

Thesis Portfolio

Scale-up and Design of the Janicki Omniprocessor with Reverse Osmosis Technology
(Technical Report)

Public Involvement in Technology Integration: Understanding San Diego's Successes and Failures with Potable Reuse
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Sciences
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science in Chemical Engineering

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May 11, 2021

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SocioTechnical Synthesis

Billions of people worldwide struggle with getting access to clean water for consumption and sanitation/hygiene activities. Many of those same people suffer from deadly illnesses due to this lack of safe water. To address this widespread problem, my capstone team and I are developing a single process that combines waste treatment, drinking water production, and electricity generation. This process sends solid waste from pit latrines first into a drier which evaporates off all of the water in the human biosolids. The water vapor is sent through a number of processes that filters and purifies it to form clean drinking water. The solids coming out of the drier are then sent to an incinerator that produces heat that generates steam for an electricity-producing steam engine. While this process is technically possible and safe, there is a large social stigma around drinking water derived from human waste which might lead to many communities outright rejecting this type of process. Thus, in order to successfully integrate this process into a community, it is important that the public not only trust the recycled drinking water, but trust that those who build and operate the facilities that produce it put public health and safety above all else.

This inherent responsibility of engineers to protect public safety and ensure access to life's most important resource can be analyzed through the framework of Social Contract of Engineering (SCE). SCE is a powerful framework for understanding the social integration of technology as it evaluates the level of transparency and accessibility to the engineering process as a means of creating a more socially-robust practice. Using SCE, I plan on completing a case study analysis of the City of San Diego's attempts, both failed and successful and with regard to public trust, at integrating potable reuse into their drinking water portfolio. It is expected that the success of integrating potable reuse into San Diego is dependent on the level of public trust in

the technology and local water agencies and that public trust is gained through direct engagement with the public. For the technical element of my thesis, it is expected that converting waste to drinking water is technically feasible, but energy intensive and uneconomical. However, potable reuse technology can be extremely beneficial to communities that struggle to generate drinking water and/or lack the access to waste treatment systems. This being said, it can only be beneficial if the community in which it's being integrated trusts that the process is safe and reliable which necessitates long-term, consistent, and broad public engagement from local governments and water authorities.