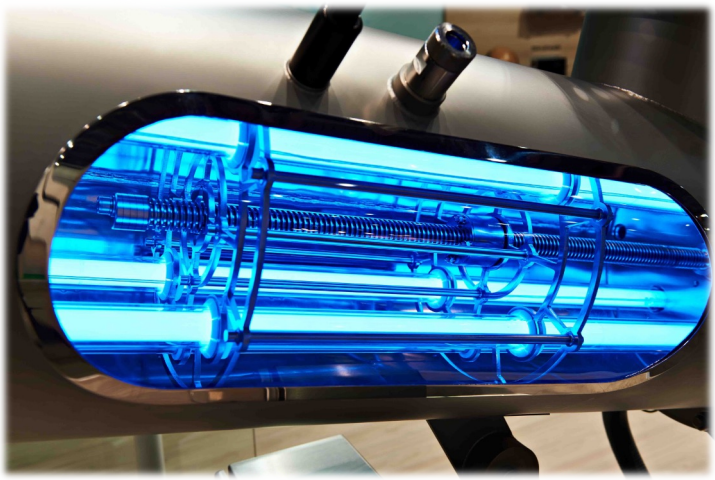
ROCKERHILL

DISINFECTION SYSTEMS for WATER TREATMENT

THE MOST EFFECTIVE WAY TO INACTIVATE HARMFUL PATHOGENS IN WATER







UV disinfection system

WHAT IS UV disinfection system?

UV disinfection is a process that uses **Ultraviolet (UV) light**, specifically **UVC light** (wavelength 200-280 nm), to kill or inactivate microorganisms like bacteria, viruses, mold, and protozoa. It's a physical, chemical-free method widely used for purifying water, air, and surfaces.

Here's how it works:

1. **Target:** UV-C light penetrates the cell walls of microorganisms.
2. **Damage:** It targets the microorganism's DNA (or RNA in some viruses).
3. **Inactivation:** The high-energy UV-C photons cause adjacent thymine bases in the DNA strand to bond abnormally, forming "thymine dimers."
4. **Prevention:** This damage prevents the DNA from being replicated correctly.
5. **Result:** The microorganism cannot reproduce or cause infection and is considered inactivated or dead.

Advantages:

1. Effective against a broad spectrum of pathogens, including chlorine-resistant ones like Cryptosporidium.
2. No chemical addition, no harmful disinfection by-products (DBPs).
3. No change to taste, odor, or pH of water.
4. Fast, immediate disinfection.
5. Environmentally friendly (no chemical residues).
6. Low operating costs (primarily electricity and lamp replacement).

TYPES OF UV SYSTEMS

We offer both medium and low pressure UV systems in aquatic applications from our trusted ETS-UV™ product portfolio. The term pressure refers to the pressure of gas inside the UV lamp—and ultimately wavelength(s) of light produced. Both low and medium pressure UV systems produce emissions in the 200–280 nm "UV-C" spectrum. Monochromatic low-pressure UV systems emit a single 254 nm energy wave, whereas polychromatic medium pressure UV systems emit energy waves across the

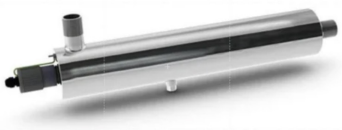
Key Characteristics of UV Disinfection:

- **Physical Process:** Unlike chlorine or ozone, UV doesn't add chemicals to the water or air. It doesn't change taste, odor, or pH.
- **Germicidal Spectrum:** Primarily effective against bacteria and viruses. Effectiveness against protozoa (like Cryptosporidium and Giardia) and mold spores varies but is generally good. *It does not remove dissolved chemicals or heavy metals.*
- **Immediate Effect:** Disinfection occurs instantly as microorganisms pass through the UV light field. There's no contact time required like with chemicals.
- **No Residual Effect:** UV provides disinfection *at the point of exposure* but leaves no residual disinfectant in the water or air to kill pathogens introduced downstream. This is a key difference from chlorine.
- **Penetration:** UV light has limited penetration. Water must be clear (low turbidity) for effective treatment. Surfaces need direct line-of-sight exposure; shadows or crevices won't be disinfected. Air streams need sufficient dwell time within the UV chamber.









Chlorination Systems

WHAT IS CHLOOEINATION SYSTEM?

A **chlorination system** is a chemical disinfection method widely used in the water treatment industry to kill pathogens (bacteria, viruses, protozoa) and ensure water safety. It involves adding chlorine or chlorine-based compounds to water, leveraging their potent oxidizing properties to destroy or inactivate harmful microorganisms.

How It Works:

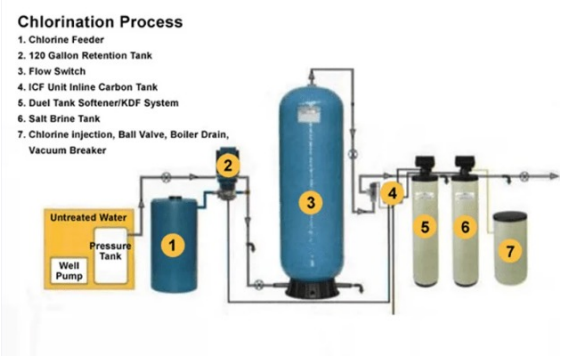
1.Dosing: Chlorine is added to raw or filtered water.

2.Oxidation & Disinfection:

- Chlorine reacts with water to form **hypochlorous acid (HOCl)**, the primary disinfectant.
- HOCl penetrates microbe cell walls, disrupting enzymes/DNA and killing pathogens.

3.Residual Formation:

- Unreacted HOCl remains as **free chlorine residual**, protecting against recontamination in pipelines.



Advantages:

- **Strong Residual Effect**: Protects water throughout distribution networks.
- **Cost-Effective**: Low operational costs at scale.
- **Broad-Spectrum Efficacy**: Kills bacteria, viruses, and some protozoa.
- **Oxidation Benefits**: Removes odors, tastes, iron, manganese, and hydrogen sulfide.



Key Components

1. Chlorine Source:

- **Chlorine Gas (Cl_2)**: Pressurized liquid gas stored in cylinders/tanks. Common in large municipal plants.
- **Sodium Hypochlorite (NaOCl)**: Liquid bleach (e.g., 12–15% solution). Easier to handle than gas.
- **Calcium Hypochlorite ($Ca(OCl)_2$)**: Solid pellets/granules dissolved into solution. Used in smaller systems.
- **On-Site Electrolysis Systems**: Generates hypochlorite from salt (NaCl) and water.

2. Feed System:

- **Injectors/Ejectors**: Mix chlorine solution/gas into water flow.
- **Dosing Pumps**: Precisely control chlorine addition (for liquid solutions).
- **Gas Chlorinators**: Regulate gas flow under vacuum for safe delivery.
- **Control Systems**: Automated sensors adjust dosing based on flow rate, residual chlorine, and water quality.

3. Contact Tank (Clearwell):

- Water flows through a tank for 15–60+ minutes to ensure sufficient **contact time** for disinfection.

4. Residual Monitoring:

- Sensors measure **free chlorine residual** (typically 0.2–2.0 mg/L) post-disinfection to ensure ongoing protection.



Applications in Water Treatment:

- **Drinking Water**: Primary disinfection for municipalities, wells, and household systems.
- **Wastewater**: Final disinfection before discharge/reuse.
- **Cooling Towers**: Prevents biofouling.
- **Swimming Pools**: Maintains hygienic conditions.
- **Emergency Response**: Rapid deployment during contamination events.

Ozone Systems

WHAT IS OZONE GENERATOR?

An **ozone generator** for water treatment is a device that produces **ozone gas (O_3)**, a powerful oxidizing agent and disinfectant, which is then dissolved into water to remove contaminants and pathogens. Ozone is highly effective for advanced water purification due to its strong reactivity and broad-spectrum action.

How Ozone Generators Work

1. **Ozone Production**:
   - **Corona Discharge Method (Most Common)**:
     - Dry air or pure oxygen passes through a high-voltage electrical field ("corona discharge").
     - This splits oxygen molecules (O_2) into atomic oxygen (O), which recombines with O_2 to form ozone (O_3).
   - **Electrolytic/UV Methods**: Less common; use electricity or UV light to create O_3.
2. **Ozone Injection**:
   - Generated ozone gas is bubbled into water via diffusers, venturi injectors, or mixing chambers.
   - Ozone dissolves, forming highly reactive **hydroxyl radicals (·OH)** in water.
3. **Oxidation & Disinfection**:
   - **Pathogen Destruction**: Ozone ruptures cell walls of bacteria/viruses and degrades their DNA/RNA.
   - **Contaminant Oxidation**: Breaks down organic/inorganic pollutants (e.g., pesticides, metals, dyes).
4. **Byproduct Management**:
   - Residual ozone decomposes to oxygen (O_2) within minutes.
   - May require post-treatment (e.g., activated carbon) to remove oxidation byproducts.

Advantages of Ozone

✅ **Stronger Oxidant**: 50% more potent than chlorine; effective against chlorine-resistant pathogens (e.g., *Cryptosporidium*).

✅ **Chemical-Free Residual**: Decomposes to O_2; no toxic byproducts like chlorinated DBPs.

✅ **Broad Action**: Simultaneously disinfects, deodorizes, decolorizes, and oxidizes metals.

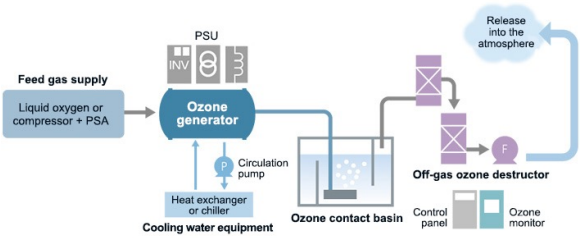
✅ **Speed**: Reacts 3,000× faster than chlorine; shorter contact time needed.

✅ **Taste/Odor Improvement**: Eliminates earthy/musty compounds without adding flavors.



Key Components of an Ozone System

Component	Function
Oxygen Source	Supplies air (compressed/dried) or pure oxygen (higher O_3 yield).
Ozone Generator	Converts O_2 to O_3 via corona discharge.
Injector/ Diffuser	Transfers O_3 gas into water (e.g., venturi, bubble diffusers).
Contact Chamber	Sealed tank allowing 5–20 min contact time for reactions.
Destruction Unit	Decomposes excess ozone in off-gas to O_2 (prevents air toxicity).
Monitoring Sensors	Measures dissolved ozone, flow rate, and residual O_3.



Applications in Water Treatment

- **Drinking Water**:
  - Primary disinfection for municipalities (kills *Cryptosporidium*, viruses).
  - Removes taste/odor (e.g., geosmin, MIB), iron, manganese, and organic color.
- **Wastewater Reuse**:
  - Advanced oxidation for micropollutant removal (pharmaceuticals, pesticides).
- **Bottled Water & Beverages**:
  - Ensures sterility without altering taste (no chemical residuals).
- **Pool/Spa Treatment**:
  - Reduces chlorine demand and chloramines ("combined chlorine" smell).
- **Industrial Processes**:
  - Coolant tower sterilization, textile dye oxidation, semiconductor ultrapure water.



Global Project References



Rockerhill is established in China from 2011 originally, with 15 years of development and improvement, today ROCKERHILL has formed the core businesses in design and engineering, manufacturing and modularization, contracting and services in water treatment,water conservation, irrigation industry.

With a manufacturing hub of 17,000 square meters in JiangSu China, and more than 30 professional technical staffs, and 20 professional senior engineers and national registration engineers, we provide sustainable values and services to our domestic and international customers by utilizing our extensive experiences and integrated competitiveness in design and engineering, technical package, procurement services and project contracting.

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