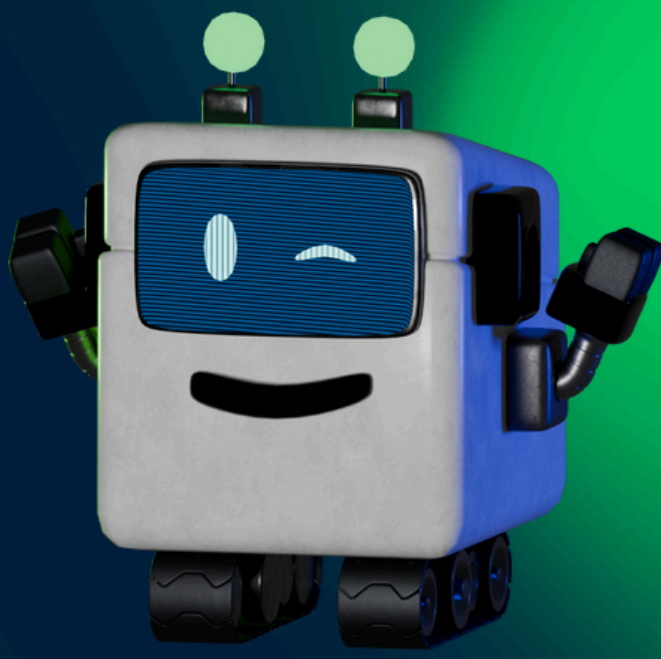
H2·E
vital energy

How Does A Hydrogen Machine Work ?

If your interested in how a hydrogen machine works in this pdf we will uncover the mechanism of a Hydrogen Therapy machine



What do the different terms mean when referring to hydrogen and Brown's Gas inhalation machines?

When researching hydrogen inhalation machines, you may come across a range of terms that can be confusing at first.
Here's a quick guide to help you understand the most common ones:

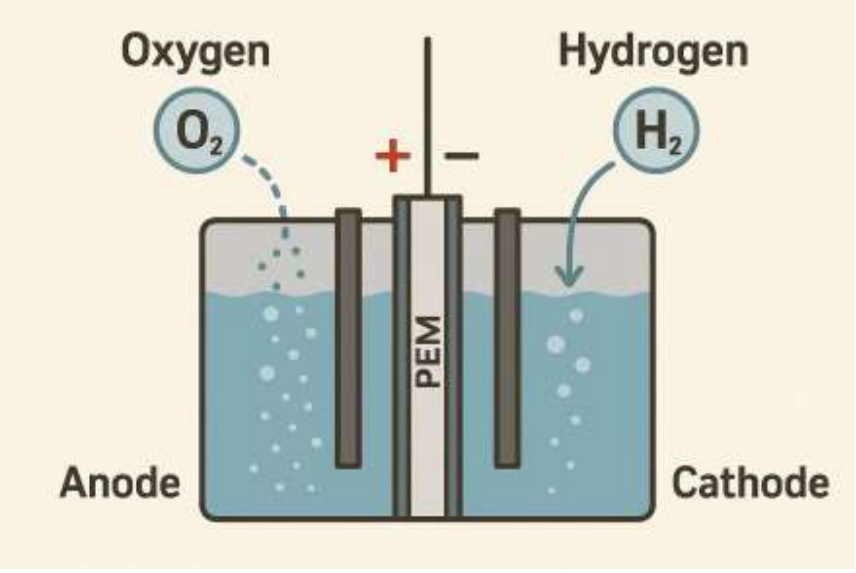
- Hydrogen generally refers to the gas hydrogen (H_2), the smallest and most abundant molecule in the universe.
- Molecular hydrogen (H_2) is the therapeutic form of hydrogen used in most inhalation therapies. It consists of two hydrogen atoms bonded together.
- H_2 is simply the chemical symbol for molecular hydrogen.
- Hydrogen/Oxygen (H_2/O_2) refers to machines that produce a mixture of molecular hydrogen and oxygen, usually by splitting water (H_2O) through electrolysis.
- Brown's Gas (also known as oxyhydrogen) is a unique form of gas produced during electrolysis that contains hydrogen, oxygen and small amounts of electrically expanded water
- Oxyhydrogen is another name for Brown's Gas and is sometimes used interchangeably.

What is hydrogen?

Hydrogen is the lightest and most abundant element in the universe. It is a colourless, odourless gas made up of two hydrogen atoms (H_2). In the context of health and wellness, molecular hydrogen (H_2) refers to hydrogen gas used for its potential therapeutic benefits, often inhaled or dissolved in water. Research suggests that hydrogen may help reduce oxidative stress and support cellular health by acting as a selective antioxidant.

How do our machines make Hydrogen/Oxygen

Our Hydrogen/Oxygen machines use a process called electrolysis to split distilled water (H_2O) into hydrogen (H_2) and oxygen (O_2) gases. Inside the machine, a Proton Exchange Membrane (PEM) separates two electrodes, an anode and a cathode. When an electrical current passes through the water, oxygen is produced at the anode and hydrogen at the cathode. These gases are collected and delivered in precise ratios through a nasal cannula for safe inhalation therapy.



Are your Hydrogen/Oxygen machines the same as Brown's Gas machines?

No, our machines are not Brown's Gas machines. Our machines use a different type of technology called PEM (Proton Exchange Membrane), which produces a clean mixture of hydrogen and oxygen, but not Brown's Gas. What is Brown's Gas? Brown's Gas (named after inventor Yull Brown) is a specific type of gas produced using alkaline electrolysis typically with added chemicals like potassium hydroxide. The gas produced contains: A 2:1 mix of hydrogen (H_2) and oxygen (O_2) A unique, gas form called electrically expanded water (ExW) Electrically expanded water (ExW) is believed by some to have special therapeutic effects. It is the presence of electrically expanded water (ExW) that makes Brown's Gas different from our Hydrogen/Oxygen machines. Brown's Gas machines due to the use of chemicals require more complex filtering and maintenance. Our focus is on the Hydrogen therapy that has clearly shown the health benefits.

What do PEM hydrogen/oxygen machines produce?

PEM machines (like the ones we sell) work in the following manner:

- They split pure water into hydrogen & oxygen gasses using a solid membrane
- They create hydrogen and oxygen gasses in a safe 2:1 ratio
- They do not require the adding of any chemicals

Is Our PEM Gas Cleaner?

Yes, the gas from PEM machines is often cleaner than gas from traditional Brown's Gas systems. Here's why:

- No chemical additives are required (just distilled water)
- Membrane filtration prevents contamination
- No mist or electrolyte carryover into the gas
- Low maintenance with no chemical residue or buildup

This makes PEM machines especially suitable for therapeutic, clinical and home use where purity is important.

Why we avoid the term “Brown’s Gas”

We choose not to use the term because:

- It is often misunderstood – many people think it’s a different gas or even brown in colour
- It is a technically inaccurate description of our machines, as our machines do not produce electrically expanded water

Our PEM hydrogen/oxygen machines deliver clean, reliable gas using modern membrane technology, without the extra byproducts of Brown’s Gas systems.

This ensures a safer and more user-friendly experience.

What is the ratio of Hydrogen to Oxygen in the gas that is output from the machine?

Our machines use water to produce Hydrogen & Oxygen in a ratio of 2:1 (66.6% Hydrogen + 33.3% Oxygen).

Can you change the ratio of Hydrogen to Oxygen?

Our machines do not allow you to change the ratio between Hydrogen & Oxygen.

When water is split into its Hydrogen & Oxygen components it naturally forms a 2:1 ratio (66.6% Hydrogen + 33.3% Oxygen) and this has been termed the ‘golden ratio’.

The ratio of 2:1 mirrors the proportions found in water, suggesting a harmony that aligns with biological compatibility. The 2:1 ratio is also very safe, ensuring stability and minimizing the risks of creating oxidative stress and free radical formation in the body.

How Our Machines Ensure Safe Hydrogen Concentration

To ensure safety, our machines automatically dilute the pure hydrogen and oxygen mixture by combining it with ambient air at the point of inhalation.

This is achieved via a low-pressure output and open delivery system, which is the nasal cannula, allowing ambient air to mix naturally with the gas before it is inhaled. This keeps the hydrogen concentration below 4%, well within the lower explosive limit (LEL) for hydrogen in air. This method of passive dilution through open-system inhalation ensures that:

- No additional mechanical dilution system is needed.
- Users receive a safe, effective concentration for therapeutic benefit

What is a Proton Exchange Membrane (PEM)?

The heart of the Hydrogen/Oxygen machine is the Hydrolysis Cell, this is where hydrogen is made. There are several methods of making hydrogen and our machines use a method that involves a membrane that works like a filter inside the Hydrolysis Cell allowing hydrogen to pass through whilst blocking other gasses and electrons

What is the Proton Exchange Membrane (PEM) made from?

PEM's are typically made from specialized polymer materials designed to allow protons (Hydrogen) to pass through them whilst blocking electrons and other gasses (Oxygen). The PEM's are also designed to remain chemically stable in the harsh corrosive conditions inside the hydrolysis cell – where the hydrogen is produced

Can the Proton Exchange Membrane (PEM) be changed / replaced?

The PEM is integrated into the Hydrolysis Cell and is not something that can be changed or replaced

How long does the PEM membrane last?

The PEM will last the lifetime of the machine. The Hydrolysis Cell which contains the PEM is the heart of the machine, the lifespan of the machine is determined by the health of this component. The Manufacturer states a 7000-hour run time without any loss of performance. After 7000 hours, the machines will continue to run for many years, but there will be a gradually drop off in performance. The most important factor that impacts the Hydrolysis Cell is the quality of the water used. The cleaner the water, the better the machine's performance and longevity

Where is the Proton Exchange Membrane (PEM) made?

For our Hydro Medic, Hydro Nova and Hydro Gen the membranes are made in the USA, our Immortal and Super Power machine the membrane is made in China.

How can I tell if there is a problem with the PEM or Hydrolysis cell?

As this is the part of the machine that is making the Hydrogen/Oxygen, it is directly related to the output of gas into the cannula or water stone. The easiest way to assess the output of the machine without any expensive testing is to observe the output of the machine when using the water stone. If there is a drop in the machine's performance, the bubbling of gas into the water through the water stone will be reduced.

What are the electrodes made from?

Titanium coated with iridium (anode) and platinum (cathode) as catalysts

Does anything corrode on or in the machine?

The inside of the hydrolysis cell is an incredibly corrosive environment; many of the materials used are selected because of their ability to resist corrosion, such as titanium which the electrodes are made from. With long term use, corrosion will occur within Hydrogen/Oxygen machines, and it is this process that ultimately determines the lifespan. This is why we place a big emphasis on the quality of water used in our machines as this is the biggest factor that can extend the lifespan by minimizing corrosion. The main parts of the machine susceptible to corrosion are the electrodes, the chamber where the electrolysis occurs, and any metal tubing involved in the delivery of the gas. The Manufacturer states a 7000-hour run time without any loss of performance. After 7000 hours, the machines will continue to run indefinitely, but there will be a gradually drop off in performance over time, which is the result of corrosion

Are the machines CE approved?

Yes, all of our machines are CE approved and have this stated on the back of each device, on the manuals and on the box.

What is SPE?

In the context of hydrogen inhalation and water electrolysis technology, SPE refers to Solid Polymer Electrolyte. It is another name for the Proton Exchange Membrane (PEM). PEM and SPE are often used interchangeably.

Why is a Filter needed?

Hydrogen and Oxygen machines use water filters to ensure the water used in the electrolysis process is clean and free from contaminants that could negatively impact the machine's performance and longevity. Our machines use a resin filter which needs to be changed every 6-12 months depending on how much you use your machine. We place a lot of emphasis on using the cleanest distilled water possible, but even distilled water with a TDS reading of 0ppm will have trace amounts of contaminant in it. Even the process of transferring pure distilled water from a bottle to the machine could expose the water to dust and other particles – particularly if transferring to a jug and then into the machine. The main reasons for the filter are:

- Preventing Mineral build up on the electrodes Over time even trace amounts of mineral contaminants can form a Scale build up on the electrodes which will lower gas production
- Improving Gas Purity Cleaner water will result in improved gas purity
- Preventing Corrosion Certain impurities can cause corrosion of the electrodes

Primary Functions of the Humidifier Bottle on The Outside of the Machine

- Humidification: The main role is to moisturize the gas before it is inhaled. Dry gas (especially pure hydrogen or hydrogen/oxygen) can irritate the respiratory tract if not humidified.
- Backflow Prevention: The water in the bottle creates a physical barrier that can prevent liquid or gas backflow into the machine.
- Bubbling Visual Indicator: When the machine is running correctly, bubbling in the bottles confirms gas is flowing.
- Safety Pressure Buffer (minor role): The water provides a modest buffer against pressure spikes

Is Hydrogen Flammable?

For hydrogen gas to become flammable or explosive, the concentration needs to reach 4% in air, this is known as the flammable range. The machines we offer are designed with advanced safety features to ensure hydrogen is produced and delivered safely. Firstly, these machines produce hydrogen on demand, meaning they don't store hydrogen, which eliminates the risk of a buildup of flammable gas. The hydrogen/oxygen gas is mixed with ambient air during inhalation via an open delivery system Additionally, our machines are equipped with multiple built-in safety mechanisms. These include:

- Pressure sensors that monitor gas flow and stop production if pressure becomes abnormal.
- Water level monitors to ensure the system operates correctly.
- Automatic shutoff systems that activate if any irregularities are detected.
- No-return valves to prevent any back-flow of gas into the machine. Even though our machines are very safe to use, please use common sense, do not use your machine next to an open flame such as a candle, gas hob or open fire.

If 4% or greater Hydrogen concentration is combustible, isn't a machine with a 66% Hydrogen & 33% Oxygen ratio dangerous?

The 66% hydrogen and 33% oxygen simply describes the ratio between the two gases produced inside the machine. Here's an analogy to put this into context: If you were making a fruit squash, the concentrate might be 66% apple juice and 33% peach juice. That tells you the ratio between the two juices in the concentrate. But when you add water, the final drink might only be 2% juice and 98% water. That describes the dilution you are actually drinking. It's the same with hydrogen/oxygen gas mixtures. Inside the machine, the ratio is about 66% hydrogen to 33% oxygen. But when you inhale through a nasal cannula, that gas mixes naturally with ambient air. The machines have been designed to produce a gas concentration which is well below the combustible 4% level and typically in the region of the 2% hydrogen level that is widely used in clinical studies.

Why Our Machines Do Not Require a Compressor

Our PEM hydrogen/oxygen machines generate gas using an advanced electrolysis process that operates at low pressure, making a compressor unnecessary. The gas flows gently and consistently at a therapeutic rate suitable for inhalation without requiring any pressurization. This design reduces mechanical complexity, eliminates noise, increases reliability and enhances safety - making the machine ideal for home and clinical use. A compressor adds noise, energy consumption, weight and moving parts that may require maintenance, without offering any real advantages

How pure is the hydrogen gas produced?

Our machines use PEM (Proton Exchange Membrane) electrolysis technology, considered the gold standard for producing clean hydrogen and oxygen gases.

Key Purity & Safety Features:

- No chemicals or additives are used - only pure distilled or deionized water
- No ozone (O_3) or chlorine is produced
- The system separates gases using a Proton Exchange Membrane, avoiding contamination
- Output gases are highly pure and suitable for therapeutic inhalation, including lung and respiratory conditions

Certifications & Manufacturing Standards

- Manufactured in an ISO-certified facility
- Compliant with CE standards for electrical safety and electromagnetic compatibility

Do the machines produce Ozone?

Our machines do not produce ozone and we have produced a video where we show the testing of this. Our machines produce hydrogen/oxygen using PEM (Proton Exchange Membrane) technology, a method that creates a very pure gas which is considered by many to be the ideal for clinical use. Some machines on the market use different technology that requires the addition of chemicals such as sodium hydroxide, which is added to the water. These machines can have the potential to create small amounts of contamination which includes ozone and chlorine. Also, some cheap ozone detectors that use a Metal Oxide Semiconductor (MOS) sensor may provide false positive readings when testing hydrogen. If you are looking to test for ozone from a hydrogen device we suggest using a detector that uses an electrochemical sensor.

Independent Laboratory Gas Purity Test

To verify the purity of the hydrogen gas output our machines have been tested by an independent laboratory in Guangzhou, China (Huaxi Testing Technology Center). The gas was tested using an Agilent 7890-5977 gas chromatograph - mass spectrometer, a highly accurate scientific instrument used worldwide. The results confirmed:

- Hydrogen purity: 99.41578%
- No ozone or harmful by-products detected This means the hydrogen produced is well above 99% purity, making it suitable for safe inhalation and therapeutic use. Is this test official? Yes. The report was issued by a certified laboratory and includes official disclaimers, such as:
- The report is valid only for the tested sample.
- It cannot be reproduced without the lab's approval.
- The lab confirms confidentiality and testing accuracy

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Breathe health, breathe molecular hydrogen

With our molecular hydrogen machines, every inhalation becomes a moment of profound well-being.

Health Is Your Greatest's Wealth

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