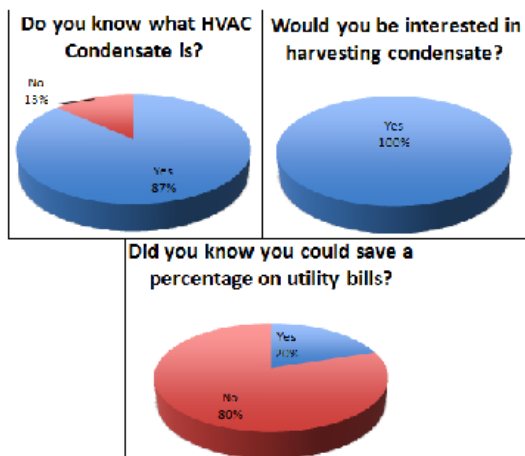


Other Possible Solutions

- Irrigation
- Cleaning Purposes (Laundry, Power Washers, Window Washing, etc.)
- Cooling Equipment (Servers & Machinery)
- Hydroelectric Power
- Decorative Fountains

Survey Information & General Comments



"I actually never thought about it, in this way. Who ever came up with this idea, is genius. I must say we can probably save about \$1000 to \$1500 at this Home Depot" - **Home Depot Manager**

"I think this is a great way of saving money, resources, and the environment. I would like to get more details in implementing this idea at my locations. Also, larger firms can really benefit from such an innovative idea." - **Business Owner- Gas Station**

"Great idea, the hotel would save a significant amount of money. Water is already used up for irrigation purposes, so using condensate would save us money and the environment." - **Hotel Manager**

Critical Barriers and Obstacles

- There is limited amount of information about condensate collection systems. Since collecting condensate is a new process that's being implemented recently, not much information is out there to determine the required steps necessary to collect and use condensate efficiently
- Potential uses are restricted to geographics and seasonality. Condensate forms whenever it's hot and humid. On days that are not humid, only minimal amounts of condensate can be collected.
- Another barrier that needs to be addressed is the rules and regulation that limit the usage of condensate inside a building and outside. The laws would have to be changed in order for condensate to be used for various purposes.

Future Action

- The next step for this project would be to use the data collected and formulated by this IPRO and market it to potential users that might be interested in using condensate water for making their businesses energy efficient
- Develop and market incentives through the government encouraging the use of condensate water.
- Market the idea to countries where the availability of water is very scarce

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DESIGN & MARKETING SOLUTIONS FOR CONDENSATE IN COMMERCIAL APPLICATIONS



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Problem Statement

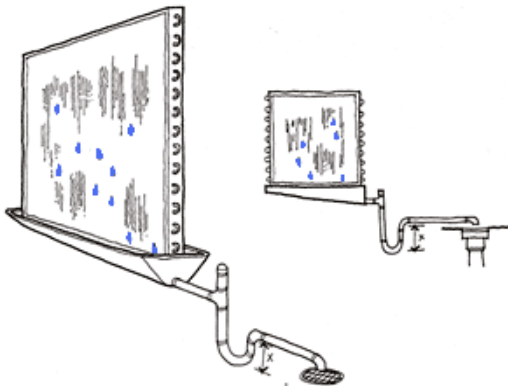
Our goal is to find viable uses for condensate produced by commercial HVAC systems. With the help of Pentair Water Co., quantification and insight will help lead to possible solutions to growing water needs.

Objectives

- Calculation of the amount of condensate water generated by air conditioning units
- Suggesting a plan for a system to collect the condensate water
- Testing the condensate for bacteria and other chemicals
- Finding a purpose for the generated condensate water
- Marketing the system to the consumer (if the water generated is a great amount and profitable)

What is Condensate?

Condensate is formed when ambient air is pulled through cooling coils of a HVAC (Heating, Ventilation, and Air Conditioning) system. Since the cooling coils are much colder than the ambient air, the water vapors within the air condense, creating water droplets. These droplets fall into a collection pan and normally discarded into sewer systems.



Why Should YOU Care About Condensate?

Condensate is generally an overlooked bi-product from HVAC systems. Most condensate collected is poured down the drain with little thought. As water needs increase, with population growth, many can look toward collected condensate as a viable source of water. This is especially useful in areas of the world where water is scarce or the need of water is high.

Many also do not know that the condensate that comes off HVAC systems is relatively clean and is comparable to distilled water. Although testing of condensate finds some bacteria within the condensate samples, with both proper maintenance, and cleaning of HVAC condensate collection systems OR filtering after collection, cleanliness of the condensate can be maintained for suitable use.

Although residential markets can also benefit using condensate, commercial markets tend to benefit the more due to the larger capacity HVAC systems, thus creating larger amounts of condensate for use. Commercial markets are able to utilize the condensate more effectively for various applications.

Condensate Facts

The amount of condensate water can range from 3 to 10 gallons/day per 1,000 square feet of air-conditioned space.

A 10,000 square foot (929 square meters) office building can produce more than 15,000 gallons (56.8 m³) of condensate water per year.

In large commercial buildings, condensate recovery often produces enough water to supply all of the landscape irrigation needs or a significant portion of makeup water for cooling towers.

For large buildings in the summer months of 0.1 to 0.3 gallons (0.4–1.1 l) of condensate per ton of air is generated by conditioning for every hour that the cooling system operates. In the San Antonio climate during peak summertime months, this translates into roughly 0.5–0.6 gallons per hour for every 1,000 ft² of cooled area.

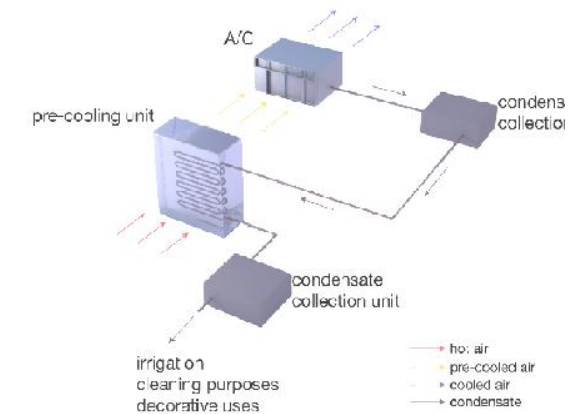
Pre-Cooling Solution

Air conditioners work by blowing air over coils filled with cold liquid. This result is cold air being pumped out. The warm air being blown in causes condensation to occur on the coils. We propose to collect this cold condensate and pump it through new coils placed before the existing coils. This will pre cool the air and make the air conditioner energy efficient.

Cooling Air at 80 degrees Fahrenheit:

Without Pre-cooling: 75.09 degrees Fahrenheit

With Pre-Cooling: 72.15 degrees Fahrenheit



Toilet Water Solution

Assuming a 120000 sq.-ft. building consisting 500 employees as a model, we approximate the following:

- 1.6 gallons per flush x 500 employees x 1.5 flushes a day x 260 days = 312,000 gallons of water a year
- 3 to 10 gallons of condensate/day per 1,000 square ft. hence an average of 6.5 gallons per day
- 6.5 gallons x 365 days a year x 120 = 284,700 gallons of condensate

This means Air conditioner condensate can make up around 90% of all water used in toilet flushing.

Water costs \$0.004 a gallon in Los Angeles, CA. This means over a \$1000 of savings a year!