Background

- Encore Wire Corporation recycles copper scrap produced from their manufacturing processes.
- The granulated wire can be sorted to remove the copper components.
- Removing most of the copper leaves a mixture of plastic insulations that’s difficult to recycle.
- Plastic Mixtures vary greatly from batch to batch

Problem

- PVC, Copper, and other plastics must be separated from the mixture to be recycled
- Sending these materials to the landfill is costly and negatively impacts the environment.
- Pure PVC can be recycled or re-used

Goals

- Remove PVC from mixture with 99% purity
- Create scalable system
- Deal with wide variations in compositions
- Separate at least 5 gallons of material in an hour

Our Design

Explanation

- Plastics vary slightly in density. Calcium Chloride changes the density of water so that one material floats and one sinks.
- Phase 1 (top box): Low-Concentration Calcium Chloride makes XLPE/Nylon float, while copper and PVC sink.
- Phase 2 (bottom box): High-Concentration Calcium Chloride makes copper sink and PVC float.

- Pumps allow for the reuse of calcium chloride solution
- Valves, conveyors, and feeders move the components automatically into sorted bins.

Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>Explanation</th>
<th>Light Mixture Variation</th>
<th>Heavy Mixture Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder Yield</td>
<td>The feeder must move along the material it is given so that it can automatically move from phase 1 to phase 2.</td>
<td>81%</td>
<td>80%</td>
</tr>
<tr>
<td>PVC Yield</td>
<td>Mixture Varies in PVC content, but this measured how much PVC is reclaimed.</td>
<td>10%, depending on Calcium Chloride purity used</td>
<td>13%, depending on Calcium Chloride purity used</td>
</tr>
<tr>
<td>PVC Purity</td>
<td>To resell PVC, we aim for minimal impurities in our collected PVC</td>
<td>87%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Innovations

- First large-scale version of a process formerly done on a small lab scale
- Providing automation to a process formerly done by hand
- Selecting and fleshing out a never-before-used method to separate a historically difficult mixture of insulations.

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