October 23, 2007

Team Members:
Ksenija Bujanovic
Claire Edlebeck
Chris Webster
Mike Oldenburg

Gas Pressure Meter (Engineering World Health)

Problem Statement

Our project goal is to develop a device that can measure the pressure of medical gasses in useful ranges. This device must be mass producible within the specified cost range, and will be used in third-world countries.

Engineering World Health Requirements

- Final cost of $5 in quantities of 200
- Size: for continuous readout – 4x4x1 or for single readout – 1x4x1
- Measurement of medically useful ranges which are between -35mmHg and 75mmHg (post-regulation, such as in ventilators, anesthesia machines, etc.) to within 10% of the measured value
- Measurements of CO_2, oxygen, and medical air
- Digital readout
- Various connections (such as hose barb, locking ring, quick release, etc.)
- Kit-able (no custom parts) with directions on how to build the device

Design Requirements

1. Physical and Operational Characteristics

a. *Performance requirements*: This device must be able to measure gas pressures as they are about to enter the patient. The range in pressures should be between -35mmHg and 75mmHg. These gasses will include oxygen, carbon dioxide, and medical air. The device must be reusable.

b. *Safety*: The device should be made out of non-toxic material. Any electronics used should be properly insulated. Any moving parts should be secured.

c. *Accuracy and Reliability*: Minimum performance should be able to measure within 10% of actual value. Superior performance should allow for measurements within 1% of actual values.

d. *Life in Service*: It is not disposable.

e. *Shelf Life*: It should last through several months of continued use. The device would be dependent on batteries.

f. *Operating Environment*: The device will be used in the hospitals of third-world countries. The hospital technology may be out-dated so the device must function in a variety of environments and support the greatest range of connection flexibility possible. The device should not depend on other, potentially unavailable tools. The device should be able to handle previously given pressures. It should also be resistant to heat and humid environments.

g. *Ergonomics:* Function and reliability are most important. Look and feel of this device is a secondary consideration. The device should be easily operated.

h. *Size*: A continuous readout must stay within 4x4x1in, while a single readout device must stay within 1x4x1in. These dimensions may apply to a device in parts or a fully constructed one.

i. *Weight*: Weight was not specified.

j. *Materials*: Materials should be non-corrosive, non-toxic, inexpensive and sturdy.

k. *Aesthetics, Appearance, and Finish*: The readout must be digital but not necessarily numeric. The aesthetic appearance of the device is not the primary concern.

2. Production Characteristics

a. *Quantity*: Price specifications were provided for quantities between 5 and 500.

b. *Target Product Cost*: For a quantity of 200 the price should be less than $5 and for a quantity of 500, it should be less than $2. We are aiming for a quantity of 200.

3. Miscellaneous

a. *Standards and Specifications*: The device must be approved by the health administration of the particular country. To receive funding, our proposal must be approved by EWH.

b. *Customer*: The primary concern of the customer is that it functions correctly, is within the cost range specified, and is easy to implement.

c. *Patient-related concerns*: Device should not inhibit patient breathing.

d. *Competition*: In the US hospitals, this device is included within the ventilator or anesthesia machines. Therefore, our device cannot be easily compared to anything available on the market. If the original pressure sensors in the third-world ventilators are repairable, the replacement pieces are either too expensive or there is no one available to fix it.