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Generation of Green Energy Using Wastewater

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Abstract **-** Generation of electricity from sustainable and renewable energy sources has captivated the world's nations and became the focus of research and development for the past decades. A need for renewable energy sources to generate electricity, such as solar energy, wind power and hydropower, emerged as fossil fuel resources are not only depleting but also causing detrimental effects to the environment through their emissions and wastes. This paper provides a roadmap to the design process of a hydropower system that generates energy using building wastewater. The underlying theory is explained and tested in a reduced scale real-life prototype. A comparison between the theoretical and experimental results proves the validity of the given theory and design roadmap. The discrepancy between experimental and theoretical flow rates was found to be 13%. The basis of hydropower is to extract the potential energy present in water height difference (i.e. water head). Hence, a real-life reduced scale prototype that utilizes a one meter head of water is designed based on a rigorous set of theoretical calculations. Simulink and ANSYS simulations are used for the design of the Pelton Wheel required for the energy conversion. Based on the solution of the theoretical transient model using Simulink and the ANSYS simulation of the 3D system, the proposed hydropower system was manufactured and tested. Using the test data and the above mentioned theoretical and experimental analysis, the full scale system design is provided using sizing and dynamic similarity which is expected to be implemented in high rise building of various waste water heights.

Keywords**:** Sustainable Energy, Hydropower Systems, Wastewater, Numerical Modelling, Picoscale Prototype.