

Bando interno per Visiting Professor Anno 2015

Candidato:

Michael J. Semmens Ph.D., P.E.

*Professor Emeritus of Environmental Engineering
Department of Civil Engineering,
University of Minnesota,
Minneapolis, MN 55455
USA*



Citizenship: Dual Citizen (USA and UK)

Personal: Married with two sons.

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Education

1973 Ph.D., University College, London, England. (Environmental Engineering)

1970 M.S., Harvard University, Cambridge. (Environmental Engineering)

1968 B.Sc., Imperial College of Science and Technology, London. (Chemical Engineering)

Principal Fields of Interest and Experience

- Research and development of physical and chemical processes for water, wastewater and waste treatment.
- Biofilm behavior and impacts on process performance in membrane separations
- Membrane bioreactors, membrane module design and membrane applications in water and wastewater treatment

Professional Employment

2011- Professor Emeritus, Department of Civil Engineering, University of Minnesota.
1989 -2011 Professor, Department of Civil Engineering, University of Minnesota.
1977-1989 Associate Professor, Department of Civil and Mineral Engineering, University of Minnesota.
1973-1977 Assistant Professor, Department of Civil Engineering, University of Illinois, Urbana, Illinois.
1968-1969 Project Engineer, Hazen and Sawyer, Consulting Engineers, New York, New York.

Visiting Appointments

1982-1983	Associate Professor, Department of Civil Engineering, University of New South Wales, Sydney, Australia.
1991-1992	Professor, Environmental Engineering Program, Cranfield University, School of Water Sciences, Bedfordshire, England
2001-2002	Short term visits to INSA, Toulouse France and Universidade de Nova Lisboa, Lisbon, Portugal
2007	Fulbright Scholar. Visiting Professor NTNU, Trondheim, Norway
2012	Teaching appointment at University of Padua, Italy
2014	Fulbright Scholar. Visiting Professor at UCD, Dublin, Ireland.

Awards:

2013	Senior Fulbright Scholarship to UCD, Dublin, Ireland for 6 months.
2011	Samuel Arnold Greeley Award from ASCE for the paper entitled “Stimulating In Situ Hydrogenotrophic Denitrification with Membrane-Delivered Hydrogen under Passive and Pumped Groundwater Conditions,” Journal of Environmental Engineering, August 2009. with B.P.Chaplin, M.R.Schnobrich; M.A. Widdowson, and P.J. Novak
2009	Charles W. Britsius Distinguished Engineer Award from the Minnesota Federation of Engineering, Science and Technology Society
2008	Samuel Arnold Greeley Award from ASCE for the paper entitled “Modeling Heavy Metal Removal by Plant Species and Sediments in Stormwater Detention Ponds” with M.Hondzo and P. Weiss
2006	Senior Fulbright Scholarship to NTNU, Trondheim, Norway for 6 months.
2003	AEESP/Wiley Interscience Award for Outstanding Contributions to Environmental Engineering and Science Education
1990	Outstanding Instructor Award, Institute of Technology, University of Minnesota
1981	Certificate of Recognition Award, American Water Works Association, Advisee won the academic achievement award for his M.S. Thesis.
1977	Radebaugh Award given for Noteworthy Advancement in Water Pollution Control, Central States Water Pollution Control Association.
1970	Science Research Council Fellowship, London University.

Teaching Experience:University of Minnesota

CE3500	Introduction to Environmental Engineering
CE5505	Water Quality and Treatment
CE5500	Water Treatment Engineering and Design
CE5501	Wastewater Treatment Engineering and Design
CE8500	Physical-Chemical Processes for Water and Wastewater Treatment - Part I
CE8501	Physical-Chemical Processes for Water and Wastewater Treatment - Part II
CE5507	Environmental Engineering Laboratory
CE4504	Membranes in Environmental Applications
IT 1101	Environmental Issues and Solutions

University of Illinois

CE241	Introduction to Environmental Engineering
CE342	Water and Wastewater Treatment
CE343	Water Chemistry Laboratory
CE440	Water Treatment Unit Operations
CE442	Waste Water Treatment Processes
CE443	Unit Operations Laboratory Course
CE444	Industrial Waste Treatment

Refereed Publications:

- 1) Gregory, and M.J. Semmens, "Sorption of Carboxylate Ions by Strongly Basic Anion Exchangers," *J. Chemical Soc., Faraday Trans: I*, 68, pp. 1045-1052, 1972.
- 2) Semmens and J. Gregory, "The Selectivity of Strongly Basic Anion Exchange Resins for Organic Anions," *Environmental Science and Technology*, 8, pp. 834-839, 1974.
- 3) Semmens, R.L. Goodrich, J.T. Wang and A.C. Booth, "The Biological Regeneration of Ammonium Saturated Clinoptilolite. I. Initial Observations," *Environmental Science and Technology*, 11, pp. 255-259, 1977.
- 4) Semmens, J.T. Wang and A.C. Booth, "The Biological Regeneration of Ammonium Saturated Clinoptilolite. II. The Mechanism of Regeneration and Influence of Salt Concentrations," *Environmental Science and Technology*, 11, pp. 260-265, 1977.
- 5) Semmens, J.T. Wang and A.C. Booth, "Nitrogen Removal by Ion Exchange: Continuous Flow Studies on the Biological Regeneration of Clinoptilolite," *Journal Water Pollution Control Federation*, 49, pp. 2431-2444, 1977.
- 6) Semmens and M. Seyfarth, "The Selectivity of Clinoptilolite for Heavy Metals," in *Natural Zeolites, Occurrence, Properties, Uses*, Pergamon Press, 1978.
- 7) Semmens, A.C. Booth, and G.W. Tauxe, "Clinoptilolite Column Ammonia Removal Model," *Journal Env. Eng. Div., ASCE*, 104, pp. 231-244, April 1978.
- 8) Porter and M.J. Semmens, "Ammonium Removal by Ion Exchange Using Biologically Restored Regenerant," *Journal Water Pollution Control Federation*, 51, pp. 2928-2940, 1979.
- 9) Semmens, J. Edzwald, J. Taylor, M. McIntyre, and R. Sanks, "Organics Removal by Coagulation - A Review and Research Needs," Coagulation Committee Report, *J. AWWA*, 71, pp. 588-603, 1979.
- 10) Semmens and T. Field, "Experience in Organics Removal by Coagulation," *J. AWWA*, 72, pp. 476-483, 1980.
- 11) Klieve and M.J. Semmens, "An Evaluation of Pretreated Zeolites for Ammonium Removal," *Water Research*, 14, pp. 161-168, 1980.
- 12) Porter and M.J. Semmens, "A Review of Virus and Protein Sorption by Ion Exchange Resins." *Environment International*, 3(4), pp. 311-320, 1980.
- 13) Semmens, D. Schnobrich, J. Klieve and G.W. Tauxe, "Modeling Ammonium Removal and Regeneration for Clinoptilolite," *Water Research*, 15, pp. 655-666, 1981.
- 14) Semmens, A. Staples, G. Norgaard, and G. Hohenstein, "Organics Removal: Carbon vs. Synthetic Resins," *Env. Tech. Letters*, 4, pp. 343-348, 1983.
- 15) M.J. Semmens, "Cation Exchange Properties of Natural Zeolites," *Chapter in Zeo-Agriculture: Use of Natural Zeolites in Agriculture and Aquaculture*, W.G. Pond and F.A. Mumpton Eds., Westview Press, Boulder, CO, 1984.
- 16) Semmens and K. Ayers, "Trace Organics Removal from Mississippi River Water During Coagulation," *Journal American Water Works Association*, 77, pp. 79-84, 1985.
- 17) Semmens and A. Staples, "Organics Removal from Mississippi Water: (i) The Nature of Organics Removed," *Journal American Water Works Association*, 78, pp. 76-81, 1986.

- 18) Semmens, G. Norgaard, G. Hohenstein, "Organics Removal from Mississippi River Water: (ii) Influence of Coagulation Pretreatment," *Journal American Water Works Association*, 78, pp. 80-84, 1986.
- 19) Semmens, G. Norgaard, G. Hoenstein, and A. Staples, "Organics Removal from Mississippi River Water: (iii) Influence of pH," *Journal American Water Works Association*, 78, pp. 89-93, 1986.
- 20) Semmens, C.F. Kenfield, R. Qin, and E.L. Cussler, "The GM-IX Process. A Novel Metal Cyanide Treatment and Recovery Technique," *J. Metal Finishing*, 85, pp. 47-53, 1987.
- 21) Semmens and W.P. Martin, "The Influence of Pretreatment on the Capacity and Selectivity of Clinoptilolite for Heavy Metals," *J. Water Research*, 22, pp. 537-542, 1988.
- 22) Kenfield, M. Semmens and E. Cussler, "Cyanide Recovery Across Hollow Fiber Gas Membranes," *Env. Sci. & Techn.*, 22, pp. 1151-1155, 1988.
- 23) Semmens, R. Qin, and A. Zander, "Volatile Organics Separation from Water Using a Microporous Hollow Fiber Membrane," *J. American Water Works Association*, Vol. 81 (4) pp.162-167, 1989
- 24) Zander, and M.J. Semmens, "Membrane /Oil Stripping of VOC's from Water in a Hollow Fiber Contactor," *J. Environ. Eng. Div. (ASCE)*, Vol. 115 (4) pp.768-784, 1989
- 25) Zander, R. Narbaitz, and M.J. Semmens, "A Preliminary Pilot Scale Test of VOC Removal by Membrane Air Stripping", *J. American Water Works Association*, Vol. 81 (11) pp.76-81, 1989
- 26) Qin, A. Zander, and M.J. Semmens, "Separating Acetic Acid from Liquids," *J. Membrane Science*, 50:1 (5) pp 51-55, 1990
- 27) Semmens, M.J., D.M. Foster and E.L. Cussler, "Ammonia Removal from Water Using Microporous Hollow Fibers", *J. Membrane Science*, 51 (1990) pp127-140
- 28) 28. Zhisong Shen, M.J. Semmens and A.G.Collins², " A Novel Approach to Ozone - Water Mass Transfer using Hollow Fiber Reactors", *Environmental Letters* , 11 pp 597-608, 1990
- 29) Wickramasinghe, S.R., M.J. Semmens and E.L. Cussler, "Better hollow fiber contactors", *Journal of Membrane Science*, 62, (1991) pp 371-388.
- 30) Ahmed, T., and M.J. Semmens, " Use of sealed end fibers for Bubbleless Membrane Aeration: Experimental Studies., *J. Membrane Science*, 69 pp 1-10, 1992
- 31) Ahmed, T., and M.J. Semmens, " The use of independently sealed microporous hollow fiber membranes for the oxygenation of water: Model development" , *J. Membrane Science*, 69 pp 11-20, 1992
- 32) Zander, A. and M.J.Semmens, "Removal of hexachlorocyclohexane isomers form water by membrane extraction into oil", *Water Research* 26 (2) pp129-137 1992
- 33) Wickramasinghe, S.R., M.J. Semmens and E.L. Cussler, "Mass transfer in various hollow fiber geometries", *Journal of Membrane Science*, 62, (1992) pp 235-250
- 34) Wickramasinghe, S.R., M.J. Semmens and E.L. Cussler, "Hollow fibers for liquid - liquid extraction ", *Journal of Membrane Science*, 62, (1992) pp 235-250
- 35) Wickramasinghe, S.R., M.J. Semmens and E.L. Cussler, "Hollow fiber modules made with hollow fiber fabric", *Journal of Membrane Science*, 84, (1993) 1-14

- 36) Leiknes, T., C.J. Gantzer and M.J. Semmens, The performance of a membrane vacuum degasser, in *Effective Membrane Separation Processes*, May 1993
- 37) Bhowmick, M. and M.J. Semmens, UV-Photooxidation for the destruction of VOCs in air, *J. Water Research*, Vol 28, (11) pp 2407-2415, 1994
- 38) Bhowmick, M. and M.J. Semmens, Batch studies on a closed-loop air stripping process, *J. Water Research*, Vol 28, (9) pp 2011-2019, 1994
- 39) Bhowmick, M. and M.J. Semmens, Laboratory scale testing of a continuous closed loop air stripping process, *J. American Water Works Association*, 86, pp 86-96, August 1994
- 40) Semmens, M.J., and C. T. Riley, "Recovery of Cadmium and Cyanide using a combination of Ion Exchange and Membrane Extraction", *J. American ElectroPlating and Surface Finishing Society*, 81, (2) Feb. 1994, pp 46-50.
- 41) Pankhania, M., T. Stephenson, and M.J. Semmens, "Hollow fiber bioreactor for wastewater treatment using bubbleless membrane aeration," *Water Research*, Vol. 28 (10) pp 2233-2236, 1994
- 42) Reed, B., M.J. Semmens and E.L. Cussler, Membrane Contactors, in *Membrane Separation Technology - Principles and Application*, R.N. Noble and S.A. Stern (Eds.) Elsevier Science B.V., 1995
- 43) Ahmed, T., and M.J. Semmens, "The use of transverse hollow fibers for Bubbleless membrane aeration", *J. Water Research*, 30 (2) pp 440-446 1996
- 44) Ahmed, T., and M.J. Semmens, "Non-linear deflection of hollow fibers in transverse flow", *J. Water Research*, 30 (2) pp 431- 439, 1996
- 45) Wiess, P.T., B. T. Oakley, Gulliver, J.S., and M.J. Semmens, "A Bubbleless fiber aerator for surface waters" *J. Env. Eng Division*, ASCE, *J. Env. Eng.*, Vol 122 (7) pp 631-639, 1996.
- 46) Weiss, P.T., J.S. Gulliver and M. J. Semmens, "Hypolimnetic Aeration with Hollow Fiber Membranes," *Journal of Lake Management*, 12 (4):468-476, 1996
- 47) Weiss, P.T., J.S. Gulliver and M. J. Semmens, "In-Stream Hollow Fiber Aeration," *J. Hydraulic Engineering*, Vol 124, 6, pp. 579-588, June 1998
- 48) Short, A. and M.J. Semmens, Pilot Studies on the Performance of the GM-IX Process, *Journal of Environmental Science and Health*, Vol. A32, No. 1, Pages 215 - 239, 1997.
- 49) Semmens, M. and P. Aptel, Theory of Phase Contact Processes, Chapter 8 in "Membranes in Water Treatment" AWWARF, McGraw-Hill, NY 1997
- 50) Johnson, D., M.J. Semmens and J. A Gulliver, "Diffusive Transport across unconfined hollow fiber membranes", *J. Membrane Science*, vol. 128, pp 67-81, 1997
- 51) Semmens, M. and P. Aptel, Phase Contact Processes - Applications, Chapter 13 in "Membranes in Water Treatment" AWWARF, McGraw-Hill, NY 1997
- 52) Johnson, D.W., M.J. Semmens and J. Gulliver, "Unconfined Membranes: Transfer Performance and Module Design, *J. Membrane Science*, vol. 140, pp 13-25, 1998
- 53) Brindle, K., T. Stephenson and M.J. Semmens, Nitrification and Oxygen Utilization in a Membrane Aeration Bioreactor, *J. Membrane Science*, vol. 144, pp 197-209, 1998.

- 54) Semmens, M.J., A. Doyle and J. Gulliver, " An Analysis of Bubble Formation Using Hollow Fiber Membranes", *Water Env. Res.*, Vol 71 (3) pp. 307-315, May/June 1999.
- 55) Johnson, D. W., Semmens, M. J. and Gulliver, J. S., " A Rotating Membrane Contactor: Experimental Studies," *Water Environment Research*, 70,7(1998) 1265-1273
- 56) Voss, M., T. Ahmed and M.J.Semmens, "Long Term Performance of Parallel-Flow Bubbleless Hollow-Fiber-Membrane Aerators," *Water Environment Research*, Vol 71, No. 1, pp. 23-30, 1999
- 57) Johnson, D. W., Semmens, M. J. and Gulliver, J. S., " A Rotating Membrane Contactor: Application to Biologically Active Systems," *Water Environment Research*, 71 (1999) 163-168
- 58) Semmens, M. J. and Hanus, D., "Studies of a Membrane Aerated Bioreactor for Wastewater Treatment" *Membrane Technology News*, NO. 111, pp. 9-13, July 1999
- 59) Brindle, Keith.; Stephenson, Tom.; Semmens, Michael J., "Pilot-plant treatment of a high-strength brewery wastewater using a membrane-aeration bioreactor." *Water Environment Research* 71, No. 6, (1999) p 1197
- 60) Essila, N., V.Voller and M.J.Semmens, Biofilms on Gas Permeable Membrane and Solid Supports: 1. Concentration and Activity Profiles, *ASCE J. of Env. Eng.*, vol.126, pp. 250-258, 2000
- 61) Essila, N., and M.J.Semmens, Biofilms on Gas Permeable Membrane and Solid Supports: 2. Substrate Flux Limitations, *ASCE J. of Env. Eng.*, vol.127 (2) pp. 126 -134, 2001
- 62) Ahmed, T., Voss, M. and Semmens, M.J., " Energy Loss Characteristics of Parallel-Flow Bubbleless Hollow Fiber Membrane Aerators," *J. Membrane Science*, Vol 171, pp 87-96, 2000
- 63) Leiknes, T and M.J. Semmens, "Membrane filtration for preferential removal of emulsified oil from water", *Water Science & Technology* Vol 41 No 10-11 pp 101-108, 2000
- 64) Haugen, K. S., Semmens, M. J., and Novak, P. J. 2001. A Novel *In Situ* Technology for the Treatment of Nitrate Contaminated Groundwater. *Water Research*, 36 (14): 3497-3506 AUG 2002
- 65) Leiknes T, Semmens M.J., Vacuum degassing using microporous hollow fiber membranes, *Sep. Purif. Tech.*, 22-3 (1-3): 287-294 Sp. Iss. SI, 2001
- 66) Fang, Y., Hozalski, R. M., Clapp, L. W., Novak, P. J., and Semmens, M. J. 2001. Passive Dissolution of Hydrogen Gas into Groundwater using Hollow-Fiber Membranes. *Water Research*, 36 (14): 3533-3542, 2002
- 67) Muenzner, H. D., Clapp, L. W., Hozalski, R. M., Semmens, M. J., and Novak, P. J. 2001. Dechlorination of PCE by Mixed Methanogenic Cultures Using Hollow-Fiber Membranes. *Bioremediation Journal*, 6(4):337-350 .
- 68) Zhang, M., Hozalski, R.M., Semmens, M.J. and Schuler, D. Evaluation of Biostability and Microbiological Quality in a Chloraminated Distribution System. *Journal AWWA* (in press).
- 69) Semmens,M.J., C. Dillon and C. Riley, An Evaluation of Continuous Deionization as an In-Line Process for Plating Rinsewater Recovery, *Environmental Progress*, Vol.20 (4) pp1-10, Dec 2001
- 70) Ahmed, T. and M.J. Semmens, "Gas Transfer from Small Spherical Bubbles," submitted to *Journal of Environmental Systems*, 2002.
- 71) Ahmed, T., Semmens, M.J. and M.A. Voss, "Oxygen Transfer Characteristics of Hollow fiber, Composite Membranes," *Advances in Env. Research*, 8 (3-4): 637-646, 2004

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- 73) Nelson, DK; RM Hozalski, LW Clapp, PJ Novak, MJ Semmens, "Effect of Nitrate and Sulfate on Dechlorination by a Mixed Hydrogen-fed Culture" *Bioremediation Journ.*, 6(3):225-236, 2002
- 74) Cole AC, Shanahan JW, Semmens MJ, and LaPara T, "Preliminary studies on the microbial community structure of membrane-aerated biofilms treating municipal wastewater" *Desalination* 146 (1-3): 421-426 Sp. Iss. SI SEP 10 2002
- 75) Zhang M, Semmens MJ, Schuler D, and Hozalski R, "Biostability and microbiological quality in a chloraminated distribution system" *J. Am. Water Works Ass.*, 94 (9): 112-122, 2002
- 76) Ma, X., PJ Novak, LW Clapp, MJ Semmens, RM Hozalski, "Evaluation of Polyethylene Hollow-fiber Membranes for Hydrogen Delivery to Support Reductive Dechlorination in a Soil Column," *Water Research* 37, pp 2905-2918, 2003
- 77) Clapp, LW, MJ Semmens, PJ Novak, RM Hozalski, "Model for In-Situ PCE Dechlorination via Membrane-Delivered Hydrogen" , *Journal of Environmental Engineering. -ASCE* 130 (11): 1367-1381 Nov. 2004
- 78) Semmens MJ, Dahm K, Shanahan J, et al. COD and nitrogen removal by biofilms growing on gas permeable membranes, *Water Research* , 37 (18): 4343-4350 Nov 2003
- 79) Ma X, Novak PJ, Clapp LW, et al. Evaluation of polyethylene hollow-fiber membranes for hydrogen delivery to support reductive dechlorination in a soil column , *Water Research* , 37 (12): 2905-2918, 2003
- 80) Ben Aim RM, Semmens MJ Membrane bioreactors for wastewater treatment and reuse: a success story, *Water Science & Technol.*, 47 (1): 1-5 2003
- 81) Ahmed T, Semmens MJ, Voss MA Oxygen transfer characteristics of hollow-fiber, composite membranes, *Adv. Environ. Research.* 8 (3-4): 637-646, 2004
- 82) Fang, Y., L.W. Clapp, R.M. Hozalski, P.J. Novak, M.J. Semmens, Membrane Gas Transfer Under Conditions of Creeping Flow: Modeling Gas Composition Effects, *Water Research*, Volume 38, Issue 10, 2489-2498, 2004
- 83) Fang, Yuan, P.J. Novak, R.M. Hozalski, E.L. Cussler, M.J. Semmens, Condensation Studies in Gas Permeable Membranes, *J. Membrane Sci.*, Volume 231, Issues 1-2, Pages 47-55, 2004
- 84) Shanahan, J. and M.J.Semmens, A multi-species model for membrane aerated biofilms, *Env. Sci and Tech*, 38(11); 3176-3183; 2004
- 85) Cole, A., T. LaPara and MJ Semmens, The Stratification of Activity and Bacterial Community Structure in Biofilms Grown on Membranes Transferring Oxygen, *Applied and Environmental Microbiology*, 70 (4): 1982-1989, 2004
- 86) Clapp LW; Semmens MJ; Novak PJ and Hozalski R, Model for in situ perchloroethene dechlorination via membrane-delivered hydrogen, *Journal of Environmental Engineering – ASCE*, Volume: 130 Issue: 11 Pages: 1367-1381, 2004
- 87) Shanahan JW, Cole AC, Semmens MJ and LaPara T, Acetate and ammonium diffusivity in membrane-aerated biofilms: improving model predictions using experimental results, *Water Science and Technology*, Volume: 52 Issue: 7 Pages: 121-126, 2005

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- 89) Xin Ma¹, Paige J. Novak², Michael J. Semmens², Lee W. Clapp³, and Raymond M. Hozalski^{2*} Comparison of Pulsed and Continuous Addition of H₂ Gas via Membranes for Stimulating PCE Biodegradation in Soil Columns, *Water Research*, 40, pp 1155-1166, 2006
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- 91) Edstrom, J. A., Semmens, M. J., Hozalski, R. M., Clapp, L. W., *Novak, P. J. 2005. Stimulation of Dechlorination by Membrane-Delivered Hydrogen: Small Field Demonstration. *Environmental Engineering Science*, 22(3):281-293.
- 92) Shanahan, J. W., M. J. Semmens, Influence of a Nitrifying Biofilm on Local Oxygen Fluxes across a Micro-porous Flat Sheet Membrane, *Journal of Membrane Science*, Volume 277, pp 65-74, 2006
- 93) LaPara TM, Cole AC, Shanahan JW, and Semmens M.J., The effects of organic carbon, ammoniacal-nitrogen, and oxygen partial pressure on the stratification of membrane-aerated biofilms, *Journal of Ind. Micro & Biotech.*, 33 (4): 315-323, 2006
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- 95) Weiss, J D., M Hondzo, and M.J. Semmens, Modeling Heavy Metal Removal by Plant Species and Sediments in Stormwater Detention Ponds, *Journal ASCE Env. Eng. Div.*, 132 (9): 1034-1042 SEP 2006
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- 97) Semmens M and Novak P, Removal of nitrate using an in situ membrane technology, *Desalination*, Volume: 199 Issue: 1-3 Pages: 496-496, 2006
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- 99) Ahimou, F., Haugstad, G., Novak, P. J., Semmens, M. J., Biofilm cohesiveness measurement using a novel atomic force microscopy methodology, *Applied and Environmental Microbiology*, 73 (9): 2897-2904, 2007
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- 101) Semmens, M.J., Alternative MBR configurations: using membranes for gas transfer, *Desalination*, Volume: 231 Issue: 1-3 Pages: 236-242, 2008
- 102) Chen Ruoyu D.; Semmens Michael J. and LaPara Timothy M., Biological treatment of a synthetic space mission wastewater using a membrane-aerated, membrane-coupled bioreactor (M2BR), *Journal of Industrial Microbiology and Biotechnology*, Volume: 35 Issue: 6 Pages: 465-473, 2008

- 103) Alvarez JR.; Shanahan JW. and Semmens MJ., The effect of a non-woven scrim at the surface of a flat-sheet, microporous membrane on gas-liquid mass transfer, *J. Membrane Science*, Volume: 318 Issue: 1-2 Pages: 435-440, 2008
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Impact of Research:

For a complete listing of publications and their impact please see Google Scholar and Research Gate: <http://scholar.google.com/citations?user=ZKla2FgAAAAJ&hl=en>
https://www.researchgate.net/profile/M_J_Semmens/stats

Papers in Proceedings (excerpta):

1. Semmens, "A Review of Factors Influencing the Selectivity of Ion Exchange Resins for Organic Ions," AICHe Symp. Series 152, Vol. 71, pp. 214-233, 1975.
2. Semmens, "Ion Exchange - Fundamental Considerations," in Water Treatment Part II, Proceedings 19th Public Water Supply Engineers' Conference, University of Illinois, Urbana, IL, pp. 115-128, 1977.
3. Semmens, "The Feasibility of Using Nitrifying Bacteria to Regenerate Clinoptilolite," Purdue Industrial Waste Conference, Proceedings, Vol. 32, p. 733, 1977.
4. Semmens and G. Ocanas, "The Removal of Specific Trace Organics from Water During Chemical Coagulation," AICHe Symp. Series 167, Vol. 73, pp. 42-48, 1977.
5. Semmens and W. Martin, "Studies on Heavy Metal Removal from Saline Waters by Clinoptilolite," AICHe Symp. Series, No. 197, Vol. 76, p. 367, 1980.
6. Semmens, "Ammonium Removal by Clinoptilolite Using Biologically Assisted Regeneration," Proceedings Zeolite '80, Pergamon Press, 1980.

7. Alleman, B.A. Benedict, M.A. LaGrega, M.J. Semmens, W.W. Schuster and M. Wanielista, "Relationship of Baccalaureate to Graduate Environmental Engineering Education," Fourth Conference on Env. Eng. Education, April 1980.
8. Linne and M.J. Semmens, "The filtration and ammonium removal performance and Regeneration of Clinoptilolite, Purdue Industrial Waste Conference Proceedings, Vol. 39, pp. 757-771, 1984.
9. Semmens, C.F. Kenfield, R. Qin and E.L. Cussler, "The GM-IX Process - A Novel Metal Cyanide Recovery Process," Purdue Industrial Waste Conference Proceedings, Vol. 42, pp. 883-892, 1987.
10. Chang and M.J. Semmens, "Selective Cyanide Recovery from Wastewaters Containing Metal Cyanide Complexes," Purdue Industrial Conference Proceedings, Vol. 43, 1988.
11. Zander, R. Qin and M.J. Semmens, "Oil Extraction of Volatile Organic Contaminants from Water Across a Non-Wetting Microporous Membrane," A.S.C.E. Environmental Engineering Specialty Conference Proceedings, July 1988. (In Press)
12. Chang and M.J. Semmens, "Cyanide Recovery From Concentrated Wastes," WPCF Industrial Waste Proceedings, October 1988.
13. Chang and M.J. Semmens, "Selective Cyanide Recovery from Wastewaters Containing Metal Cyanide Complexes," International Conference on Physiochemical and Biological Detoxification of Hazardous Wastes, May 1988.
14. VanderTop, V. and M.J. Semmens, "The influence of water quality on bubbleless membrane aeration performance," Purdue Industrial Conference Proceedings, Vol. 47, pp 317-327, 1992.
15. Schwarz, S. and M.J. Semmens, "Pilot studies of membrane air stripping: Design implications and Cost Analysis," Purdue Industrial Conference Proceedings 1993.
16. Johnson, D., M.J. Semmens, M.Rieth and S. Schwarz, "Bubble Free Aeration for the Control of VOCs and Odor Emissions", Proceedings WEF Conference, Chicago, 1994
17. Johnson, D., M.J. Semmens, "The Performance of Unconfined Hollow Fiber Membranes as Pipe Flow and Mixed Flow Aerators", Proceedings ASCE Environmental Engineering Conference, Boulder CO, 1994
18. Jewell, L. and M.J. Semmens, "Immiscible Organic Liquid Recovery Using Unconfined Membranes", Proceedings ASCE Environmental Engineering Conference, Boulder CO, 1994
19. Johnson, D., M.J. Semmens, "The Performance of a low head membrane aerator ", Proceedings AFS National Conference, Halifax, Canada, August 1994.
20. Gulliver, J., B. Oakley and M.J. Semmens, A new Instream Aerator, Proceedings of the National Conference on Hydraulic Engineering '93, ASCE, New York, NY pp.603 - 609, 1993
21. Weiss,P., J.S.Gulliver, B.T. Oakley and M.J. Semmens, " The Performance of a vertical fiber membrane aerator," ASME FED Vol. 187, Aeration Technology, Eds. REA Arndt and A Prosperti, Book # G00865, pp.59-66, 1994
22. Semmens, M.J. and C.J. Gantzer, Gas Transfer in Hollow Fiber Membranes, Research Proceedings, WEF Conference, Anaheim, CA Oct. 1993
23. C.J. Gantzer, and M.J. Semmens, "Bubbleless Gas Transfer for Reducing Emissions of Odours and VOCs," WEF Specialty Conference: Odor and VOC Emission Control for Municipal and Industrial Wastewater Treatment Facilities, Jacksonville,FL April 1994.

24. Jewell, L. and M.J. Semmens, "Solvent Spill Recovery Using Hollow Fiber Membranes," Proceedings WEF Conference, Chicago 1994.
25. Semmens, M. and D. Johnson, " Low head membrane oxygenator for aquaculture." AFS Conference, Halifax, NS August 1995
26. Semmens, M. J. and Hanus, D., "Studies of a Membrane Aerated Bioreactor for Wastewater Treatment" MBR II – Membrane Bioreactor Conference, Cranfield University, July 1999
27. Shanahan, J. and M.J. Semmens, "Membranes in Bioreactors" Presentation at the Central States Water Environment Control Association Conference, Pheasant Run, WI May 16th-20th, 2000.
28. Ben Aim, R and MJ Semmens, "Membrane Bioreactors for Wastewater Treatment and Reuse: A Success Story" IWA Conference Asia Environmental Technology 2001 (Singapore, 30 October - 1 November 2001)
29. Semmens, M. J., Membranes in Bioreactors – Applications in Wastewater Treatment, Proceedings BCC Membrane Technology Conference, Newton, Massachusetts, Dec 2-5 2001

Discussions, Technical Notes and Reports (*excerpta*)

1. M.J. Semmens and P.S. Porter, "Virus Removal by Ion Exchange," Report to the National Science Foundation, NTIS, 1975.
2. M.J. Semmens, "A Feasibility Study for the Biological Regeneration of Ammonium Saturated Clinoptilolite," Illinois Water Resources Center, UIUC-WRC-77-0126.
3. M.J. Semmens, "The Regeneration of Clinoptilolite by Biologically Restored Brine," Illinois Water Resources Center, UIUC-WRC-79-0139.
4. M.J. Semmens, "Optimization of Coagulation Adsorption for Organics Removal," Report to EPA, CR806377 - NTIS, 1983.
5. S.R. Linne and M.J. Semmens, "Ammonium Removal and Filtration Performance of Clinoptilolite," Environmental Engineering Program, University of Minnesota, ENV-84-01, 1984.
6. M. Semmens and S. Chiesa, "Feasibility of CMA Manufacture from Wastes in the State of Minnesota," submitted to the Department of Transportation, May 1985.
7. C.F. Kenfield and M.J. Semmens, "Metal Leaching Tests on Asphalt Containing Sludge Ash," submitted to the Metropolitan Waste Control Commission, September 1985.
8. Y.Y. Chang, R. Qin, C. Kenfield, M.J. Semmens and E.L. Cussler, "Treatment of Plating Wastewaters Containing Cyanide Complexes by a Gas Membrane - Ion Exchange Process" , Minnesota Water Resources Research Center, Technical Report #131, 1989.

Books Authored

1. Liebman, M.J. Semmens, and J. Stukel, "Air and Water Quality." A preliminary textbook for CE 3500, University of Minnesota.

Books Edited

1. J.T. O'Connor and M.J. Semmens (Eds.), Trace Metals in Water Supplies: Occurrence, Significance and Control, Proceedings 16th Water Quality Conference, University of Illinois-Urbana, IL, 1974.
2. M.J. Semmens (Ed.), Water Distribution Systems, Proceedings 17th Public Water Supply Engineers Conference, University of Illinois-Urbana, IL, 1975.
3. M.J. Semmens (Ed.), Water Treatment, Part I, Proceedings 18th Public Water Supply Engineers Conference, University of Illinois-Urbana, IL, 1976.
4. M.J. Semmens (Ed.), Water Treatment, Part II, Proceedings 19th Public Water Supply Engineers Conference, University of Illinois-Urbana, IL, 1976.

Sponsored Projects

- ❖ 1974 National Science Foundation, "Virus Removal by Ion Exchange," \$17,000.
- ❖ 1974 Office of Water Research and Technology (Allotment Grant), "Feasibility of Biological Regeneration of Clinoptilolite," \$12,000.
- ❖ 1975 Office of Water Research and Technology (Allotment Grant), "Development Study of Biological Regeneration of Clinoptilolite," \$12,000.
- ❖ 1976 Office of Water Research and Technology (B102 ILL-Matching Grant), "Development Study of Biological Regeneration of Clinoptilolite," \$80,000.
- ❖ 1977 Grant in Aid of Research, Graduate College, "Organics Removal by Coagulation," \$7,500.
- ❖ 1977 Anaconda Mining Company, Denver, Colorado, "An Investigation of the Potential of Zeolites for Removing Heavy Metals from Waste Waters," \$15,000.
- ❖ 1978 Office of Water Research and Technology (Matching Grant), "The Potential of Natural Zeolites for Heavy Metals Removed from Waters and Wastewaters," \$60,000.
- ❖ 1979 Environmental Protection Agency, Municipal Water Supply Division, "Optimizing Coagulation - Adsorption for Haloform and TOC Removal," \$113,842.
- ❖ 1980 Anaconda Copper Co., Denver, Colorado, "Ammonium Removal by 1010A, Design Information for Municipal Waste Treatment," \$28,000.
- ❖ 1980 Metropolitan Waste Control Commission, "Ammonium Removal by Zeolites," \$36,000.
- ❖ 1981 Water Resources Center Matching Grant, "Low energy Filtration using Buoyant Media," \$43,000.
- ❖ 1983 3M Company, "Buoyant Media Filtration," Dr. Chiesa Co-Principal Investigator, \$31,000.
- ❖ 1984 National Science Foundation, "Research Equipment Funds for Particle Characterization Equipment," \$23,000
- ❖ 1984 Institute of Technology, "Research Equipment Funds for Particle Characterization Equipment," \$23,000 of State Matching Funds.
- ❖ 1984 Graduate School Research Support, "Optimization of Engineering Management and Water Quality in Aquaculture," \$6,000.
- ❖ 1984 Minnesota Department of Transportation, "A Feasibility Study to assess Calcium Magnesium Acetate Production," \$13,010.
- ❖ 1985 Minnesota Department of Transportation, "Calcium Magnesium Acetate Production from Waste Resources," with S. Chiesa Co-Principal Investigator, \$70,000.
- ❖ 1985 Metropolitan Recovery Corporation, "Ion Exchange studies for heavy metal removal from plating waste rinse waters," \$25,000.
- ❖ 1986 Minnesota Water Resources Center, "Membrane process for Cyanide Recovery from dilute and concentrated waste waters," \$40,000.
- ❖ 1987 LCMR - "Innovative Water Treatment Technology development" with E. Cussler, \$170,000.
- ❖ 1987 U.S. Department of Navy, IPA Agreement, "Interfacing Ion Exchange and Membrane Processes," \$18,000.

- ❖ 1988 U.S. Department of Navy, IPA Agreement, "Development of GM-IX Process and Pilot Plant Studies," approximately \$80,000.
- ❖ 1988 U.S.G.S., Development of a Novel Closed Loop Air Stripping Process," \$180,000.
- ❖ 1988 U.S. Department of Navy, "Design and Build GM-IX Pilot Plant," \$24,650.
- ❖ 1989 U.S.E.P.A., Competitive Grants Program, Washington D.C. "An Evaluation of a VOC-Membrane Air Stripping Technology" \$135,000
- ❖ 1990 USAF- Argonne National Labs., "Membrane assisted solvent extraction" \$40,000
- ❖ 1991 Mitsubishi Rayon Corporation, "Testing and Evaluation of Composite Hollow Fibers for Membrane gas transfer. \$30,000
- ❖ 1992 NSF- "Evaluation of a vertical fiber membrane aerator" with J.Gulliver co-PI. \$227,000
- ❖ 1992 USEPA-CCITT "Mass transfer behavior of unconfined membranes" with J. Gulliver and E. Cussler \$168,290
- ❖ 1992 USEPA-CCITT "Membrane module design for pervaporation" with E. Cussler \$169,891
- ❖ 1994 USEPA - SITE Emerging Technology Grant, "A Demonstration of Membrane Gas Transfer in Waste Remediation" \$300,000
- ❖ 1995 NSF - Travel Grant to Develop Membrane Research Cooperative Studies in the UK. \$5000 with J. Gulliver
- ❖ 1995 US Army CERL, " Oil recovery from wastewaters generated by the machining industry," \$25,000
- ❖ 1996 USEPA-CCITT " Oil Recovery and Reuse in the Machining and Metal Fabrication Industry", \$56,371
- ❖ 1996 St Paul Water Utility, "Modeling, design and testing of a pilot plant," \$38,000
- ❖ 1996 USEPA-CCITT "An assessment of an in-line copper recovery technology as a waste reduction strategy for the metal finishing industry" \$84,348
- ❖ 1997 USEPA-CCITT, " Modeling membrane processes." \$40,000
- ❖ 1998 St Paul Water Utility, " Examination of Ozone and MIEX for NOM Removal" \$76,000
- ❖ 1998 WERF, "Innovative High Rate Biological Treatment Using Membranes" \$102,200
- ❖ 1998 SERDP " An Innovative Passive Barrier System Using Membrane-Delivered Hydrogen Gas for the Bioremediation of Chlorinated Aliphatic Compounds." Co PIs : P. Novak and R. Hozalski. \$1,400,000
- ❖ 1999 St Paul Water Utility, " Studies of Biological Quality in Distribution system" \$40,000
- ❖ 2000 WERF "Innovative High Rate Membrane Bioreactor – Pilot Studies," \$300,000
- ❖ 2000 Minnesota Water Resources Center, Using Hydrogen to denitrify nitrate contaminated water." \$30,000 Co PI Dr. P. Novak.
- ❖ 2001 State of Minnesota, Legislative Commission on Minnesota Resources, "Membrane hydrogen injection for in-situ denitrification of nitrate contaminated water supplies", \$250,000 Co PI Dr. P. Novak.
- ❖ 2001 Seagrant Environmental Technology Program, "Innovative Nutrient Removal Technology Development" \$225,000, Co PI Dr. P. Novak.
- ❖ 2001 National Science Foundation, " Characterization of Membrane Aerated Biofilms." \$325K , Co. PI Dr. Timothy LaPara
- ❖ 2002 St Paul Water Utility, " Examination of Ozone for NOM Removal" \$50,000
- ❖ 2003 National Science Foundation, GOALI Program with 3M Corporation, " Characterizing Biofilm Adhesion to Gas Permeable Membranes." \$325K , Co. PI Dr. Novak and Dr. G. Haugstad
- ❖ 2004 St Paul Water Utility, " Examination of Taste and Odor Removal by GAC and Ozone" \$50K
- ❖ 2003 Syngenta "Atrazine Removal by Immobilized Enzymes" \$80K Co PIs Prof. M. Sadsowsky and Prof. L. Wackett.
- ❖ 2005 State of Minnesota, Legislative Commission on Minnesota Resources, "Unwanted Hormone Therapy", \$300K Co PIs Dr. P. Novak and Dr. D. Swackhamer.
- ❖ 2006 St Paul Water Utility, " Examination of Taste and Odor Removal by GAC and Ozone" \$80K
- ❖ 2007 St Paul Water Utility, "Improving aeration effectiveness in Lake Vadnais" \$80K Co PIs M.Hondzo and R. Hozalski
- ❖ 2007 HDR Engineering Inc., "Data Analysis for the UF Pilot Plant at the Minneapolis Water Treatment Plant", \$25K
- ❖ 2009 St Paul Water Utility, " Optimization of lake aeration for water quality management" \$90K
- ❖ 2009 City of Minneapolis, Assessment of UF Membrane Pilot Plant Fouling Data, \$75K (Technology Specialists)
- ❖ 2010 City of Minneapolis, " Optimization of PAC application for Geosmin Removal" \$100K

- ❖ 2010 EPA SBIR, “Development of an alkalinity sensor” \$75K (Technology Specialists)

Review Duties

1. National Science Foundation, Research Proposals.
2. Environmental Protection Agency, Research Proposals.
3. American Water Works Association, Paper Reviewer.
4. Water Pollution Control Federation, Paper Reviewer.
5. International Copper Association, Proposal Reviewer.
6. ASCE Environmental Engineering Division, Paper Reviewer.
7. AIChE Journal, Paper reviewer
8. Elsevier Journals, Paper reviewer

Academic Consulting Activities

1976-77	Attorney General's Office, State of Illinois
1977-79	Anaconda Copper Company, Denver, Colorado
1979	CH2M-Hill, Richmond, California
1979-82	Anaconda Minerals Company, Denver, Colorado
1979-83	State of Minnesota, Department of Natural Resources
1984-86	Midas Resource Corporation, Denver, Colorado
1985-87	Metropolitan Recovery Corporation, Minneapolis, Minnesota
1984-87	Donaldson Company, Bloomington, Minnesota
1985-86	Barr Engineering
1986-88	Johnson Division, Minneapolis, Minnesota
1986-89	U.S. Department of Navy
1988	Progress Technology Corporation, Tampa, Florida
1989-91	Hoechst Celanese, Charlotte NC
1990-91	Applied Membrane Technology, Minnetonka, MN
1990-91	Arthur D. Little, Boston, MA
1990	City of Fargo, ND
1991-present	Membran Corporation, Minneapolis, MN
1995-7	HDR Engineering, Minneapolis, MN
1999 - 2001	Imation, St Paul, MN
1999	General Mills
2001-2003	3M St Paul, MN
2004	Exxon Mobil, Joliet, IL
2004-2005	SJE Rhombus, Grand Rapids, MN.
2004-2006	CH2M-Hill Engineers, Eagan, MN
2008-2010	City of Minneapolis Water Works, Fridley, MN
2009-2010	Coskata, Chicago, IL
2011-	Entegris, Boston, MA

Professional Registration

Registered Professional Engineer in the State of Minnesota. License # 19623

Patents

1. “A Water Purification Process.” Patent No. 4,098,690 Issued July 4, 1978
2. "A Novel Membrane-Ion Exchange Process for Selective Recovery of Cyanides." Patent No. 4,895,659, Issued January 23, 1990
3. "A Bubbleless Gas Transfer Device and Process." Patent No. 5034164 Issued July 23, 1991
4. "Oil Stripping of VOC's using a Coated Membrane" Patent No. 4960520, Issued October 2, 1990

5. "A High Efficiency Microbubble Aeration" Patent No. 5,674,433, Issued October 7, 1997.
6. "Biofilm Wastewater Treatment Devices" Patent No. 20060096918 Issued May 2008
7. "Magnetically Responsive Membranes" Patent No. US 2014/0231351, August 21, 2012

Business Experience:

In 1991 I formed a company called **Membran Corporation** and assigned my Bubbleless Gas Transfer Device Patent to the company. This company manufactured gas transfer modules for water and wastewater applications until March 1996 when it closed down manufacturing operations.

During the 5 years of operation I was involved as the Chief Technical Officer and President, the Company raised over \$2,000,000 in private investment funds and over \$700,000 Federal and State Funds. Our research and development studies led to an additional 3 patent applications including a joint patent application with the University of Minnesota.

In the late 1990's started my own Consulting Partnership called **Technology Specialists**. Partners include academic colleagues nationally and internationally.

Recent projects have included:

- ❖ 2007 City of Minneapolis – Optimization of chemical treatment and membrane fouling study, \$75,000
- ❖ 2008 Coskata – Membrane Bioreactor for Methanol Production \$5,000
- ❖ 2009 SERDP (subcontract) – Magnetically responsive membranes for fouling control in oil-water separations. \$30,000
- ❖ 2010 USEPA- SBIR Development of a bicarbonate sensor for water treatment \$75,000

Professional Societies Membership

Associate of the City and Guilds Institute, London (ACGI); Association of Environmental Engineering Professors (AEEP); American Water Works Association (AWWA); International Water Association (IWA), European Membrane Society (EMS).