

## **Factors Reducing Ozone Concentration**

The ozone concentration in the water declines due to consumption by such "ozone demand" factors as microbes, minerals, and organics. It also has a time exponential decline due to its natural "half-life" (time for the concentration to fall in half). Half-life depends on ozone demand, temperature, pH and other factors.

Assuming a neutral pH of about 7 and room temperature, typical ozone half-lives in water are:

- 1 - Clean, high quality water Over 10 minutes
- 2 - Water with some chlorine or minor contaminants 1-10 minutes
- 3 - Moderately dirty water, water with strong chlorine or organics, etc. 10-60 seconds
- 4 - Waste water with significant reaction elements A few seconds

Based on the information above, it is clear that not all similar sized swimming pools will require the same size ozone generator. It is key that bather loads, other water contaminants and the environment need to all be carefully considered when sizing an ozone generator to a specific pool.

## **Ozone on Swimming Pools**

Ozone is a highly oxidative product, is more powerful and quicker acting than any of its chemical comparatives such as chlorine or hydrogen peroxide and known to kill bacteria types that the others cannot through normal safe levels of concentration. Ozone is especially effective in removing odours, precipitating iron and manganese, oxidizing organics as well as killing bacteria and sterilizing the water. It is safe to use and cost effective to operate. Ozone has been adopted by multiple municipal water sanitation plants world wide and is becoming more and more the sanitizer of choice for swimming pools especially since the ban placed on the use of chlorine in multiple countries. Unlike other sanitizers, especially chlorine that leaves a residue of trihalomethanes implicated as carcinogens in the development of kidney, bladder and colon cancer, Ozone reacts with organic materials to break them down into simpler compounds that are not dangerous. Ozone is also good at breaking down harmful residues created by other sanitizers.

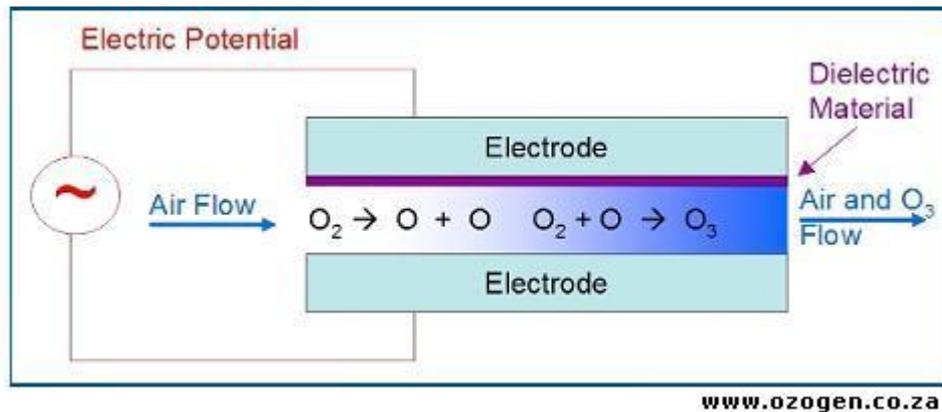
There is lots of evidence available to prove that the use of ozone on swimming pools is far superior to the use of any other sanitizer, not to mention the added health benefits.

## **How it Works**

Ozone is an unstable compound generated by the exposure of oxygen molecules to a high energy electrical discharge. The weak bond holding ozone's third oxygen atom is what causes the molecule to be unstable and thus, very effective. Oxidation reaction occurs upon any collision between an ozone molecule and a molecule of an oxidizable substance (i.e. bacteria, fungi (mold & yeast), viruses, forms of iron & manganese...) The weak bond splits off leaving oxygen as a by-product. During an oxidation reaction, organic molecules are changed and dissolved metals are made no longer soluble.

## The Technology

The Ozogen units are targeted at the general swimming pool market and based on the following corona discharge principle as indicated in the diagram below. Ozone is generated by creating an electric field between two electrodes that is strong enough to rip apart molecules known as a corona or corona discharge.



Ozogen create a corona discharge inside a reactor constructed of high grade stainless steel combined with high purity ceramic components. This design is definitely one of the most robust and reliable commercially available. We then take this reactor and combine it with solid state electronics concealed in epoxy to prevent moisture contamination and fit this inside a specially designed housing with a cooling fan, protection fuse and neon light to show that high voltage is being applied to the reactor. Heat is an ozone killer so on our bigger units that generate more heat, we add water cooling that uses the swimming pool water to keep the core of the reactor cool and ensure high performance even in the hottest conditions. The corona discharge technology is chosen because it allows large amounts of ozone to be generated in a device that can last for many years unlike some of the other technologies.

## Ozone Transfer into the Swimming Pool Water

Air is sucked through the swimming pool units using a venturi that is installed on the swimming pool return pipe from the pool filter to the pool. This venturi can be easily fitted to 50mm PVC pool pipes by cutting out a small section of pipe and securing the venturi in place with PVC glue. For 40mm plastic pipes or other, simple reducers are used that are available at most swimming pool shops. Part of the venturi design includes a mixer to ensure a high transfer of ozone into the swimming pool water. Installation is generally simple and quick. The venturi used by Ozogen ensures adequate airflow through the pool units, to maximise ozone output as well as ensuring a good transfer of ozone into the water.

## Cloudy Water in an Ozone Swimming Pool

Don't Worry... In This Case, It's Good!!!

Cloudy water can be caused when an ozone generator is first installed because the ozone oxidizes the organics in the water causing them to form a chain which then becomes visible to the eye and gives the water the cloudy appearance. Another way water can appear cloudy is with an imbalance in the water. Always check to make sure the pH, alkalinity and calcium hardness are balanced. Customers are concerned when, within a day or two of installing their ozone generator, their pool water becomes cloudy. The common reaction is to "shock" the water which clears the water for one or two days before it turns cloudy, and they need to "shock" it again. Shocking the body of water with large amounts of chlorine will break down the molecular chains formed by ozone, but is not recommended. Water will appear clear

temporarily, but a few days later the shock is exhausted and the ozone cycle begins again, resulting in cloudy conditions.

To avoid this cycle, the chains formed by the ozone must be allowed to grow large enough to be filtered.

**Steps to Clear Cloudy Water:**

- Balance any imbalance in the pH, alkalinity or calcium hardness.
- Remove and clean filter or backwash filter.
- Operate pool pump for at least 12 hours. It may be necessary to increase filtration time to more than 12 hours initially.
- Make sure the ozone generator is working properly for the entire filtration cycle.
- Let the water remain cloudy for an extended period to allow the chains to become large enough to be caught in the filter.
- If using a sand filter, put a few handfuls of alum into the filter, through the skimmer, to reduce the pore size of the filter media. After 24 hours, backwash the filter.