4th March 2021, Thur 9:00am to 10:30am SGT

Cisco webex

Canadian Virtual Showcase

Water Tech Companies

Jointly organised by :

Canada

PUB SINGAPORE WATER EXCHANGE

SWA SINGAPORE WATER ASSOCIATION

Welcome

Time (SGT)	Agenda
9:00am – 9:10am	Opening & Housekeeping by SWA
9:10am – 9:20am	Opening Remarks by Her Excellency Ms. Lynn McDonald, High Commissioner of Canada in Singapore
9:20am– 9:30am	Keynote Address by Mr Moh Tiing Liang, Deputy Director (Industry and Technology Collaboration) PUB, Singapore's National Water Agency : Opportunities in the Singapore water sector
9:30am – 9:35am	Presentation by Tradeworks Environmental Inc
9:35am – 9:40am	Presentation by Pani Energy
9:40am – 9:45am	Presentation by Waterlix Inc
9:45am – 9:50am	Presentation by SewerVue Technology Corp
9:50am – 9:55am	Presentation by WaterShed Monitoring
9:55am – 10:00am	Presentation by Anaergia
10:00am – 10:25am	Q & A / Panel Discussion Moderator : Mr Kunal Shah SWA Council Member Managing Director of Anaergia Inc
10:25am – 10:30am	Closing by Singapore Water Association

Presenters :

TRADEWORKS ENVIRONMENTAL

pani

Waterlix Inc.

SewerVue IN-PIPE GPR

WaterShed Monitoring

Anaergia Breaking Barriers to Sustainability

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Housekeeping

- ✓ To ensure a smooth session, please mute your microphone and turn off the camera. You may communicate with us after the event.
- ✓ Please share your questions in the chat where we will try to provide answers where possible in the Q & A Segment.
- ✓ Do identify yourself so we can respond to any unanswered questions
- ✓ We will be recording this session and reserve the rights to the video

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Disclaimer

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- Information shared today is true and accurate as of publication date.
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Moderator

Mr Kunal Shah
Council Member, SWA
Managing Director, Anaergia Inc

Kunah is a SWA Council Member and Managing Director & Regional Business Development Head of Asia at Anaergia , a global leader in Organics waste management maximizing resource recovery from Wastewater, Solid waste and Agricultural waste. Kunah himself is a Chemical Engineer with over 12 years of global experience in the space of water, wastewater, Municipal solid waste and Bioenergy.

Presenters :

TRADEWORKS ENVIRONMENTAL

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Keynote Address

Mr Moh Tiing Liang
Deputy Director
(Industry and Technology Collaboration Department)
PUB, Singapore's National Water Agency

Moh Tiing Liang is a Deputy Director at the Industry & Technology Collaboration Department in PUB, Singapore's National Water Agency and oversees PUB's technology collaboration efforts with the aim to grow technologies through partnerships with the industry and other stakeholders. In this role, he leads a team to commercialize water technologies that are co-developed by PUB. Tiing Liang graduated in mechanical engineering from the National University of Singapore and obtained his EMBA from Rutgers University.

Presenters :

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Q & A

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Upcoming

17th March 2021

[Hybrid] Behind the Scene: Brave Blue World, sponsored by DuPont, SUEZ and Xylem

24th March 2021

[Webinar] Israeli Digital Water Technologies with Ministry of Economy and Industry, Israel

Presenters :

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pani

Waterlix Inc.

SewerVue IN-PIPE GPR

WaterShed Monitoring

Anaergia Breaking Barriers to Sustainability

Thank You

For further queries on this event, please contact :

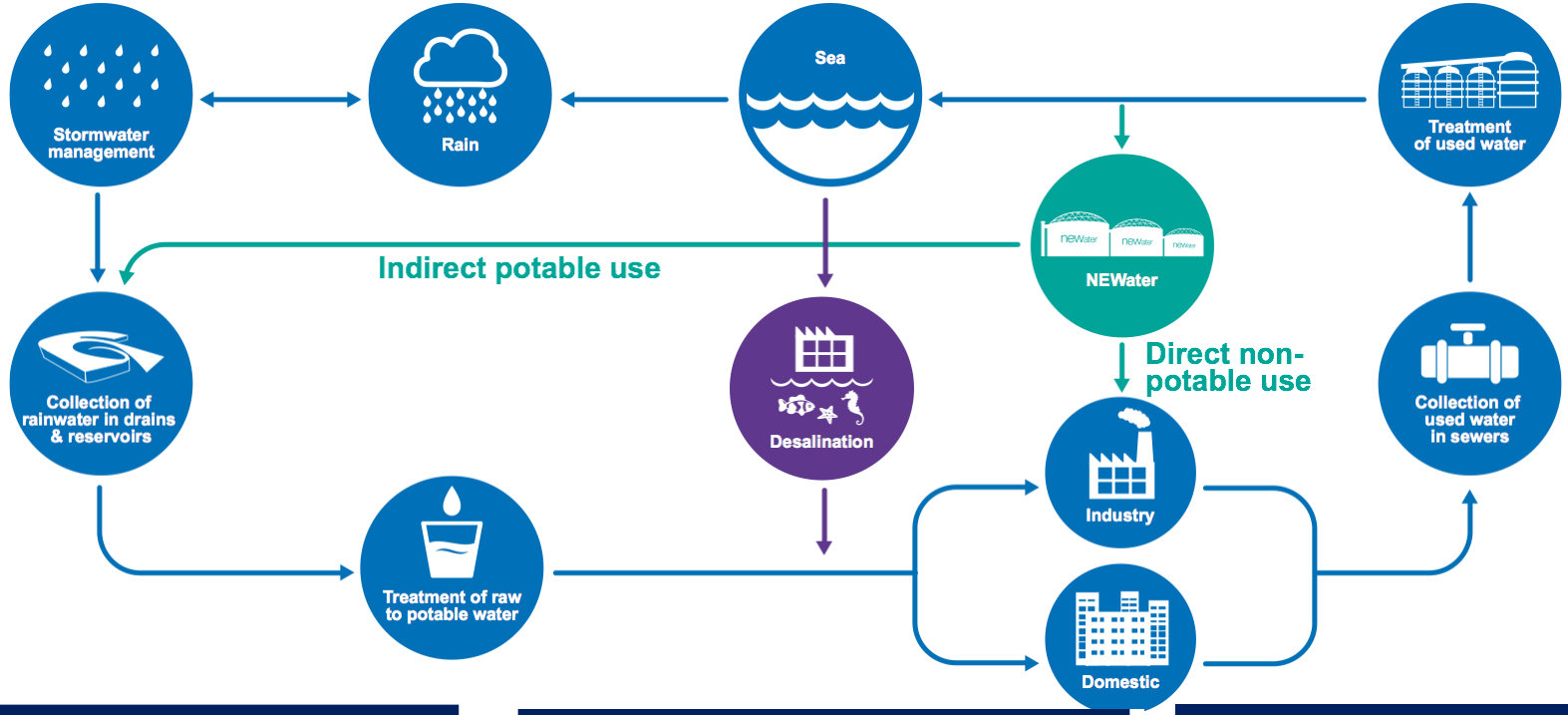
Singapore Water Association
T: (65) 6515 0812
enquiry@swa.org.sg
www.swa.org.sg

PUB SINGAPORE'S NATIONAL WATER AGENCY

Opportunities in the Singapore Water Sector

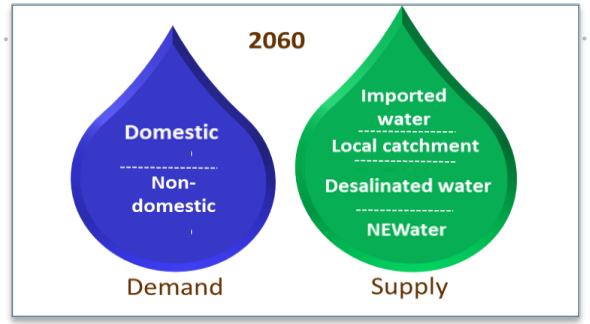
Presented by Mr Moh Tiing Liang
Deputy Director (Industry and Technology Collaboration)

PUB Manages the Entire Water Loop

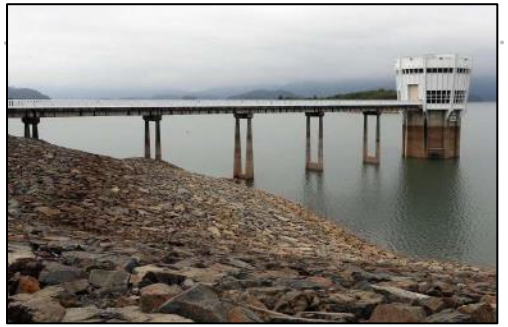


- Supply Good Water
- Reclaim Used Water
- Tame Storm Water

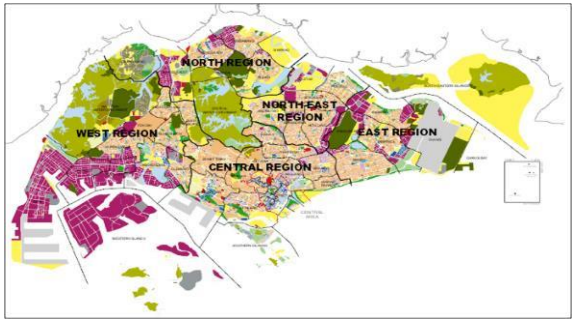
Singapore's Water Challenges



Rising Water Demand



Water Scarcity

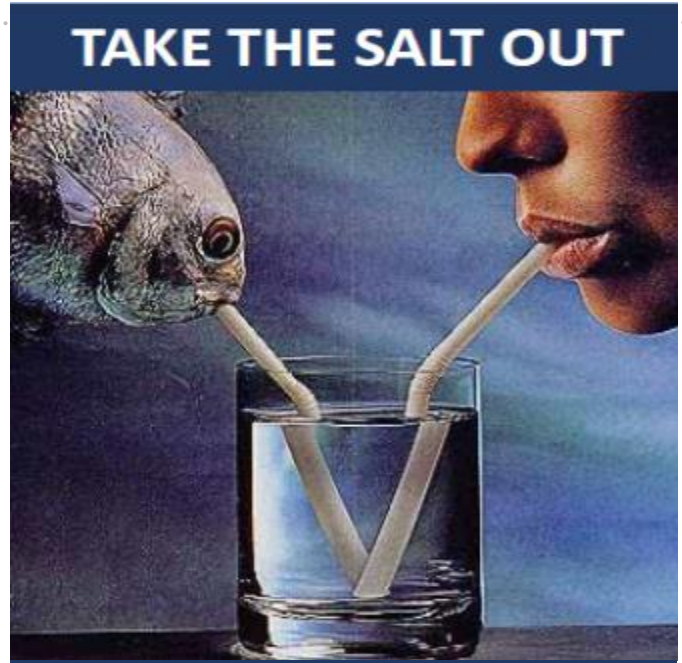


Land Constraints

Rising Public Expectations

Strengthening Singapore's Water Resilience

Water Reuse



Seawater Desalination

Technology as the Lever for Water Sustainability

PUB leverages technology to overcome water challenges and meet long-term water sustainability

Preparing Singapore for the Future

1 Desalination and Water Reuse

Reduce energy consumption

Current: 3.5kwh/m³

Long-term goal: <1 kWh/m³ by 2050

2 Used water treatment

Improve treatment energy self-sufficiency

Current: 25%

Long-term goal: 100% by 2050

3 Industrial Water Solutions

Reduce water consumption by industries

Current: cumulative 15 MGD savings

Long-term goal: cumulative 100 MGD by 2060

4 Waste Reduction and Resource Recovery NEW

Reduce amount of dewatered sludge sent to incineration

Current: 0.16kg/m³

Long-term goal: 0.08 kg/m³ by 2060

5 Coastal Protection NEW

Increase coastline protection

2025 target: Completion of integrated coastal-inland drainage model and site-specific engineering studies

Long-term goal: 100% coastline protection by 2050

Collaborating with the Industry

- Vibrant Water Ecosystem with over 200 Companies & more than 25 Research Centres

Co-digestion of Used Water Sludge and Food Waste

Anaergia

- To demonstrate co-digestion of used water sludge and food waste in enhancing biogas production.
- Over 2 to 3 times average specific biogas yield compared to conventional sludge digestion.
- Co-digestion of used water sludge and food waste will be adopted in the future "Tuas Nexus" water reclamation plant cum solid waste incineration plant project.

Detection of Heavy Metals in Used Water

Island Water Technologies

Sentry bio-electrochemical sensor

- The Sentry bio-electrochemical sensor is used to detect presence of heavy metals in the used water
- Installed at Water Reclamation Plants and factory sites since Oct 2020
- Collection of real-time data for baselining, calibration, and validation of sensors is ongoing

Launchpad at the Singapore Water Exchange

- **An ecosystem** of different stakeholders in the water value chain.
- A platform to showcase local water technologies and spur commercialisation.

Singapore International Water Week

SIWW2021 Event Format

SIWW2021 SPOTLIGHT — 21 June 2021

- High-level summit for water leaders in governments, utilities, academia and industry
- Hybrid: physical for Singapore attendees, virtual for overseas attendees
- Co-located with World Cities Summit

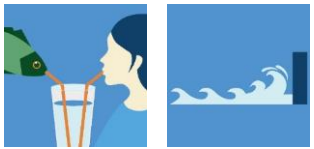
SIWW2021 ONLINE — 21 June – 2 July 2021

- Thematic webinars
- Virtual Water Convention technical and poster sessions
- Virtual Water Expo and product showcases

SIWW2021 Key Thematic Areas

Climate Resilience

Building resilience to impacts of climate change on urban water systems

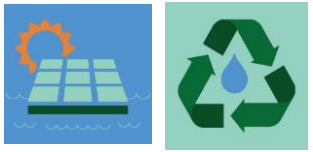


Digital Water

Leveraging digital technologies across urban water cycle to achieve optimization and efficiency

Resource Circularity

Embracing circular resource management to reduce water, energy and resource footprint



PUB SINGAPORE'S NATIONAL WATER AGENCY

Thank You

TRADEWORKS ENVIRONMENTAL

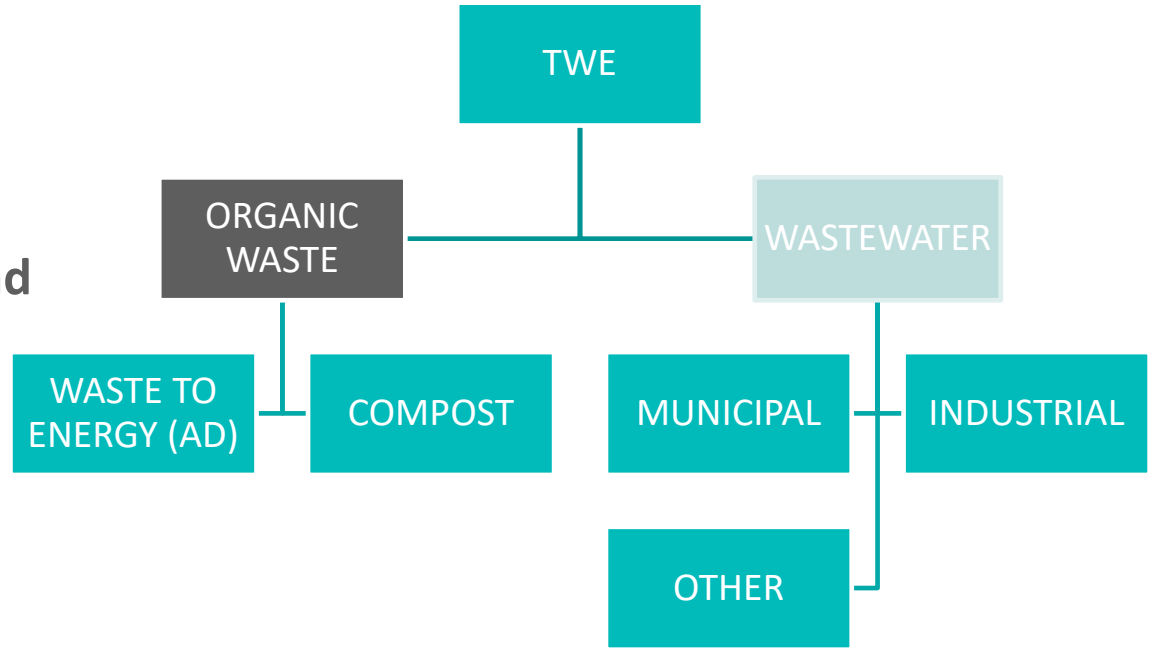
A NEW PARADIGM IN ORGANIC WASTE AND WASTEWATER TREATMENT

TRADEWORKS
ENVIRONMENTAL

TRADEWORKS ENVIRONMENTAL – COMPANY PROFILE

Biological solutions for the treatment of organic wastes and wastewater by:

- **Integrating the Ydro Process®** in existing wastewater and organic waste treatment systems
- Offering unique solutions for **process analytics and optimization**
    - hard-to-treat problems
    - Troubleshooting systems
- Development of **Corporate Sustainability Goals** using Ydro Process ®
- **Global Network -** agents and distributors to support industrial and municipal customer applications



We are a team of Engineers and Scientists dedicated to providing sustainable Waste & Wastewater Treatment Solutions

CHALLENGES WITH CONVENTIONAL ORGANIC WASTE & WASTEWATER TREATMENT TODAY

"1L of gas can contaminate 1M Liters of water"
-Gov. of Canada

- High treatment, energy and disposal costs
- GHGE (big carbon footprint, with very high costs for alternatives)
- Additional Infrastructure (expansion, more processing, etc.)
- Significant negative by-products with conventional methods

- Unsustainable (always one step behind the problem)
- Chemical Based (adding more issues & costs)
- Targeting symptoms only
- Growing demand stressing systems

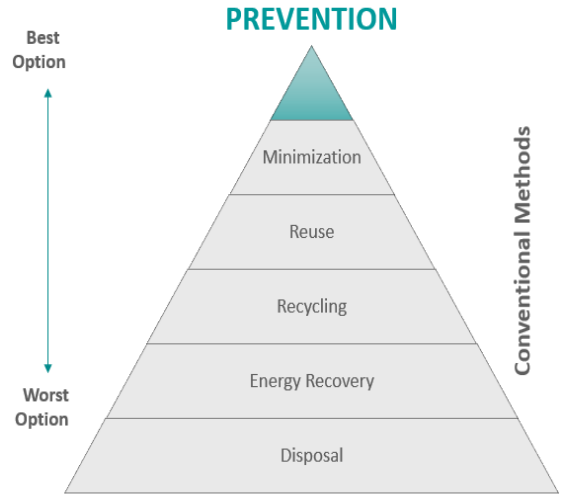
THE SUSTAINABLE SOLUTION: THE YDRO PROCESS®

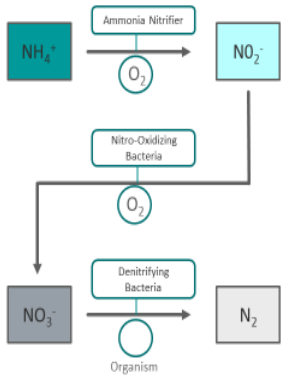
- **Products:** **Ydro Series ® Microorganisms**
  - Specialized microbial strains that enhance the microbial community and its abilities to degrade organic compounds
    - Suite of 25+ formulations according to the wastewater characteristics and target objectives
- **Process:** **Technical/Operational Support**
  - Parameter adjustments according to targeted objectives
- **Service Application:** **Activation/Dosing**
- **Consultation-** **Technical know-how biological systems**
- **Equipment** **– PRIME SCREEN™**
  - Biologically enhanced primary screening

THE YDRO PROCESS®

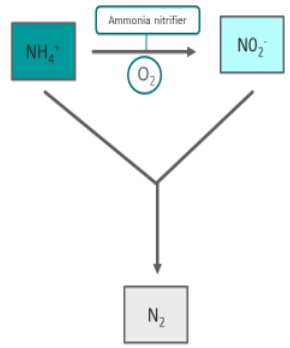
The Ydro Process® is a proven sustainable wastewater treatment method that results in:

- Optimization of existing biological processes
- Elimination of H2S and FOG
- Reduction of:
  - Sludge (+50%)
  - Influent parameters
  - Electricity consumption (15%+)
  - Green House Gas Emissions
  - O&M Costs (35%+)
- Improvement of Effluent
- Resilience to toxic shock and loading





Reaction Route of Conventional Nitrification/Denitrification

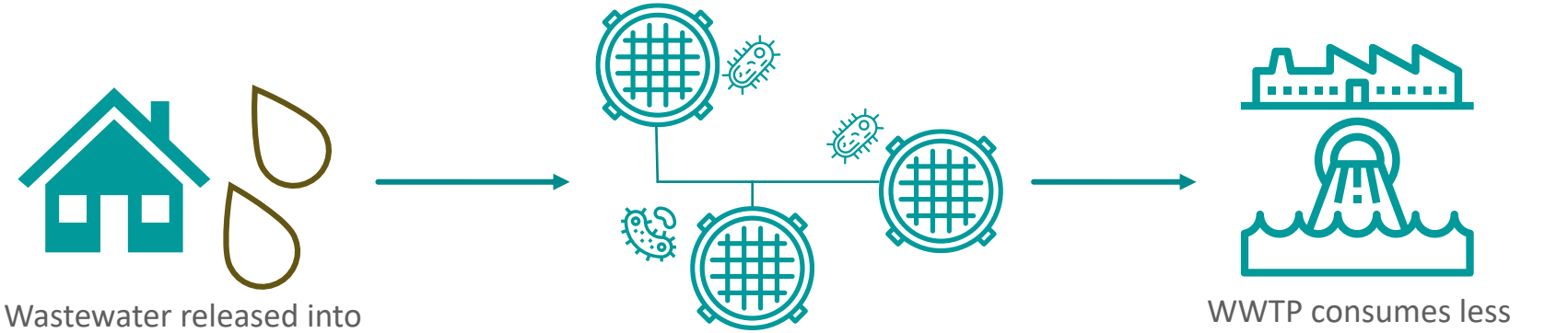


Nitrification/Denitrification with the Ydro Process®

We create sustainable standards incomparable to current methods

HOW IT WORKS

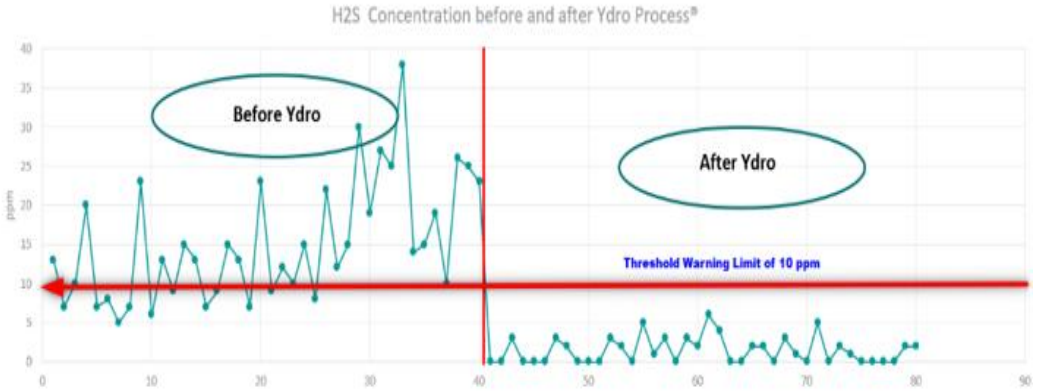
SEWER GRID APPLICATION



Wastewater released into the system

Ydro Series® MOs dosed into target manholes/lift stations within collection system

WWTP consumes less electricity and produces less sludge



The Ydro Series® Microorganisms utilize the Sulphur as their "electron acceptor".
This way, the mechanism of H2S formation is disengaged,
and odors are not formed in the first place.

1. **ODOR** REDUCTION

2. **FOG** REDUCTION

3. **INFLUENT** REDUCTION

PROJECT – PRIME SCREEN™

Collection System Application /Very Fine Scree at the headworks

Objectives:

Collection system application:

1. Eliminate Odors & FOG in Collection System & Lift Station (EPA issues)
2. Eliminate FOG and clogging in Pipes

Fine Screen to remove:

1. Hair, ling, strings, rags, stickers, fibrous solids, etc.
2. Protect the overall integrity of the system

Project date: November 2019; ongoing
Client: City of Delphos
Place: Delphos Ohio, USA

PROJECT – THERMI LAKE BEFORE & AFTER

Rehabilitation of Lake - Recipient of Municipal and Industry Effluent.

KEY MARKETS

MUNICIPAL

Collection Systems

Treatment Facilities

INDUSTRIAL WASTEWATER APPLICATIONS

Compliance

Reuse

ORGANIC WASTE-TO-ENERGY (Biogas)

Anaerobic digestion Enhancement and Optimization

ORGANIC WASTE -TO-REUSE

Composting

SEPTIC/CESSPOOLS

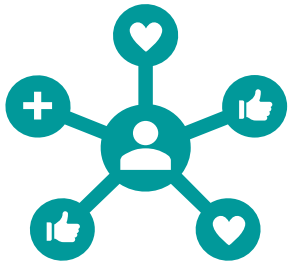
LAGOONS

AQUACULTURE

BODIES OF WATER

YDRO PROCESS® BENEFITS

The Ydro Process® An Integrated Biotechnology Solution for Wastewater & Organic Waste Treatment



Social Responsibility

Eliminate odors, trucks in the streets, sewer back-flows, etc., generated by wastewater & waste management

Environmental Responsibility

Reduce energy demand

Reduce by-product disposal

Reduce the overall carbon footprint of the system to levels incomparable to current methods and technologies

Economic Benefits

Reduce annual O&M costs by 10% - 25%

ROI: 3-10 Months

“Each one of us holds a responsibility to future generations to be our best, to do our best and, to leave our best behind.”

To learn how you can join the movement for a cleaner earth, contact us.

Meni Mancini
Founding Partner
5045 Orbitor Drive
Building 12, Suite 201
Mississauga, ON L4W 4Y4

T: 905.366.7660
C: 416.540.2179
F: 866.529.8497

meni@tradeworksinc.com
www.tradeworksinc.com

Thank You

Cleaning Water for a Sustainable Future

TRADEWORKS
ENVIRONMENTAL

www.tradeworksinc.com

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Digital Operator Coach™ for Water &
Wastewater Treatment Plants

existing hardware, existing people, existing data.

1

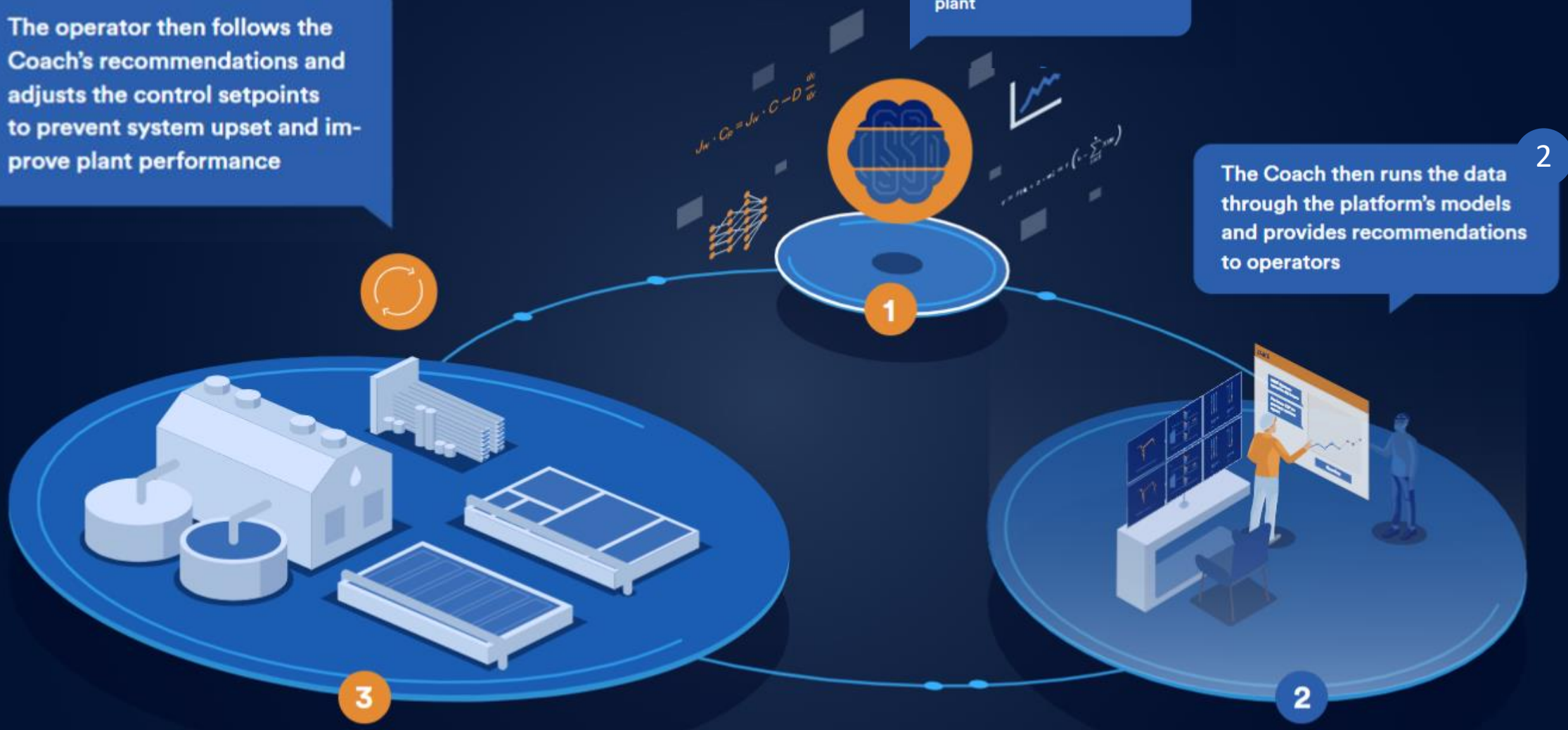
The Coach aggregates data from multiple sources in the plant

2

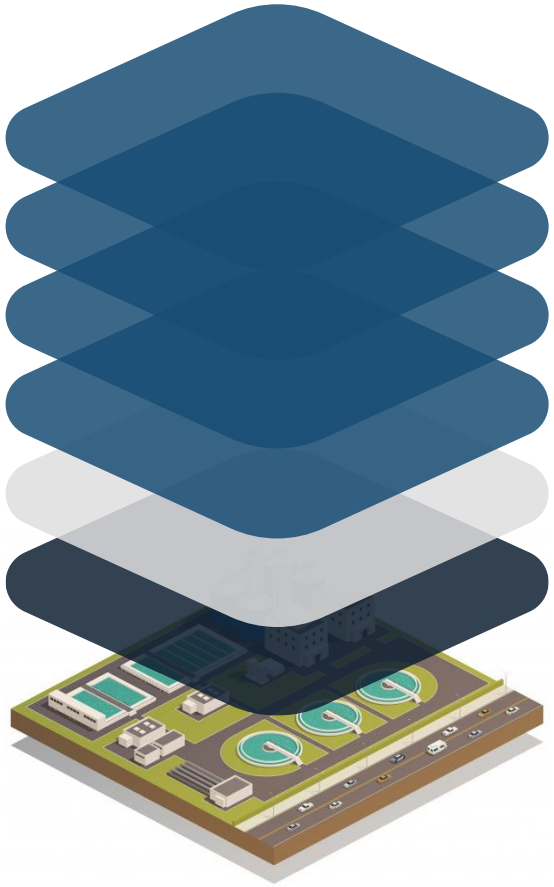
The Coach then runs the data through the platform's models and provides recommendations to operators

3

The operator then follows the Coach's recommendations and adjusts the control setpoints to prevent system upset and improve plant performance



Same process, higher efficiencies.



OPTIMIZATION

FORECASTING

INSIGHTS

ANALYTICS

EXISTING SYSTEMS (SCADA/DCS)

pani

OPERATIONAL INSIGHT FOR IMPROVED PLANT RELIABILITY AND PERFORMANCE

Secure, read-only access

SEAMLESSLY INTEGRATES WITH EXISTING SYSTEMS AND PEOPLE

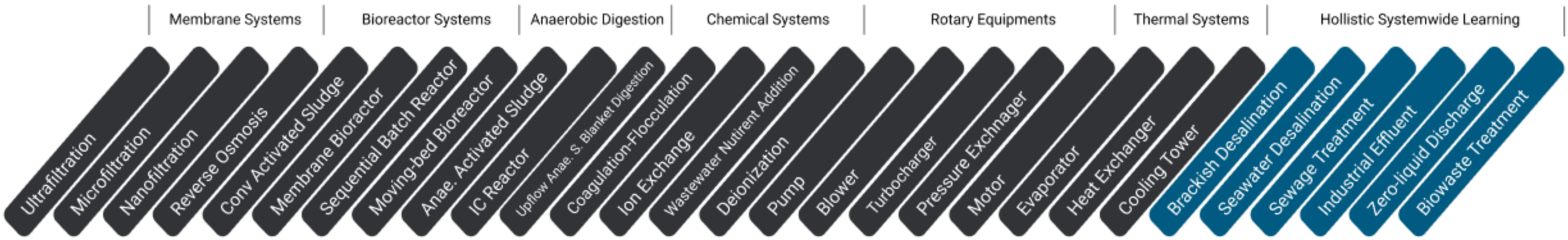
pani

AI Operator Coach for water & wastewater treatment

Delivering tangible value at 0$ CAPEX

- Lower **OPEX (2-25%)**
- Reduce **Downtime (~20%)**
- Increase **Equipment Life (3-15%)**
- Increase **Plant Efficiency (2-15%)**

Our AI technology is purpose built for treatment.



RO Use-Cases

Incumbent Solution

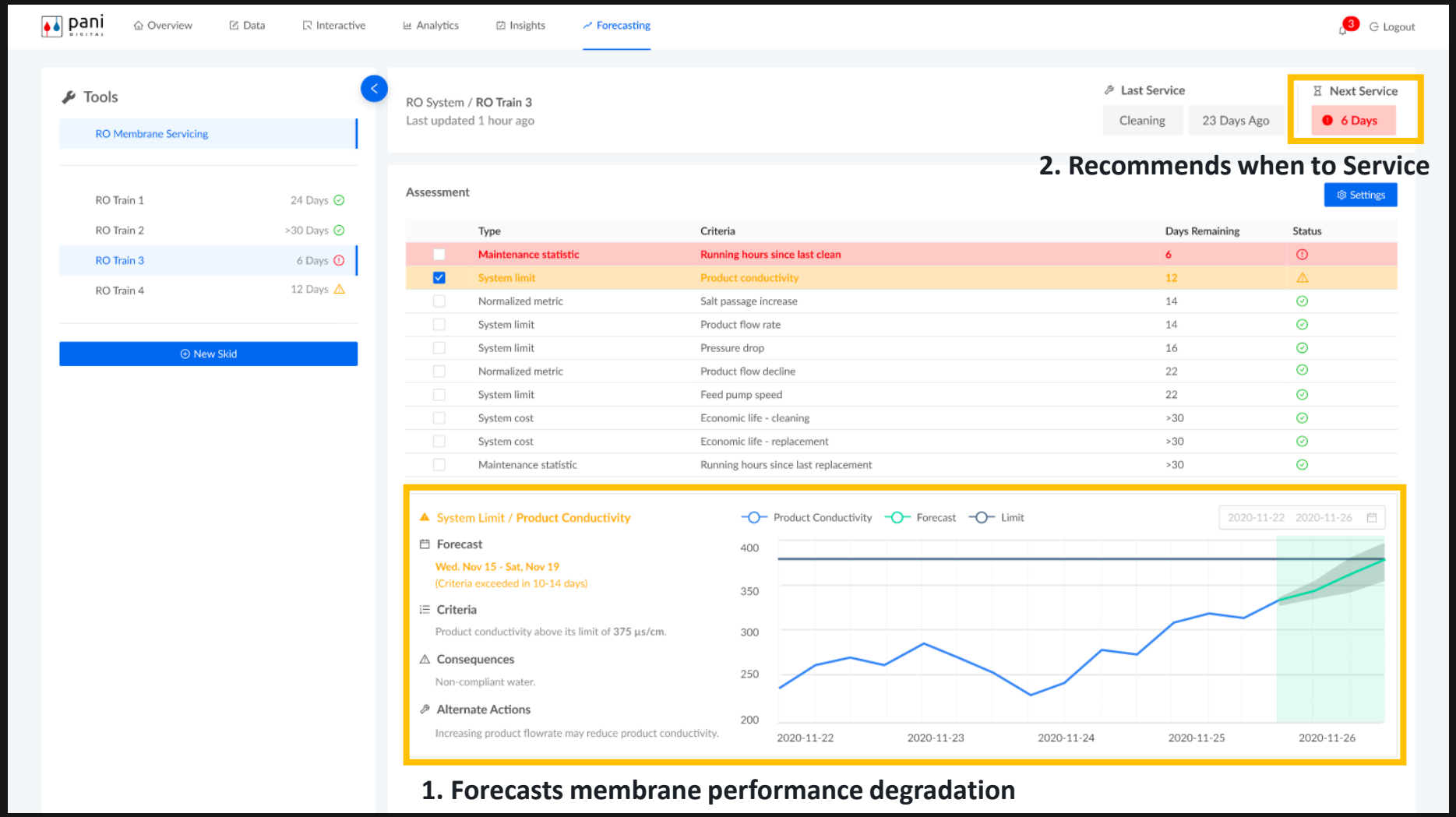
- Cannot predict membranes being damaged, and operators can only react.
- ✗ Downtime (lost production for adjacent bottling plant)
- ✗ Reactive maintenance limits membrane life (higher expenses)

Pani

- AI Coach forecasts degradation, recommends **when to service and how to service** (clean, flush, replace) membrane assets:
- Prevents downtime (saves $500,000 in downtime)
- Extend membrane life (saves $150,000 in replacement)

MEMBRANE FORECASTING

DIGITAL OPERATOR COACH™



RO Use-Cases

Incumbent Solution

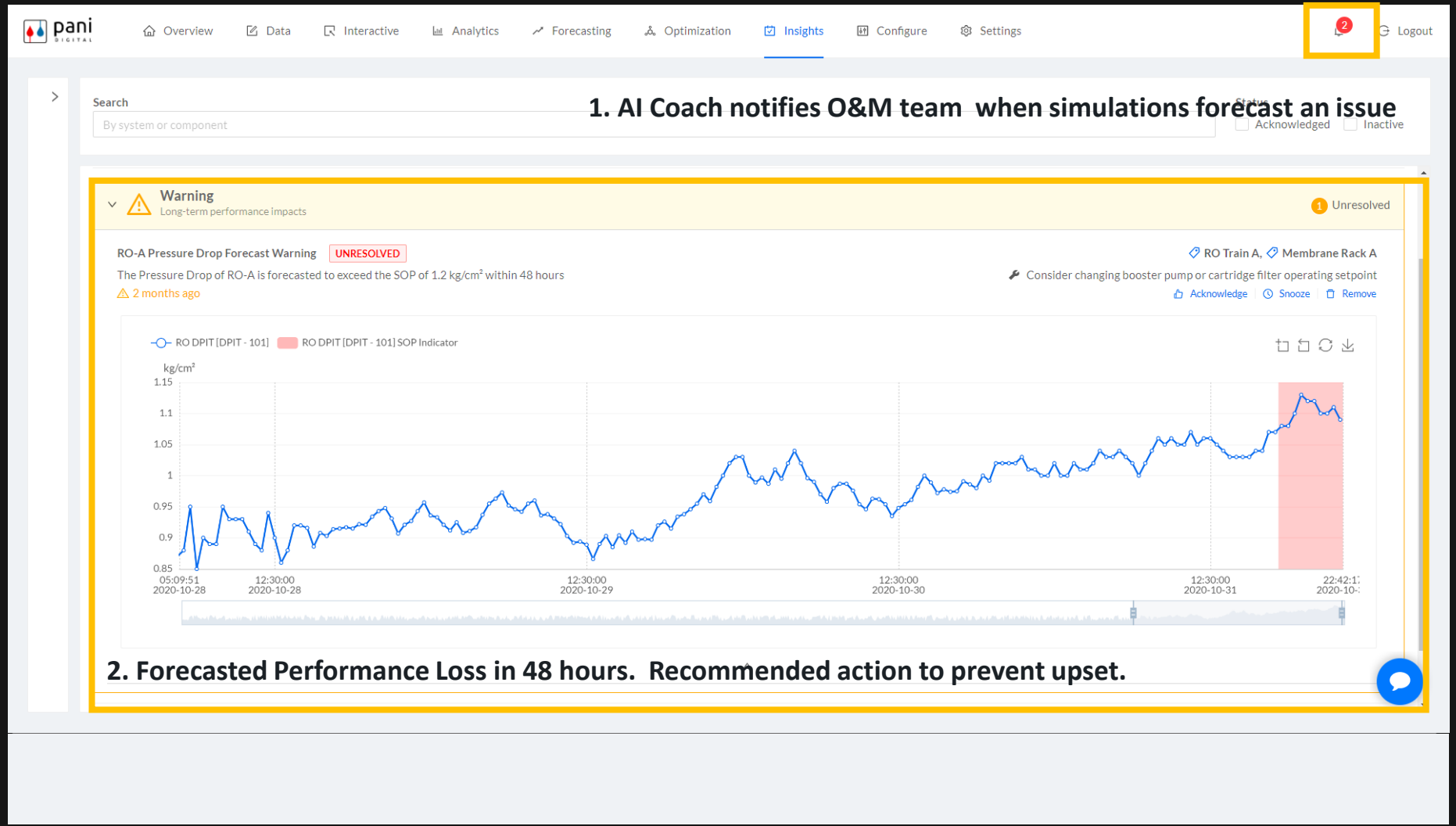
- Cannot predict membranes being damaged, and operators can only react.
- Cannot predict change in influent conditions. Uncertainty over polymer/FeCl3 dosing rates
- ✗ High chemical costs (overdosing)
- ✗ Compromised water quality downstream (compliance fines)

Pani

- AI Coach forecasts degradation, recommends when to service and how to service (clean, flush, replace) membrane assets:
- AI Coach forecasts influent conditions 48 hours in advance. Prescribes dosing rates.
- 12% savings in chemicals
- Avoid fines from missing water quality targets

INSIGHTS: REAL-TIME RECOMMENDATIONS

DIGITAL OPERATOR COACH™



RO Use-Cases

Incumbent Solution

- Cannot predict membranes being damaged, and operators can only react
- Cannot predict change in influent conditions. Uncertainty over polymer/FeCl3 dosing rates
- Sensors drift over time. Operators rely on manual analysis to detect faults

- ✗ Costly and manually intensive fault detection
- ✗ Decisions made on inaccurate readings may compromise plant reliability

Pani

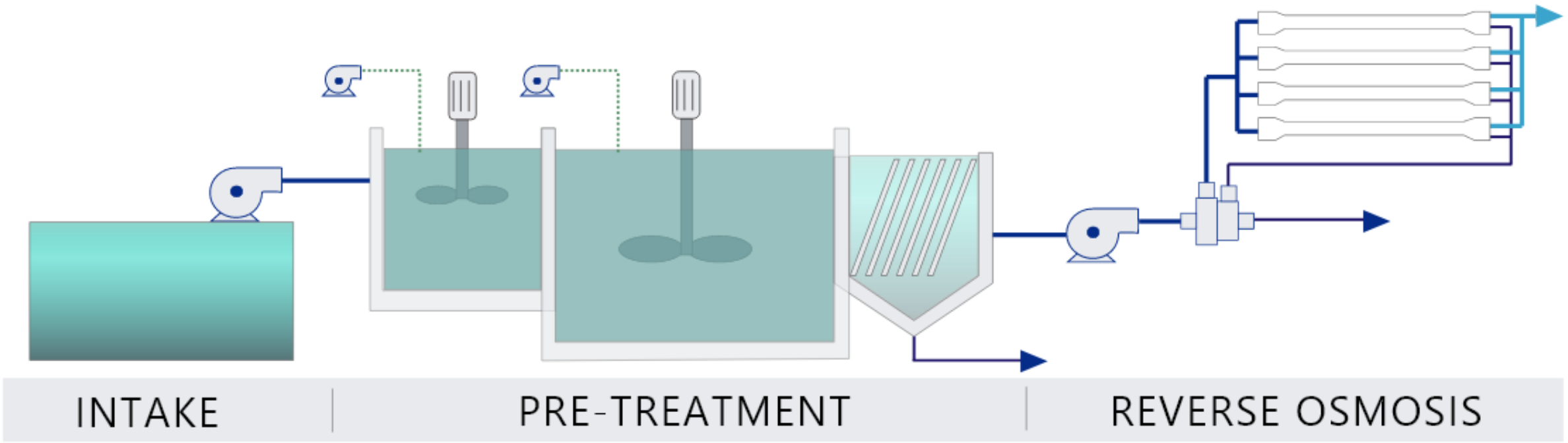
- AI Coach forecasts degradation, recommends when to service and how to service (clean, flush, replace) membrane assets:
- AI Coach forecasts influent conditions 48 hours in advance. Prescribes dosing rates
- AI Coach runs cloud-based simulations to analyze trends and predict sensor faults in advance:

- Higher data reliability
- Lower O&M costs
- Eliminate guesswork and manual analysis

Background: Reverse Osmosis Case Study (1/3)

CLIENT: One of Asia's largest manufacturers

PLANT: 6MLD desalination facility for power plant and other industrial end use



pani

Solution Summary: Reverse Osmosis Case Study (2/3)

Prescribed Control Set-points

PROBLEM: HIGH RO ENERGY COSTS

Lack of tools to determine best set-points (pressures, flows, On/Off cycles) in real-time for varying influent conditions and product goals

SOLUTION: RO OPTIMIZATION

The Coach prescribes optimum pressure and flow rates to meet production goals, product water quality, and minimize energy use

PROBLEM: HIGH PRE-TREATMENT CHEMICAL COSTS

Unsure of correct FeCl3/Polymer dosing for pre-treatment resulting in high chemical consumption

SOLUTION: DIGITAL JAR TEST

The Coach learns from historical dosing to prescribe optimal dosing rates

Membrane Analytics

PROBLEM: UNSURE WHEN TO REPLACE MEMBRANES

Lack of tools and data to decide the best time to replace the membranes.

SOLUTION: AUTOMATIC COMPARISON TO NEW MEMBRANES

The Coach simulates the RO performance for new membranes. With this analytic, the operator understands the **monetary and operational benefits of replacing the membrane.**

Estimated Benefits:

5-11% ↓ Lower Energy Consumption

7-12% ↓ Lower Chemical Costs

20-35% ↑ Longer Membrane Life

Disclaimer: These are not, in any way claims for what your plant may receive in savings, rather projections from our models and past experience with treatment plants.

See what global water leaders are saying about Pani's Digital Operator Coach™

"Pani's advanced analytic solution helps **optimize water/wastewater processes such as chemical consumption for varying input water quality.** Pani's intuitive user interface directly recommends operator in real-time to prevent unplanned downtime and optimize shut-down & maintenance activities.

It is an **economic solution for companies to adopt**, in both emerging and developed markets."

Vekatesh. M,
Head of Technical Services

TATA

"Operation and maintenance of treatment systems can now be **optimized beyond long-perceived standards using Pani's AI Operator Coach**.

Pani is opening the door to drastically improved life cycle costs in many facets of treatment."

Ashu S.,
Project Lead

Aquatech

pani

SUMMARY
PANI ENERGY

Digital Operator Coach™

Cloud-based, ML platform for process optimization of water and wastewater infrastructures

- Holistic plant optimization (WTP and WWTP: biological, chemical, membrane)
- ROI based SaaS model ($0 CapEx)
- Pani's water experts handle integration (~10 hours for setup)

Looking for:

- **Pilot implementations**

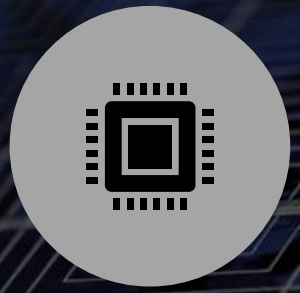
- ENSURE WATER QUALITY (INCOMING AND EFFLUENT)
- LOWER OPEX (3-25%)
- REDUCE DOWNTIME (~20%)
- INCREASE RECOVERY (3-15%)

Artificial Intelligence for Water

Waterlix Inc.

Our Work

Artificial Intelligence Solutions



Supporter of Open Data

Assess AI Solutions

Operation Research

- Revenue management,
- Energy Saving

Waterlix Inc.

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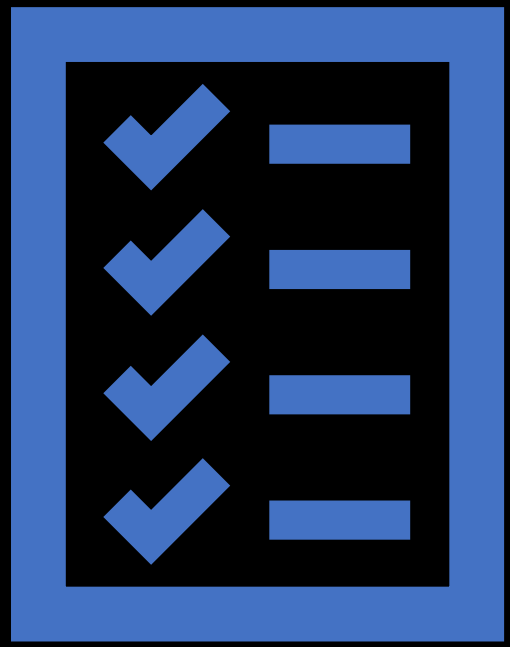
AI Solutions

Water Demand Analysis	•Short term analysis of demand •Connecting Demand at account level to economical indices •Tracking changes by location
SCADA Data Analysis	•Identify Anomalies (Watermain Breaks, etc.)
Condition Assessment	•Using Geo-Data and Assessing the Process of Break in the Water Network
Remote Sensing Pollution Analysis in Water Bodies	•Pollution Monitoring in Lakes and Ocean Identifying Pollution Sources
Sewer Treatment Optimization	•Analysis of Sewer Process, Developing predictive models to reduce the energy consumption in the treatment process •Sewer treatment in near freezing temperatures

Assess New AI Solutions

Creating a Test Plan	Identify goals Define a process to achieve them
Work with Utilities and Solution Providers	Identify KPIs and Set Benchmarks for comparisons
Perform Testing	Acquire the Data from Utilities Transparent Testing with Service Providers
Report	Analyze added values comparative Reports for decision making



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Operation Research Solutions

- Revenue Management and pricing (Water/Sewer Services)
- Pump Schedule Optimization
  - Energy Saving
  - Carbon footprint reduction
- Optimal Assignment of Resources for Municipal Projects

Waterlix Inc.

Our Customers

Canada

- City of Kitchener, ON
- City of Guelph, ON
- City of London, ON
- Niagara Region, ON (New)

The United States of America (New)

- Suez, New York
- Dallas Water Utilities, Texas
- Durham Utilities, North Carolina