

# **MINNESOTA TECHNICAL ASSISTANCE PROGRAM**

Fact Sheet

#### UNIVERSITY OF MINNESOTA

Membrane filtration can recover valuable materials from waste streams.

## Membrane filtration systems

Membrane filtration can recover valuable materials from waste streams that are not recoverable using standard filters, such as cartridge or sand filters. Typical particle filtration uses a porous barrier to separate substances based their state of matter, gas, liquid, or solid. Examples include removing dust and paint from air, or removing solids from wastewater.

Membrane filtration separates materials based on their size, regardless of the state of matter allowing for separating without the addition of an energy intensive and expensive phase change process, such as evaporation or distillation. The ability to retain particles or molecules that are small enough to pass through an ordinary filter is the key advantage of the membrane filtration system. As an example, a solution of dissolved sugar in water can be separated into sugar and water by applying pressure across a membrane designed with the proper pore size for the sugar.

After separation the concentrate, rich in particles or molecules becomes less expensive to dispose of and the permeate, usually purified water, can often be put back to use in the process. As an example, membrane filtration may be considered for the treatment of wastewater if you would like to recover product or process chemicals that are currently going down the drain, or if you have high oxygen or solid loading.

Membrane filtration is a general term that covers a variety of separation technologies including reverse osmosis (RO), nanofiltration, ultrafiltration and microfiltration. Each technology is effective within a range of molecule/particle sizes. The figure below shows how the membrane filtration technologies compare.

#### **RO Membrane Filtration Example**

Traditionally in maple syrup processing all of the water in sap is removed by evaporation, known as dewatering, which is energy and cost intensive. To reduce the cost of dewatering, many maple syrup producers concentrate the sugar solution using RO.

RO applies pressure across a membrane. The water molecules in the solution pass through the membrane, but the sugar molecules cannot because they are too large for the membrane pores. This results in a concentrated sugar solution and a water stream mostly free of sugar. RO allows 75% of the

Technology	Reverse Osmosis		Ultrafiltra	Ultrafiltration		Particle Filtration	
		Nanofil	tration		Microfiltration		
Example Particles	aqu	eous salts antibiotics amino acids sugars cide/herbicide	viru: proteins/e oil e	gelatin ; nzymes nulsions	 bacteria paint pigr wood resin	yeast cell nent milked flour-	
Typical PSI	1000	600	200	10	00	75	15
	0	0.001	0.01	0.1	1.0	10.0	
			м	icrons			

MnTAP is a non-regulatory program in the School of Public Health at the University of Minnesota and is funded by the Minnesota Pollution Control Agency. © 2008 MnTAP. Reprint only with permission from MnTAP. Available in alternative formats upon request. Printed on recycled paper containing a minimum of 10% post-consumer waste. water to be removed from the maple sap before it is sent to an evaporator. Removing the majority of the water with RO reduces energy costs for evaporation by about 60%.

### **Manufacturers and Suppliers of Membrane Filtration Equipment**

MnTAP maintains the list of membrane filtration equipment manufacturers and suppliers below solely as a service to Minnesota companies. This is not a complete list of available manufacturers or suppliers and does not represent an endorsement by MnTAP. By providing the list, MnTAP does not guarantee that the products do or do not comply with environmental and safety laws in any specific application.

Company	Local Representative	Equipment Type
GE Osmonics Minnetonka, MN 952.933.2277 <www.gewater.com></www.gewater.com>	Filtra Tech Systems, Inc. Shakopee, MN 952.988.9600 800.783.4955 <www.filtratechsys.com></www.filtratechsys.com>	Microfiltration, ultrafiltration, reverse osmosis
Infinitex Clarence, NY 716.741.8381 <www.splitter.com></www.splitter.com>		Microfiltration, ultrafiltration, nanofiltration
Koch Membrane Systems Wilmington, MA 888.677.5624 <www.kochmembrane.com></www.kochmembrane.com>		Microfiltration, ultrafiltration
PCI Membrane Systems Inc. Zelienople, PA 724.452.6300 <www.pcims.com></www.pcims.com>	Lewis Pain 920.923.5869	Microfiltration, nanofiltration, reverse osmosis, ultrafiltration
Sanborn Technologies Walpole, MA 508.660.9150 <www.sanborntechnologies.com></www.sanborntechnologies.com>		Nanofiltration, ultrafiltration
PFC Equipment, Inc. Maple Grove, MN 800.328.2350 <www.pfcequip.com></www.pfcequip.com>	Kristjan 612.597.0997	Microfiltration, ultrafiltration



#### **For More Information**

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that maximize resource efficiency, prevent pollution, increase energy efficiency, and reduce costs. Our information resources are available online at <mntap.umn.edu>. Please call MnTAP at 612.624.1300 or 800.247.0015 for personal assistance or more information about MnTAP's services.