

Project Design Specification: EWH – Flow Meter  
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February 3, 2006

Function: We were asked to design a relatively inexpensive flow meter to be used in third world countries. Its function will be to measure medically useful ranges (0-15 Liters per minute) of single or continuous readout rates.

Client Requirements:

- less than \$2 each when mass produced
- single readout: 1x4x1”
- continuous readout: 4x4x1”
- accurate within 10%
- to be attached to an O<sub>2</sub>, CO<sub>2</sub>, or medical air source.

1. Physical and Operational Characteristics

- a. *Performance Requirements*: Device will be used in third world countries on a regular basis, attached to a flow source tube at both ends.
- b. *Safety*: Devices will be labeled with which type of gas they are measuring and sterilized after any contact with patient. Ends of meter will lock smoothly into source tube to prevent any injuries from sharp edges.
- c. *Accuracy and Reliability*: The flow meter needs to be accurate within 10% of the actual value with a reliability of 90%. An excellent device would allow for a value within 1% of the actual.
- d. *Life in Service*: The flow meter needs to be able to be shipped to different countries around the world and still be reliable. It should have a life span of a minimum of 1 year before losing accuracy.
- e. *Shelf Life*: If it is electrical it needs to be able to be stored in all types of conditions since it will be used in various countries, especially areas that are hot and humid, without electrical failure. Any type of device needs to withstand being packed away for extended periods of time, up to 6 months, and not decompose.
- f. *Operating Environment*: This device will be operating in many different kinds of conditions. It is a device for third world countries, so any and all of their environments should be accounted for. This includes dry, dusty, humid, hot, cold, and rainy. It also needs to be able to have many people handle it since it will have a long journey before reaching its final location.
- g. *Ergonomics*: Needs to be easily used by everyone with a simple readout that shows when the gas is at the correct flow rate. People who are not doctors or specially trained should be able to distinguish the proper flow rate.
- h. *Size*: The continuous readout flow meter should be no bigger than 4inX4inX1in, and the single readout flow meter should be no bigger than 1inX4inX1in.
- i. *Weight*: While there is no weight limit on the product, a lighter product will allow for cheaper shipping to consumers. Because the ultimate goal

of the product is to create the flow meter as inexpensively as possible, a lighter product is preferable, but not if it comes with higher material cost.

j. *Materials*: No material restrictions aside from cost.

k. *Aesthetics, Appearance, and Finish*: Aesthetics are not a concern, as this product is to be produced as cheaply as possible for use in third world countries. The readout, however, should be clear and easy to read.

## 2. Production Characteristics

a. *Quantity*: Produce one working prototype but able to mass.

b. *Target Product Cost*: The target product cost for the project is less than \$2 each when produced in quantities of 500.

## 3. Miscellaneous

a. *Standards and Specifications*: Since the product may be used in a variety of places, any local standards and international standards would need to be met. However, there are no international regulations that would be valid to our project that we are aware of.

b. *Customer*: The customer would like the product to be as accurate as possible, if readings could be accurate within 1% that would be ideal.

c. *Patient Related Concerns*: The device may need to be sterilized after each use depending on what type of machine it is hooked up to. There are no concerns in terms of patient privacy. Their safety is of the utmost concern.

d. *Competition*: There are hundreds of similar products for sale now. Patents on devices similar to this involve more complicated designs and since we are designing a very simplified and inexpensive version of the product, the chances of violating a patent are minimal.