

Portable Oxygen Device Design: Membrane and Pressure Swing Adsorption Technology Alternatives and Market Analysis

Technical Report Submitted to:
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1.0 Executive Summary

A portable device that generates oxygen from air was designed and priced. The device produces a 5 liter per minute steady stream of 99.9% pure oxygen to individual patients. The device uses ceramic oxide membrane technology using BICUVOX membranes and is operated using a 12 V DC battery lasting 4 hours with 2 hours recharge time. The device is rectangular (16 in x 15.5 in x 13.9 in) weighing approximately 18 pounds. The cost estimate for the device is approximately \$2500.

An alternative pressure swing adsorption device was also designed. The device can produce 5 liters per minute of 99% oxygen which can be used to fill portable oxygen canisters. The cost for building the device is estimated to be \$4200. The device is about the size of a standard kitchen refrigerator and consumes approximately \$75 of electricity per month. Polymer and cryogenic technologies were also considered.

An economic analysis of the designed devices was performed. The selling price for the pressure swing tank re-filler is \$18,500 with a total capital investment of \$80 million and a net present worth of \$105 million. For the membrane portable oxygen generator, the selling price is \$11,000, the total capital investment is \$133 million, and the net present worth is \$166 million dollars.