

## ■ Specifications

Name	Plasma generator
generation method	Pulse discharge system
Power Consumption	15A/Single-phase 200V
voltage	1~20kV
frequency	350MHz
Amount of treated water	100 ~ 150L / min
Tank Material	SUS

Name	adsorption device
material	Specialty resins
Contact Tank	20~50L (FRP)

## ■ About PFAS

PFAS is a general term for artificially produced organic fluorine compounds, and it is said that there are about 10,000 types of them.

Due to their chemical structure, carbon and fluorine are strongly bonded, so when released into the environment, they often remain undecomposed and easily accumulate in organisms, leading to their characterization as "forever chemicals."

Therefore, they are also known as "forever chemicals," leading to international discussions on their management. PFAS has excellent physicochemical properties that are difficult to replace with other substances, including heat resistance, weather resistance, chemical resistance, water repellency, and oil repellency. Therefore, they are widely used in various applications such as textiles, medical devices, electronic equipment, semiconductor products, construction materials, and lubricants.

PFAS released into the environment during the production or use of products can be taken up by drinking water or food, leading to harmful effects such as disruption of substance transfer between cells and the presence of carcinogenic substances in the body.

International efforts are underway to ban the use of PFAS, but the treatment of PFAS released into the environment remains a major challenge.



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# PLASMA

## PFAS Decomposition and Purification System

# PFAS Decomposition and Purification System by Underwater Plasma Discharge.

NSS-TOKYO

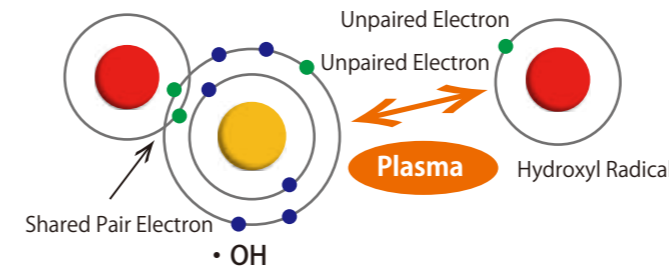
Due to its nature of being difficult to naturally decompose in the environment, PFAS is also known as the eternal chemical or "Forever Chemical," and countermeasures are being considered worldwide. The PFAS decomposition purification system generates plasma in water using high-voltage pulse power and uses chemical reactive species such as radical OH generated there to decompose harmful substances. It is a treatment technology that adsorbs the remaining trace residues using special resins, making it possible to treat PFAS and difficult-to-decompose organic compounds in water.

## What is Plasma?

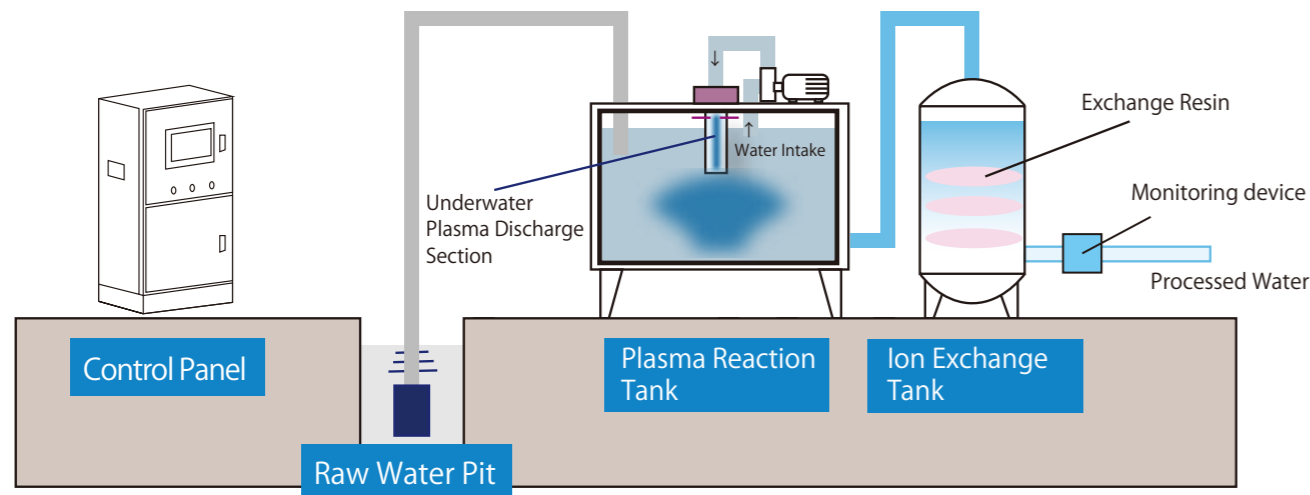
Plasma refers to a state of matter where atoms and molecules are separated into ions and electrons. Along with solids, liquids, and gases, it is known as the fourth state of matter and is seen in phenomena such as lightning, auroras, fluorescent lamps, and neon signs. The plasma utilized in the manufacturing industry is broadly categorized into "high temperature plasma" and "low-temperature plasma." The temperature of low-temperature plasma is at room temperature and is used for surface modification, cleaning, sterilization, and disinfection.

## Generation of Radical OH.

Radical OH corresponds to the hydroxyl group and is generated by plasma or ultraviolet radiation. It is the most oxidizing species among molecules called reactive oxygen species, and reacts with various substances such as carbohydrates, proteins, lipids, and can also cleave C-C bonds in chemical reactive species organic compounds. Major domestic electronics manufacturers employ it in various air purifiers and other devices to assist in the removal of hazardous substances.



## System Flow Sheet



## Principle of PFAS Decomposition by Underwater Plasma

Normal plasma is in a state where atomic nuclei and electrons are separated due to high temperature and high energy. However, low-temperature plasma has large electron kinetic energy and is in a state where it is somewhat ionized, yet the thermal energy of ions and molecules is small, and the temperature is low. Our underwater plasma discharge technology is a groundbreaking system that removes harmful substances and bacteria dissolved in wastewater using our unique pulse discharge system to generate plasma in water. Through low-temperature plasma, the radical OH with more than 80 times the oxidation power of ozone generated in water can chemically decompose difficult-to-decompose organic compounds into carbon dioxide, nitrogen, water, and more. We have a track record of decomposing difficult-to-decompose organic compounds such as hexavalent chromium and nitric acid nitrogen in industrial wastewater, and have successfully completely decomposed PFAS, also known as forever chemicals, making them harmless. Furthermore, our system, using specially developed resins, can recover trace amounts of remaining PFAS to the utmost limit.

## System Configuration Equipment



Water Plasma Discharge and Special Adsorbent Material were used for decomposition and adsorption tests of PFOS, PFOA, and PFHxS, and it was proven that the residual values of PFAS were below the national interim guideline values and were undetectable.

	Raw Water (ng/L)
PFOS	63000
PFOA	4100
PFHxS	4900

Water Environment  
50ng/L  
⇒

	After decomposition ~ adsorption
PFOS	≤ 5
PFOA	≤ 5
PFHxS	≤ 5

As per internal data from NSS Kyushu Corporation.