

ABSTRACT

Increased air pollution in Indonesia has caused various respiratory disorders, such as asthma, ARI, COPD, and lung cancer, as well as reduced oxygen levels in the human body. To overcome the impact of air pollution, it is necessary to procure high concentrations of oxygen. Oxygen is an important element that supports the function of human organs. However, the distribution of oxygen-producing equipment in Indonesia is still uneven, with the majority of the supply being in Java Island, which is capable of producing 1,488 tons of oxygen per day, while the supply outside Java is only 271 tons per day. Therefore, the manufacture of oxygen concentrators is an important solution to provide high concentrations of pure oxygen for people with respiratory problems. An oxygen concentrator is a medical device that delivers oxygen to patients with less than normal blood oxygen levels and is essential in the treatment of respiratory disorders. In this digital era, an oxygen concentrator equipped with an oxygen purity monitoring feature via smartphone is needed to increase efficiency and ease of use for users and health institution.

The design of this oxygen concentrator is using the Pressure Swing Adsorption (PSA) method with a portable design and completed with a long-distance monitoring application. This product is capable of producing oxygen with an average purity level of 87.18%, and the highest purity level reaches 95.62%, at PSA chamber pressure between 3-5 bar. Input process of the PSA chamber is taken every 8 seconds within 15 minutes of data collection. This product weighs ± 15 kg and is accompanied by a flowmeter to monitor the air flow into the holding tube. The PSA system works by alternately adsorbing nitrogen and purifying oxygen. In the first 4 minutes, the oxygen produced is discharged into free air because the purity is not stable yet, and after 4 minutes, the purer oxygen will be put into the holding tube. The system takes 240 seconds or 15 cycles to reach stability, caused by pressure instability when the compressor is just turned on. The app allows users to monitor the oxygen purity and usage history of the device through the history feature. Data such as oxygen concentration, pressure, and flow rate are sent by the ESP32 to the Thingspeak platform at 15-second intervals according to the platform's delay.

Keywords: Pressure Swing Adsorption, Oxygen, Oxygen Concentrator, ISPA, PPOK