H_2HUBB TEST REPORT

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Evaluation Introduction

This report provides a comprehensive evaluation of the PureOne Oxyhydrogen Inhalation Therapy Device manufactured by Pureffect, a company based in Canada. H_2HUBB classifies this unit as a Home-Grade, Mid-Flow-Rate Oxyhydrogen Inhalation System.

The PureOne device utilizes alkaline oxyhydrogen electrolytic cells (no membrane separation) operating with a sodium hydroxide (NaOH) electrolyte dissolved in distilled water. Gas produced by the electrolysis process is directed through a multi-stage humidification and bubbler system designed to scrub electrolyte aerosol and condition the gas prior to inhalation. The device offers programmable session durations of 1, 5, 10, 20, 30, and 60 minutes, in addition to a continuous operating mode, allowing extended inhalation sessions of up to 8 hours or more per use cycle.

As part of our evaluation, H_2HUBB conducted controlled flow-rate testing to quantify hydrogen gas output (mL/min) under monitored electrical and operating conditions. We compared measured performance to theoretical electrolysis modeling to assess efficiency and consistency. In addition, we evaluated system architecture, bubbler/scrubber configuration, electrolyte management, and operational safeguards to determine whether appropriate safety mechanisms are present for reliable home use. This investigation determines whether the PureOne device meets H_2HUBB's performance standards for hydrogen inhalation systems required for official approval and public recommendation.

To learn more about our H_2 performance standards for hydrogen water bottles, visit **H_2HUBB.**

H_2 Products

- Company: Pureffect
- Product Name: PureOne
- System Type: Oxyhydrogen Inhalation Device
  - Gas Composition: ~66.7% Hydrogen (H_2) / ~33.3% Oxygen (O_2)
  - Electrolysis Technology: Alkaline oxyhydrogen cell (non-membrane design)
  - Electrolyte: Sodium Hydroxide (NaOH) in distilled water
  - Flow Classification (H_2HUBB): Mid-Flow-Rate Home-Grade System
- URL Link: **https://pureffect.ca/product/pureone/**

Method and Procedure

- Distilled Water (test medium): 6.0 pH
- Electrolyte: Sodium Hydroxide (NaOH), crystalline form
- Electrolyte Concentration: 65 g NaOH dissolved in 1400 mL distilled water (46.4 g/L | ~1.16 mol/L)
- Electrolyte Reservoir Volume: 1.4 L (1400 mL)
- Water Temperature Prior To Testing: 61°–66°F (16.1°–18.8°C)
- Hydrogen Output (100% capacity): >550 mL/min H_2 | ~45.76 mg/min H_2 (SATP-corrected)
- Test Elevation: 277 meters (909 ft above sea level)
- Flow Testing Protocol: 1-hour continuous runtime | Alicat H_2 Mass Flow Meter
- Measurement Standardization: All gas volumes corrected to SATP (temperature and pressure adjusted)
- Output Levels Evaluated: 20%, 40%, 60%, 80%, 100% capacity

Test Results

To evaluate hydrogen gas flow rate and inhalation gas purity, the PureOne system was assembled according to manufacturer specifications using 65 g of sodium hydroxide (NaOH) dissolved in distilled water (46.4 g/L). The device was tested at 20%, 40%, 60%, 80%, and 100% duty output settings, with each level operated for a continuous 1-hour session following a 10-minute electrochemical stabilization period.

Produced oxyhydrogen gas was routed through a drying column, followed by an inline humidity and temperature sensor to monitor environmental conditions prior to entering an Alicat Mass Flow Meter for precise flow-rate measurement (mL/min). All measurements were standardized to SATP to ensure consistency across ambient conditions. Multiple trials were performed at each duty level, with voltage, amperage, and wattage recorded to verify electrochemical consistency. Reported values represent averaged results following stabilization and minor correction for line resistance and moisture effects. In addition, staged pH and TDS measurements were conducted on the humidifier/bubbler system to assess electrolyte aerosol capture and evaluate gas scrubbing effectiveness.

The results below present measured hydrogen output performance, corresponding oxygen production, and estimated inhaled H_2 and O_2 concentrations for an average adult (6.5 L/min minute ventilation) using a standard nasal cannula model with a 20-second inhalation / 40-second exhalation breathing cycle.

H_2 Flow Rate Test Results at SATP:

Output Level: 20% Capacity:

- Device H_2 Flow Rate (mL/min | mg/min) avg: ≅ 192.19 mL/min H_2 (≈15.8 mg/min)
- Device O_2 Flow Rate (mL/min) avg: ≅ 96.10 mL/min
- Total H_2/O_2 Flow Rate (mL/min) avg: ≅ 288.29 mL/min
- Inhaled Gas (6.5 VE): H_2 ≅ 1.00% | O_2 ≅ 21.13%

Output Level: 40% Capacity:

- Device H_2 Flow Rate (mL/min | mg/min) avg: ≅ 355.91 mL/min H_2 (≈29.3 mg/min)
- Device O_2 Flow Rate (mL/min) avg: ≅ 177.96 mL/min
- Total H_2/O_2 Flow Rate (mL/min) avg: ≅ 533.87 mL/min
- Inhaled Gas (6.5 VE): H_2 ≅ 1.83% | O_2 ≅ 21.13%

Output Level: 60% Capacity:

- Device H_2 Flow Rate (mL/min | mg/min) avg: ≅ 440.04 mL/min H_2 (≈36.2 mg/min)
- Device O_2 Flow Rate (mL/min) avg: ≅ 220.02 mL/min
- Total H_2/O_2 Flow Rate (mL/min) avg: ≅ 660.06 mL/min
- Inhaled Gas (6.5 VE): H_2 ≅ 2.26% | O_2 ≅ 21.37%

Output Level: 80% Capacity:

- Device H_2 Flow Rate (mL/min | mg/min) avg: ≅ 574.36 mL/min H_2 (≈47.2 mg/min)
- Device O_2 Flow Rate (mL/min) avg: ≅ 287.18 mL/min
- Total H_2/O_2 Flow Rate (mL/min) avg: ≅ 861.54 mL/min
- Inhaled Gas (6.5 VE): H_2 ≅ 3.00% | O_2 ≅ 21.50%

Output Level: 100% Capacity:

- Device H_2 Flow Rate (mL/min | mg/min) avg: ≅ 696.40 mL/min H_2 (≈57.3 mg/min)
- Device O_2 Flow Rate (mL/min) avg: ≅ 348.21 mL/min
- Total H_2/O_2 Flow Rate (mL/min) avg: ≅ 1044.60 mL/min
- Inhaled Gas (6.5 VE): H_2 ≅ 3.60% | O_2 ≅ 21.61%

Claimed H_2 mg/L (ppm) confirmed: Yes — Measured hydrogen production matches the manufacturer's stated claims and aligns with expected electrochemical output for a mid-flow alkaline oxyhydrogen system.

H_2HUBB Hydrogen Flow Rate Assessment:

H_2HUBB's hydrogen gas flow rate testing confirms the manufacturer's performance claims for the PureOne oxyhydrogen inhalation device. At standard atmospheric pressure (SATP), the unit produced between 192.19–696.40 mL/min of hydrogen gas across the 20–100% duty output range, aligning with expected electrochemical performance for a mid-flow alkaline oxyhydrogen system. When operated within these duty levels using a single-user nasal cannula, the device delivers an estimated inhaled hydrogen concentration of approximately 1.00–3.60% for an average adult (6.5 L/min rest ventilation). These inhaled concentrations fall within ranges commonly used in human clinical research and do not exceed safety thresholds reported in the literature. It is important to clarify that while the final inhaled hydrogen concentration at the user interface is within safe therapeutic ranges, the pre-mixed gas composition within the cannula line (approximately 66.67% H_2 / 33.34% O_2) remains flammable and potentially detonable under certain conditions. Proper safety considerations and adherence to manufacturer handling guidelines are therefore essential when operating oxyhydrogen systems.

Overall, the measured results exceed **H_2HUBB's minimum performance standards for hydrogen inhalation devices**. Based on inhaled concentration modeling, H_2HUBB recommends operating within the 40–100% duty range for most average adults to achieve approximately 2.0–4.0% inhaled hydrogen, supporting therapeutic potential consistent with clinical research.

Averaged Durational Purifier Scrubbing Results:
(Continuous Operation – 100% Duty Output)

15-Hour Continuous Runtime

- Purifier 1 (700 mL): ≅ 234 ppm TDS | pH ≈ 11.5–12
- Purifier 2 (700 mL): ≅ 6–7 ppm TDS | pH ≈ 8.5–9
- Final Drinking Purifier (900 mL): ≅ 0-1 ppm TDS | pH ≈ 7.3

H_2HUBB Purifier Scrubbing & Gas Cleanliness Assessment:

According to our testing, averaged 15-hour continuous-use results demonstrate progressive alkaline aerosol capture within Purifier 1, which measured approximately 234 ppm TDS. Secondary-stage loading (Purifier 2) remained minimal (≈6–7 ppm), and downstream ionic presence within the final drinking water bubbler remained extremely low (≈ 0-1 ppm average). For perspective, sodium hydroxide (NaOH) is highly soluble in water (hundreds of grams per liter at room temperature). Even at the 15-hour mark, the amount captured in Purifier 1 represents only about 0.02% of NaOH's theoretical saturation capacity, while Purifier 2 represents approximately 0.0006%. This confirms that the purifiers are operating with substantial theoretical headroom and are nowhere near chemical saturation.

However, saturation capacity is not the primary limiting factor. The more practical consideration is the gradual buildup of hydroxide (OH^-) within the purifier water. Because distilled water has virtually no buffering capacity, rising hydroxide concentration results in a more rapid increase in pH over time. As pH increases, the likelihood of minor alkaline transfer into downstream stages also increases. This behavior became noticeable beyond 12 hours of continuous operation, with measurable downstream ionic presence first observed after extended runtime (>15 hours).

Pureffect's official documentation ties Purifier water replacement with distilled water to each reservoir refilling event and does not specify a fixed hourly runtime interval. Therefore, H_2HUBB's empirically derived 8–10 hour guidance is a conservative supplement based on measured performance data and is not contradicted by the manufacturer's published instructions.

Based on averaged data from two independent trials, H_2HUBB recommends replacing Purifier 1 (and preferably Purifier 2) water every 8–10 hours during continuous high-output operation, with 15 hours representing a practical upper threshold to preserve optimal scrubbing margin. While significant theoretical capacity remains, proactive replacement minimizes hydroxide crossover and maintains consistent gas-cleaning performance.

When maintained within these intervals, the PureOne's staged purifier system provides acceptable gas-cleaning performance for a mid-flow, home-grade alkaline oxyhydrogen inhalation device.

Internal Performance

Manufacturer's Rated Electrical Values: (as stated on the power supply)

- **Type of device/electrolytic cell**
  - Oxyhydrogen (H_2/O_2) Alkaline Electrolysis
  - No membrane (NaOH electrolyte system)
- **Power Supply Rating:**
  - Rated Voltage: 24V
  - Rated Current: 15A
  - Rated Power: 360 Watts
- **Confirmed Electrical Values (Measured):**
  - Applied Voltage (100% duty): 24.40V DC
  - Measured Current (100% duty): 13.0 A
  - Total Electrical Power: 317.2 Watts (24.40V × 13.0 A)
- **Cell Configuration:**
  - Number of Stacks: 1
  - Cells per Stack: 11 (in series)
  - Electrolyte: NaOH dissolved in distilled water
  - Cell Efficiency (calculated): ~64%
- **Electrolytic Cell Stack Characteristics:**
  - Voltage per Stack (100% duty): 24.40 V
  - Cells per Stack: 11 (in series)
  - Voltage per Cell: 2.22 V (24.40 ÷ 11)
  - Current per Cell: 13 A (same across all cells in series)
  - Effective Electrochemical Current per Stack: 143 A (13 A × 11 cells)
  - Power per Stack: 317.2 W (24.40 V × 13 A)
  - **Note:** "Effective electrochemical current" represents the total electron activity across all 11 cells combined. The actual electrical current flowing through the system remains 13 A, since the cells are wired in series.
- **H_2 Production (Based on Measured Amperage @ SATP)**
  - Theoretical Maximum:
  - 1088.36 mL/min H_2
  - 544.18 mL/min O_2
  - 1632.54 mL/min total H_2/O_2
- **Electrolytic Cell Efficiency (Measured vs Theoretical @ 100%)**
  - 696.40 ÷ 1088.36 = ~64% electrochemical efficiency

Product Assessment

Functionality:

- **Master Power Switch:**
  - Controls overall system power (on/off).
- **Session Timer Function:**
  - Allows selection of preset inhalation sessions (1, 5, 10, 20, 30, and 60 minutes). Activates both the timing circuit and electrolysis process.
- **Continuous Operation Mode:**
  - Enables extended runtime beyond preset sessions
- **Water Reservoir:**
  - Requires distilled water only.
  - Reservoir capacity: approximately 1.4 liters (1400 mL).
- **Electrolyte Requirement:**
  - Sodium hydroxide (NaOH) crystals dissolved in distilled water are required to create the conductive alkaline electrolyte necessary for electrolysis.
- **Digital Display & Output Control:**
  - A front-mounted digital display (approximately 2" × 3") shows real-time gas output percentage and includes touch controls for adjusting duty level (20%, 40%, 60%, 80%, 100%).
  - Display provides clear visibility of operating status and output selection.

- **Gas Purifiers (Humidifier / Scrubbing System):**
  - The device includes a staged purifier system designed to reduce sodium hydroxide aerosol carryover from the generated oxyhydrogen gas.
  - Purifier 1: Primary scrubbing stage
  - Purifier 2: Secondary scrubbing stage
  - Final Drinking Bubbler: Optional third-stage water interface that may also function as a drinking water bubbler

Reliability:

- New: Yes
  - Initial test results and evaluation are currently on the report. (see Overall Opinion)

Product Safety

Safety Components:

The PureOne system incorporates multiple safety mechanisms designed to support operational safety and thermal stability:

- **Low-Water Protection:**
  - Automatically protects the electrolysis cells from overheating by preventing operation when reservoir water levels are insufficient.
- **Large Distilled Water Reservoir (1.4 L):**
  - Provides thermal buffering capacity to help reduce excessive heat buildup during extended operation.
- **Internal Cooling Fans:**
  - Assist with heat dissipation and reduce the likelihood of hydrogen accumulation within the enclosure in the event of a minor leak.
- **One-Way Check Valve:**
  - Prevents backflow of water into the electrolysis chamber and helps protect the H_2 cells from potential thermal or liquid damage.
- **Two-Stage Purifier System:**
  - Water-based purifiers designed to capture sodium hydroxide aerosol and improve inhalation gas cleanliness.
- **Pressure Sensor Kill Switch:**
  - Automatic shutdown mechanism triggered at approximately 2.25 psi, helping prevent unsafe internal pressure buildup.
- **Stage-One Purifier Pressure Relief Valve:**
  - Additional mechanical pressure relief rated at approximately 4–5 psi, providing a secondary safeguard.
- **Heat Ventilation Ports:**
  - Allow passive heat escape to help prevent excessive internal temperature accumulation.

Note: Oxyhydrogen systems such as the PureOne produce a premixed hydrogen/oxygen gas stream (approximately 66.67% H_2 / 33.34% O_2). This mixture is inherently flammable and detonable under certain conditions. Because the gases are pre-mixed prior to delivery, an ignition event at the tip of the nasal cannula (e.g., exposure to an open flame, spark, or high-heat source) could theoretically allow combustion to propagate backward along the gas pathway. The PureOne incorporates staged water-based Purifiers and pressure-relief mechanisms that help mitigate flashback risk. The water columns act as physical barriers to flame propagation, and the integrated pressure sensor shutoff (≈2.25 psi) along with the stage-one purifier pressure relief valve (≈4–5 psi) provide additional protection against unsafe pressure buildup. While these safeguards reduce risk, they do not eliminate the need for proper user precautions.

For this reason, ignition sources should always be avoided near the cannula interface during operation. Users should not smoke, use open flames, or expose the cannula tip to sparks while the system is running. Proper adherence to manufacturer safety guidelines is essential when operating oxyhydrogen inhalation devices.

Overall Opinion

The PureOne Oxyhydrogen Inhalation Device has been evaluated and verified through independent H_2HUBB testing as a well-engineered mid-flow alkaline oxyhydrogen system for hydrogen inhalation. The manufacturer specifies a hydrogen gas output of approximately 50 L/hr (≈833 mL/min) at a gas composition of 66.67% H_2 and 33.34% O_2 under standard operating conditions. Our independent testing confirmed that the device achieves output levels consistent with its electrochemical design and manufacturer specifications across all duty settings.

Unlike membrane-based PEM/SPE systems, the PureOne utilizes a no-membrane alkaline electrolysis configuration with a sodium hydroxide (NaOH) electrolyte solution. While this design enables efficient gas production, it introduces additional maintenance variables and safety considerations, including electrolyte concentration management and purifier water replacement to mitigate alkaline aerosol carryover.

Through empirical flow-rate analysis, inhaled concentration modeling, and staged purifier pH/TDS testing, H_2HUBB confirmed that when properly maintained and operated within recommended intervals, the device produces hydrogen concentrations within clinically studied ranges for inhalation. Our results demonstrate reliability and consistency in the device's electrochemical performance and purifier scrubbing function, supporting its credibility as a home-grade therapeutic hydrogen inhalation system.

At present, there is no universally established IHSA gas-purity certification standard specifically governing alkaline oxyhydrogen inhalation systems, nor was third-party laboratory gas chromatography analysis provided with this unit at the time of evaluation. In lieu of laboratory gas composition analysis, H_2HUBB conducted staged purifier durability testing, multi-hour pH and TDS monitoring, and electrochemical consistency verification to assess alkaline aerosol crossover risk and overall gas cleanliness. Based on these empirical evaluations, the staged purifier system demonstrated effective mitigation of sodium hydroxide vapor when operated within recommended maintenance intervals.

Hydrogen gas output flow rate is a critical performance parameter for inhalation devices. At H_2HUBB, the minimum performance standard for hydrogen generators or inhalation units—whether pure hydrogen, oxyhydrogen, or hydrogen blended with air—is 120 mL/min of H_2. At typical resting ventilation rates (approximately 4–6 L/min) using a nasal cannula for an average adult, this corresponds to roughly 0.7–1.0% inhaled hydrogen. Human clinical research on molecular hydrogen inhalation commonly utilizes concentrations ranging from 0.5% to 4% or higher at resting breathing rates, levels that have demonstrated therapeutic potential across various conditions. Based on this body of evidence, H_2HUBB establishes 120 mL/min of hydrogen output as the baseline requirement for inhalation systems to ensure meaningful therapeutic capability. **The PureOne H_2 inhalation device exceeds this minimum standard, delivering molecular hydrogen output well within clinically studied and therapeutically relevant ranges.**

From a design perspective, H_2HUBB recommends consideration of housing refinements to more clearly distinguish the PureOne from similar oxyhydrogen/Brown's Gas systems currently available in the market and to further elevate the device's visual identity and perceived build differentiation. While this does not affect performance, stronger product distinction can enhance brand positioning and consumer recognition. Additionally, given the inherent flammability of premixed oxyhydrogen systems, H_2HUBB believes the integration of an inline quick-connect flame arrestor within the post-device gas line would represent a prudent engineering enhancement. Flame arrestors are commonly used in hydrogen-handling applications to quench flame fronts and prevent flashback propagation in other industries. Although the PureOne includes staged water purifiers and pressure-relief safeguards, an inline flame arrestor would provide an added layer of redundant protection consistent with best practices in combustible gas systems.

Conclusion

In conclusion, the PureOne delivers a therapeutically relevant and electrochemically consistent hydrogen output across all tested duty levels. While the device is capable of producing clinically meaningful inhaled hydrogen concentrations, proper usage context and maintenance are critical due to its premixed oxyhydrogen configuration. Because the system generates a flammable and potentially detonable hydrogen/oxygen mixture prior to delivery, users must strictly avoid ignition sources near the cannula interface and adhere to recommended purifier water replacement intervals to maintain optimal gas cleanliness.

The manufacturer's hydrogen output specifications were validated through independent H_2HUBB testing, and the measured electrochemical performance aligns with the product's stated operating parameters. No mechanical or electrical safety deficiencies were identified during evaluation, and the system incorporates multiple safeguards including staged water purifiers, pressure monitoring, and pressure-relief mechanisms. While we recommend consideration of additional enhancements—such as stronger product housing differentiation and the optional integration of an inline flame arrestor for added redundancy—these suggestions are precautionary improvements rather than corrections of identified faults.

Overall, the PureOne exceeded H_2HUBB's minimum hydrogen flow performance standards. When operated and maintained responsibly within the guidelines outlined in this report, it performs as a reliable mid-flow oxyhydrogen inhalation system suitable for in-home therapeutic use. Based on our findings, we are confident in recommending this product to the public, provided users follow informed safety practices.

H2HUBB APPROVED HYDROGEN PERFORMANCE

Approved By: Tywon Hubbard

TYWON HUBBARD

CEO, H_2HUBB LLC