Hot Water Recirc

Hybrid Cross-Over Zone Valve

ELECOMP Capstone Design Project 2025-2026

Sponsoring Company:

Taco, Inc.
1160 Cranston Street
Cranston, RI 0292
https://www.tacocomfort.com

Company Overview:

Taco is a Global manufacturing company headquartered in Cranston, RI that services both the Residential and Commercial/Industrial HVAC and Plumbing markets on a global scale. Products include pumps, valves/accessories, controls and tanks.

Taco has 1000+ employees and 7 manufacturing plants in RI, MA, TX, CA, Canada, Italy, and Czech. In addition, Taco has an Engineering office in Switzerland and remote Sales employees across both the US and Europe.

Taco is known as a Global leader in the pump industry for hydronic heating and cooling in both Residential and Commercial markets.

Technical Directors:

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Project Motivation:

Taco has recently submitted a provisional patent for a domestic hot water recirc loop hybrid cross-over valve. This product will be the 3rd generation cross-over valve for Taco. The motivation for this project is to take this idea to the next level with a working breadboard prototype. New ideas that come out of this project, if patentable will be added to the existing patent and the students' names will also be added as inventors.

Anticipated Best Outcome:

To have a working prototype with bread board electronics that function a Domestic Hot Water Recirc loop in a home. Requires some Mechanical Engineering to work with mounting electronic actuators for valve operation and sensors.

Project Details:

Hot Water Recirc loops have become very popular in the plumbing industry to reduce the amount of water wasted by running water until hot water final arrives at the faucet. These products are especially popular outside the West in states like California and Arizona where it's imperative to save on the amount of wasted water.

This project is proprietary and has IP already submitted around this concept. The patent will be given to the students to work from after signing an NDA with Taco. The technologies that will be utilized in this design include BLE, data measurement, power generation, valve actuation, IOS and Android App development and the firmware required to run and communicate to the entire system.

Overall system concept: Maintain the temperature at each fixture in the most efficient manner to preserve both water and power.

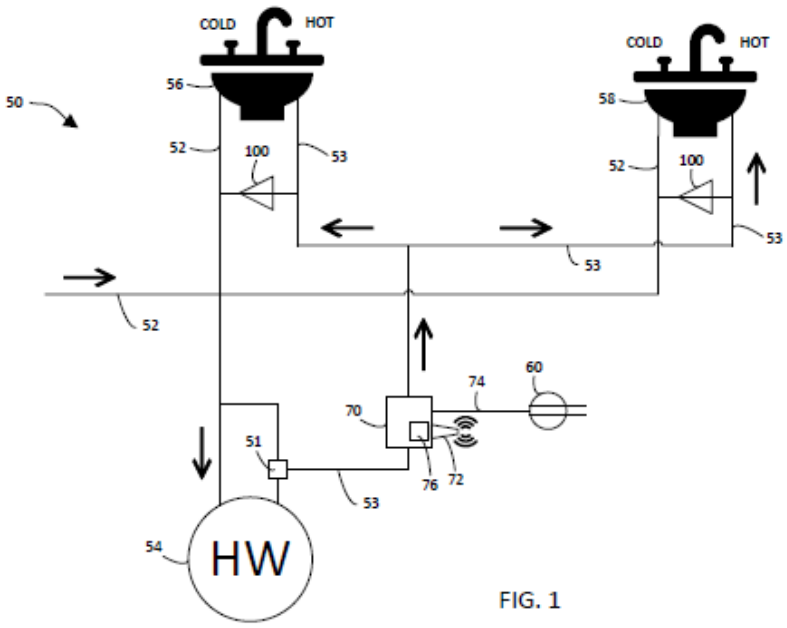

FIG. 1

Hardware/Electrical Tasks:

- Electronic Schematic Design
- PCB Board design and layout
- Specifying power generator

Firmware/Software/Computer Tasks:

- Firmware written to control hybrid cross-over valve operation
- Firmware written to control power generation
- Firmware written for communication via Bluetooth to system circulator pump
- Firmware written for communication via Bluetooth to Mobile App

Mechanical Tasks:

- Mechanical mounting of sensor pads
- Mechanical mounting of valve actuator with simple valve design
- Mechanical mounting of power generator

Composition of Team:

- 1 Electrical Engineer (preference to the one taking Mike Smith's PCB class)
- 2 Software Engineers
- 1 ELE or CPE senior having Mechanical Engineering skills, or having a senior friend in the ME department, who can work on the project, on a paid hourly basis, on Tuesday evenings.

Skills Required:

Electrical Engineering Skills Required:

- PCB Schematic Design
- PCB Board Design and Layout
- Source off-the-shelf components
- Self-Starter/innovative drive

Computer Engineering Skills Required:

- Write Firmware including algorithms for valve functions
- Write Firmware for communication between BLE and circulator pump
- Self-Starter/innovative drive

Mechanical Engineering Skills Required:

- Solid Works Design skills
- Sourcing off-the-shelf components
- Prototyping
- Self-Starter/innovative drive

Anticipated Best Outcome's Impact on Company's Business, and Economic Impact

Get a working prototype of the concept with feasibility analysis to determine if product will be feasible to go to market with from a functional, cost and manufacturing point of view. The potential to increase Taco's market share in this business sector is aligned with our strategic goals as a company and could add a significant amount of dollars to our Top line revenue.

Broader Implications of the Best Outcome on the Company's Industry:

With a good business case this could open the market to this new technology that could save a significant amount of water and energy in homes and businesses across the US and the world.