

# Membrane Filtration for Drinking Water Treatment Course Outline

## **Course Description**

This 1 day course is designed to increase the operator's knowledge of several membrane filtration methods for municipal drinking water treatment as well as their applications, operations, and maintenance requirements.

## **Course Pre-requisites**

There are no specific pre-requisites for this course. However, Grade 12 (or equivalent) math skills are an asset. Math upgrades are available –contact us.

## **CEU Credit**

Yukon University will be submitting a request for EOCP to allocate 0.6 CEUs for this course.

## **Course Duration**

- 1 day
- 8:30 am to 4:00 pm
- 1 hour lunch break
- Morning and afternoon break (15 minutes each)

## **Course Topics and Learning Outcomes**

### Generalities

- Definitions
- Applications
- Driving Process
- Separation Mechanism
- Morphology
- Physico-Chemical Characteristics

### Types of Technologies

- Filtration Spectrum
- Molecular Weight Cut-Off (MWCO)
- Driving Process
- Membranes for Drinking Water
- How to Choose a Membrane
- Silt Density Index (SDI)

#### Types of Modules

- What is a Module
- Types of Modules

#### Sizing Equations

- Flux
- Specific Flux
- Recovery Rate
- Flow Balance
- Transmembrane Pressure

#### Operational Modes

- Hydraulic Configurations
- Concentration Effects
- Deposition Mode
- Cross Flow System
- Continuous Stirred Tank Reactor (CSTR)
- Multi-Stage Filtration

#### Operational Issues

- Fouling
- Concentration Polarization
- Precipitation
- Adsorption
- Biofouling
- Integrity Failure

#### Membrane Cleaning

- Types of Cleaning
- Transmembrane Pressure and Cleaning
- Before and After Backpulse
- Before and After Soaking

### Integrity Control

- Challenge and Integrity Testing
- Challenge Testing Requirements
- Indirect Integrity Testing
- Direct Integrity Testing
- Non Destructive Performance Testing

### Practical Design

- Preliminary Design
- Disinfection or Not
- System Components
- Feed Pump and Pretreatment
- Backwashing and Cleaning
- Post-Treatment
- Instrumentation
- Other Considerations
- Residuals
- Pilot Testing
- Start-Up
- Training
- Typical Systems

### Waste Management

- Type of Waste
- Management of Cleaning Waste
- Management of Concentrate Waste
- How to Deal with Waste

### The Marsh Lake System

- Process Flow
- Main Design Criteria
- Z-Box S Package

### Examples

Test what you learn

### **Delivery Methods/Format**

<b>Instructional Method</b>	<b>Percentage of Class Time</b>
Hands-on/Q & A	10%
Examples/Case Study	15%
Presentation/Lecture	25%
Slides	25%
Demonstration	15%
Video/DVD	10%
Tutoring	0%

**Materials/Handouts**

Hand-Outs and Materials: Powerpoint presentation: Pictures, Charts, Examples, Case studies  
 Course manual: PPT presentation  
 Equipment List: Filtration system(s)

**Course Requirements**

Attendance and participation in class are required. CEUs will be allocated based on attendance and course completion; Yukon University records will show a pass or fail result. If the participant doesn't attend the class, Yukon University records will show a "no show" result and no CEUs will be allocated.

**Evaluation**

There will be a quantifiable evaluation at the end of this course with a passing mark of 70%. If anyone fails this evaluation, arrangements can be made for a re-assessment. Please note that this evaluation is for self-assessment purpose only.

**One Day Outline**

- 8:30 am to 9:00 am: Generalities
- 9:00 am to 9:30 am: Types of Technologies
- 9:30 am to 10:15 am: Types of Modules
- 10:15 am to 10:30 am: Health Break
- 10:30 am to 10:45 am: Sizing Equations
- 10:45 am to 11:00: Operational Modes
- 11:00 am to 11:15 am: Operational Issues
- 11:15 am 11:30 pm: Membrane Cleaning
- 11:30 am to 12:30 pm: Integrity Control

12:30 pm to 1:30 pm: Lunch  
1:30 to 2:30 pm: Practical Design  
2:30 pm to 2:45 pm: Waste Management  
2:45 pm to 3:00 pm: Health Break  
3:00 pm to 3:15 pm: The Marsh Lake System  
3:15 pm 3:30 pm: Examples  
3:30 pm to 3:45 pm: References  
3:45 pm to 4:00 pm: Test