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Emergency Oxygen Concentrator for COVID 19 Pandemic Augmented with Percent Oxygen Monitoring

S. Ongtakul, A. Thitirattanapong and C. Pintavirooj*

***Abstract*—** In this research we have designed a low cost, oxygen concentrators which based on pressure swing absorption that can produce up to 85% of pure oxygen streams. It is largely used in patients suffering from chronic respiratory diseases during COVID-19 pandemic. Pulse oximeter is also installed on the system to evaluate the oxygen treatment.

***Clinical Relevance*- Lung** of COVID-19 patient loses its function to exchange oxygen. The proposed oxygen concentrator will be used to increase oxygen level in the blood.

I. INTRODUCTION

The new COVID-19 disease was first identified in China at the end of 2019 and has spread rapidly all over the world. It has been projected that, by March 2021, the number of infections could reach 300 million cases and over two million deaths. One of the main implications for COVID-19 patient is pneumonia where the lung is infected, hence patients suffering from insufficient oxygen in the blood. As the number of COVID-19 cases have become significantly increased, the demand of oxygen generator also skyrocketed. This research concerns the design and construction of emergency low-cost oxygen concentrator to be used for mild COVID-19 symptom which are forced to be treated at home.

II. METHODS

Our absorption-based oxygen concentrator uses zeolite packed in the sieve canister. Oil-free compressor is then used to pump air in. Zeolite will absorb nitrogen from the air leaving oxygen to travel towards the outlet. To evaluate the treatment, we have equipped the system with a pulse oximeter to measure the percent saturation oxygen, pulse rate and patient temperature. To prevent COVID-19 infections between patients and caretakers, we have designed an android application to remotely control the oxygen concentrator

Our designed pressure swing adsorption (PSA) oxygen concentrators consists mainly three cylindrical canisters. The first two canisters are filled with zeolite absorber. The remaining canister is the buffer container. Dust-free air from oil-free compressor is controlled with a series of solenoid valves to alternately pump into the first two canisters. Zeolite acted as the molecule filter will absorb nitrogen from the air. The remaining air with enriched oxygen will then store at the buffer container before releasing to the patient. Using two zeolite-filled canisters, the system is called two-bed pressure swing absorption oxygen concentrator. The pneumatic diagram of the two-bed systems is shown in Figure 2. To evaluate to oxygen treatment, we have equipped our PSA oxygen concentrator with a pulse oximeter, the OEM YS2000A SpO2 module. With its intended use with Covid-19 patients, remote applications are beneficial. In the research we used the MIT App Inventor to control and display data.

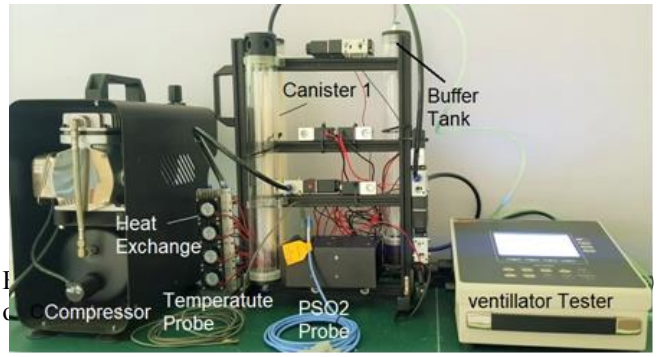

Figure 2 Pneumatic diagram of our designed pressure swing adsorption (PSA) oxygen concentrators

III. RESULTS

The experiment results demonstrate a promising result as the proposed oxygen concentrator can provide an oxygen up to 85% for two-bed system.

IV. DISCUSSION & CONCLUSION

Through the process of developing the oxygen concentrator, the optimized model has been produced to reflect the need of medical oxygen. In addition, including remote systems to further utilize the instrument during exposed circumstances with promising results for treatment of lung infection.

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*All Authors are with Department of Biomedical Engineering, School of Engineering, King Mongkut Institute of Technology Ladkrabang, Bangkok 10520, e-mail: chuchart.pi@kmitl.ac.th.