# MEMBRANE FILTRATION & MEMBRANE BIOREACTORS

David H. Paul, Inc.
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CONTENT



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Courtesy Photos: Pall, GE -Zenon, Koch Membrane Systems

## Membrane Filtration & Membrane Bioreactors

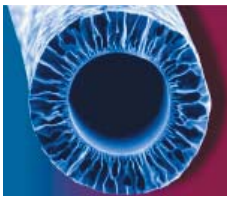
Microfiltration (MF) or Ultrafiltration (UF) membranes are growing at a fast pace. Applications include the production of drinking water, high purity water, food and dairy products, beverages and more. Membrane Bioreactors (MBR) are MF/UF products used in sewage treatment. This seminar covers the basics of Membrane Filtration and MBR and is perfect for anyone wanting to know about these newest membrane technologies.

## Who Should Attend

Anyone wanting to know the latest, UNBIASED information on membrane water treatment technologies (DHP is a training company, NOT an equipment vendor). Anyone wanting to obtain a more advanced understanding of microfiltration/ultrafiltration and membrane bioreactors.

## Technologies Covered

- Microfiltration (MF)
- Ultrafiltration (UF)
- Membrane Bioreactors (MBR)



Courtesy Photos: Hydranautics, Koch Membrane Systems, Norit

## Why You Should Attend

Courtesy Photo: Dow Omexell

Decisions made today affect your design, operation and budget tomorrow. It's hard to get unbiased information about which membrane product to use and the risks and benefits of different membrane products. As the world's leader in advanced water treatment training, David H. Paul, Inc. has trained and consulted in hundreds of facilities and knows what works and what doesn't. This seminar has been designed to offer you an unbiased, fact-finding, well-rounded experience that will put membrane water treatment in perspective and in a way that is simple to understand. David H. Paul, Inc. has no affiliation with any membrane manufacturers or OEMs.

This seminar is presented in an easy-to-understand, step-by-step, interesting and educational format, delivered without a sales pitch and taught by an unbiased industry expert. Return to your facility with the ability to make the right decisions based on what you learned.

## What You'll Receive

- 8 hrs of enjoyable, interesting, easy-to-understand membrane water treatment training
- 8 hrs of the latest in multimedia training including 3-D animations
- A highly illustrated workbook
- Break refreshments

# MEMBRANE FILTRATION & MEMBRANE BIOREACTORS

## Instructors

**David Paul** is the author of over 150 published articles on membrane water treatment, has developed and administers a 4,000 page correspondence training program on advanced water treatment, and has created and administers on-campus Associate Degree in Advanced Water Treatment programs at four different locations in the United States. David is the President of David H. Paul, Inc. (DHP), an advanced water treatment training and consulting firm located in the USA. DHP has trained over 16,000 water treatment professionals worldwide since 1988.

**Bill Dees** provides water treatment training and consulting services for David H. Paul, Inc. (DHP). He has over 18 years of design, installation, operation, maintenance, troubleshooting, training and consulting experience of water treatment systems including membrane, ion exchange, pretreatment and post-treatment equipment. Bill is also the Technical Services Manager for DHP, responsible for membrane module autopsies and consulting. Bill holds an Associate of Applied Science Degree in Industrial Water Treatment from San Juan College, DHP's first on-campus, college degree program.

## Overview of Topics

- Dissolved and suspended contaminant removal by membranes
- Membrane water treatment overview
- How each technology works and what each can and can't do
- Hollow Fiber Microfiltration, Ultrafiltration & MBR

Courtesy Photo: Siemens

## What You'll Learn

- What you need to know about each membrane technology to make effective, timely decisions
- The key manufacturers for each technology
- How each product works
- The pretreatment required for each technology
- Chemicals used in each technology
- Appropriate applications for each technology

## Certificate of Completion

Each attendee will receive a DHP certificate of completion following the course.

## What Others Say About DHP Training Seminars

DHP has trained over 16,000 water treatment professionals worldwide since 1988. Trainees include industrial, governmental and drinking water clients. The average rating given by attendees for all DHP seminars, including this one, is over 9 (on a scale of 1-10, with 1 being a terrible rating and 10 being an outstanding rating).

**The following are typical comments from attendees of DHP Seminars:**

**"Great Course! Well worth the time."**
Bob Castle - Water Quality Manager
Marin Municipal Water District

**"Excellent training materials and presentation."**
Gary Trent
Abbott Laboratories

**"Excellent... got what I was interested in and more, especially in the inner workings of UF."**
Eric Lozano - Austin Energy

**"Well presented and well worth the investment."**
John Countz - Operations Manager
Consolidated Water Co.

**"Excellent! More than I expected."**
Mark Hall
Texas Water Development Board

**"It was great!"**
Trent Hughes - Civil Engineer
Black & Veatch

**"Great Course."**
Joe Gonzales
Xcel Energy

**"Most Excellent!"**
Mike Milner - Alternative H2O Solution



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## Detailed Agendum

**7:45** **Refreshments (Provided)**

**8:00** **Introductions**

**8:15** **Water Contaminant Overview**

- Contaminants (Dissolved & Suspended)
- The characteristics of contaminants that cause their removal by membrane technologies

**Membrane Water Treatment Overview**

- Pressure driven membrane technologies
- Membrane configurations (Flat Sheet, Hollow Fiber, Tubular)
- Membrane Elements (Spiral Wound, Hollow Fiber Modules)
- Membrane Element & Module Operation
- Applications for each membrane technology
- Chemicals commonly used for each membrane technology

**9:00** **Break (Refreshments Provided)**

**Workshop 1**

**9:15** **Microfiltration & Ultrafiltration**

- Four reasons for the explosive growth
- Microfiltration membranes
- Ultrafiltration membranes
- Pretreatment options
- Module operation
  - Inside-out configuration
  - Outside-in configuration
  - Pressurized modules
  - Submerged modules
  - Crossflow filtration
  - Dead-end filtration
  - Water flux
  - Trans-membrane pressure
  - Backwash
  - Chemically-enhanced backwash
  - Clean-in-place

Courtesy Photo: GE-Zenon

**10:15** **Break (Refreshments Provided)**

**10:30** **Microfiltration & Ultrafiltration (Continued)**

- Step-by-step video presentation of the modules, normal operation and backwash of:
  - Pressurized outside-in modules
  - Submerged outside-in modules
  - Pressurized inside-out modules
  - Integrity testing and fiber breakage repair

Courtesy Photo: Pall

**Workshop 2: MF & UF**

**11:30** **Lunch (Not Provided except at FilmTec and Koch Membrane Systems venues)**

**12:30** **Pretreatment options**

- Chemicals used in MF and UF applications
- Membrane manufacturers

**Workshop 2: MF & UF**

**1:45** **Break (Refreshments Provided)**

**2:00** **Sewage Treatment**

- Overview
  - Effluent regulations
  - Issues
- Conventional treatment
  - Clarification
  - Activated sludge
    1. Aerobic
    2. Anoxic
- Tertiary treatment

Courtesy Photo: Siemens

**Membrane Bioreactors**

- Where they fit in
- How they work
- Benefits

**3:15** **Break (Refreshments Provided)**

**3:30** **Step-by-step video and animation presentations of:**

- Modules
- Normal operation
- Backwash

**Workshop 3: MBR**

**4:30** **Summary & Conclusions**

- Final Questions & Answers
- Seminar Evaluation

**5:00** **End**

**NOTE: For venues at which there is a tour, workshop times, break times and/or lunch time are reduced to allow for a tour starting between 3:30 PM and 4:00 PM.**



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