H_2HUBB TEST REPORT

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Evaluation Introduction

Our report summarizes our analysis of the Cooler H_2 Hydrogen Water System offered by Tyent USA. H_2HUBB classifies this device as a pressurized dissolution-loop hydrogen water system. The unit features a PEM/SPE membrane to ensure pure hydrogen gas production and requires distilled water, or source water with low total dissolved solids (TDS), such as reverse osmosis water, for proper operation. The system operates on a 15-minute cycle, during which it actively recirculates water from the drinking-water reservoir through the device, dissolving molecular hydrogen into the water within a pressurized loop. We evaluated the system's dissolved hydrogen performance after multiple 15-minute cycle without any dilution from the device's auto-refill function. According to the listed power specifications, the unit uses a 12V/5A power supply. Our investigation was conducted to determine whether this product meets H_2HUBB's hydrogen product performance standards, which must be achieved for a device to be approved and recommended by H_2HUBB.

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

H_2 Products

- Company: Tyent USA
- Product Name: Cooler H_2 - Hydrogen Water System
- Type: High-Concentration H_2 Water Device
  - PEM/SPE
  - Water Cooler Hydrogen Water Generator
  - Recirculating Pressurized Hydrogen Dissolution Loop
- URL Link: **https://www.tyentusa.com/products/cooler-h2**

Method and Procedure

- Distilled water: 6.0 pH (verifies that unit can function with low water conductivity)
- ΔpH (delta pH): Did not increase
- Water Temperature: 47.30~49.10°F/ 8.5~9.5°C
- Reservoir Vol Size: 2.0 L or 2000 mL (67.62 oz)
- Cycle Time Frame:
  - 15-minutes
- Contamination Tests:
  - Chlorine generation (Cl2)
  - Ozone Generation (O3)
- Test Location: 277 meters (909 ft elevation)
- Test Methodology:
  - Electrochemical detection using Unisense H_2 Microsensor.
  - All dissolved H_2 tests are reported at measured water temperature and local pressure.
- Claimed Dissolved H_2 mg/L: 4.0 mg/L as stated on packaging

Test Results

To measure the dissolved hydrogen gas concentration produced by the Cooler H_2 device, we assembled the system according to Tyent USA's instructions and the user manual, then attached a 5-gallon reusable water container filled with distilled water. The system was allowed to recirculate hydrogen water for several days to ensure adequate PEM membrane conditioning and to allow the water temperature to reach the unit's rated operating range. After confirming that the system had sufficient time to optimize, we accessed hydrogen water directly from the outlet plumbing rather than from the 2 L storage tanks in order to minimize hydrogen loss from agitation during chamber entry. We collected 125 mL (4.2 oz) samples for dissolved hydrogen measurements. All measurements were conducted using the Unisense H_2 Microsensor paired with the UniAmp amplifier, calibrated at the hydrogen water temperature range of 8.5–9.5°C. Each test was performed multiple times to ensure accuracy and reproducibility, and the resulting values were averaged to determine the unit's overall performance. While the primary focus is on the mean dissolved hydrogen concentration, peak concentration values are also reported to provide a more comprehensive assessment of the system's hydrogen-generation capability.

H_2 Concentration at Local Conditions:

- 15-mins avg mg/L (ppm): ≅ 4.20 mg/L (ppm)

Peak H_2 Concentration at Local Conditions:

- 15-mins peak mg/L (ppm): ≅ 4.50 mg/L (ppm)

Avg H_2 mg Produced in Designated Vol:

- 15-mins: ≅ 8.40 mg (≡ 101.20 mL Dissolved)

- **Claimed H_2 mg/L (ppm) confirmed: Yes. The device's measured dissolved hydrogen concentration was within approximately 1–4% of the claimed (marketing) values, demonstrating strong agreement with the manufacturer's specification.**

H_2HUBB Hydrogen Concentration Assessment

- According to our testing, the Cooler H_2 Hydrogen Water System consistently achieved dissolved molecular hydrogen concentrations ranging from 4.0 to 4.40 mg/L (ppm) after 15-minute generation cycles, with a peak concentration of 4.50 mg/L (ppm) measured using the Unisense H_2 Microsensor. Based on current human clinical literature, this level of dissolved molecular hydrogen is sufficient to provide a therapeutically relevant hydrogen dose. The device exceeds H_2HUBB's performance standards for **H_2 Concentration and Daily Dose of H_2**. For practical use, users should expect these results to represent the device's optimal hydrogen dose after several days of operation and PEM conditioning.

Contamination Test:

- Chlorine (Cl2): No detectable levels
- Ozone (O3): No detectable levels

Internal Performance

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

- **Type of device/electrolytic cell**
  - Pure H_2: PEM/SPE membrane
- **Applied volts:**
  - 12 volts
- **Total Amps:**
  - 5.0 amps
- **Total watts:**
  - 60 watts

- **Electrolysis volts:**
  - 2.33 volts
- **Electrolysis amps:**
  - 1.58 amps
- **Total watts:**
  - 3.68 watts

H_2 Production vs. Dissolved Hydrogen:

- **Theoretical Max H_2 Production at 8.5°C:**
  - 11.36 mL/min or 0.93 mg/min
- **Theoretical Max Dissolved H_2 Level**
  - 15-mins: ≅ 7.45 mg/L (ppm)
- **Measured Dissolved H_2 reading:**
  - 15-mins: ≅ 4.20 mg/L (ppm)
- **Percentage of Max H_2 Dissolved (as measured):**
  - 15-mins: ≅ 56.37% dissolved
- **Percentage of Max H_2 Undissolved (loss):**
  - 15-mins: ≅ 43.62% undissolved

Hydrogen Water Dispensing Characteristics:

- **Dispensing flow rate from drinking-water chamber:** 2.0 L/min
- **Maximum dispensing volume before auto-refill dilution:** 650 mL (22 oz)
- **Auto-refill dilution event:** Reservoir is diluted with 650 mL of distilled water

Product Assessment

Functionality:

- Cooler H_2 System
  - High-concentration hydrogen water infusion system
  - Integrates with the provided commercial Igloo water dispenser
- Master Switch button
  - Located on the back of the H_2 generator
  - Activates the device when switched on
- Restart button
  - Initiates a 15-minute hydrogen dissolution cycle
  - Allows the user to manually restore the reservoir to optimal dissolved hydrogen levels when desired
- Sleep button
  - Reduces operational noise
  - Lowers hydrogen concentration output
- Water inlet
  - Draws water from the drinking-water reservoir within the commercial dispenser
- H_2 water outlet
  - Returns hydrogen-rich water back into the commercial Igloo water dispenser
- O2 outlet
  - Expels oxygen gas produced during electrolysis

Overall Opinion

The Cooler H_2 Hydrogen Water System from Tyent USA is a well-engineered, high-pressure molecular hydrogen infusion device designed to dissolve molecular hydrogen into clean drinking water. In H_2HUBB's evaluation, once the system was fully optimized and the drinking water had cooled, a 15-minute operating cycle produced an average dissolved hydrogen concentration of 4.20 mg/L (ppm) in 2 L (67.62 oz) of water, corresponding to a total hydrogen content of 8.40 mg, or approximately 101.20 mL of dissolved H_2 gas at local conditions. The device also achieved a peak hydrogen concentration of 4.50 mg/L, demonstrating its ability to exceed the 4.0 mg/L benchmark that many high-performing flagship hydrogen water systems currently do not achieve.

It is important to note that this device has also undergone prior third-party hydrogen concentration testing, which reported a mean concentration of 4.05 mg/L, a minimum of 3.90 mg/L, and a peak of 4.17 mg/L. The instrument used to obtain those results was the DH-35A portable dissolved hydrogen meter. This unit is a polarographic membrane hydrogen electrode and is regarded as a credible instrument for measuring dissolved hydrogen gas in water. When properly calibrated and handled, it is considered one of the better hydrogen water measurement tools available on the market, though still below the precision of the Unisense H_2 Microsensor and Gas Chromatography, the gold standard.

H_2HUBB's documented results correspond well with those prior findings, falling within an approximately 1-4% discrepancy window across all data points. This minor variance could be due to several factors, including differences in calibration protocols between labs, PEM cell performance, manufacturing variability, testing protocols, or test conditions. The discrepancy is small enough that the two sets of results are in close agreement, with our testing showing only a slightly higher average range and peak value. Taken together, these two independent lab findings indicate that the device is performing in an approximate dissolved hydrogen range of 3.90–4.50 mg/L, which should increase consumer confidence in the hydrogen concentration performance of the system.

For this reason, we believe Tyent USA should consider marketing the device as achieving a dissolved hydrogen concentration range of 4.0–4.30 mg/L, with a peak concentration range of 4.20–4.50 mg/L. This would best reflect the available testing on the device and provide consumers with a realistic expectation of the hydrogen levels they should receive in their water when purchasing the unit. H_2HUBB will display its own measurements on the H_2HUBB website using the Unisense H_2 Microsensor paired with the UniAmp amplifier, a laboratory-grade electrochemical system that provides real-time detection and precision comparable to gas chromatography, thereby reflecting our internal testing standard.

Dissolved hydrogen concentration (mg/L (ppm)) is a critical performance metric, as research suggests that 1-3 mg of H_2 or more per day appears to be therapeutic for humans. Furthermore, the **IHSA** standard for this type of product is a minimum of 0.5 mg/serving or 0.5 mg/L. H_2HUBB's performance standard for hydrogen water devices is slightly higher than IHSA, as we require the device to provide a concentration of 0.8 mg/L (ppm) and 0.8 mg/day consistently. The Cooler H_2 Hydrogen Water System offered by Tyent USA surpassed H_2HUBB standards for both **H_2 Concentration and Daily Dose of H_2.** Based on current research data, we believe the device's mg/L (ppm) performance provides adequate levels of hydrogen gas to induce therapeutic effects in humans. **According to our test results, the product will be able to easily provide 2-5 mg of H_2 per day.** We are pleased with the device's dissolved hydrogen concentration.

Additionally, H_2HUBB is familiar with and favorable toward the technology utilized in this system, having evaluated similar systems in the past that use comparable design principles. This type of technology is currently uncommon in the broader hydrogen market. Batch pressurized-chamber and pressurized hydrogen dissolution-loop systems generally incorporate three essential factors for dissolving hydrogen gas into water: lower water temperature, increased partial pressure, and a dissolution design that enhances hydrogen's ability to enter solution. This design takes advantage of the fundamental physical properties that govern dissolved molecular hydrogen in water.

For instance, at SATP, hydrogen's maximum solubility in water is approximately 1.57 mg/L at 25°C (77°F) and 1 atm. By simply lowering the water temperature to 0°C (32°F) at the same pressure, hydrogen's maximum solubility increases to approximately 1.96 mg/L, representing about a 25% increase in H_2 solubility. This technology uses colder water temperatures and elevated pressure to drive dissolved molecular hydrogen concentrations beyond the normal saturation point of 1.57 mg/L, in some cases doubling or even tripling that level. It also improves hydrogen retention in water, as colder temperatures slow hydrogen dissipation.

Additionally, this type of technology generally exhibits higher dissolved hydrogen efficiency (DHE) compared with most flagship or countertop hydrogen water devices. In our testing, the Cooler H2 device demonstrated a DHE of 56%, meaning that of all the hydrogen gas produced by the PEM hydrogen cell, more than 50% was successfully dissolved into the water. That is an impressive result, especially considering that throughout our testing, hydrogen water bottles typically dissolve only about 5–20% of the hydrogen gas they produce, hydrogen infusion machines (HIMs; PEM flow-through hydrogen water devices) generally dissolve about 20–30%, and conventional or hybrid water ionizers typically dissolve about 15–25%, respectively, under ideal conditions. This means the Cooler H_2 delivers a greater proportion of the hydrogen it generates to the consumer rather than losing it as waste in the form of undissolved gas bubbles in the water. For this reason, these systems are especially well suited to allow users to consume higher doses of H_2 in smaller volumes of water. With the Cooler H_2, a user can consume approximately 2.50 mg of H_2 in every 650 mL (22 oz) of water dispensed from the device, based on average measured concentrations. This means that by drinking just over 1 liter of water, a person can ingest approximately 5.0 mg of H_2 per day, which corresponds exceptionally well with current human clinical literature. This also makes the device's design highly suitable for larger families, gyms, business offices, or wellness centers, where family members, clients, or employees can consume an estimated 2.0–2.50 mg dose of H_2 by simply drinking approximately 16–22 oz of water. Based on the studies **[1][2][3]**, that dose corresponds to a moderate and therapeutically relevant molecular hydrogen dose. We discuss this technology in greater depth in our **article on the subject**. The Cooler H_2 exhibits these key design characteristics, and we are pleased to help consumers access a system built on this advanced hydrogen-water technology.

Overall, the Cooler H_2 Hydrogen Water System is a well-engineered device constructed for the production of clean, high-concentration hydrogen water and capable of delivering consistently high, therapeutically relevant concentrations of dissolved molecular hydrogen within its 2 L reservoir. The manufacturer's safety claims were supported by H_2HUBB's evaluation, and the device's performance meets—and in several respects exceeds—H_2HUBB's objective internal performance standards. No safety concerns were identified during testing, and the system incorporates appropriate safeguards to prevent the formation of undesirable byproducts such as chlorine or ozone in the drinking water. Based on our findings, the Cooler H_2 represents a safe, high-performing, and reliable option for in-home, office, gym, or wellness-center hydrogen water use, offering consumers a combination of strong usability, high-capacity dispensing, and clinically meaningful hydrogen dosing.

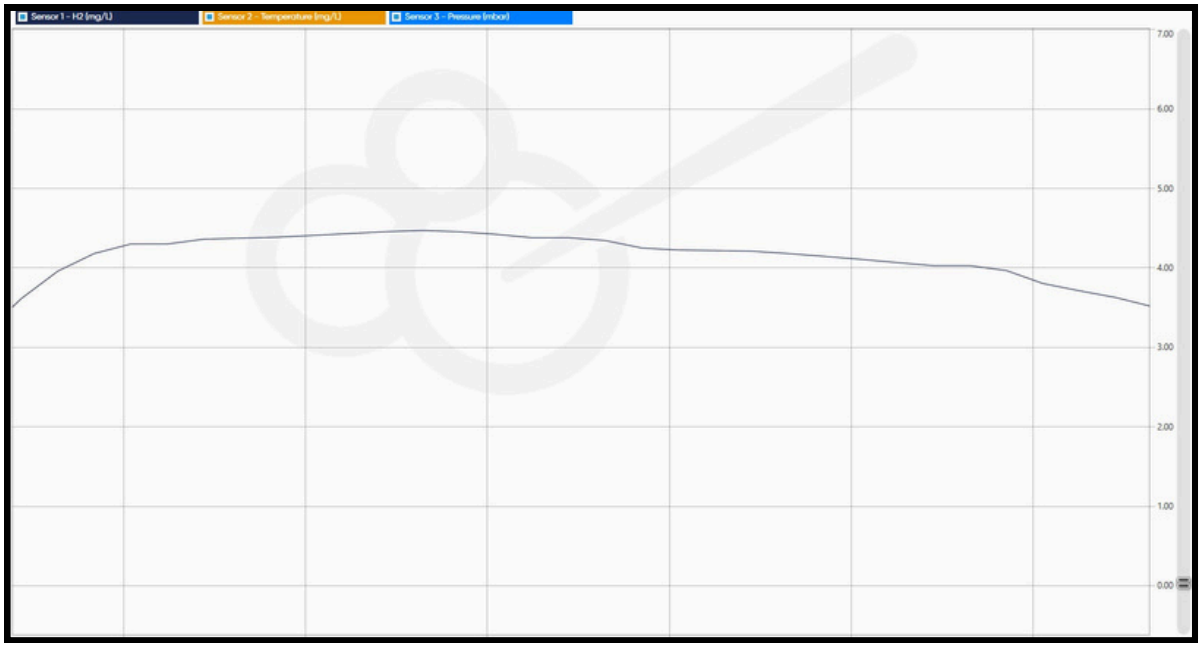
Figure 1. 15-Minute Dissolved H_2 Time-Trace – Cooler H_2 - Hydrogen Water System (Unisense H_2 Microsensor)

This plot displays the real-time amperometric output from the Unisense H_2 Microsensor paired with the UniAmp amplifier during a 15-minute hydrogen dissolution cycle of the Cooler H_2 device. The sensor signal, measured in picoamperes and converted to mg/L hydrogen, captures the dynamic dissolved H_2 concentration in the water in real time with a temporal resolution as fine as 0.02 seconds per data point. Data were recorded during sampling of hydrogen-rich water produced by the Cooler H_2 device.

The Unisense H_2 Microsensor was calibrated at 8.5°C using the local dissolved hydrogen saturation value of 1.73 mg/L for accurate measurement under our laboratory conditions. Our lab elevation is 277 m, corresponding to approximately 0.97 atm, which lowers the local hydrogen saturation concentration relative to standard atmospheric pressure.

The trace illustrates both the steady-state dissolved hydrogen concentration and the natural signal fluctuations that occur in high-H_2 water during sampling and measurement. Due to the elevated hydrogen concentration and resulting microbubble formation, occasional signal spikes were observed, which is a known artifact in high-H_2 solutions. To minimize this effect, H_2HUBB employed a controlled re-entry technique by removing and reimmersing the microsensor to dislodge surface bubbles, then averaging the top 15 stable readings to determine the final dissolved hydrogen value.

This high-resolution time series demonstrates the Cooler H_2 device's ability to generate and sustain elevated dissolved hydrogen concentrations under the tested operating conditions.



H_2 Hubb LLC disclaimer: All tests conducted and test results produced by H_2 Hubb LLC have been done according to industry-accepted practices and standards. Nevertheless, these results may not necessarily reflect test results performed by manufacturers, suppliers or third-party labs. Our test results are independent of all other parties, and testing by other parties may produce different results. We understand that many variables are involved in testing, some of which are extremely difficult to control. These reports are not meant or intended for any other purpose but to uphold H_2 Hubb LLC's business practices and to validate the reasons for our recommendations.

Approved By: Tywon Hubbard

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