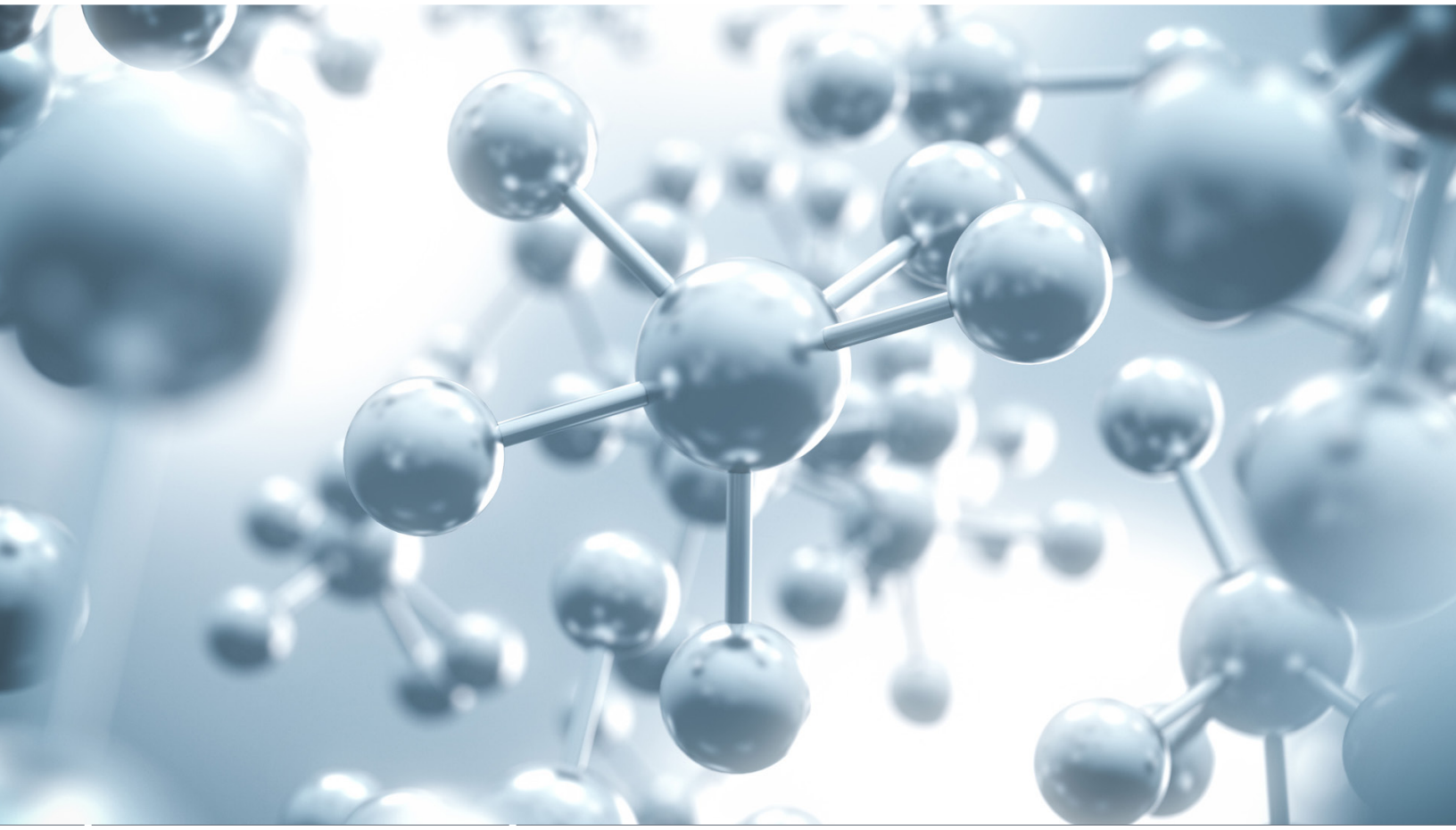
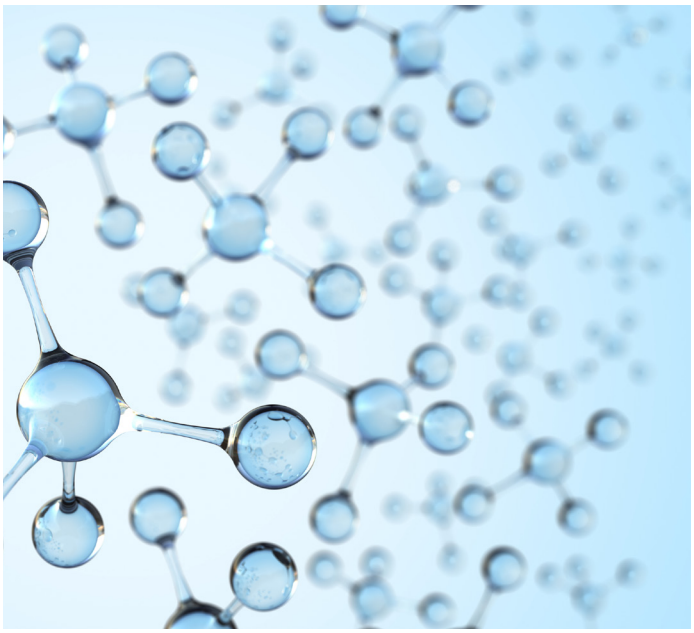
Agile Magnetics



HIGH FREQUENCY TRANSFORMERS FOR OZONE EQUIPMENT MANUFACTURING

When most people hear the word "ozone," they think of the Earth's atmosphere. As high-school science class taught us, the ozone layer protects the Earth from ultraviolet (UV) radiation emitted by the sun.

Ozone is a relatively simple molecule. Standard gaseous oxygen, which we breathe, is a molecule comprised of two bonded oxygen atoms (represented by the chemical formula O_2). Ozone is an oxygen allotrope — essentially the same element but with a different chemical structure: It features three bonded oxygen atoms (represented by the chemical formula O_3).



Ozone is formed when oxygen molecules are split: When separated, individual oxygen atoms, which are negatively charged (represented by the chemical formula O-), seek out other molecules to bond with; when they bond with a standard O_2 molecule, the result is a three-atom ozone molecule. For this reason, ozone is often referred to as "activated oxygen."

Ozone Sterilization

Aside from playing an important role in protecting us from harmful solar radiation, ozone is also a sterilant. In fact, ozone is the second most powerful sterilant in the world, used in disinfection and sterilization processes in various industries, including semiconductor and equipment manufacturing, food and beverage production, and the medical sector.

In these and other sterilization applications, the part to be sterilized is placed in a vacuum chamber. The chamber is humidified, and then ozone is introduced. As ozone molecules attack contaminates — rupturing their cell walls — they naturally revert back to stable, harmless O_2 molecules; catalytic agents are added prior to ventilation of the chamber to convert any remaining O_3 molecules to O_2 molecules.

Ozone sterilization is unique in that it can be done at low temperatures. Most conventional sterilization techniques require extremely high temperatures, which are not always ideal for the product at hand and can require considerable energy use. Ozone sterilization avoids these issues and does not produce hazardous residue or release toxic gas into the atmosphere.

Ozone Generation

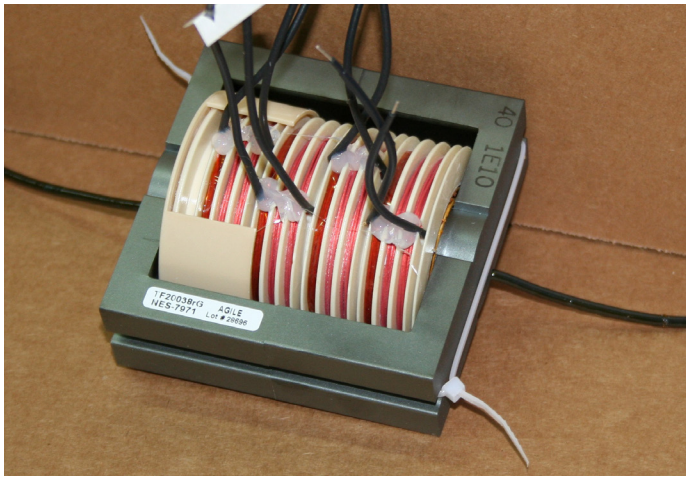
Ozone is a naturally occurring element, but sterilization processes require greater levels of ozone than are available naturally, creating the need for ozone generators. There are two primary methods of ozone generation.

Ultraviolet Ozone Generation

Ultraviolet (UV) ozone generation has been used for several decades. During this process, ambient air is passed across a UV lamp, which emits light at a frequency of roughly 185 nanometers (nm). This UV light splits oxygen molecules in the gas. The resulting O- atoms then attach to other O_2 atoms for stability, thereby forming ozone.

Corona Discharge Ozone Generation

Corona discharge is a much more modern and efficient method of ozone generation. Nearly every commercial and industrial ozone generator today uses this method. The corona discharge process mimics a naturally occurring method of ozone creation — lightning strikes.



A corona discharge is a spark created when air around an electrically charged conductor is ionized. A corona discharge functions like a miniature lightning bolt, splitting O_2 molecules as it strikes. Corona discharge ozone generators include a dielectric, a material — commonly glass, ceramic, mica, or quartz — that can be easily polarized. This dielectric diffuses a corona discharge over a wide area, resulting in a much higher rate of ozone generation than a single discharge point. As air moves through the discharge field, O_2 molecules are split, and O_3 molecules are newly bonded.

Unlike UV generation, corona discharge ozone generation cannot use ambient air, as moisture in the air leads to the production of nitric acid, which is highly corrosive. Instead, either dry air — cooled to at least -80 °F (-62 °C) is used to eliminate the maximum amount of moisture — or pure oxygen must be supplied.

High Voltage Transformers for Ozone Generation

For optimal performance, corona discharge ozone generators rely on a high voltage spark. Standard power, either 120 volts AC current (VAC) or 220 VAC, is much too low. Instead, anywhere from 500 and 20,000 volts is required.

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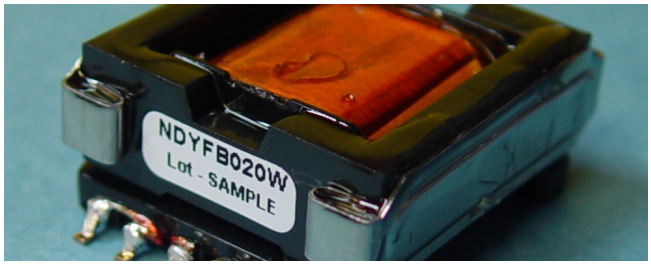
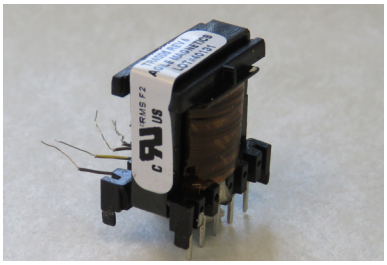
There several different methods and combinations of parts and components for ozone generators that can be used to create this voltage. One option is a high voltage transformer. However, these are not ideal for every scenario — high voltage transformers tend to be larger, so they may not work in some tight spaces, and it can be challenging or impossible to adjust their output voltages in the event of changes in the operating environment.

Line frequency ozone generators can also be used. These generators pair a transformer with a basic rheostat, which can be used to adjust the output voltage of the transformer. This is an ideal setup for ozone production scenarios in which ozone need fluctuates. A third option is a line choke, a series of smaller, lower-voltage transformers that gradually step up the voltage.





Learn More

Though a relatively young technology, ozone sterilization is already becoming an integral process in many applications and industries. Hotels and other hospitality-industry businesses use it for odor removal, for instance, and remediation companies are starting to rely on it for cleaning and sterilizing in fire-, smoke-, flood-, and mold-damage applications.

Ozone sterilization is also becoming increasingly important in the food and beverage and medical industries. Food and beverage manufacturers are beginning to use ozone cleaning techniques in their facilities and on their food-handling equipment; this removes harsh chemicals from the equation, creating safer conditions for customers, employees, and the environment. And in the medical industry, low-temperature ozone sterilization is proving wildly effective at eliminating contaminants, thereby safeguarding human health and safety and extending the lifespan of expensive medical equipment.

Agile Magnetics has years of experience designing and manufacturing high-quality magnetics for a huge variety of industries and applications, including those that are increasingly relying on ozone generation and sterilization. We're easily able to meet and exceed the very stringent guidelines for safety, isolation, and other properties required by the medical industry.

Agile Magnetics produces cost-efficient and space-saving custom high frequency ozone transformers and inductors for air and water purification systems. To learn more about our transformers for high power ozone generators, inductors for ozone generators, and other products, contact our team today.

Contact Us to Learn More

At Agile Magnetics, we offer complete custom design and manufacturing services for high frequency transformers, specifically specializing in applications requiring limited space and noise reduction. Working with the most advanced materials, our engineers can design a transformer to meet all of the requirements of your specific application. To learn more about our capabilities or to get a quote, please contact us today.

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