

# Briefing Note: PSA Plant Oxygen Purity

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*This document was developed by Build Health International for the Global Fund's Project BOXER.*

**Objective:** This memo aims to address the range of oxygen purities advertised by manufacturers as well as requested by end users.

## **93% oxygen purity meets WHO medical oxygen standards**

The WHO's International Pharmacopoeia (Eleventh Edition, 2022) states that the standard medicinal oxygen at Oxygen 93% "is produced from ambient air by pressure swing adsorption (PSA)". The oxygen purity range for Oxygen 93 is between 90-96%; this purity range is often stated by manufacturers and users as  $93 \pm 3\%$ .

While some PSA plant manufacturers have equipment that produces  $95 \pm 1\%$  oxygen purity, it should be noted that a PSA plant with a  $93 \pm 3\%$  oxygen purity has much the same tolerance for oxygen purity. A  $95 \pm 1\%$  purity plant would produce oxygen in the range of 94-96% oxygen, while a  $93 \pm 3\%$  purity plant would produce 90-96% oxygen. Regardless of the specification, the maximum oxygen purity does not exceed 96%, due to the limits of pressure swing adsorption technology. While the  $93 \pm 3\%$  purity plant does have a lower tolerance range (down to 90%), this is still acceptable with no impact on patient care per the WHO's standards for medicinal oxygen.

## **95% or higher oxygen purity plants require larger investments**

As more oxygen product is demanded from the PSA plant, the purity will decrease. For example, a 20 Nm<sup>3</sup>/h PSA plant set to produce oxygen at a purity of  $93 \pm 3\%$  could produce 20 Nm<sup>3</sup>/h of oxygen output flow, while the same equipment set to produce  $95 \pm 1\%$  oxygen purity would produce 18 Nm<sup>3</sup>/h. This means that with the same budget, a larger PSA plant can be procured if the oxygen requirement is specified to be  $93 \pm 3\%$ . If one were to look at a  $95 \pm 1\%$  purity and  $93 \pm 3\%$  purity plant with the same output flow (for example, 20 Nm<sup>3</sup>/h), the  $95 \pm 1\%$  purity plant would need to have larger equipment in order to achieve the same flow rate. The larger equipment will require a larger initial capital investment for equipment, site preparation and will also have increased operating expenses due to the increased power consumption of the larger equipment when compared to a  $93 \pm 3\%$  purity plant.