Announcing the Final Examination of Christopher Boyd for the degree of Master of Science

Time & Location: March 16, 2011 at 1:30 PM in Engineering 2 211P
Title: Effect of Acetic or Citric Acid Ultrafiltration Recycle Streams on Coagulation Processes

Integrating ultrafiltration (UF) membranes within conventional surface water coagulation/ flocculation/ sedimentation processes is growing in popularity. UF systems are able to produce high quality (low turbidity) filtered water that meets drinking water standards. For typical drinking water applications, UF membranes require periodic chemical cleaning via chemically enhanced backwashes (CEBs). Citric acid is a common chemical used for this purpose. Problems may arise when the recycle stream from a citric acid CEB is blended with raw water entering the coagulation basin. Citric acid is a chelating agent capable of forming complexes that interfere with alum or ferric chloride coagulation. Interference with the coagulation process negatively affects settled water quality and may lead to violations of primary or secondary drinking water standards. Acetic acid was investigated as a potential substitute for citric acid in membrane cleaning applications. A jar testing study was conducted to compare the impacts of both citric acid and acetic acid on coagulation with aluminum sulfate (alum) and ferric chloride coagulants. Citric acid adversely affected coagulation at lower acid/coagulant (A/C) molar ratios than acetic acid, and a coagulation interference threshold was identified for both acids based on settled water turbidity goals recommended by the U.S. EPA. Pilot testing was conducted to assess the viability of acetic acid as a UF membrane cleaning agent. Acetic acid CEBs maintained pilot performance in combination with sodium hypochlorite CEBs for filtering a raw California surface water. It is believed that this is the first water treatment application of acetic acid for cleaning ultrafiltration membranes in the United States.

Major: Environmental Engineering

Educational Career:
Bachelor's of Environmental Engineering, BS, 2009,

Committee in Charge:
Dr. Steven Duranceau, Chair, CECE
Dr. David Cooper, CECE
Dr. Andrew Randall, CECE

Approved for distribution by Dr. Steven Duranceau, Committee Chair, on January 12, 2011.

The public is welcome to attend.