EnPRO 355:KlarAqua

Low-Cost Water Purification System for Developing Countries

www.klaraqua.com

THE PROBLEM

¼ of the human population is without access to potable water.

5 million people die annually due to water-born, water-based, and water-related diseases.

A child dies every 8 seconds from gastro-intestinal infections caused by consuming contaminated water.

This rain tank, referred to as "estanque de agua buena" or "good water pond", is the only source of water for people in the rural village of San Luis Potosi in Mexico.

KLARAQUA'S MISSION

DESIGN AND IMPLEMENT SUSTAINABLE POTABLE WATER SOLUTIONS FOR HOUSEHOLD USE

Educate Population

- *Locals need to know that a water problem exists*
- *They should be educated about water safety issues and possible solutions*
- *Strong focus will be placed on women, schools, and hospitals*

Promote Health

- *Provide convenient access to potable water through hygienic practices*
- *Prevent diseases that affect their quality of life: work productivity, welfare of children, and life expectancy*

Stimulate Local Economy

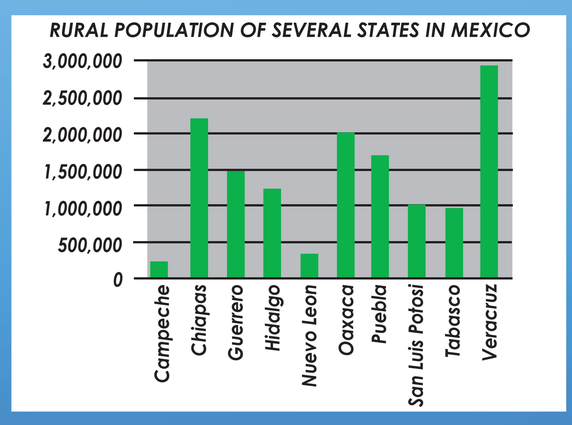
- *Local potters and artisans will be trained to produce the filters and assemble the system.*
- *The product can be sold locally by creating microenterprises that keep all profits in the community*

POTENTIAL MARKET

Rural Communities in Mexico

Through an effective collaboration with a complementary team of students at Tecnológico de Monterrey in Mexico, IPRO 355 has attempted to solve the water pollution problem while taking into consideration local conditions and usage patterns, cultural factors and social economics.

The team has identified several states in Mexico that have rural populations with limited access to drinking water that are ideal for testing product implementation feasibility.



CURRENT SITUATION

FILTRATION SYSTEMS IN USE

- *Sand filters*
- *Bio-filters*
- *Chlorination units*
- *Solar-based systems (SODIS Solar Pasteurization)*
- *Clay-based systems (with and without colloidal silver)*

DISADVANTAGES

- *High cost*
- *Lack of availability in rural areas*
- *Constant maintenance*
- *Consumption of fossil fuels*
- *Dependence on foreign aid*

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The Catalyst for Sustainable Health and Economic Development

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KLARAQUA'S SOLUTION

A LOW-COST, CLAY-BASED WATER PURIFICATION SYSTEM

ADVANTAGES

- *Affordable*
- *Versatile*
- *Decentralized*
- *Sustainable*
- *Relevant*
- *User-Friendly*
- *Self-Contained*

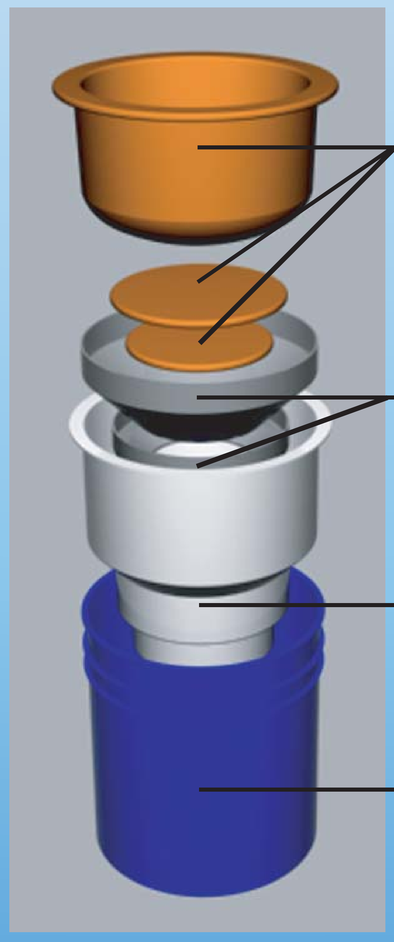
ESTIMATED UNIT COSTS

FILTER ELEMENTS	US ($)	MEX(pesos)
Ceramic bowl and discs	1.72	19
Colloidal Silver	1.18	13
Plastic casing and cones	1.90	21
5-gallon bucket	3.45	38
TOTAL	**$8.25**	**91 pesos**

SYSTEM DESIGN

DESIGN CHALLENGES:

- Reduction of weight
- Developing a user-friendly product
- Identifying availability of proposed components
- Minimize leakage of contaminated water at problem areas
- Efficiently removing multiple pollutants in water sources
- Finding effective methods for using colloidal silver as a bactericide



PROPOSED SOLUTION:

Three ceramic filters, one bowl and two disks, impregnated with sawdust or rice husk to improve porosity and brushed with colloidal silver to remove bacteria. The three separate filtration layers provide versatility in the removal of multiple contaminants.

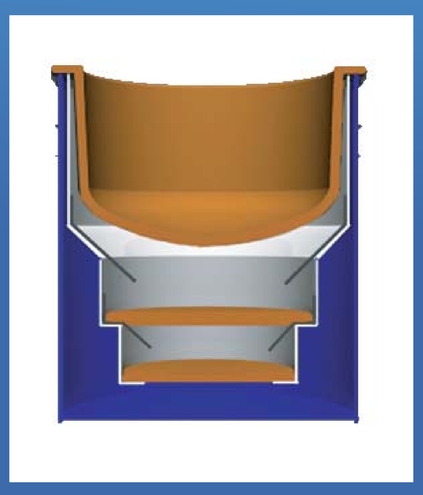
Two plastic funnels serve as mechanisms to prevent leakage around the edges of the filters by directing the flow of water through the center each filter instead of around the perimeter.

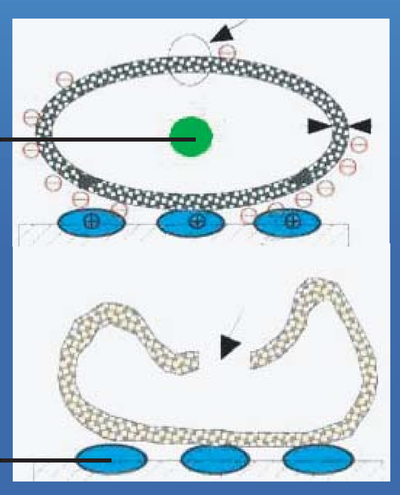
A plastic casing manufactured by the process of vacuum-forming houses the filters and serves as an internal element of quality control.

A 5-gallon plastic bucket allows the system to be self-contained while utilizing current water storage methods to maintain cultural relevancy.

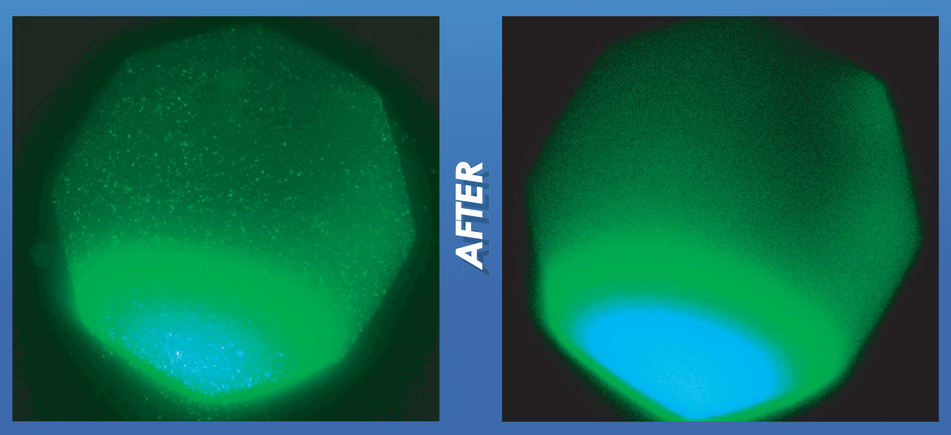
FILTER COMPOSITION & TESTING

Particle size and ratio between clay, sawdust, and colloidal silver are the keys to efficiency.





BACTERIA FILTRATION



Fluorescent microscopy was used to determine the presence of bacteria before and after filtration. Pictures taken before filtration showed numerous alive bacteria while pictures taken after filtration indicate the filters were successful in removing most of the alive bacteria.

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Helping Communities Enjoy Healthy Lives...ONE DROP AT A TIME

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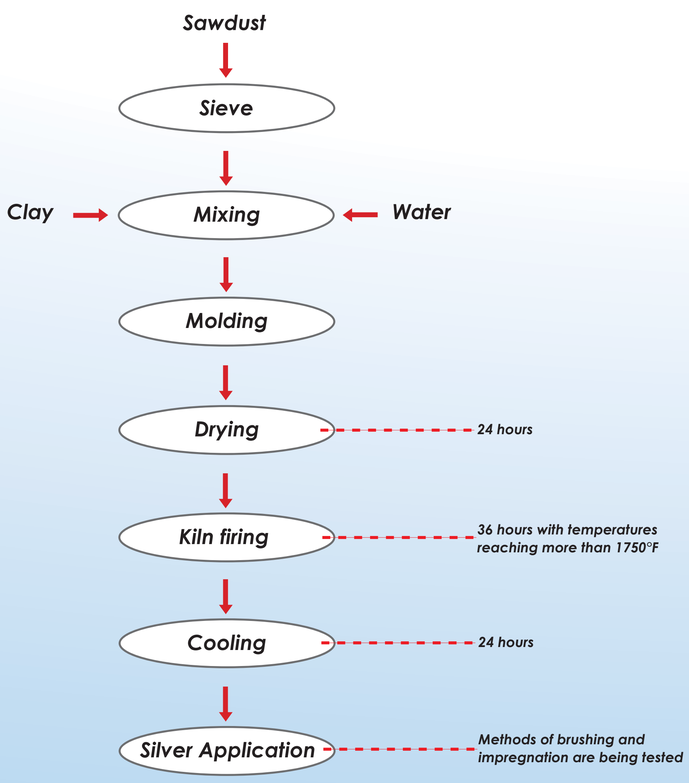
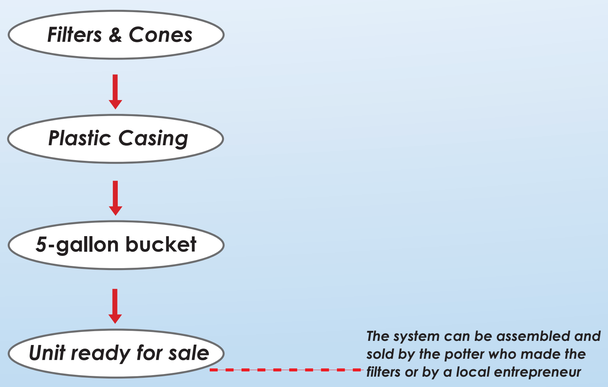
FABRICATION PROCESS

FILTERS

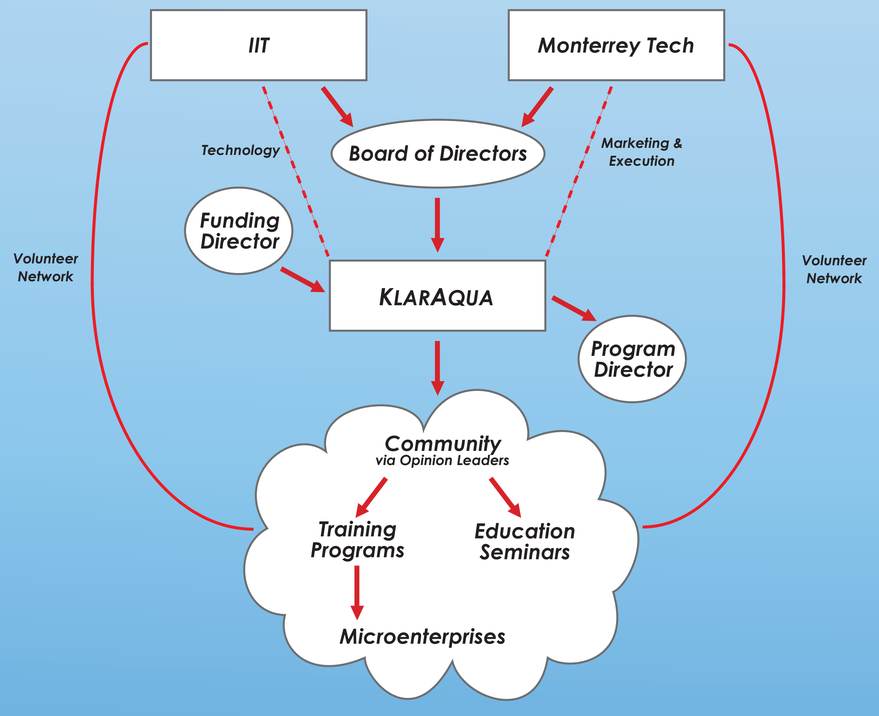


PLASTIC COMPONENTS

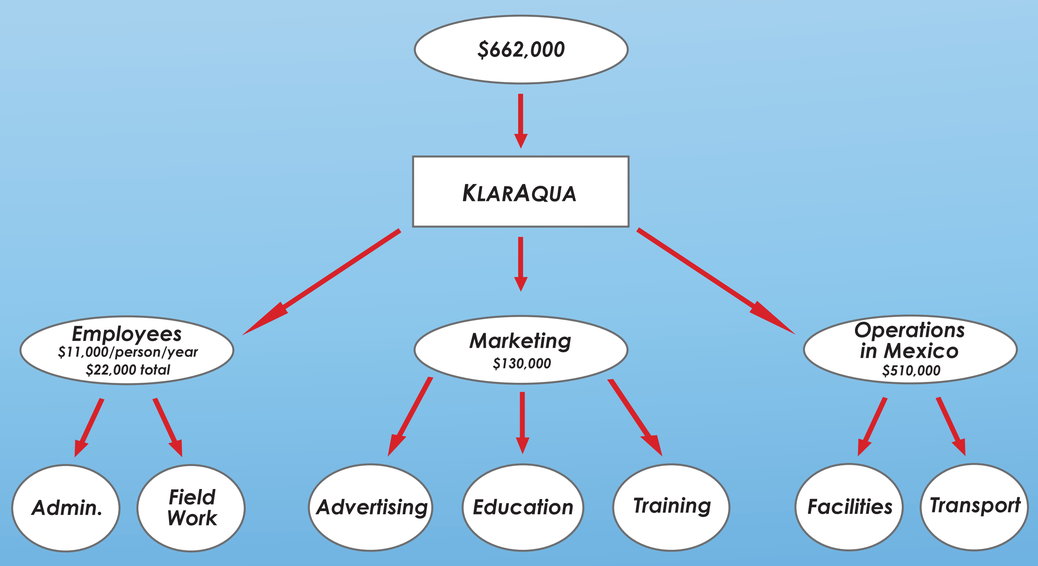
SYSTEM ASSEMBLY



BUSINESS MODEL



DISTRIBUTION OF FUNDS



NEXT STEPS

- *Produce a full-scale working prototype to validate effectiveness of bacterial removal*
- *Experiment with ways to remove multiple contaminants*
- *Finalize filter composition & design details*
- *Develop culturally appropriate and highly customized education and training programs*
- *Site visits to Mexico to learn about the market and potential barriers to entry*
- *Conduct pilot studies to gather user experience data to improve future design and business planning prior to implementation on a larger scale*

THE TEAM

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