Applying Ozone to Commercial Swimming Pools – Before or After The Filter

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The mode of application of ozone to an existing or new swimming pool's water can be considered the most important decision to the success of the system, second only to the amount of ozone produced by the chosen generator. In addition to properly sizing the ozone generator for a particular pool, the designer must also address the way it will be applied. It is generally accepted that the only way to safely apply ozone to a pool is with venturi injection (vacuum), but it is still open to discussion whether to apply ozone before or after filtration. We will review the pros and cons of both theories.

Note: These Lists, Figures and Tables are best understood in conjunction with the audiocassette recording of the presentation. Please see page 6 for order information.

What is Ozone?

- Ozone is a very powerful form of oxygen with three atoms (O_3).
- It is the most powerful oxidizer and disinfectant that can be safely used in pools and spas.
- It is considerably stronger and faster than chlorine, without chlorine's side effects.
- It leaves no traditional chemical by–products.
- It kills bacteria, viruses, cysts, molds, mildew and yeast.
- It oxidizes hydrogen sulfides, iron and manganese.
- It dissolves in water 13 times faster than oxygen.
- It eliminates chloramines.
- It acts as a micro–flocculant.

Oxidizing Potential of Various Reagents

Oxidizing Reagent	Oxidizing Potential
Ozone	2.07
Hydrogen Peroxide	1.77
Hypochlorous Acid	1.49
Chlorine Gas	1.36
Hypobromous Acid	1.33
Oxygen	1.23
Bromine	1.09
Iodine	0.54

UV or CD Ozone?

- UV Ozone is capable of producing up to 550 ppm in air.
- CD Ozone is capable of producing up to 50,000 ppm in air (this number is increased in other applications but not practical for swimming pools).
- Typically UV systems are not large enough for a commercial pool, considering the amount of water, or more importantly the bather load to water volume ratio.

How Do You Get the Ozone Into the Water?

- Pressure (diffuser)
- Vacuum (injector)
- The best way to achieve effective mass transfer is by vacuum.
- Only dissolved ozone is effective.

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- Undissolved ozone must be degassed and destroyed.

Full Stream

- **DEFINITION:** To apply the ozone to the main water stream.
- By convention in the US, full stream application is usually referred to as the "DIN" method whether it actually follows the German rules or not.
- This method is rarely used in the US because of the high cost.

Side Stream

- **DEFINITION:** To apply the ozone to a portion of the main stream.
- Usually referred to as "Slip stream" (25% or greater is preferable).
- Commonly used in the US and Canada.

Applying Ozone After Filtration

- In the US, side stream application is predominantly applied after filtration.
- Depending on the local health codes, an aqueous ozone destruct may be installed down stream of the ozone contact tank to ensure less than 0.1 ppm dissolved ozone enters the pool. An ORP controller/monitor may be used instead of the destruct to measure the ozone after it has been diluted in the main stream to ensure less than 0.1 ppm enters the pool by lowering feed levels.
- Systems with older equipment or equipment who's content is unknown will not be subjected to the oxidation of ozone when applied this way.
- It is generally easier (on existing pools) to physically install the booster pump, injector, contact tank and ozone system down stream of the filtration equipment.

(See Figure 1)

Applying Ozone Before Filtration

- The benefits may outweigh the disadvantages.
- Ozone acts as a micro–flocculant, which aides filtration. Consequently, applying it before the filter will benefit the filtration process. It may also reduce pathogen levels in the filter, which is a great breeding ground for bacteria, molds, etc.
- Any dissolved ozone left in the water will surely be consumed, guaranteeing less than 0.1 ppm ozone entering the pool, and removing the risk of halogen degradation by ozone.
- GAC could be substituted for some of the filter media, further enhancing the system in terms of quality filtration.

Concerns to be addressed before applying ozone before the filter:

1. Construction materials of the filter system. Ozone will aggressively attack some materials found in older or lesser quality filters. The manufacturer must be consulted before installation to ensure the filter isn't damaged. Any undissolved ozone

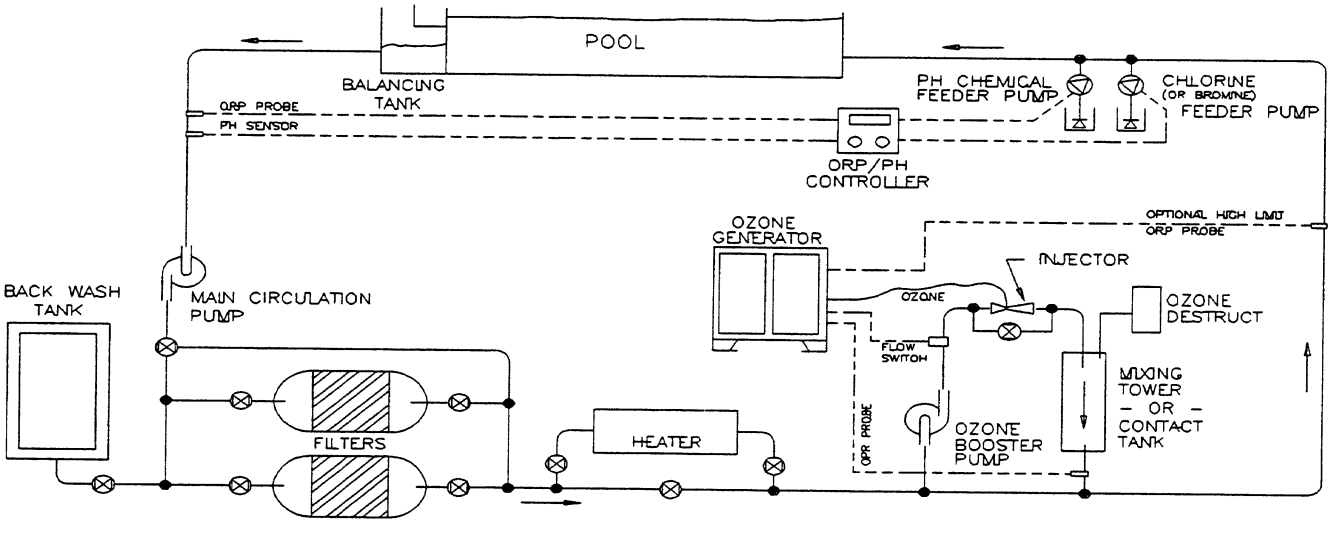
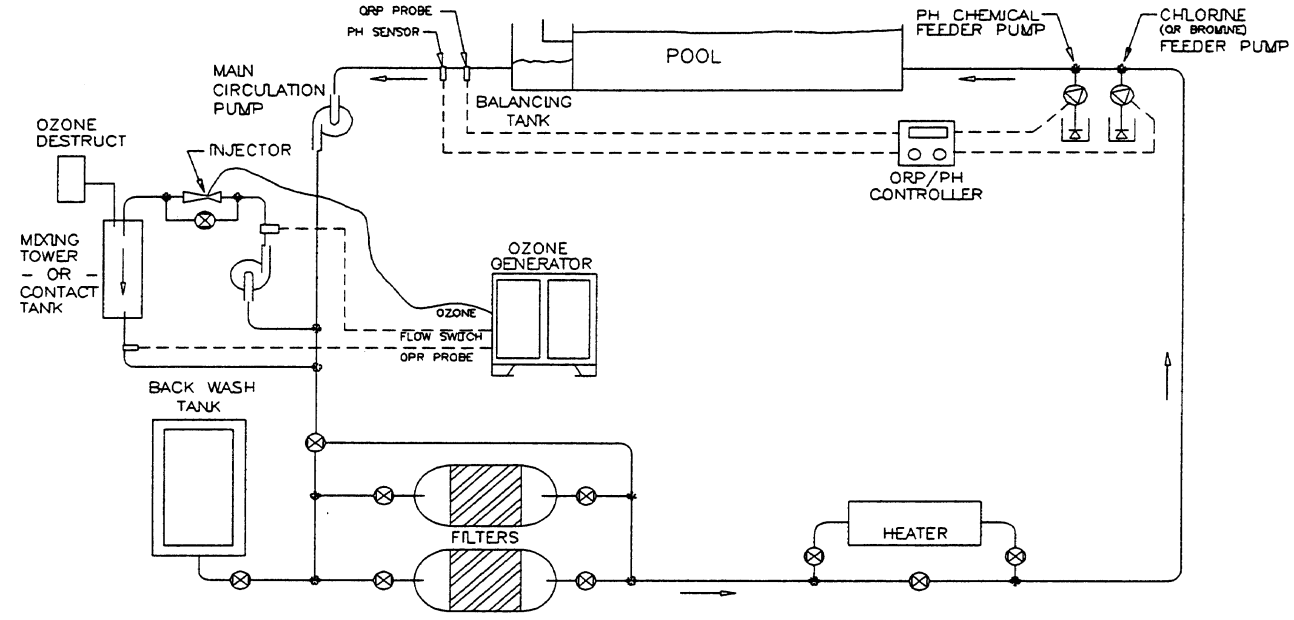
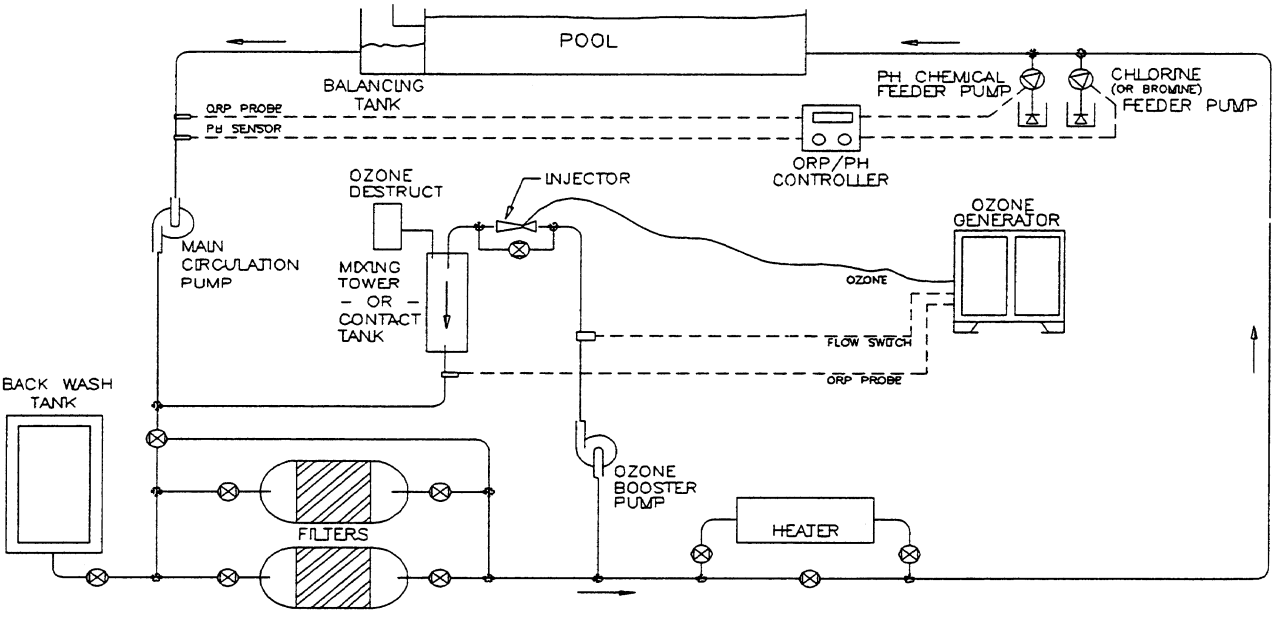


Figure 1 – Applying Ozone After Filtration





Figures 2 & 3 – Applying Ozone Before Filtration

and air must be removed and destroyed to ensure no air builds up in the filter.

2. Booster pumps must be sized to ensure the main filtration flow is not affected and that adequate vacuum levels are attained in the injector.

(See Figures 2 and 3)

Summary

There are pros and cons of both application methods, depending on the equipment materials content, equipment location, room sizes, age of the system, and many others factors. Each pool system must be considered carefully, and studied before a decision is made.

About the Author

Beth Hamil is Vice President of DEL Industries. Among other accomplishments related to ozonation, she developed the first UV systems listed by UL, UR, and NSF, and the first as well as the first NSF listed CD system for commercial pools and spas for use with either residual bromine or chlorine. She is the author or co–author of various ozone related publications and articles, and has been in the pool and spa industry since 1978.