Product Design Specification

Engineering World Health Aspirator (February 2007)

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Problem Statement

Most developing world hospitals do not possess operating suction machines. The main problems are the lack of available spare parts, the cost of a replacement unit, and dependence on consistent electricity. The objective of this project is to design a suction machine that can be manufactured from locally available materials (and therefore repaired using locally available materials and expertise).

Client Requirements:

- Device should run on batteries, electrical power (when available) and hand (or foot) power.
- Should provide the broadest range of applications possible.
- Device should include autoclavable suction tips.
- Must be completely manufactured from locally available materials for under $100.

Design Requirements

1. Physical and Operational Characteristics
   a. Performance requirements: Must perform at a level acceptable for surgery and have a variable level of pressure.
   b. Safety: Must be safe for use on human surgeries and must have an autoclavable tip.
   c. Accuracy and Reliability: Must be able to reliably provide suction throughout an entire surgery or operation.
   d. Life in Service: Must last long enough to be economically viable and worth the time and energy to build. Locally repairable.
   e. Shelf Life: Storage in third-world hospital conditions.
   f. Operating Environment: The system will be used for surgery and operations.
   g. Size: Must not interfere in operating room procedures or with staff.
   h. Weight: Able to move in and out of operating room
   i. Materials: Completely manufactured by locally available parts.
   j. Aesthetics, appearance, and Finish: Must be clean.

2. Production Characteristics
   a. Quantity: Create instructions to build locally in any desired quantity.
   b. Target Product Cost: <$100 in locally available materials.
3. **Miscellaneous**
   
a. **Standards and Specifications:** Vacuum pressure range of 0 – 550 mmHg and a flow rate range of 0 – 30 lpm.

b. **Customer:** Needs to run and power device with varying electricity and limited resources.

c. **Competition:** Medical aspirators are widely available in developed countries. Our goal is to provide a cheap alternative that can be locally built and repaired in third world countries.