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Problem

- HVAC systems produce condensate which must be drained.
- Debris enters the airstream and settles in the condensate line.
- Without routine maintenance, a clog may form and prevent drainage, leading to costly water damage.
- Owners forget maintenance and waste money hiring technicians to unclog the drain.

Sample of Clogged Drain Lines:



Home Damage from Water Infiltration:

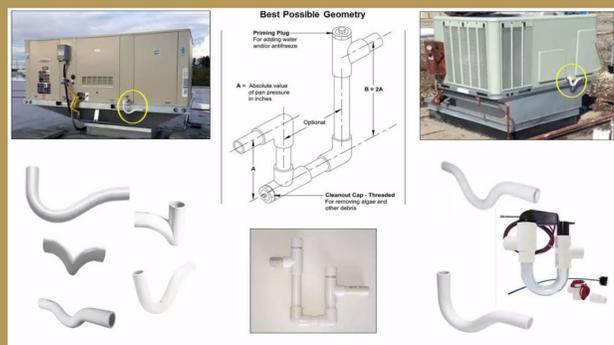


Sponsor's Home Cleaning Set-up to Avoid Water Damage:



Proposed Solution

- To prevent or combat any possible clogs, the proposed solution was to develop an automated system to routinely clean the condensate drain line.
- Design focus of the drain line was placed on the P-trap because it is the section of drain line most likely to have a clog.



Part	Name
1	Milton 1/4" Tank Valve
2	PVC Schedule 40 End Cap
3	3" PVC, Schedule 40
4	Pressure relief valve
5	1/4" Tee
6	Electronic Solenoid Ball Valve
7	3/4" Schedule 40 Adapter
8	Check Valve
9	3/4" PVC T-joint
10	3/4" PVC Pipe
11	3/4" Schedule 40 Elbow

Process

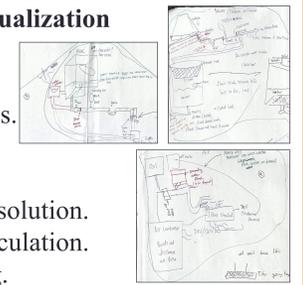
Conceptualization

Customer needs:

- Automated cleaning.
- Low maintenance cycles.
- Safe product.

Initial ideas:

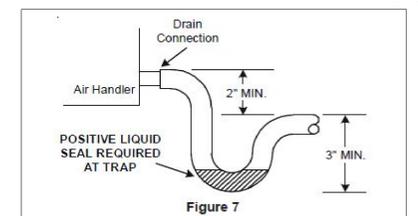
- Chemicals for mold dissolution.
- Closed loop water recirculation.
- Pressurized air cleaning.



Prototype

Design Procedure:

- Researched common dimensions for P-traps.
- Began with calculations to determine the minimum pressure that would move water in a 3/4" pipe.



- Calculated the minimum pressure that would move water through a clog ~40PSI.
- Calculated pressure loss numbers that can be extrapolated to a larger system.
- Built a prototype that would satisfy the requirements of the customer and the pressure calculations.

Final Design

- Includes automation that starts the cleaning cycle every 28 days.
- Each cleaning cycle lasts less than 1 minute.
- LEDs light up to depict when the cycle is ON or OFF.
- A manual push button and a Bluetooth operated app to start the cycle whenever the user would like.

Future Proposals

- A system equipped with the capability to detect power failure, as well as a back-up power supply.
- A system that detects the event in which the pressurized air is unable to clear a clog in the pipeline.
- A one piece fully integrated system that costs roughly \$50 to sell.