**PowerPail**

Low Infrastructure Hydro-Electric Power Generation Team

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### Introduction

Eighteen percent of the world population does not have access to reliable electricity, even though many of these people live near potential hydro-electric power generation sources. There are several disadvantages to hydro-electric power generation:

- Expensive infrastructure
- Specialized machinery
- Skilled labor to install and maintain
- Disruption of local ecosystems

The PowerPail is a low cost hydroelectric generator that is easy to install. It does not require the creation of expensive infrastructure, does not need specialized machinery or skilled labor and provides reliable power for immediate needs such as lighting, water purification, and charging electronic devices.

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### Turbine Design

Traditional pelton wheel designs (left) require labor intensive assembly and welding that increases the cost of the turbine. PowerPail uses an injection molded turbine (right) which reduces cost by eliminating assembly and using less expensive materials.

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### Results

The PowerPail has been successfully designed to generate 300 watts. The final unit cost to the user is $300. It is lightweight, portable and requires minimal assembly and time to set up. It is also easy and inexpensive to ship the device using the five gallon bucket as the shipping container.

The figure below shows lines of constant power (in watts). Overlaid are flow rate curves for three supply line diameters. A supply line of 2.5" in diameter achieves the 300 W operating condition at 130 feet of hydrostatic head.

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### PowerPail Benchmarking

<table>
<thead>
<tr>
<th></th>
<th>PowerPail</th>
<th>Rainbow Power Hydroelectric Generator</th>
<th>Five Gallon Bucket Hydroelectric Generator</th>
<th>Watter Buddy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Output</td>
<td>300W</td>
<td>300W</td>
<td>90W</td>
<td>189W</td>
</tr>
<tr>
<td>Install Hours</td>
<td>2</td>
<td>72-168</td>
<td>168+</td>
<td>10</td>
</tr>
<tr>
<td>Cost</td>
<td>$300</td>
<td>$2400</td>
<td>$400</td>
<td>$695</td>
</tr>
<tr>
<td>Weight</td>
<td>20 lbs.</td>
<td>31 lbs.</td>
<td>22 lbs.</td>
<td>8 lbs.</td>
</tr>
<tr>
<td>Knowledge Required</td>
<td>Basic Assembly</td>
<td>Basic Construction, Plumbing, Electrical</td>
<td>Basic Construction, Plumbing, Electrical</td>
<td>Plumbing, Electrical</td>
</tr>
</tbody>
</table>

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### Recommended Operating Conditions

- **Head Height**: 40-200 ft.
- **Flow Rate**: 30-70 GPM
- **Supply Pipe Diameter**: 2-3 in.
- **Slope**: 1-10°