



## SCIENTIFIC & RESEARCH PROJECTS

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### **Project Title:**

**New Method for Industrial Water Reuse and Energy Minimization**

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### **Abstract:**

Water and energy are key commodities utilized in the process industries. Water minimization and energy minimization have been studied separately. In this paper, a new systematic design methodology has been developed for the simultaneous management of energy and water systems that also feature maximum re-use of water. In addition to allowing re-use of water, issues about heat losses inside unit operations have also been incorporated in this new design method. To implement such a design, two new design aspects are introduced; new method for “Non-isothermal Mixing” points identification and new “Separate System” generation. The first aspect involves “non-isothermal mixing”, which enables direct heat recovery between water streams, and therefore allows the reduction of the number of heat transfer units. An NLP model is formulated to identify feasible non-isothermal mixing points in the network regarding minimum operation cost, which satisfy minimum freshwater and utility requirements. The other aspect is the generation of “separate system” in heat exchanger network design. The flexibility of mixing and splitting of water streams allows separate systems to be created as a cost-efficient series of heat exchanger units between freshwater and wastewater streams. The new design aspects have been illustrated with an example.