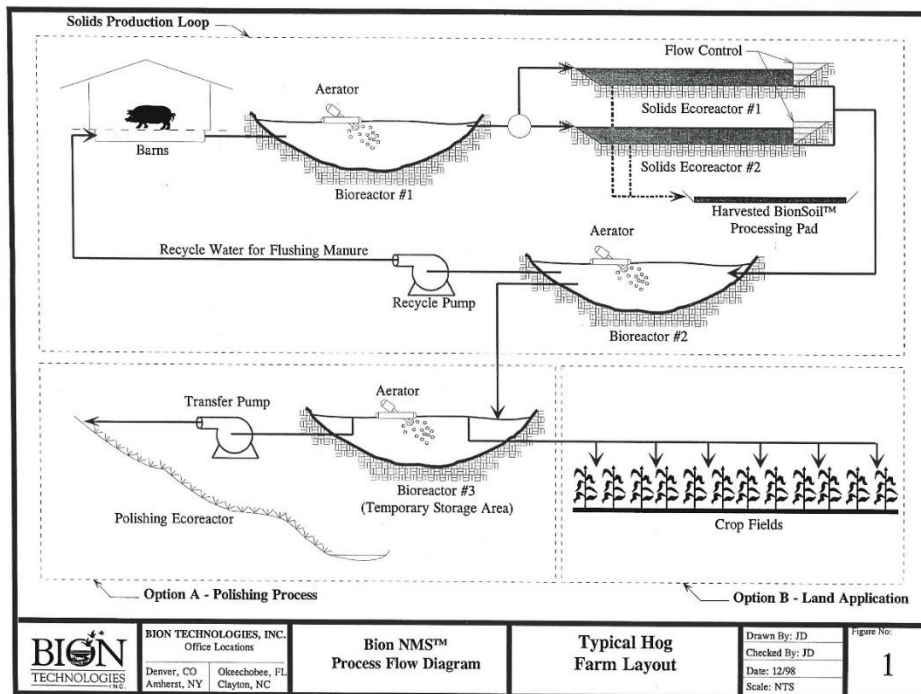
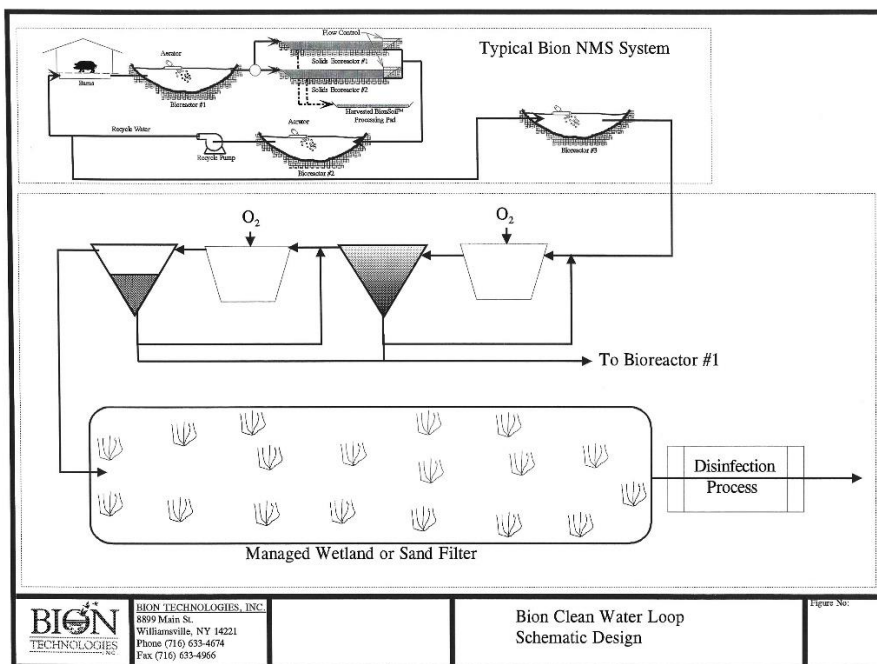
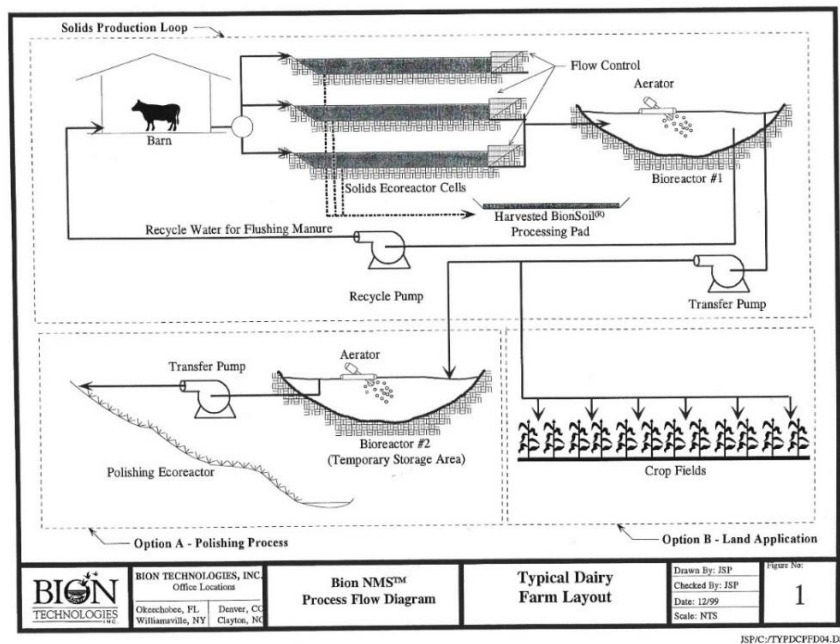


Bion Environmental Technologies

Prior to TimberFish I developed an environmental biotechnology, the Bion Technology, for nutrient and manure management for the large animal agriculture and food processing industries. This consisted of an integrated recycling system comprising microbial growth bioreactors, solids separation and processing ecoreactors, and polishing wetlands. The technology produces a valuable soil byproduct and clean water from manure and food processing wastes. It uses a process that combines low oxygen nitrification – denitrification with microbial nutrient capture to virtually eliminate the greenhouse gas emissions that are the source of ozone depletion in the atmosphere and the production of odors from anaerobic agricultural and manure management systems.

The systems were applied in a variety of configurations depending on the source and nature of the treated waste stream. The following diagrams show applications for hog and dairy farms and a clean water extension that could be used for either.





A description of how this technology can reduce atmospheric emissions of carbon dioxide and greenhouse gases from large animal agriculture can be found in the following two papers;

“Dairy Farm Atmospheric Emissions Control Using a Microaerobic Biological Nutrient Removal (BNR) Process.” Proceedings of the American Society of Agricultural and Biological Engineering 2007 International Symposium on Air Quality and Waste Management for Agriculture. Authors: James W. Morris, Jere Northrop, George W. Bloom, Steve Pagano

Abstract. A whole farm air emissions and waste management model was applied to a 1,250 cow dairy in Central Texas. The model divided the entire farm’s waste management system into eleven component units, from manure excretion through and including emissions from crop irrigation. The model used directly measured microaerobic biological nutrient removal process (BNR) emissions, and estimated emissions for all other components (determined by using literature values and process engineering fundamentals), to arrive at proposed voluntary maximum whole farm waste management system emission standards representing reductions up to 94% for ammonia, 58% for VOCs, methane 83%, hydrogen sulfide 82%, and oxides of nitrogen 44%. The proposed voluntary standards are as follows (all in Kg per cow annually): 8.2 ammonia, 1.5 VOCs, 59 methane, 1.8 hydrogen sulfide and 0.15 oxides of nitrogen.

and,

“Nutrient and Atmospheric Emissions Performance of a Microaerobic Biological Nutrient Removal Process (BNR) Treating Dairy Residuals.” Proceedings of the 2005 Animal Waste Management Symposium, Research Triangle Park, NC, October 5-7, 2005. Authors James W. Morris, Jere Northrop, George W. Bloom, Steve Pagano

Abstract. A microaerobic biological nutrient removal process (BNR) was retrofitted to an existing anaerobic lagoon to manage both atmospheric emissions and nutrients discharged from a 1,250 cow dairy in Central Texas. The BNR waste management system was operated to maximize biological nutrient recovery and successfully removed 74% of the total nitrogen and 79% of the phosphorus load. Simultaneously, the system achieved substantial reductions of air emissions of up to 99% for ammonia, volatile organics (VOCs) by 98%, methane 94%, hydrogen sulfide 95% and oxides of nitrogen 93%.

Further descriptions of this technology can be found in the following patents by Jere Northrop that were assigned to Bion Environmental Technologies.

United States Patent No. 8,287,734 entitled “Method for treating nitrogen in waste streams” issued on October 16, 2012. Inventors Jere Northrop, James W. Morris. Assigned to Bion Technologies, Inc.

United States Patent No. 8,039,242 entitled “Low oxygen biologically mediated nutrient removal” issued on October 18, 2011. Inventors James W. Morris, Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 7,879,589 entitled “Micro-electron acceptor phosphorus accumulating organisms” issued on February 1, 2011. Inventors James W. Morris, Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 7,575,685 entitled “Low oxygen biologically mediated nutrient removal” issued on August 18, 2009. Inventors James W. Morris, Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 7,431,839 entitled “Low oxygen biologically mediated nutrient removal” issued on October 7, 2008. Inventors James W. Morris, Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 6,908,495 entitled “Low oxygen organic waste bioconversion system” issued on June 21, 2005. Inventors Jere Northrop, James W. Morris. Assigned to Bion Technologies, Inc.

United States Patent No. 6,689,274 entitled “Low oxygen organic waste bioconversion system” issued on February 10, 2004. Inventors Jere Northrop, James W. Morris. Assigned to Bion Technologies, Inc.

United States Patent No. 5,755,852 entitled “Bioconverted nutrient rich humus” issued on May 26, 1998. Inventor Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 5,626,644 entitled “Storm water remediatary bioconversion system” issued on May 6, 1997. Inventor Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 5,538,529 entitled “Bioconverted nutrient rich humus” issued on July 23, 1996. Inventor Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 5,472,472 entitled “Animal waste bioconversion system” issued on July 23, 1996. Inventor Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 5,078,882 entitled “Bioconversion reactor and system” issued on January 7, 1992. Inventor Jere Northrop. Assigned to Bion Technologies, Inc.

United States Patent No. 4,721,569 entitled “Phosphorus treatment process” issued on January 26, 1988. Inventor Jere Northrop. Assigned to Zabion, Ltd.