

Problem Statement

A/C condensate is a wasted resource, since it is drained out in buildings. Yet, there has been minimal research conducted regarding the reuse of condensate and no attempt to create a device to recycle it for a practical use.

Our goal is to develop a marketable product/system that effectively collects and reuses condensate generated from residential central A/C units for outdoor applications.

To accomplish this, our team established a list of objectives:

Objectives

- Determine the rate of condensate formed within a day at residential sites and relate it to weather conditions.
- Determine the amount of condensate produced over a long period of time by creating a device to collect and measure it.
- Identify possible contaminants of the condensate and perform biological and chemical analyses on samples.
- Keep a clear and extensive record of the semester's work.
- Create a product that is:
 1. Scalable
 2. Marketable to a large group
 3. Economical:
cheap to produce \Rightarrow cheap to buy

Conclusions

- There is a substantial amount of A/C condensate produced, thus it is considered a wasted resource.
- There is interest in a product that recycles condensate and most consumers are willing to spend \$50-\$100 for it.
- The ACRU is a product designed to collect and reuse condensate for outdoor purposes; a downscaled prototype was developed to test its functionality.
- Analysis of condensate samples needs to continue to ensure its safety.
- Market analysis needs to continue to determine target market and reach economic goals.

Acknowledgements

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IPRO 348:

Design a System to Recycle Condensate from Residential Air Conditioners

The Drip Drops



"every drop counts"

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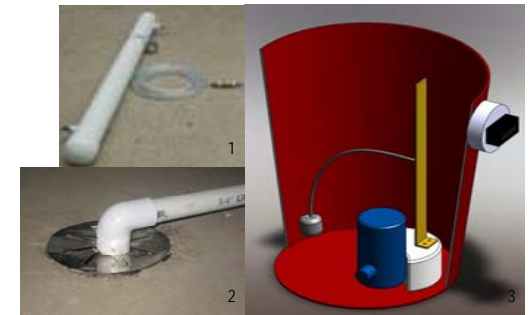
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The Drip Drops

"every drop counts"



1- Materials used for prototype
2- A/C condensate drain
3- Piece of prototype design



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What is Condensate?

Condensate is the liquid produced by cooling appliances when air passes over the cooling coils of the appliance, and the water vapor in the air condenses into liquid. This liquid is drained out in all appliances and therefore can be considered a wasted resource.

Is it Practical to Reuse Condensate?

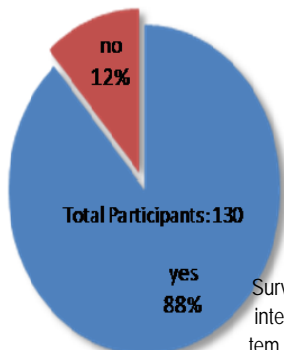
Our research suggests that it is useful to create a product that reuses A/C condensate for 2 main reasons:

1. Volume of A/C Condensate

An average house in the Chicagoland area (Chicago and neighboring counties) is expected to generate about 25 gallons of condensate a week, possibly more. There are about 2 million homes in the Chicagoland area with central A/C units, which gives a total of 49 million gallons of condensate wasted every week during summer. This is about 10 times the amount of water in the Shedd Aquarium!

2. Interest in Product

According to a survey conducted regarding the public's interest in recycling condensate, 88% of participants indicated they would purchase a product that would do so.



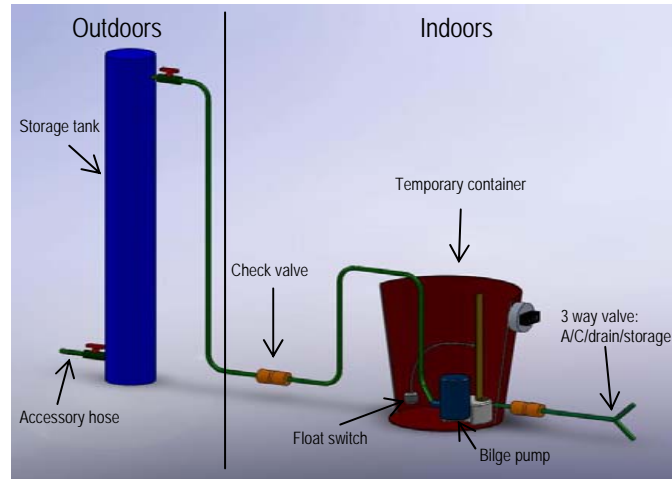
Survey question: Would you be interested in purchasing a system to recycle A/C condensate?

The Product: *ACRU*

The **Air conditioner Condensate Recycling Unit (ACRU)** is a product developed to collect and reuse condensate for outdoor gardening purposes. At this time, our team has created a prototype of the ACRU.

The Design

This prototype of the ACRU is designed for single-family homes with central A/C units. All parts are designed to be scalable, so that it can be made to fit different size A/C units.



2D drawing of ACRU prototype

How it works:

As condensate is produced in the indoor A/C unit, it is collected in a temporary container near the A/C unit. Once the container fills up, a float switch triggers a bilge pump that pumps the condensate into an outdoor storage tank. To use the condensate, an accessory hose, such as a drip line or the hose of a water feature, can be attached to the opening near the bottom of the tank.

Prototype Specs:

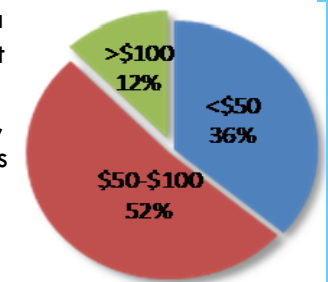
- Storage tank: 10' PVC tube 6" in diameter with end caps, has openings for brass inserts to fit tubing and accessory hose
- 10' metal strap anchor to attach storage tank to side of house
- Temporary container: 5 gallon container with float switch that activates bilge pump when ~2.4 gallons of condensate is filled
- 10' of 3/4" flexible tubing
- 3/4" check valve to prevent backflow from storage tank into temporary container
- 3-way valve to either drain or store condensate from A/C unit
- On/off switch to control use of condensate in storage tank
- Accessory hoses: drip line kit, hose to attach to water feature, etc.

The Economics

Cost of Prototype: \$200.34 (including tax), the most expensive parts being the pump, float switch, and AC/DC converter.

Current Market: Homeowners with central A/C units. (68% of the Chicagoland area)

Goal: To develop a quality product that is relatively inexpensive to produce, so that its price falls in the \$50-\$100 range. As the survey indicates, most consumers are willing to spend in this range.



Survey question: How much would you be willing to pay?