International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

Carry-and-Breathe: Portable Oxygen Bottle with Flexible Neck

Dr Divya Sathis
Associate Professor Department of Management Studies Sist, Chennai, Tn, India.

Dinesh M, Shyam Sundar, Hari Priya, Abirami
Student Department of Management Studies, Sist, Tn, India.

ABSTRACT: Portable oxygen delivery systems are increasingly demanded for emergency, travel, and preventive healthcare applications. Existing portable oxygen cans and cylinders often lack structural durability, user interaction, and real-time feedback regarding oxygen flow, which reduces consumer confidence and limits usability. This paper presents the design and development of a novel portable oxygen delivery system featuring a fully aluminum-coated bottle, a transparent oxygen exhauster pipe, and an interactive top-mounted control module. The aluminum coating enhances mechanical strength, corrosion resistance, and thermal stability, while the transparent exhauster pipe allows users to visually verify oxygen flow during usage. The interactive top module introduces improved flow regulation and usability compared to passive oxygen delivery devices. The proposed design is developed using a structured engineering methodology supported by CAD modeling and material analysis. The study concludes that integrating material innovation with user-centered design significantly improves safety, portability, and user trust, making the system suitable for both medical and non-medical oxygen supplementation applications.

Keywords: Portable Oxygen System, Aluminium Coating, Transparent Exhauster Pipe, Interactive Medical Device, Oxygen Delivery Design

I. INTRODUCTION

Oxygen therapy is critical for individuals experiencing respiratory distress, high-altitude sickness, fatigue, and emergency medical conditions. Traditional oxygen delivery systems, such as high-pressure cylinders and stationary concentrators, are designed primarily for hospital environments and require trained personnel for safe operation. Recently, portable oxygen cans have gained popularity among the general public; however, these products often suffer from poor durability, limited flow control, lack of transparency, and minimal user interaction. As a result, users cannot verify oxygen delivery in real time, leading to

misuse, dissatisfaction, and reduced trust in the product. There is a growing need for lightweight, durable, and user-friendly oxygen solutions that bridge the gap between medical functionality and consumer usability.

This research addresses these challenges by proposing an interactive portable oxygen delivery system combining structural robustness, visual feedback, and ergonomic control in a compact form suitable for daily use.

II. LITERATURE REVIEW

Previous research on oxygen delivery technologies has focused on clinical oxygen therapy, oxygen concentrators, and high-pressure storage systems. Studies have explored advancements in flow regulation, oxygen purity monitoring, and safety mechanisms for hospital-based applications. In recent years, portable oxygen cans have been introduced for non-clinical use; however, literature indicates these devices are largely passive, disposable, and designed with minimal attention to user interaction and material longevity. Several studies emphasize that transparency and visual feedback improve user confidence and safety in medical devices. Material research highlights aluminum and aluminum-coated structures as effective solutions for improving strength, corrosion resistance, and thermal management in portable containers. Despite these findings, limited research integrates material innovation, transparent flow visualization, and interactive control into a single portable oxygen delivery system. This paper addresses this gap through a unified design approach.

III. RESEARCH GAP AND PROBLEM STATEMENT

While existing oxygen delivery systems provide basic functionality, they fail to address the needs of modern consumers who demand safety, transparency, and ease of use. Most portable oxygen cans do not offer visual confirmation of oxygen flow, making it difficult to assess whether oxygen is being delivered effectively. Plastic or partially coated containers reduce durability and increase the risk of damage during handling and transportation. The absence of interactive controls limits user regulation of oxygen flow. These limitations highlight a significant research gap in developing consumer-oriented oxygen delivery systems that combine durability, transparency, and interactivity. This study addresses

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

the lack of an integrated, user-centered portable oxygen system that provides real-time visual feedback, enhanced structural integrity, and intuitive operation.

IV. OBJECTIVES AND SCOPE OF THE STUDY

The primary objective is to design and develop an innovative portable oxygen delivery system improving durability, usability, and safety. Key goals include:

- Aluminum-coated bottle for mechanical strength and hygiene.
- Transparent exhauster pipe for visual verification of oxygen flow.
- Interactive top module for user control and comfort.

The scope covers conceptual design, material selection, CAD modeling, and functional analysis. Clinical testing and oxygen generation technologies are beyond the scope; the focus is on design innovation and user experience enhancement.

V. CONCEPT OF THE CARRY-AND-BREATHE SYSTEM

The Carry-and-Breathe system is designed as a compact, user-friendly oxygen delivery solution for both emergencies and daily use. The system emphasizes portability without compromising structural integrity or safety. The aluminum-coated bottle provides durability and resistance to external damage. The transparent exhauster pipe allows users to visually confirm oxygen flow, improving confidence and reducing misuse. The interactive top module integrates flow regulation and status indication into a single interface. Together, these elements form a cohesive system addressing both functional and psychological user needs, making oxygen delivery intuitive and reliable.

VI. SYSTEM DESIGN AND ARCHITECTURE

The system architecture integrates structural, functional, and interactive components seamlessly. The aluminum-coated bottle acts as the primary oxygen storage unit and provides a stable base. The top-mounted interactive module contains the flow regulation mechanism, enabling precise oxygen release control.

Fig. 1. Conceptual architecture of the Carry-and-Breathe portable oxygen system showing the aluminum-coated bottle, transparent-exhauster pipe, interactive top module, and mouthpiece.

The transparent exhauster pipe connects the top module to the mouthpiece, allowing continuous visual monitoring of oxygen flow. Sealing mechanisms and joint interfaces prevent leakage and ensure safety. Ergonomic handling, balanced weight distribution, and ease of operation are prioritized, making the system suitable for users of varying ages and physical abilities.

VII. MATERIALS AND SAFETY CONSIDERATIONS

Material selection ensures safety and reliability. Aluminum coating provides corrosion resistance, thermal stability, and hygiene. The transparent exhauster pipe is made from medical-grade polymer, offering flexibility, clarity, and resistance to kinking. Silicone-based sealing materials prevent oxygen leakage and maintain consistent flow. All materials comply with oxygen storage and delivery standards, meeting essential safety requirements for non-clinical oxygen supplementation.

Fig. 2. Exploded view of the portable oxygen bottle assembly highlighting the aluminum-coating, internal liner, and top module components.

VIII. METHODOLOGY

The methodology integrates conceptual development, material analysis, and CAD-based modeling. Components are modeled using CREO Parametric software to ensure dimensional accuracy and assembly compatibility. Iterative design

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

refinement optimizes ergonomics, flow path alignment, and structural integrity. The design is evaluated based on usability, safety, and innovation criteria derived from literature and consumer expectations, ensuring technical feasibility and user-centeredness.

IX. EXPECTED RESULTS AND DISCUSSION

The design is expected to significantly improve over existing portable oxygen systems. The aluminum-coated bottle enhances durability and reduces transport damage. The transparent exhauster pipe provides immediate visual feedback, allowing users to confirm oxygen flow. The interactive top module improves engagement and controlled delivery, reducing wastage and discomfort. Overall, these features improve user satisfaction, reduce misuse, and enhance safety. The design also allows integration with future technologies such as digital monitoring and smart connectivity.

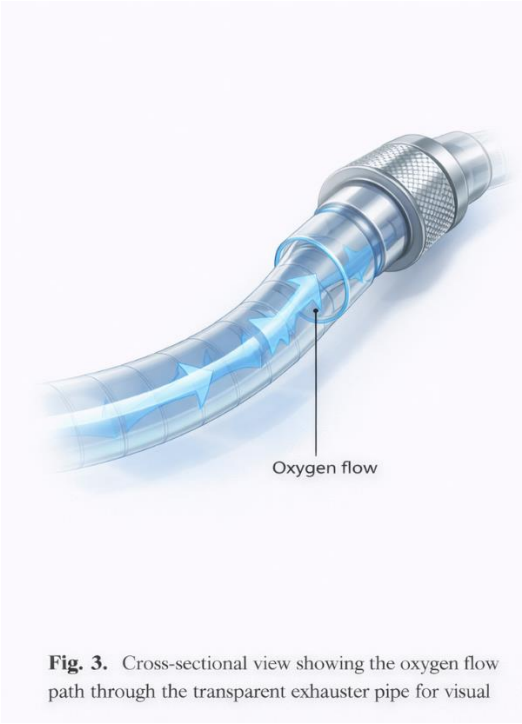

Fig. 3. Cross-sectional view showing the oxygen flow path through the transparent exhauster pipe for visual

Fig. 4. User interaction module showing ergonomic top control interface and handling of the system.

Challenges include regulatory approval, cost optimization, and public awareness. Portable oxygen devices must comply with medical device regulations and oxygen safety standards, which vary by region. Balancing affordability with high-quality materials and interactive features is critical. Educating users on proper usage and limitations prevents misuse. Addressing these challenges requires collaboration between designers, manufacturers, and regulatory authorities. This paper presented an innovative design for an interactive portable oxygen delivery system with a fully aluminum-coated bottle and transparent exhauster pipe. By combining material innovation with user-centered design principles, the system addresses key

X CHALLENGES

limitations of existing portable oxygen products, enhancing durability, safety, and user confidence. Future work may focus on integrating smart sensors, digital connectivity, and clinical validation to further enhance functionality and expand applicability in preventive and emergency healthcare.

REFERENCES

[1] World Health Organization, “Oxygen therapy for respiratory diseases,” WHO Press, 2021.
[2] J. Smith et al., “Design considerations for portable medical devices,” IEEE Access, vol. 9, pp. 11234–11245, 2021.
[3] A. Kumar and R. Patel, “Material selection in medical device design,” Journal of Biomedical Engineering, vol. 15, no. 2, 2020.