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.

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.

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

- Researched common dimensions for P-traps.
- Began with calculations to determine the minimum pressure that would move water in a ¾” 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.

Part Name

<table>
<thead>
<tr>
<th>Part</th>
<th>Name</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Milton 3/4&quot; Tank Valve</td>
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<tr>
<td>2</td>
<td>PVC Schedule 40 End Cap</td>
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<tr>
<td>3</td>
<td>3&quot; PVC, Schedule 40</td>
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<tr>
<td>4</td>
<td>Pressure relief valve</td>
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<tr>
<td>5</td>
<td>1/4&quot; Tee</td>
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<tr>
<td>6</td>
<td>Electronic Solenoid Ball Valve</td>
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<tr>
<td>7</td>
<td>3/4&quot; Schedule 40 Adapter</td>
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<td>8</td>
<td>Check Valve</td>
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<tr>
<td>9</td>
<td>3/4&quot; PVC T-joint</td>
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<tr>
<td>10</td>
<td>3/4&quot; PVC Pipe</td>
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<td>11</td>
<td>3/4&quot; Schedule 40 Elbow</td>
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</tbody>
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Sample of Clogged Drain Lines:

Home Damage from Water Infiltration:

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