The Pedal-Powered Washing Machine

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Community Partner

MayaPedal

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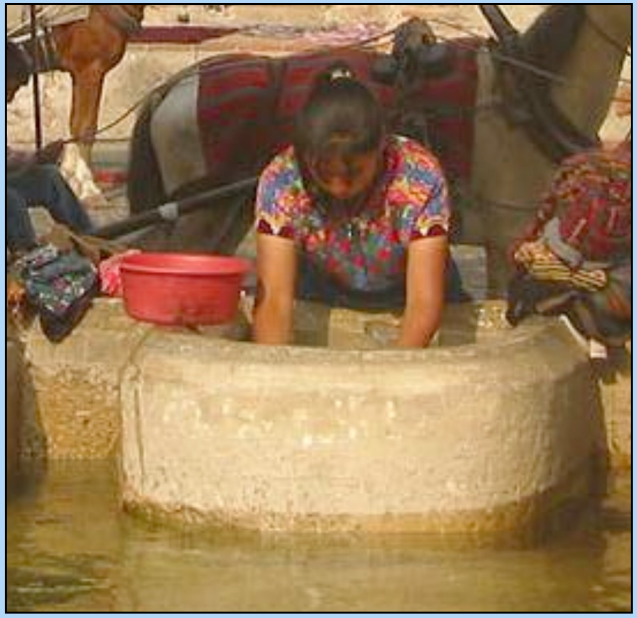
www.mayapedal.com

Mission:

"To support the basic family economy, through the design and distribution of bicycle machines, providing an efficient alternative for the rural development of Guatemala."

The Challenge:

An Alternative to Manual Washing



- Harsh detergent and straining scrubbing motions
- Awkward posture causes back pains
- Time-consuming, uncompensated labor limits economic and educational opportunities
- Lack of technological improvements for women

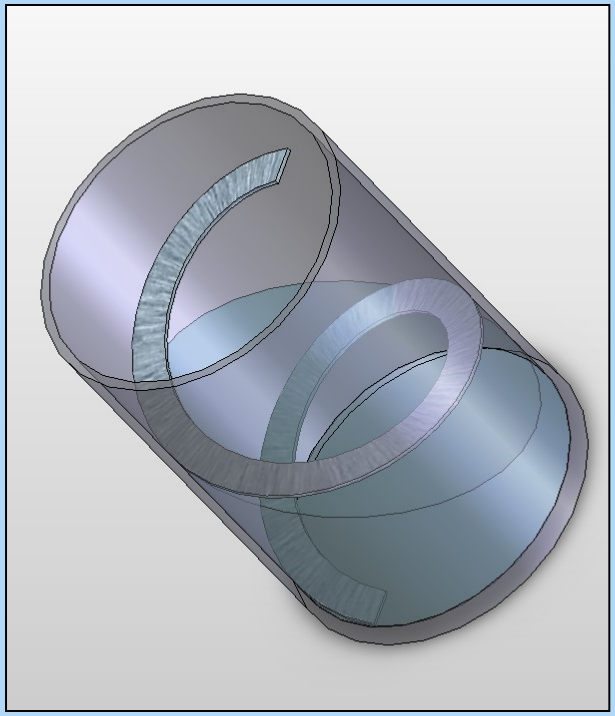
Problem Statement

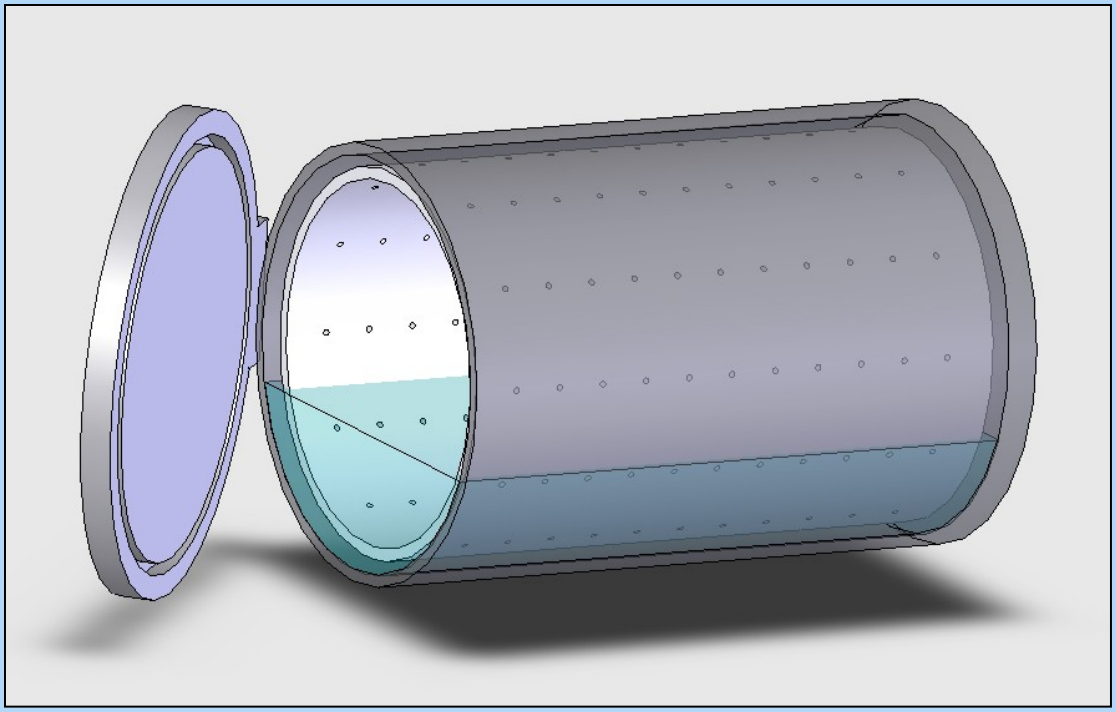
Women in Guatemala wash clothes manually, but the detergents are chemically harmful to their hands, and the motion of scrubbing is straining to the muscles. Our goal is to design an **inexpensive** and **durable** pedal-powered washing machine for use in rural areas to gently wash clothes. Due to cost constraints, the washing machine is to be **shared among several families** or can be used by a local entrepreneur to run a laundering service. The washing machine must be **easy to build and maintain locally** with **local materials**, easy to operate (minimal required steps), and **easy to power** by women or children. It must also be more comfortable to use than manual methods and **culturally acceptable** in Guatemala.

Women’s Cooperative Interview

- Manual wash: 8 hours per week for 1 load
- Women willing to pedal if wash time < 6hrs
- Expecting to spot treat very dirty clothes
- Use powder laundry detergent same as US
- Expected cost for personal machine: $70
- Should maintain social aspect -> install at public tank for community use?
- Wringing is straining -> Want spin dry
- Multi-tasking desired -> Table

Top Competing Concepts





Tilted axis

- Helical spiral
- Single barrel
- No seals

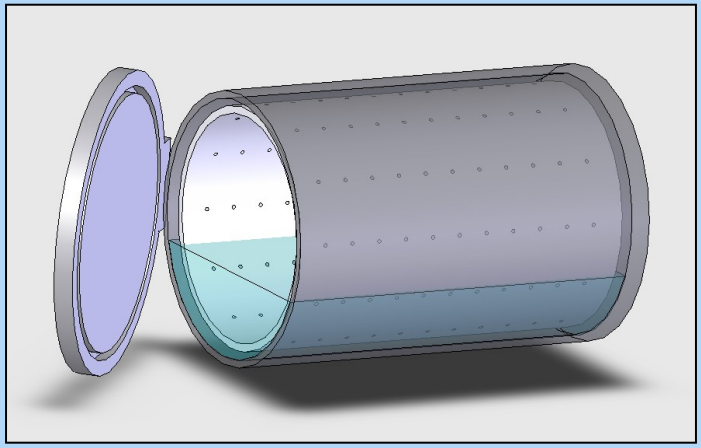
Horizontal Axis

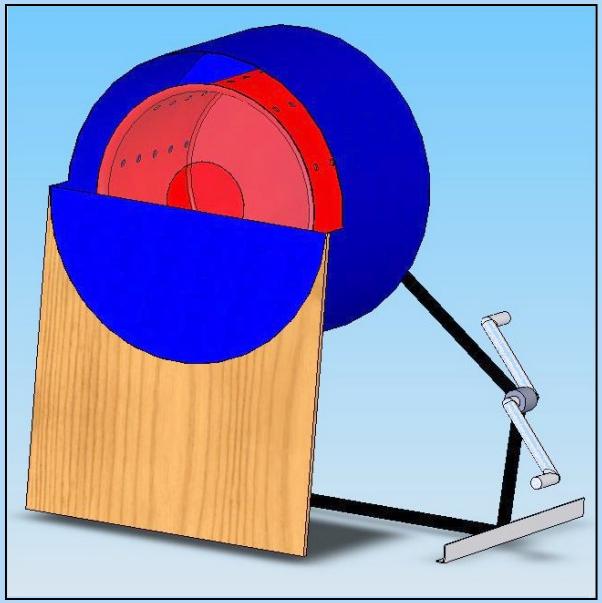
- Triangular fins
- Double barrel with spin-dry
- Must seal outer barrel

Test Stands

- Adjustable stands model horizontal and tilted axes
- Experimented with different fin shapes and materials
- Proved spin drying capability with pedal-power
- Identified technical challenges of sealing, mounting, and stabilization

Alpha Prototype





Purpose

- Full-scale proof of concept
- Maximize use of bike parts
- Power matching
- Test cantilevered barrel on bike bearing
- Determine manufacturing challenges

- Triangular wooden fins tumble clothes
- Holes in inner bucket for spin dry
- Front loading with clear inner lid for visibility
- Plastic barrels so no rusting
- Accessible drain plug in front

- Slightly tilted to keep clothes in barrel
- Sealed splash guard cover
- Metal rib reinforces circular shape
- Sturdy wooden frame
- Usable with any chair for adjustability

- Inner barrel cantilevered from bike bearing
- 5 available speeds with gear shift
- Free wheel allows rests between pedaling
- Wide base for stability

Next Steps

May-mid June

- Beta prototype
- User manual and documentation

Summer in Guatemala

- Adapt design to local materials
- Trial tests with women cooperatives
- Modification of design from user feedback
- Installation at 3 public tanks for testing and publicity
- Train local to build, maintain, and get feedback
- Documentation of design

Beta Prototype

- Steering column or industrial bearings
- Inner barrel supported at each end
- Steel outer barrel welded supports
- Top-loading with trap door
- Longer axially to allow for larger loads
- Cemented into place for security and stability
- Faucet drain spout instead of plug

Potential Business Model

Next few years:

- Production in pre-existing workshops
- Need electricity, trained welder, prefabricated parts, construction materials
- Scale: 100s/year at ~$150?

Distant future:

- Outsourcing of custom-made parts in China
- Assembly in factories in home country
- Distributed and sold commercially
- Scale: 1000s/year at ~$70?

Summary

- Uses less water, power, and soap
- Cleans as well as commercial washer with similar capacity
- Spin dries so no wringing needed
- Comfortable to use
- Enables women to do more rewarding things
- Technology for women
- Stimulates micro-enterprise
- Community investment that also benefits the poor
- Sustainable with local production and maintenance
- Replicable anywhere with bicycles

Where We're Headed

May 2005

- Develop and document 2nd prototype at MIT

June-August 2005

- Build bicilavadora in Guatemala
- Test prototype with women's cooperative
- Refine and test design on-site
- Install multiple machines and get feedback
- Document design
- Train local machinist to build the bicilavadora

Fall 2005 and beyond

- Transfer technology to other communities

Any Questions?