ONTARIO WATER CONSORTIUM

LE CONSORTIUM POUR L'EAU DE L'ONTARIO

ONTARIO CLEAN WATER AGENCY

AGENCE ONTARIENNE DES EAUX

Wastewater Intensification Workshop Report of Proceedings

December 4, 2023

Generously sponsored by: VEOLIA

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Table of Contents

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Objectives

- To build community in the municipal wastewater sector in Ontario
- To foster collaboration and knowledge sharing between utilities, technology companies, consulting engineers, academic researchers and government
- To provide municipal attendees the necessary information and resources to encourage their consulting engineers to explore and adopt WWI strategies as effective solutions for addressing infrastructure, growth, climate, and other pressures in Ontario

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Agenda

9:00am – 9:30am:	Registration and coffee
9:30am – 10:00am:	Welcome and brief overview of the workshop objectives and transfer-in
10:00am – 10:35am:	Map your Wastewater Intensification Journey
10:35am – 11:00am:	WWI Intensification Panel
Panelists:	**Yaldah Azimi**, Wastewater Process Optimization Program Manager, Ontario Clean Water Agency *Process Optimization as an Intensification Strategy*
	Sudhir Murthy, CEO NEWhub Water Corporation and RESbonds International Corporation *WWI Strategies: Horizontal Stack – Concrete, Mechanical and Digital*
	Art Umble, Director: Stantec Institute for Water Technology & Policy *Wastewater Resource Recovery Facilities in 2040 – Rural, Suburban and Urban*
11:00am – 11:20am:	**Coffee Break and Networking**
11:20am – 12:10pm:	WWI Intensification Panel continues
12:10pm – 12:40pm:	Open Space Technology (OST) Introduction and Set-up
12:40pm – 1:30pm:	**Lunch**
1:30pm – 3:00pm:	OST Discussions
3:00pm – 3:15pm:	**Coffee Break and Networking**
3:15pm – 3:30pm:	Open Discussion to debrief and internalize the OST session
3:30pm – 3:50pm:	Closing Circle and closing remarks and next steps by the Ontario Water Consortium and the Ontario Clean Water Agency.

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Principles of Engagement

- Choose to show up and be fully present
- Pay attention to what has heart and meaning
- Tell truth without blame or judgement
- Be open to outcome, not attached to outcome

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Map your Wastewater Intensification Journey

1. Just Starting

Characteristics:

- Limited or no knowledge of process intensification.
- Traditional wastewater treatment methods in place.
- No dedicated resources for intensification.

2. Awareness & Exploration

Characteristics:

- Basic knowledge of process intensification.
- Initial research into potential strategies.

3. Planning & Resource Allocation

Characteristics:

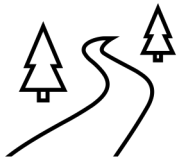
- Decision to pursue specific intensification strategies.
- Initial budgeting and resource allocation.
- Formation of a dedicated team or hiring of consultants.

4. Initial Implementation

Characteristics:

- Pilot testing of selected strategies.
- Initial challenges and troubleshooting.
- Monitoring and data collection.

5. Scaling & Expansion



Characteristics:

- Positive results from pilot tests.
- Decision to scale up and expand the implemented strategies.
- Continuous monitoring and adjustments.

6. Optimization & Refinement

Characteristics:

- Established intensification strategies in place.
- Focus on improving efficiency and effectiveness.
- Regular reviews and updates to the intensification plan.

7. Advanced Implementation

Characteristics:

- Multiple intensification strategies in place and optimized.
- Recognized as a leader in wastewater process intensification.
- Sharing knowledge and best practices with others.

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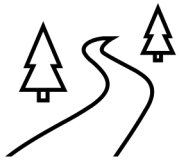
Map your Wastewater Intensification Journey



What challenges/opportunities are you currently facing and how are you hoping to overcome them?

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Map your Wastewater Intensification Journey

Step 2: Awareness & Exploration: Identify needs & look around for ppl around you to do the work with	
Convenor:	**Participants:** Mehran Andalib, Adam Moore, Tony Kobilnyk, Kirby Oudekerk, Rania Hamza
Discussion Topics:	Cost – Sharing with big municipalities WW & biosolids driven (Greenway WWTP) Have to intensify - no room – located middle of downtown

Highlights of Discussion:

- Increase capacity – quantity (30%) population growth), quality, combined sewer overflow needs to be redefined
- MBR was picked as solution
- Peak flows can go up to 500 MLD vs design flow of 170 MLD
- Carbon diversion – high-rate treatment, no primaries
- Incineration – add centrifuge – 25% solids, almost dry + Low energy – heat exchange
    - Hybrid – AD and Incineration [Food waste & sewage sludge] – Co-digestion
- Solids – biohydrogen production for land application, huge amounts of solids to store during winter months

Recommendations:

Barriers:

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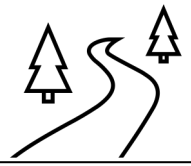

Map your Wastewater Intensification Journey

Step 3: Planning & Resource Allocation	
Convenor:	**Participants:**
Potential Discussion Topics:	1. Steps for creating an intensification plan. 2. Importance of stakeholder engagement. 3. Overview of potential funding sources or grants
Highlights of Discussion: • Working in silos • Multiple areas of intensification at plants • Budget and cost escalation in current market • More grants dedicated to intensification to align with Province's drive for growth • Getting MECP's acceptance	
Recommendations:	
Barriers:	

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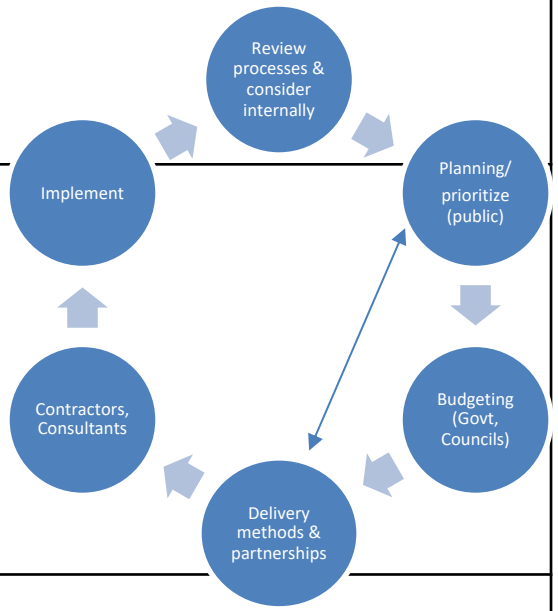
Map your Wastewater Intensification Journey

Step 3: Planning & Resource Allocation

Convenor: Sangeeta Chopra	Participants: Mariana Balaban, Kyle Snell, John Mabira, Leany Moreno
Potential Discussion Topics:	1. Steps for creating an intensification plan. 2. Importance of stakeholder engagement. 3. Overview of potential funding sources or grants



Highlights of Discussion: What is the "pressure" requiring intensification?

1.Indentify needs of each plant. Review current process and see what processes can be "intensified"
- map it out – budgeting + planning - + funding methodology
- prioritize your plan & then go back to revisit.

2.Stake holder Engagement

3.Potential Partnership
- Infrastructure programs/grants
- Infrastructure loans – Ontario infrastructure Bill
- Regional projects – (efficient/cost effective long term)

Recommendations:
- More Grants
- Consistent infrastructure programs
- Adopt difficult delivery models
- Select cost-effective technologies long-term

Barriers: Funding, rising costs, Staff Retention/Skills/ Trades Development, Climate change adaptation/ Regulatory Changes

Extra Notes: Biosolids management is challenging for small municipalities

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Map your Wastewater Intensification Journey

Step 4. Initial Implementation	
Convenor: Aaron Law	**Participants:** : Chenyang Zhao, Susan Aitlin, Richard Chen, Robin Skeates, Barbara Anderson, Yaldah Azimi, Eliav Eini, Jacob Sitko
Potential Discussion Topics:	1. Best practices for pilot testing 2. Importance of data-driven decision making 3. Case studies of initial implementation challenges and solutions

Highlights of Discussion:

- MABR trial NT – Toronto
- Side stream EPR ABTP –Toronto
- Challenge retrofit into operating facility – old
    - operating new technology/resistance from staff to changes
    - resistance to maintaining new equipment + esp analyzers
- Capacity -limitations resulting from WSER – greater nitrification
- Operate
- Length of time
- GHG emissions

MECP – Regulatory push?? To aid change??

Information sessions with MECP to inform about concerns with new regs (discharges)
-Emphasize that protection of environment is of highest concern

- Operator training & Engagement
    - smaller plants – easier to engage
    - start earlier
    - Tony Ho paper – on Human Infrastructure

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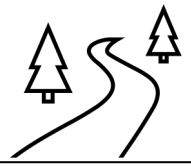

Map your Wastewater Intensification Journey

Step 4. Initial Implementation Cont'd	
Convenor: Aaron Law	**Participants:** : Chenyang Zhao, Susan Aitlin, Richard Chen, Robin Skeates, Barbara Anderson, Yaldah Azimi, Eliav Eini, Jacob Sitko
Potential Discussion Topics:	1. Best practices for pilot testing 2. Importance of data-driven decision making 3. Case studies of initial implementation challenges and solutions

Highlights of Discussion:

COT

1. Retrofit into existing infrastructure eg. Ashbridge side stream bio-P/NTTP MABR
2. Operation resistance – Training/prepare operators
3. Capacity – dry weather
4. Infrastructure process switching from CAS
5. Aeration, limit DO to save energy
6. Length of time for implementation
7. N_2O
8. MECP is going to update ECA
9. Technical knowledge on the owner side
10. Information session with MECP

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Map your Wastewater Intensification Journey

Step 5: Scaling & Expansion	
Convenor:	**Participants:** City of Toronto (Emily Legers), Wayne Parker, Jeff Peeters, Tanush Wadhawan
Potential Discussion Topics:	1. Potential Pitfalls and how to avoid them 2. Importance of staff training and capacity building

Highlights of Discussion:

- Real estate an issue
- Looked at Hydro Cyclone - Inline, RAS recoveries from settling sludge in WAS; rearrange stuff
- Aerobic granulation
- Nitrous oxide emissions (biggest C contributor)
- Side stream EBPR
- Dow's EPDs on chemicals (Eniv. Protection declaration)
- Palletization
- Have looked at THP (cost prohibitive)
- Anergia not looked at

Recommendations: Art Umble

Outcomes – Data, wet weather regulations. P-outcomes, pro-rating limits

Eg. Phosphorus: P-offsetting – very little tractions, wet weather flows. Consistency → requires working with the regulator, community and multiple agencies

Barriers:

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WWI Intensification Panel

Yaldah Azimi, Wastewater Process Optimization Program Manager, OCWA

Process Optimization as an Intensification Strategy

Yaldah is the Wastewater Program Manager in the Innovation, Process Optimization and Technical Services at the Ontario Clean Water Agency. Yaldah is a chemical engineer and researcher in the field of wastewater treatment. Their core expertise is on the impacts of the engineered environment on the physical and chemical properties of biomass, and creating value from waste. Yaldah functions as a process designer, optimizer, researcher, troubleshooter and educator in our field. Their current passion is on addressing the disconnects between engineering and operations. Yaldah has an M.A.Sc and PhD in Chemical Engineering from the University of Toronto and conducted their postdoctoral research in the environmental biotechnology group at Oxford University.

Sudhir Murthy, CEO NEWhub Water Corporation and RESbonds International Corporation

WWI Strategies: Horizontal Stack – Concrete, Mechanical and Digital

Sudhir is the CEO of NEWhub Holding Company, a water technology incubator; and NEWhub Water, a technology consulting and licensing company. Dr. Murthy has over 30-year experience creating new policies and business models for water technology innovation, and for developing, commercializing and adopting new technologies, with over $2.5 billion in implementations worldwide. He worked at DC Water, the public water utility serving the Washington, DC Metro for 16 years, and started the innovation program for the then new Authority and eventually served as its Innovations Chief. He has developed and commercialized many technologies including inDENSE, DEMON, DETOUR, miGRATE and AvN through licensed partners globally. Dr. Murthy is a Professional Engineer and a licensed wastewater treatment plant operator with a MS and PhD in Civil and Environmental Engineering from Virginia Tech.

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WWI Intensification Panel

Art Umble, Director: Stantec Institute for Water Technology & Policy

Wastewater Resource Recovery Facilities in 2040 – Rural, Suburban and Urban

Art is a global leader in promoting planetary sustainability. As director of the Stantec Institute, he is responsible for the execution and publication of applied research associated with circular economy, emerging contaminants, machine learning, and process intensification, and water use, and how these areas are influenced by a changing climate. He is focused on accelerating the adoption of technology through strategic partnerships with key stakeholders in the global environmental space. His experience includes leading Stantec's Global Wastewater Treatment Sector, university teaching, and managing a publicly owned water and wastewater utility.

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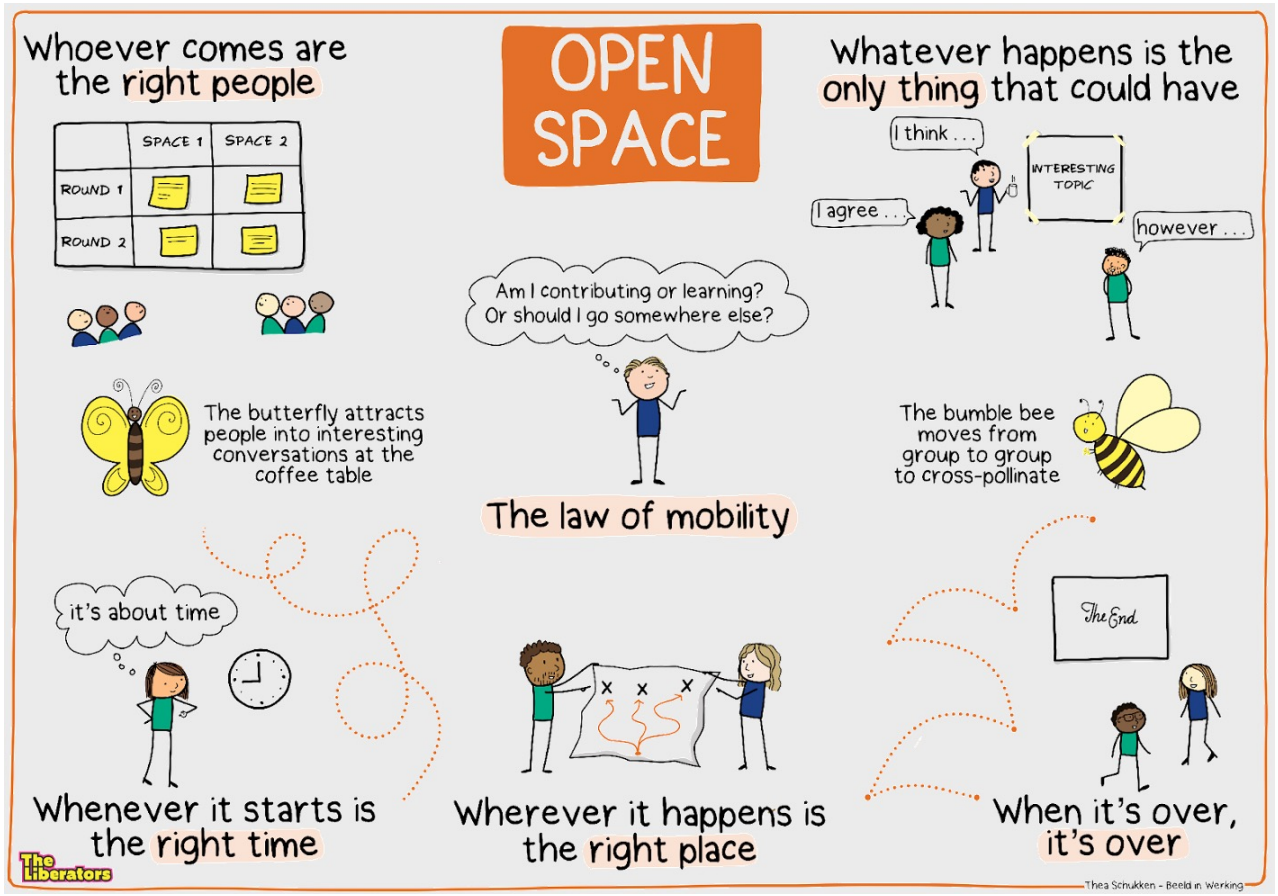
Afternoon Discussion using Open Space Technology



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Discussion Topics

	1	2	7	9	3	5	11
# 1	Wet weather flow treatment and its impact of plant capacity (WWTP) - Harpreet	How to deal with solids stream intensification regionally? Cindy K	What are technologies to achieve a nitrate limit in effluent? Stephanie Weber	Are there tools available to do full carbon accounting when evaluating alternative technologies – Wayne Parker	Getting Buy-In for Intensification – Drivers, Benefits, Barriers - Aaron Law	Applications of InDense and Anamox screens in, Canada/USA? Suppliers? Kyle	How to get Outcomes based Approach – Small, Med and Large – Art Cost savings?
# 2	Unpacking the alphabet soup of 2° intensification technologies…MBR, IFAS, denitrification, MABR etc – How do I choose which one makes sense? Jeff Peeters	Anaerobic digestion intensification new technologies – Sorin M	Budget and Resource allocation. Chenyang	Process Monitoring and operation buy-in eg. MABR - Richard	How to create an environment to help people say "yes"?	What role does AI have in process intensification? Adam M	Circular leadership - Art

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Discussion Topics

	1	2	7	9	3	5	11
#3	Owner's Remorse – Innovation adoption off the mark - Eliav	Granular Sludge use for increase of AS Plants capacity – Sorin M	How can we improve our data quality to support Innovation? Emily Zegers	Funding opportunities, PP partnerships, provincial, regional, growth finance - Kirby	Work Model between utility and vendor to develop innovative Solutions - Sudhir	Process Interdependencies in context of optimization - Yaldah	GHG assessment with different unit processes in intensification – Adam M

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Afternoon Discussion Topics

Topics Discussed in Time Slot #1

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Afternoon Discussion Topics

Topic of Discussion: Wet weather flow treatment and its impact of plant capacity	
Convenor: Harpreet Rai	**Participants:**
Highlights of Discussion: • CLIRCA (Reza, Hollowirth, Chris Manning) • Consolidated Linear Infrastructure • Potential solution to wet weather issue • Year and a half old – relatively new • There is a deadline – January 2024 • Give rationale for a by-pass • Frequency distribution	
Recommendations: • Pursue consolidated linear infrastructure • Find opportunities to mitigate wet-weather flow on partial treatment	
Barriers:	

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Afternoon Discussion Topics

Topic of Discussion: Solids Stream Intensification	
Convenor: Cindy Kambeitz	**Participants:** Durham, Peel, London and Stantec

Highlights of Discussion:

- See recommendations

Recommendations:

- Advocacy group speaking on behalf of Municipal Biosolids generators (marketability, regulations, studies etc.)
- Provincially led "Hubs" for outlets. Provincially monitored land availability

Barriers:

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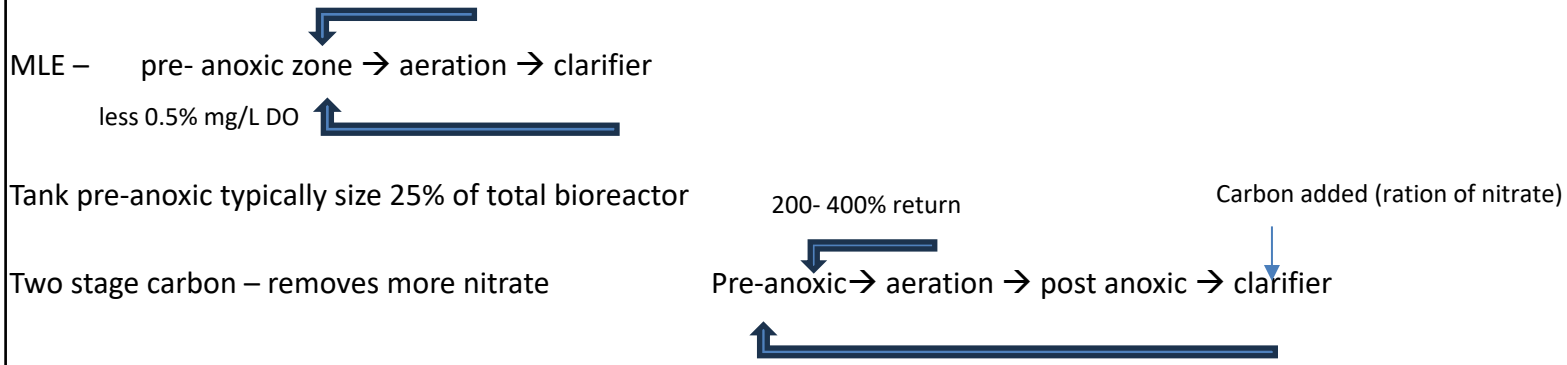
Afternoon Discussion Topics

Topic of Discussion: Technology to achieve nitrate limit in effluent	
Convenor: Stephanie Weber	**Participants:** Stephanie Weber, Adam Moore, Chad Springer, Rania Hamza, John Mabira

Highlights of Discussion:



- Bardenpho is when there is also anerobic tank for phosphorus removal (biological)
- Can add MaBr in pre-anoxic tank
- Can get filaments in pre-anoxic tank

Recommendations:

Barriers:

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Afternoon Discussion Topics

Topic of Discussion: Carbon accounting	
Convenor: Wayne Parker	**Participants:** Richard Chen, Emily Zegers, Thomas Wendling, Chandra Baker, Mohamed Abdesamine Rajesh Seth

Highlights of Discussion:

- REIT-Screen has added a GHG module for w/w treatment
- WEAO - GHG inventory spreadsheet (Tool) - operational emissions
- BEAM model – Biosolids emissions
- OWC model
- Digital Twins - resources to support - Cobalt H_2O?
- Role of AI?
- Inability to get info on power consumption by major equipment within plants
- Energy use vs N_2O generation optimization
    - lack of instrumentation to identify optimum operating conditions
    - accuracy of monitors/ sensors that limit quality of estimates
- Embodied emission for tankage– conventional vs intensification
    - Sewers as sources?
- Comprehensive source – discharge tool doesn't exist

Recommendations:

Barriers:

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Afternoon Discussion Topics

Topic of Discussion: Getting buy-in for intensification	
Convenor: Aaron Law	**Participants:** Dominika Celmer-Repin, Gregory Barber, Kurtis Tamming, Carlos Diaz, Chenyang Zhao, Tony Kobilnyk

Highlights of Discussion: Difference between general support for innovation and addressing specific needs

Need buy in from:

- Stakeholders
- Who to talk to about specific ideas
    - Operational team, permitting, design, consulting, optimization staff, regulators, community, council
    - Depends on stage of technology, different needs

How to get by in?

- Depends on innovation culture
- Anxiety about innovations
- Include regulators early and often
- Think about community goals
- Muni strategic planning can create limits

Recommendations: Clear Proposal

- Create business case for municipality with good ROI, transparency, adjust messaging to level of staff at municipalities
- Need to respond to identified issues, communicate confidence in solution

Barriers:

- Risk- adverse, innovation culture, cost and R&D budget

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Afternoon Discussion Topics

Topic of Discussion: Getting buy-in for intensification Cont'd	
Convenor: Aaron Law	**Participants:** Dominika Celmer-Repin, Gregory Barber, Kurtis Tamming, Carlos Diaz, Chenyang Zhao, Tony Kobilnyk

Extra Notes:

- Piloting not recommended when sure outcome is needed, use piloting as feedback loop
- Larger piloting more risky
- Just because a tech is proven still doesn't mean it will work perfectly in our situation, depends on site conditions
- When tech is new, Muni's tend to push back as much on vendors as possible, balancing act
- Muni's want to address research on most efficient operations of infrastructure and research on for " greater good", socioeconomic benefits also important

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Afternoon Discussion Topics

Topic of Discussion: Applications of InDense and Anamox Screens	
Convenor: Kyle Snell	**Participants:** Josh Zhang, Eliav Eini, Leany Moreno, Yaldah Azimi

Highlights of Discussion:

- Perhaps InDense & MABR great apart but not together
- InDense not necessarily granular
- InDense pairs very well with MBR as it reduces fouling
- Time based waste
- $10m^3/hr$ cyclone – InDense
- $5m^3/hr$ – cyclone – Anamox
- Guelph has Anamox process?
- Basically concern is fouling rates for MABR
- De-watering concern with Hydrocyclone
- Opens up ECA concerns for bypass and effluent restrictions
- Seasonal issues would impact InDense

Recommendations:

Barriers:

- Need anaerobic zone regardless to achieve Bio P

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Afternoon Discussion Topics

Topic of Discussion: How to get outcomes based approach, small, med, large – cost savings?	
Convenor: Art Umble	**Participants:** Susan Aitlin, Mariana Balaban, Barbara Anderson, Robin Skeates, Rahim Kanji, Narasimman Lakshminarasimman, Hank Andres
Highlights of Discussion: Outcome based solutions 1. Public Health & Environment resilience 2. Infrastructure flexibility/Reliability/Longevity/Modularity 3. Scale 4. Recovery & Circularity 5. Climate change ready 6. Governance & Financial Ops What would be the metrics to measure the outcomes	
Recommendations:	
Barriers:	

Afternoon Discussion Topics

Topics Discussed in Time Slot #2

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Afternoon Discussion Topics

Topic of Discussion: Alphabet Soup of 2° Intensification Technologies	
Convenor: Jeff Peeters	**Participants:** Harpreet Rai, Sudhir Murthy, Stephanie Weber, Chad Springer, John Mabira

Highlights of Discussion:

IFAS	Bio intensification
MBR	Bio + hydraulic intensification
MABR	Bio – intensification + energy savings
InDense	Hydraulic intensification
MABR + InDense	Bio + hydraulic intensification + energy savings Process synergy

Recommendations:

Barriers:

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Afternoon Discussion Topics

Topic of Discussion: Anaerobic Digestion Intensification – New Technologies	
Convenor: Sorin Manta	**Participants:** Yaldah Azimi, Hank Andres, Cindy Kambeitz, Wayne Parker, Sherin Khalil

Highlights of Discussion:

Ephyra and Cambi technologies

- Pilot conducted at Waterloo and City of Toronto interested, also Region of Peel and Durham
- Construct Ephyra as conventional treatment and there influent small SRT
- MECP response to 9 day SRT, will be circulated as a response to our ECA opp
- Control box of Ephyra is often a question
- Sludge more dilute in NA versus Europe
- Cambi vs Ephyra
    - Dry cake on Cambi
    - 55° vs 35° (Ephyra)

Recommendations:

- Ephryra is a good technology to be considered in condition that is not involving more heating of sludge

Barriers:

- No installation in Ontario

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Afternoon Discussion Topics

Topic of Discussion: Process Monitoring and Operation Buy-In	
Convenor: Richard Chen	**Participants:** Dominika Celmer-Repin, Eliav Eini, Jacob, Leany Moreno

Highlights of Discussion:

<u>Operation Challenges:</u>

- Hespler WWTP is in performance testing: overall removing Nitrogen
- Nitrification rate is lower in the winter
- NO_3^- N_7 - 10 mg/L in effluent
- Some challenges on mixing which lowered nitrification rate
- Biomass blanket at the tank bottom, produce ammonia
- Biofilm can grow very thick
- Set air flow rate in MABR aeration control
- Condensate removal is critical

<u>Monitoring:</u>

- NH_3 – N Influent/efficient
- Composite samples analyzed by university
- O_2 probe on exhaust line is very important, sensor fouls from moisture
- Don't cheap out on instrumentation
- Biofilm thickness < 400 µm, thickner in the front
- Some FOG accumulate in the winter

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Afternoon Discussion Topics

Topic of Discussion: How to create a "YES" environment	
Convenor: Hailin Wang	**Participants:** Mariana Balaban, Geoff Totten, Robert Nyman
Highlights of Discussion: 1. Education to raise awareness 2. Piloting to showcase the new ideas 3. Doors open with general public 4. Sexy factors in planning and designing style to make it easier to accept by politicians 5. Municipal election to have more younger generations voice heard. (No solution? – at the political level)	
Recommendations	
Barriers:	

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Afternoon Discussion Topics

Topic of Discussion: What role does AI have in process intensification?	
Convenor: Adam Moore	**Participants:** John Glass, Kyle Snell, Josh Zhang, Mohamed Abdelsamie, Gregory Barber, Emily Zeger

Highlights of Discussion:

- Software development in general is changing at a fast pace
- Aeration intensity, feedback control for DO and ammonia are currently used
- COD,BOD,MLSS, are other parameters monitored
- Next step is decision making support and the operator and engineer will have to decide what information is good to proceed with
- What about data quality? – Analytical accuracy on instrumentation is a huge deal for operations
- Conversations are starting to happen on AI starting to extrapolate diagnosis on instrumentation reading and feedback for the need for calibration – alarm for enough "drift" – Need to recalibrate
- What role will the operator have eventually?
- AI is being used to monitor operators (are they wearing PPE? Are they performing their routine checks (camera)?
- One concern is the drop in skill level of operators
- Everyone will need programming literacy
- Operator's role -maintenance tasks, calibration
- Within our lifetime, it's not conceivable for AI to be the ORO at a WW facility
- AI systems right now are a more adaptive data management system, rather than making changes to the system automatically
- Plenty of situations where the operator would still need to be doing routine check
- Some pants right now can only be run automatically as the systems have advanced so far in the last 50 years – manual control is in some cases not available
- Cameras are being linked to AI to detect issues

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Afternoon Discussion Topics

Topic of Discussion: Circular Economy / Leadership	
Convenor: Art Umble	**Participants:**
Highlights of Discussion: • Market research experience/expertise needed by utilities • Value of product that is recovered/supply chain capacity • Need a centralized to do market research • Public Education • District heating (heat recovery from sewage)	
Recommendations	
Barriers:	

Afternoon Discussion Topics

Topics Discussed in Time Slot #3

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Afternoon Discussion Topics

Topic of Discussion: Owner's Remorse	
Convenor: Eliav Eini	**Participants:** Harpreet Rai, Chandra Baker, Jeff Peeters, Aaron Law, Yaldah Azimi

Highlights of Discussion:

- "This was supposed to be easier"
- Design basis to construction / commissioning
  - Assumption changed
  - Conditions changed
- Small communities – range of conditions may vary more
  - Modular design to "right size"
- Operations reluctance to operate new systems at lower than design capacity (ie. Turn-down of blowers to met lower loading)
- Building in flexibility
- Risks of changing assumptions need to be identified / managing (sensitivity)
- Additional data for design basis (sampling: monitoring effort, grab sample vs composite)
- Operator comfort: "we tried it, it didn't work"
  - Is it data driven?

Recommendations

- Ensuring equipment turndown and still meet the design flows
- Phasing / staggered expansion

Barriers:

- Added maintenance complexity
- "If I waited 10 years would something better come along?"

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Afternoon Discussion Topics

Topic of Discussion: Granular sludge use for increase of AS plants capacity	
Convenor: Sorin Manta	**Participants:** Mohamed Abdelsamie, Hank Andres, Sherin Khalil, Youngseck Hong

Highlights of Discussion:

- Nereda technologies
- Idea of retrofitting one primary clarifier
- Challenges → SBR vs continuous flow
- Where do I discharge the Nereda effluent? - Going to disinfection
- High TSS would be a problem
- At least 6m height, that is recommended for 2/3 ratio to budget
- Nereda pilot in Calgary
- Nereda does not share data
- InDense technology is good to be considered

Recommendations

- Looking for info from a first installation in Ontario
- SBR is not agreed, plug flow is more acceptable

Barriers:

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Afternoon Discussion Topics

Topic of Discussion: Improve data quality	
Convenor: Emily Zegers	**Participants:** Leany Moreno, Chenyang Zhao, Josh Zhang, Jacob, Cindy Kambeitz, Sangeeta Chopra, Michael Menalo, Kyle Snell, Gregory Barber

Highlights of Discussion:

Problem: Manual typed data is usually treated as quality data in comparison to SCADA data

- Manual input data needs to be validated
- Compliance data needs to be verified every month by compliance group
- Compliance group should flag the questionable data
- Flow data drifts over time (eg. Scale build up in the pipe and decrease the pipe diameter → flow rate increased over time – CCTV to verify
- Separate compliance sampling from process sampling
- Process data needs to be gathered at an adequate frequency
    - Set frequency of sampling and review
    - Set up threshold on process parameter for notification to the process team to review
    - Hach RIOS/ERIS etc. data management platforms – separate database from SCADA historian

Recommendations

Barriers

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Afternoon Discussion Topics

Topic of Discussion: Funding opportunities (PP, Prov, Region, Grants)	
Convenor: Kirby Oudekerk	**Participants:** Carlos Diaz, Kurtis Tamming, Geoff Totten, Stephanie Weber, Hailin Wang, Narasimman Lakshminarasimman

Highlights of Discussion:

- Quick development aligns well with intensification – agile
- Rural – partnerships required for funds – especially research → work with academia
- Pilot tests as mean for smaller muni's to adopt new technology at lower costs
- Mapleton – design-build-operate is being explored, heavy development pressure

Recommendations

- Pilot opportunity for smaller muni's
- Consolidated biosolids opens space for intensification
- Work with academia to reduce implementation risk

Barriers:

- Lack of control – awareness of funding
- Some ops resistance to technology change – political co-operation
- Implementation time constraints on funding