The Recycling Home Energy Appliance

The Rhea project proposal is designed to take Rhea from an MVP to a fully testable fully-functioning appliance that could be placed in a future demonstration home.

When it comes to air exchanges in today's homes, we should use the rule of, the number of occupants plus one. A typical family should have five complete air exchanges per day for optimum health. In a world obsessed with energy efficiency, this can be problematic as the more you change your air the more energy spent on heating or cooling. For the electricity cost of about 10 cents per year, Rhea can operate its capture vessels and remove the energy from greywater as it leaves the home. The first vessel takes the water at its warmest and adds heat to the incoming water source through absorption. In the second vessel, the cooled water can be used again to preheat incoming fresh air before entering the onboard air-to-air exchanger, again increasing the efficiency of the home. Rhea also captures the vent air from bathrooms, hood fans, central vacuums, and clothes dryers, reducing the number of penetrations in the building envelope. Rhea absorbs the thermal energy from these sources, again adding to the home's efficiency.

Rhea is essentially a mechanical room in a box with recycling capabilities and can be built from simple models to complex models. Rhea has multiple intake ports that allow it to choose where it takes in its fresh air based on the home's current needs and the most efficient way forward.

This project will use IF This Then That technology to maximize Rhea's energy-saving capabilities. Through the use of an embedded Google Mini or Amazon Echo, we can control the inputs and outputs, have access to local weather forecasting, and can create data chains that will allow Rhea to make the correct decision at the correct time.

Rhea uses a natural gas-powered flash hot-water heater to provide the home with its forced-air heating and domestic hot-water needs. Part of the project is devoted to minimizing the on/off cycles of the heater to reduce the percentage of unburned gas emitted and to prevent unnecessary wear and tear. Another one of Rhea's functions is to deliver hot water to the home's faucets. Rhea uses a circulation pump to keep warm water in the line when the owners feel the need to do so, this function can shut down at night and when the occupants are out. We chose to set this temperature at 34°C as this is ideal for hand washing and promotes good water efficiency. Having someone open a high-volume fixture such as a shower or kitchen sink triggers the circulating system to come on in the morning. Occupants can program when it shuts down but only activating it will trigger it to come on. This way if you leave on vacation or don't follow your usual schedule this part of the system will remain off. So, if nobody is home it doesn't come on, thus ensuring there is minimal energy wasted.

One of Rhea's purposes is to power flush the sewer line over and over again with up to a 40-liter flush (10 low-flow toilets at once) undoing the damage that low-flow toilets and fixtures are currently having on today's sewer lines. When you add that to Rhea's recycling capabilities, it's not a stretch of the imagination to see a day when municipalities make Rheas mandatory in new home construction. By developing our energy-efficient technology for increased gas/water/electricity conservation, efficiency and productivity we maximize our resources and infrastructure. All while collecting better data, developing the best practices, and managing security, risk, and vulnerability.

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