member from 2017-2019, and has been a member of the Conference Committee since 2018.

Danielle Anders is a Senior Project Manager with GEI Consultants working in asset management and drainage. She has been involved in WEAO for over 10 years, starting as a member of the Collection Systems Committee, then furthering her interest in the Asset Management Committee as member and then Chair. She moved onto the Board in 2019 as a Director, then-Treasurer, and served as WEAO's Vice-President and President in 2023-2024.

Linda Cooke-Weaver is the National Sales Manager for Wolseley's Strategic Infrastructure Group, specializing in water and wastewater and overseeing the Municipal Market. She has been a Water Environment Federation/Water Environment Association of Ontario member since 2017, was recently the WEAO Treasurer, and is currently serving as the WEAO Vice-President. Linda is also a member of every water and wastewater association throughout Canada, including the Canadian Water and Wastewater Association (CWWA), the Ontario Water and Wastewater Association (OWWA) Board, the American Water Works Association (AWWA) Manufacturers Equipment Council (MEC), and the Ontario Pollution Control Equipment Association, where she is President and Representative to the Ontario Coalition for Sustainable Infrastructure. Linda is a past Membership Chair and Publications Chair with OWWA and served on the Halton Region Joint Municipal Regional Waste Management Committee as a citizen representative. Linda was the recipient of the 2021 OWWA Award of Appreciation and the 2014 Dr. Albert E. Berry Award.

I first met Robert many years ago when I was part of a committee tasked with finding a new Executive Director for the CWWA. He applied and accepted this national leadership role in 2012, after almost 20 years as a senior municipal administrator – most of those years serving as a CAO for small and medium-sized communities. He has served as CWWA's Executive Director since, acting as the spokesperson for the Canadian water sector at the national level. Robert has participated in national roundtables addressing infrastructure funding, flood risk, cybersecurity, and the development of the Canada Water Agency. He was part of the leadership team that brought the World Water Congress & Exhibition to Canada in 2024. His personal project involves working with an international coalition towards regulation and labelling of products deemed "flushable".

As is customary, a shovel was also awarded to the Water Environment Federation (WEF) Representative in attendance at the conference. Tracy Ekola, P.E., is a member of the 2024-2025 WEF Board of Trustees and serves as Vice-President and Midwest Senior

Director for Brown and Caldwell. She has been an active member of WEF and the Central States Water Environment Association (CSWEA), participating in various committees and leadership roles for nearly three decades. Tracy has served on the WEF House of Delegates both as a delegate-at-large and for CSWEA. She has participated in the House of Delegates Budget Committee and multiple workgroups. She also served as the Conveyance and Watershed Community Director and directed multiple task forces within the Community Leadership Council. Tracy has contributed to several WEF committees, including Government Affairs, Utility Management, and Program Community. She has worked closely with utilities and regulators to provide input on a range of issues, from water quality and wastewater treatment to biosolids management and land application, always striving for cost-effective, innovative, and environmentally protective solutions. Her collaborative spirit has been instrumental in advancing policies that benefit communities, stakeholders, and industry partners alike.

This year's Geoffrey T.G. Scott Award recipient is Peter Takaoka. I have known Peter since joining WEAO in the early 1990s. Peter is a lifetime member of WEAO and has worked for organizations such as Procter and Redfern, Maple Leaf Foods, and R.V. Anderson. His involvement with WEAO/WEF began in 1979. He first volunteered on the Seminar Committee, eventually chairing it in 1985. He also chaired the Newsletter Committee in the early 1980s, which later evolved into the Communications Committee, and led negotiations for the first publishing contract for *Influents* magazine. In 1988, he chaired the WEAO Annual Conference Committee and was one of its founding members, returning as Chair again in 2000-2001.

Peter was inducted into the Ontario 5S in 1991 and has served – and continues to serve – as Treasurer since 1995. In 2000, he was elected to the WEAO Board of Directors and served as President for 2007-2008. During his time on the Board, Peter collaborated with many talented individuals to redraft WEAO's Constitution and By-Laws, grow student membership through outreach at post-secondary institutions, and help develop WEAO's Strategic Plan. He also participated in the mentorship program, guiding both Young Professionals and seasoned newcomers to Canada as they worked to establish careers. Peter received the Arthur Sidney Bedell Award in 2010. In addition to his leadership and volunteer work, he holds a Class IV Wastewater Treatment Operations certificate.

Congratulations to all this year's award winners! The organization is incredibly lucky to have you as members and volunteers.

The Chapter met at the new WEAO office in Mississauga on February 24 to discuss our 2025 plans. We were pleasantly surprised to see the Shovel and the Geoffrey T.G. Scott Award proudly displayed for all to view. Thank you to the office for your continued support of the Chapter – and congratulations on your new location!

This year, the Annual 5S Luncheon was held on Monday, June 16 at That's Italian Ristorante in Woodbridge from 11:30 a.m. to 2:00 p.m. In addition to luncheon planning, the Chapter Executive will be working more closely with office staff to establish a better presence on the 5S members-only portal of the WEAO website.

I very much enjoyed to connecting with my fellow 5S members in June and wish all members a happy, healthy, and successful rest of 2025.

WEAO Residuals and Biosolids Committee

Annual Seminar: Current Issues & Biosolids Management Practices

Aleah Henry, Veolia WTS
Sarah Mason-Renton, Lystek International

On Wednesday, November 26, 2024, the WEAO Residuals and Biosolids (R&B) Committee held their annual seminar at the Mississauga Grand for a day of presentations and panel discussions.

Paul Purser (Veolia) introduced the first round of speakers and panelists which included: Mark Torrey (Kawartha Lakes area Farmer), Erik Apedaile (Apedaile Environmental), Mike Lishman (Biogenie) and Wayne Metzger (Highland Custom Farming). Mark Torrey presented the results of Nutri-pel application to pasture, and the resultant increase in supported cattle. Erik Apedaile then spoke on the benefit of slow-release nitrogen for crops, and best management practices (BMPs) for coordinating with neighbours. Mike Lishman gave an overview of the biosolids application program in Quebec, noting that biosolids should not be seen as waste, but rather as valuable products. Wayne Metzger spoke about eliminating commercial phosphorus fertilizer products through the use of Lystegro and biosolids, and how this provided a sense of security for the future. The panel moderated by Sara Mason-Renton (Lystek International) spoke to the benefits of applying biosolids with slow-release nutrients and high organic matter for crops and pasture, biosolids availability, transport and storage, as well as BMPs to manage public perception and community relationships.

Kelly Ward (Lystek International) presented a thermal hydrolysis process using high temperature, shearing and alkali addition to enhance digestion. She described the waste characterization study that was carried out to determine the best feedstock options for this process through biochemical methane potential (BMP) testing.

After the networking break, Phil Sidhwa (Orgatec Energy, Inc.) gave an update on the Ontario BioCouncil goals, which include

Moderated discussion on innovation in land application and current issues

Participants enjoy the networking break.

Hosts welcome a virtual presenter.

Biosolids/residuals baseline/CEC moderate discussion panel

supporting operators and farmers, promoting a positive industry image and providing expert resources to government and regulators during policy development. He focused on the importance of science-based regulations, and the potential impacts of compounding worst case assumptions leading to low limits.

Dominika Celmer-Repin (Region of Waterloo) introduced the next set of speakers including Dr. Ryan Prosser (Guelph University) and Terry Obal (SGS North America Labs). Dr. Prosser presented his research assessing PFAS and microplastic content in soils that have received biosolids. The microplastics research included characterization of the type and concentration in various biosolids through isolation, quantification and spectroscopy characterization. PFAS testing included both cake and liquid biosolids as well as soil from amended and unamended fields. Following this, Terry Obal gave an overview of laboratory analysis of PFAS (including measurement through LCMS/M and using EPA-1633), challenges with compound classification, and the importance of appropriate sampling equipment to minimize PFAS adsorption.

Following a networking lunch, Dean Iamarino (Halton Region) introduced Nathalie Decan (CFIA) who joined the seminar virtually to present an update on the smooth implementation of interim PFAS standards. She noted that only commercial biosolids are required to meet the standard and described the procedures for demonstrating compliance. Next, Shirley Ann Smyth (ECCC) spoke about the chemicals management plan administered by Health Canada and the ECCC to assess chemicals used for their persistence, bioaccumulation, toxicity and quantity of use. She spoke about the CMP monitoring program for wastewater, sampling and the criticality of analyte selection.

Dr. Banu Ormeci (Carlton University) presented a research update giving an overview of various technologies for both liquid and solid stream treatment. She detailed the importance of a comprehensive PFAS monitoring mass balance including liquid, solid and gaseous streams.

The final panel moderated by Dominika Celmer-Repin and Dean Iamarino, included John Glass (Peel Region) as well as previous speakers Terry Obal, Dr. Banu Ormeci, and Shirley Anne Smyth. The group led a spirited discussion about setting lower limits in PFAS standards, technological limitations in contaminant removal, and the differences between CEC remediation vs. destruction.

The great selection of panelists and speakers complemented each other to share experiences with biosolids application, contaminant testing, monitoring and standards. The combination of panels and presentations encouraged discussion and participant interaction.

The R&B Committee would like to thank everyone who made it out for the winter seminar and look forward to seeing everyone in winter 2026 for the next one.

Process Operations Quiz

By Anna Lacourt, M.Eng., P.Eng., York Region

QUIZ #6 IN THE SERIES – COMPLETION DEADLINE: AUGUST 4, 2025

Welcome to the sixth quiz in the series. Thanks to everyone for their great efforts on the fifth quiz and congratulations to the winners Divya Patel and Amanda Wang! In these last couple issues, we've built on the hydraulic principles and equations introduced in the first few articles. Recently, we have been focusing more on the form that equations would be presented to Operators on the licensing exams. Since we started these quizzes, all of the articles are intended to work together to solidify these important concepts to the reader. If you are struggling to understand any of the more recent concepts, please refer to the previous articles and do not hesitate to contact either me or Hany for further assistance!

The solutions to Quiz # 5 are included below. Quiz #6, accessible via the QR code below, will be the last quiz on hydraulics before we shift gears to another process-related topic. If you have any questions on the solutions for Quiz #5 or any of the new material, please reach out to me at *anna.lacourt@york.ca*.

QUIZ RULES

The Process Operations Quiz is provided in each Influents issue with a QR code linking you to a fillable online form containing the quiz. Further instructions can be found at the link via the below QR code.

QUIZ #6 QUESTIONS

QUIZ #5 SOLUTIONS

1. (**1 mark**) Which of the following represents the mechanical power delivered to the pump shaft?
   a. BHP
   b. WHP
   c. PE
   d. MHP

Answer: A – Brake Horsepower or BHP is considered the pump input power, or the power that is delivered to the pump shaft from the motor. For a detailed explanation on all the power components of a system, please refer to my colleague Hany's Article #38 in the Winter 2024 issue of the *Influents* magazine.

2. (**1 mark**) The following equation $\frac{Nm}{s}$ is a measure of:
   a. Torque
   b. Work
   c. Efficiency
   d. Power

Answer: D – Breaking the units down: A Newton (N) is the force required to accelerate a mass of 1 kg by 1 m/s^2; so, this is a unit of force. The meter is a unit of distance, so the numerator units represent force x distance. The denominator, s, denotes time.

Combining these three units, we have $\frac{force\ x\ distance}{time}$. If we recall from Article 36 of the Operator Science/Math Corner, the numerator is the calculation for work. If we consider the denominator, as well, we have . This is the equation for calculating power. Therefore, the answer is d, power.

3. (**3 marks**) For a pump having a water horsepower of 80 hp, what would the output be in kW?

N.B.: Both kW and hp are units of power, so this question is simply requiring a conversion from hp to kW. We know that 1 hp = 746 Watts or 0.746 kW.

$$\text{Therefore: water power for this system} = 80\ hp \times \left(\frac{0.746\ kW}{1\ hp}\right) = 59.7\ kW$$

4. (**5 marks**) A pump is delivering a flow of 1,700 gallons per minute (GPM) against a head of 53 ft. The pump operates with an efficiency of 63%. Calculate the Brake Horsepower.

Show all your work to receive full marks

The format of this question was tied to the simplified equations provided in Article #39 of the Spring 2025 issue of *Influents*. These simplified equations are intended to provide Operators assistance with the certification exams. As a result, a rigorous solution using first principles is not provided in this issue and I will be using the equations provided in the aforementioned article. For a detailed explanation on how these equations are derived and work for these problems, please refer to Article # 39 mentioned above.

Recall:

$$Brake\ Horsepower, hp = \frac{(Flow, gpm) \times (Head, ft.)}{(3,960) \times (Pump\ efficiency, \%\ expressed\ as\ a\ decimal)}$$

In this case, we know that the pump output flow is 1,700 gpm, the head is 53 ft., and the efficiency is 63%. Therefore, the calculation is:

$$Brake\ Horsepower, hp = \frac{(1,700\ gpm) \times (53\ ft.)}{(3,960) \times (0.63)} = 36.1\ hp$$

Operators Certification Corner – 2

Hany G. Jadaa; C.Chem., M.Sc. Eng., **LEXICON** Environmental Consulting Services Inc.

Welcome everyone to another segment titled "*Operator Certification Corner*". Before we dive into this issue's content, I want to let everyone know that Article #40: May The Power Be With You – Part 2 of the Operators Science/Math Corner will be published in the next issue! Now, onto the main show. Each OCC segment will have two typical exam questions with four-multiple choice answers. Questions will be randomly selected from vast areas of knowledge in our industry to help you prepare for certification exams. Answers from each OCC will be posted in the following issue.

In order to keep track of areas of strengths and weaknesses (also to assist me in directing future process articles where operators need more support), please submit your answers to *lexicon@ca.inter.net*. All responses will remain confidential and will be used only for internal statistical purposes.

Efficient settling in a clarifier is achieved by controlling

a) Surface tension of particulate matter entering the tank
b) Drag forces that apply to the particles in the tank
c) Maintaining proper depth of liquid level in the tank
d) Surface overflow rate in the tank

An operator increased the RAS pumping rate in your plant. As a result, you notice that the concentration of your MLSS in the aeration tank has also increased. Based on this observation, which of the following statements is TRUE?

a) Before the increase, much of the mixed liquor solids were in the clarifier blanket
b) Before the increase, much of the mixed liquor solids were settling in the aeration tank due to insufficient mixing
c) During the increase, the solids loading rate to the clarifier was too low
d) After the increase, the increased exposure of the solids to BOD caused an increase to the MLSS concentration

ANSWERS TO OCC-1

Grit channels are typically designed to remove sand, gravel, eggshells and coffee grounds by means of

a) Creating a differential head loss between the inlet and the outlet to the channel
b) Introducing small amount of dissolved oxygen to the channel allowing the microorganisms to start accessing BOD and SS
c) Decreasing the water's velocity to allow all types of solids to settle
d) Decreasing the water's velocity to allow only suspended solids to settle

Solids that are retained by a 1.2 um filter paper and are burned away in a 550°C furnace are termed

a) Total Suspended Solids (TSS)
b) Total Dissolved Solids (TDS)
c) Total Volatile Suspended Solids (TVSS)
d) Total Volatile Dissolved Solids (TVDS)

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