

URBAN SOLUTIONS AND SUSTAINABILITY R&D CONGRESS 2023

BUILDING SUSTAINABLE, RESILIENT, AND LIVEABLE CITIES OF TOMORROW

4TH - 5TH OCTOBER 2023



Proof of concept to field trials and everything in between: A partnership to codevelop and deploy technologies for sustainable environment

Sowrirajalu Bhuvana
Environmental and Water Technology
Centre of Innovation





An ESG-NP Partnership Since Oct 2006



Universit
y



Technology
Readiness



Industry

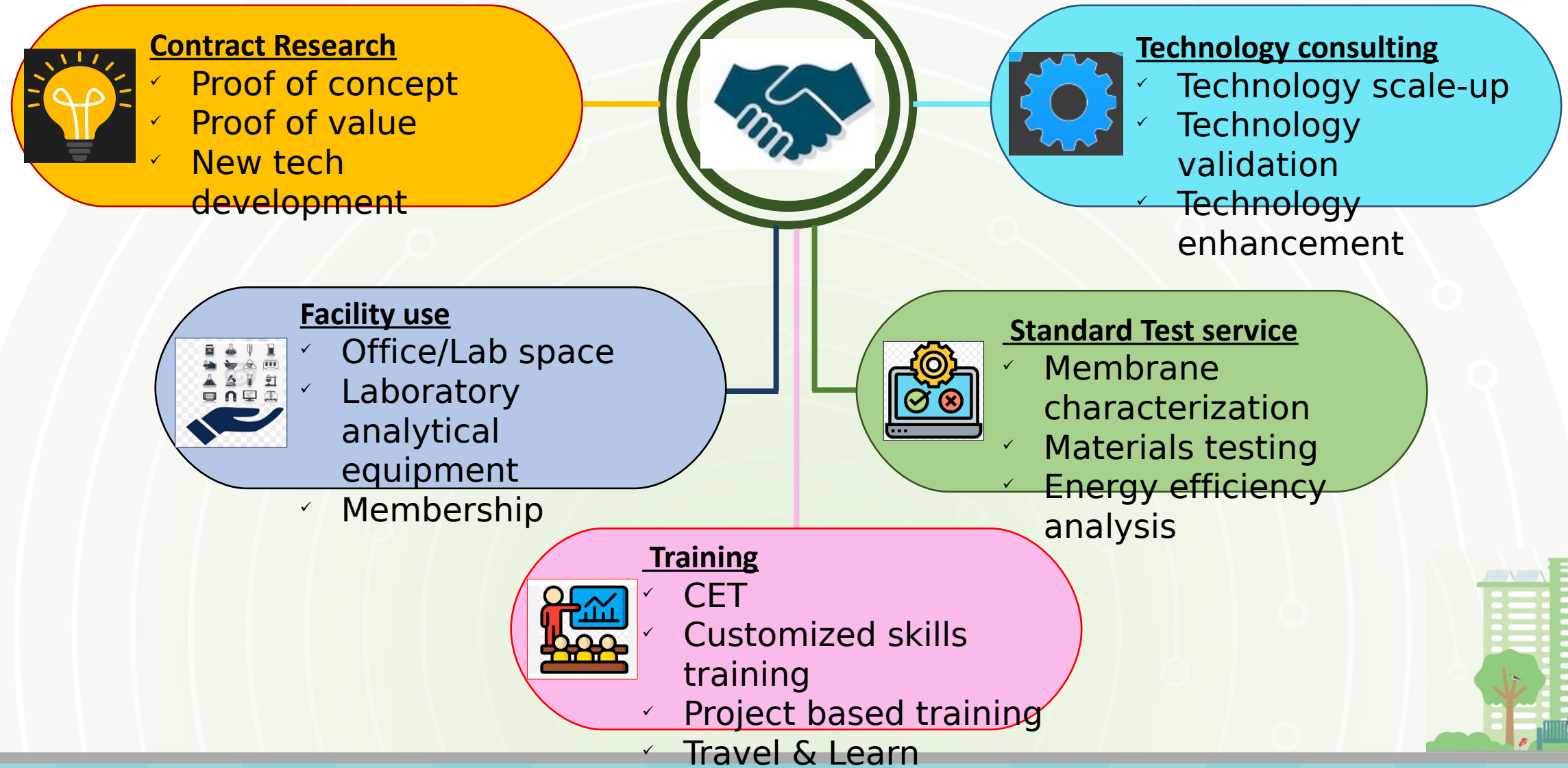


Our mission is to partner strategic industry sectors in applied R&D and consultancy projects to translate ideas into practical solutions or innovation for a sustainable environment.



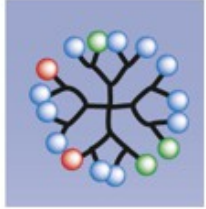


Capabilities & Focus areas



From Development to Scale-Up: Functionalized Dendritic Polymer-Incorporated PVDF Ultrafiltration Membrane - In collaboration with

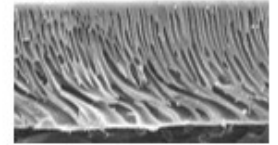




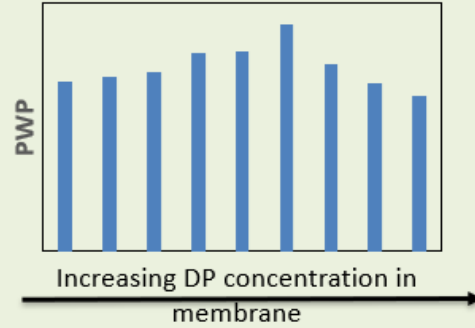
Firmbase Pte Ltd
Proprietary hydrophilic
functionalized dendritic
polymers (DP)



EWTCOI
Facilities & know-hows on
membrane development



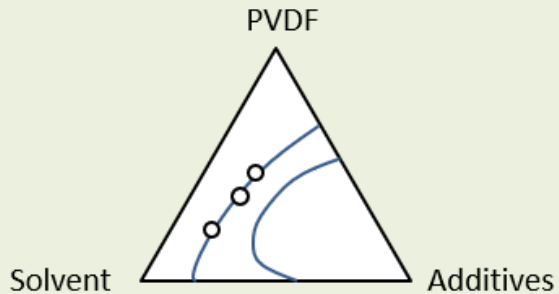
Identify optimal concentration of dendritic polymer



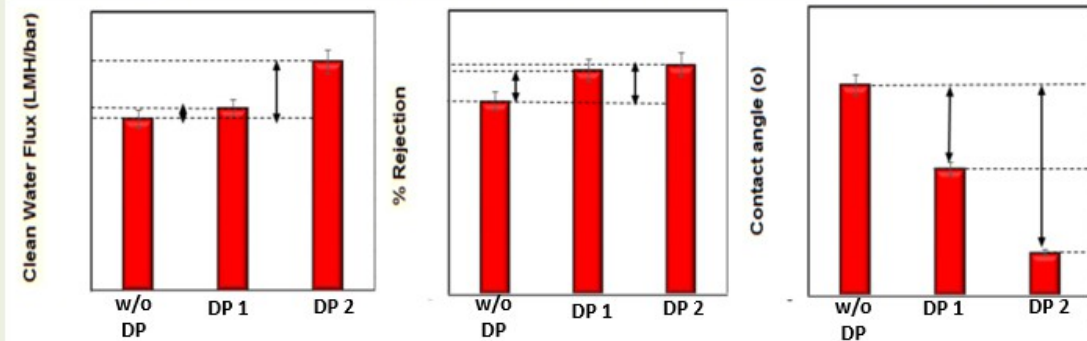
Effects of dendritic polymer concentration on membrane characteristics were studied

- ✓ Allows company to gain confidence on the technology
- ✓ Reduces financial burden on tech development
- ✓ Helps company to decide on further steps quickly

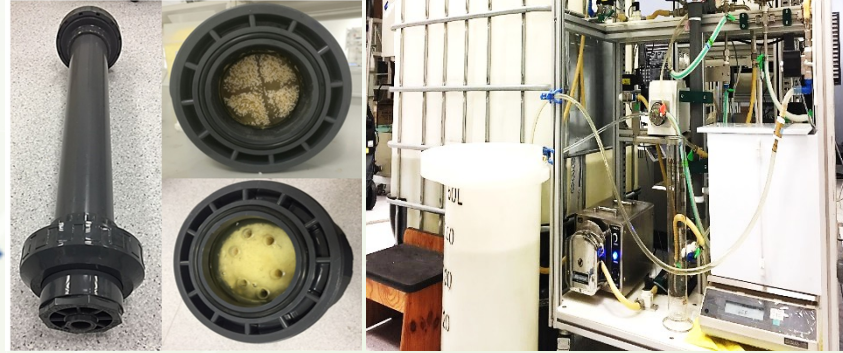
Design dope formula



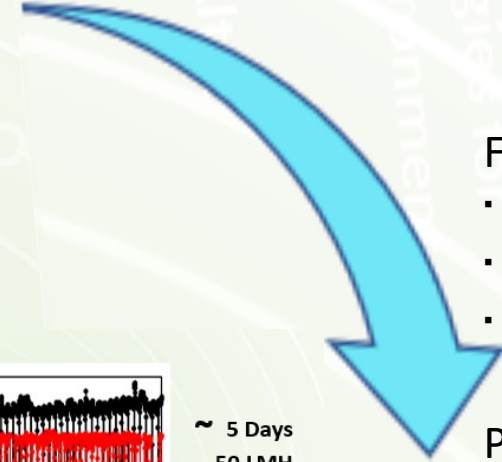
Compare dendritic polymers with different functional groups



Phase 1: Feasibility study



Modules (2.4m²) integrated system



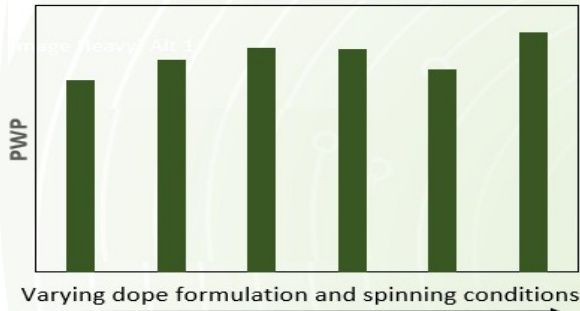
Feed water:

- Turbidity: 7 ± 2 NTU
- TDS: 232 ± 15 ppm
- TOC: 25 ± 5 ppm

Permeate water:

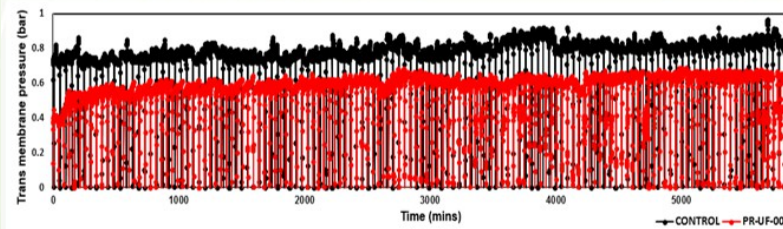
- Turbidity: < 0.1 NTU
- TDS: 190 ± 15 ppm
- TOC: 15 ± 3 ppm

Optimize dope formulation and spinning conditions for hollow fiber production



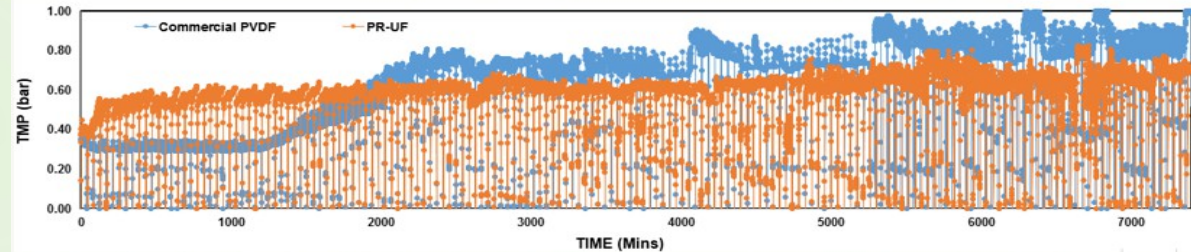
- ✓ Key values of the product
- ✓ Applications
- ✓ Market potentials
- ✓ Identified challenges

Comparison with control PVDF:



~ 5 Days
 50 LMH
 85% recovery

Comparison with commercial PVDF:



Phase 2: Lab scale hollow fiber production &



(ii) Quality check parameters

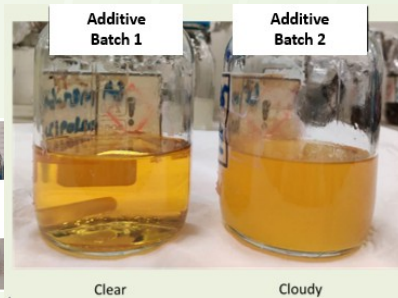
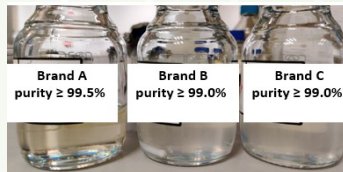
		solubility test	TIC or glycerol content	DI/DO	PWP	Rejection	Yield, properties	Contact angle
Before size preparation	Additive-1	<						
	Additive-2	<						
During spinning	nascent fiber							
	coagulant tank 1							
After fiber washing	coagulant tank 2							
	soaking tank							
	(fiber washing)							
During fiber drying	wet fiber							
	soaking tank							
	(glycerol exchange)							
	glycerol-dried fiber							
	freeze-dried fiber							



- ✓ Protocols for continuous fabrication
- ✓ Quality check parameters
- ✓ Knowledge transfer



- ✓ Cost reduction measures
- ✓ Quality/consistency of raw material
- ✓ Performance reproducibility



Phase 3: Scaled up hollow fiber production &



Journey with Firmbase

SMART CHILLED WATER PUMPING SYSTEM for SUSTAINABLE COOLING

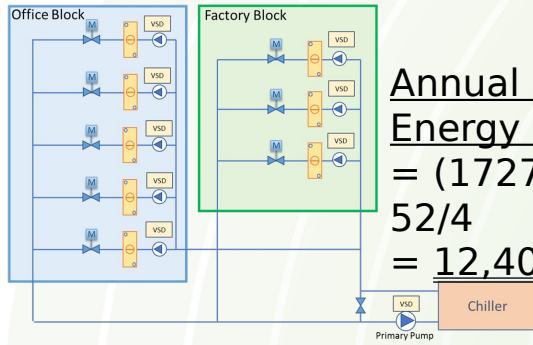
- In collaboration with



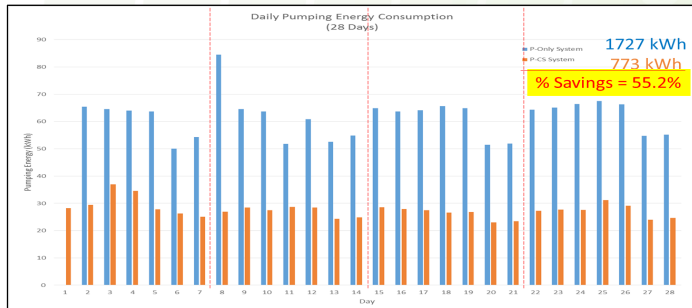
Key Projects

Phase 1 - Simulation & Test

Demo Site: Grundfos Singapore



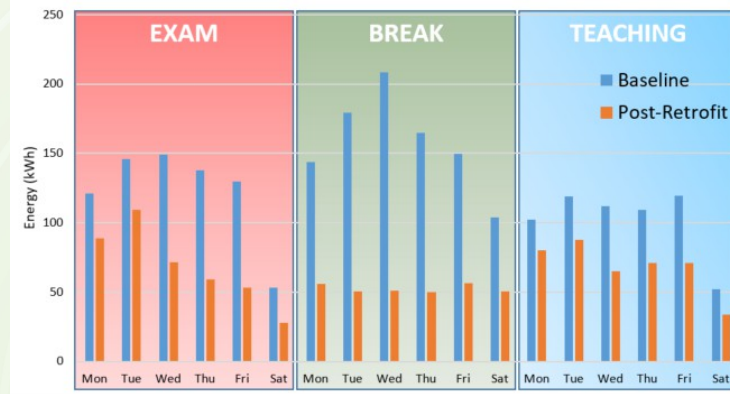
Annual CHW Pump
Energy Savings
= $(1727 - 773) \times 52/4$
= **12,402 kWh**



Phase 2 - Validation pilot Test



Chilled Water Pumping Energy Consumption



Baseline (kwh)	2,300
Post-Retrofit (kWh)	1,131
Reduced	51%

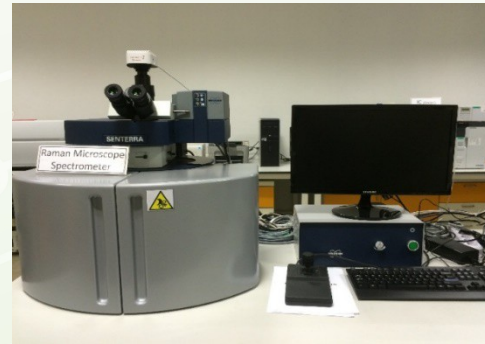
Phase 3 - Commercial deployment



& more



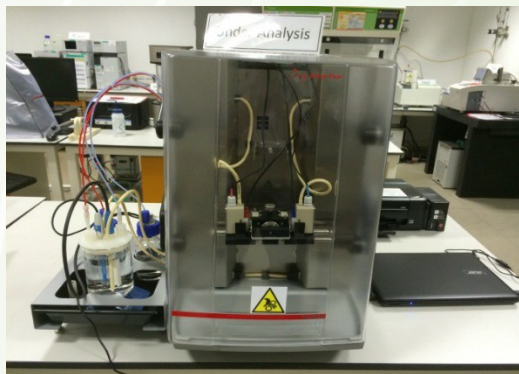
Fourier Transform Infrared Spectroscopy



Raman Spectroscopy



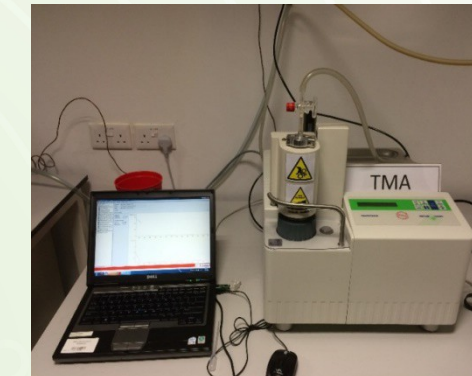
Melt Flow Index Tester



Surface charge/Zeta-potential analyzer



Thermo-Gravimetric Analyzer



Thermo-Mechanical Analyzer





**Lab scale
electrospinning
device**



**Non solvent induced phase separation
(NIPS) unit**



Fouling Evaluation System



**Pilot scale
electrospinning device**



TIPS



Flat sheet casting machine



Centrifugal Potting



Vertical Potting



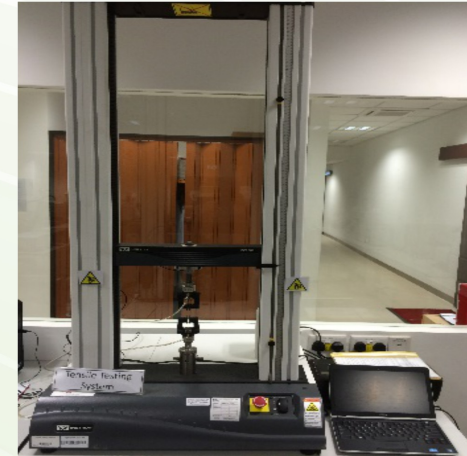
Membrane & Module Fabrication laboratory



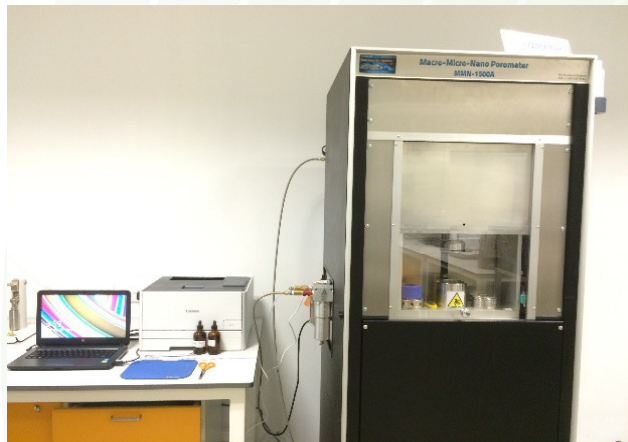
SEM-EDX
(Image Heavy) Alt 1



Morphology Microscope



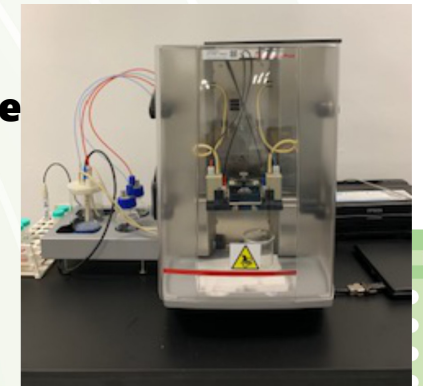
Tensile Testing Machine



Porometer (max 2nm)



Contact angle analyzer



Zeta Potential analyzer



2023

TECH CLINIC

We Want To Support You

One of the biggest challenges companies face is finding the right partner to support them in tech development or tech solutions for their unique problems.

EWTCOI can help you! Reach out to us!

Serving the Industry for 17 Years



Water Solutions



Sustainable Materials



Membrane Development



Energy Management

OCT 12, 2023, 9 AM – 5 PM

Registration closes on 11 Oct, 12pm.

Join our Facilities Tour

Want to get to know us more? Join us for a guided facilities tour of our 15 labs!

1-1 Consultation

Choose from one of the hourly slots for a 1-1 consultation with our experts.

Sign up here

<https://lnkd.in/gF-nwf3c>

Or **Scan QR code**



Upcoming event



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**Email us for details / further
discussion!**

Thank you