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HIGHEST DEGREE:
Ph.D. Environmental Engineering, Montana State University, 2004

PROFESSIONAL REGISTRATION:
Registered Professional Engineer, Montana, #10536PE

PROFESSIONAL EXPERIENCE:
Industrial Coordinator/Research Professor, Center for Biofilm Engineering, Bozeman, MT, 2000-Present
Research Engineer, Center for Biofilm Engineering, Bozeman, MT, 1995-1999
Environmental Engineer, Matney-Frantz Engineering, Bozeman, MT, 1990-1995

AREAS OF EXPERTISE:
Technical:

- Biofilm measurement and control in industrial systems
- Development of testing protocols for assessing the efficacy antimicrobial products and surfaces
- Engineered systems for microbial process control
- Control of microbial souring of oil in pipelines and subsurface formations
- Biodegradation of organic chemicals in soil and groundwater

Technology Transfer:

- Communication of biotechnology research advances with industry and government
- Organization of bi-annual technical meetings for Engineering Research Center Industrial Associates
- Organization and presentation of biofilm analytical methods workshops for industry and academic researchers and strategic planning workshops for industrial partners

RECENT INDUSTRIAL PROJECT EXPERIENCE:
All industrial project work was performed under confidentiality agreements which prevent identification of project sponsors, locations, or other specific details.

Field Scale
Control of Contamination of Bacteriological Liquid Growth Media Production Line – A production line for the formulation and packaging of rapid detection growth media experienced bacterial contamination leading to product loss. The design of the line and disinfection practices were reviewed and recommendations were made for design changes and protocol improvements, leading to a significant improvement in product loss.

Biofilm Control in a Pharmaceutical Manufacturing Facility – Bacterial cell growth leading to the presence of endotoxin and product loss was assessed and controlled in the water for injection system of a large pharmaceutical manufacturing plant. Cleaning protocols were analyzed and recommendations made for enhanced cleaning and site monitoring, resulting in identification of problem areas of the plant and biofilm eradication.

Endotoxin and Biomass Assessment and Control in a Wound Care Product Manufacturing Facility – Endotoxin from suspected bacterial contamination of a wound care dressing manufacturing facility caused extended plant downtime and product loss. Systematic sampling of each production step led to determination of likely biofilm growth areas. Recommendations for additional disinfection steps prevented problem recurrence.

Biofilm Assessment and Control in a Liquid Soap Manufacturing Facility – Bacterial contamination of the process stream of a liquid soap manufacturing facility led to product contamination and loss. Production formulation tanks and piping runs were sampled and analyzed for biofilm accumulation. Enhanced cleaning steps were proposed and prevented problem recurrence.

Biofilm Control in a Laboratory Animal Production Facility Water System – Pathogenic bacteria surviving in biofilms growing in the water system of a facility for growing laboratory animals led to animal sickness and death. Disinfection practices were analyzed and changes were recommended, leading to problem resolution.

Laboratory Scale

Biofilm Growth and Control in an Oilfield Water Injection System – Biofilm accumulation in a 60 km pipeline carrying seawater from the Persian Gulf to injection points in the Saudi Dawa field caused unacceptable levels of headloss and corrosion. Laboratory studies assessed the performance of various antimicrobial dosing regimens for application to the field site, leading to more effective protocols for injection water treatment.

Testing Antimicrobial Chemistries and Surfaces in Biofilm Control in Water Supply Lines – Surfaces imbedded with antimicrobials, as well as soluble antimicrobial chemistries were tested for their ability to control initial biofilm colonization of piping systems carrying low organic carbon water. Experiments were carried out over 6 months to assess the performance of various surface modifications and disinfectant chemistries, resulting in a test matrix that helped to guide the choice of construction materials for a new line.

Testing Antimicrobial Chemistries in the Removal of Mature Biofilm (>20 separate experiments over several years). Standard biofilm reactor systems and tests were used to assess the efficacy of many proprietary chemistries and techniques of application in the removal and killing of mature biofilms. These experiments were sponsored by numerous industrial companies with the intention of assessing the performance of their product(s) against standard biofilms.

SELECTED PUBLICATIONS:

Sturman, P.J. 2012. Biofilm Control in Industrial Water Systems. In: *Biofilm Control in Drug Manufacturing*. Ed: Clontz L and Wagner C. PDA DHI Technical Books. October 2012.

Sturman, P.J., O.R. Stein, J. Vymazal and L. Kröpfelová. 2008. Sulfur Cycling in Sub-Surface Constructed Wetlands. Chapter 29 Wastewater Treatment, Plant Dynamics and Management in Constructed and Natural Wetlands. Vymazal, J. (ed.) pp. 329-344. Springer, Dordrecht.

Kjellerup, B.V., R.H. Veeh, P. Sumithraratne, T.R. Thomsen, K. Buckingham-Meyer, B. Frolund, and P.J. Sturman. "Monitoring of Microbial Souring in Chemically Treated Produced Water Biofilm Systems Using Molecular Techniques. Journal of Industrial Microbiology and Biotechnology. 32:4, pp 163-170. 2005

Sanders, P.F. and P.J. Sturman. "Biofouling in the Oil Industry", invited chapter, Petroleum Microbiology, American Society for Microbiology (ASM) Press, Washington D.C. 2005.

Sturman, P.J. and I. Saxena. "Development and Testing of a Fiber-Optic Probe for Biofilm Detection and Quantification", In: Proceedings: International Conference on Biofilm Monitoring, Porto, Portugal. March 2002

Zelver, N., M. Hamilton, B. Pitts, D. Goeres, D. Walker, P. Sturman, and J. Heersink. "Methods for Measuring Antimicrobial Effects on Biofilm Bacteria: from Laboratory to Field", invited Chapter, Biofilms: Methods Enzymology Series, R.J. Doyle (Ed.), Academic Press. 1999.

Recent Invited Presentations:

Engineering Aspects of Biofilm Growth and Response to Antimicrobial Treatment, Parenteral Drug Association Biofilm and Bioburden Workshop, April 8-10, 2014, San Antonio, TX

Standard Methods for Biofilm Testing: Progress and Future Directions, FDA/CBE Co-sponsored meeting: Biofilms, Medical Devices and Anti-Biofilm Technology – Challenges and Opportunities, February 20, 2014, Silver Spring, MD.

Legionella Growth and Survival in Biofilms: laboratory models and the environment, Society for Industrial Microbiology Conference on Recent Advances in Microbial Control, October 29, 2012, Arlington, VA

Visualizing Antimicrobial Action in Biofilms, Society for Industrial Microbiology Conference on Recent Advances in Microbial Control, November 7-10, 2010, Arlington, VA

Biofilm Growth Models and Standardization, FDA Seminar on Biofilms in Medicine, April 6, 2010, Rockville, MD