



# NTL ALASKA, INC.

3536 INTERNATIONAL WAY, FAIRBANKS, AK 99701

(907) 452-6852 fax (907) 452-6853

www.ntlalaska.com

## INTRODUCTION TO MEMBRANE WATER TREATMENT

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Instructor: Michael R. Pollen, President, NTL Alaska, Inc.

### I. Introduction

- A. What is membrane water treatment?
- B. Membrane treatment history
- C. Current and future developments with membrane technology

### II. Types of Membranes

#### A. Particle Filtration Technologies

- 1. Microfiltration (MF)
- 2. Ultrafiltration (UF)
- 3. *AWWA Video: "Water Supply Operations: Membrane Technology"*

#### B. Molecular Separation Technologies

- 1. Nanofiltration (NF)
- 2. Reverse Osmosis (RO)
- 3. Electrodialysis/Electrodialysis Reversal (ED/EDR)
- 4. *AWWA Video: "Desal 1010: The Basics of Desalination"*

### III. Principles of Membrane Separation

- A. Basic Theory
- B. Membrane Terminology
- C. Membrane Structure

*"Understanding Water"*

**IV. Membrane System Configurations**

- A. Single Stage Systems**
- B. Reject Staged Systems for Better Efficiency**
- C. Permeate Staged Systems for Higher Purity**

**V. Water Quality Considerations and Pretreatment Requirements**

- A. Surface Water Sources**
- B. Ground Water Sources**
- C. Sea Water Sources**

**VI. Operation and Maintenance Considerations**

- A. Monitoring Parameters**
- B. Membrane Integrity Testing**
- C. Membrane Cleaning**
- D. Membrane Storage**
- E. Concentrate Disposal**
- F. Degasification**

**VII. Membrane Application Examples**

- A. Membrane Softening**
- B. Brackish Water Desalination**
- C. Natural Organic Matter (NOM) Removal**
- D. Seawater Desalination**
- E. Arsenic Removal**