

ECE 481 Ethics in Electrical and Computer Engineering
Dept. of Electrical and Computer Engineering
Ohio State University

Final Project:
Electronic Water Filtration Methods

Your company designs, manufactures, and distributes electronic systems. It has a world-wide market. Your boss feels that there is a large untapped market for a low-cost “personal” water filtration systems (i.e., ones that individuals can set up and operate on their own rather than ones that are set up for large numbers of persons on a water distribution “grid”) for persons in under-developed countries. Your company did some preliminary investigations and compiled the information below. This information is not complete, but the company wants you to work with it to find a market, conduct a design feasibility study, and a preliminary design for at least one country.

Regional constraints: It has found that the following constraints are typical for some of the people who would be interested in purchasing such systems:

- Water is needed for a family of 4-6, for drinking, cooking, and bathing.
- There is no nearby potable water source. Reliance on rainwater is not feasible (it should be viewed as something one is lucky to get any of).
- Women typically carry any water at least 2km for use at home. Typical gathering points are distant streams, lakes, or rivers that are significantly polluted. Ground wells reach water provided you dig far enough, but they are expensive and the water that comes up is also significantly polluted.
- Living quarters are of the “hut” type (e.g., tree branches with a piece of plastic for a roof or sheet metals sides and top). None are wired for electricity. Some huts are in arid regions, essentially desert-like.
- There are no nearby electricity sources.
- Pooling resources to develop a single system for a large number of people could, perhaps, be a solution; however, there is little to no infrastructure, little to no tax base, and no trusted coordinating agency (e.g., a government or aid agency). There is no hope that the government or anyone else will run electrical lines or a water supply to the village in the next 20-30 years. Some say that would “never happen.”
- Most of the villages are remote, and will take almost a day of driving to get to from the nearest “city” (often through mountains).
- You cannot assume the availability of large quantities of diesel fuel or gasoline (e.g., to run an electric generator, which is much too expensive anyway) and regardless, it is prohibitively expensive in most areas (partly due to problems with transporting it).
- Contaminants vary greatly, from arsenic to a range of bacteria. All levels are significantly above UN or US standards for safety.

- Current practices vary, but most rely on transporting water and gathering firewood for boiling the water.

1. Problem Statement:

Give an overview of the data on availability of clean drinking water in the world. Choose a country that has acute problems in that a significant proportion of its population does not have access to clean drinking water. Explain, for that country: typical living conditions for a family that may be interested in a personal electronic water filtration system (hut, terrain, weather, distance to water sources, types of water sources, diet, income levels, contaminants in water, availability of electricity and other fuel sources, social services of the government or other agencies).

2. Design Assessment and Proposal:

Competitors offer chemical methods to perform water filtration or digging/pumping strategies. Which ones? Give URLs. Your design challenge is to pick a country, contaminant, operating conditions (identified in 1.), and electronic filtration method that will compete with such approaches. You must explain how it will compete in the market with your identified competitors on measures including:

- [a] Cost (Challenge: what portion of their income will they dedicate to the product?)
- [b] Ease of operation (Can children operate it? Is it safe under all weather and operating conditions?)
- [c] Reliability (Specify failure rates, service, and repair plan).

3. Questions and Discussion:

1. Explain how the concept of “sustainable development” applies to your design. Discuss a plan for “design for environment” (see text for an example). Discuss life-cycle costs.
2. Explain how the ideas of technology transfer and “appropriate technology” apply to your design.

4. Requirements:

Design Team: You must form a team to complete the project. Your team must have between 2 and 4 persons on it. All must contribute to the assignment. List on the cover of the final report the title of the report, the persons on the team, the email address of the person who holds the master of the electronic document, *and the percentage contribution of each individual.*

Report: Type your report using standard font sizes and margins. The main body of the report must be less than 10 pages, but appendices can be attached (e.g., competitor product specification sheets). It should be in Word. Submission of your report indicates a willingness to have it posted on the web (as a sample solution of this problem). Submission must be done via paper (not electronically). If an electronic version of your report is needed you will receive an email request.

Due Date: Due Thursday, March 15, at noon. Submit a *paper copy* to the Receptionist at Rm. 405 Dreese Labs and ask her to put it in the mailbox of Prof. Passino in 205 DL, with the time/date written by her at the top. It is highly recommended that you complete the project well before the deadline.