

## KEEPING THE WHEELS TURNING WITH OZONE

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Figure 1: Ozone Treatment System

### Introduction

American Racing Custom Wheels of Rancho Dominguez, California is one of the three largest automobile wheel manufacturers in the country. Founded in 1956 and employing more than 2,500 people at seven manufacturing plants, they supply aftermarket and original equipment aluminum wheels to both automakers and car enthusiasts. As with many large manufacturing operations whose processing systems use large volumes of water, wastewater disposal is a crucial concern. American Racing's Southern California plant alone disposed of almost half a million gallons of wastewater in 2000 at a cost of more than \$150,000.

In order to more efficiently address these needs an innovative coolant recycling system based on ozone technology from ClearWater Tech, LLC of San Luis Obispo, California was introduced into the American Racing plant which not only resulted in substantial coolant savings and reduced wastewater but also dramatically improved worker safety and health.

### Background

Although historically ozone has not been used extensively in coolant recycling, its benefits as

a biocide in the water treatment industry are well documented. Used in Europe to purify municipal drinking water since the late 1800s, ozone is now widely used to purify water in agriculture, industrial laundries, bottled water, wineries, food processing, aquaculture and numerous industrial processes. Ozone is a naturally occurring gas that has the distinction of being the most powerful oxidizer commercially available. It safely and effectively neutralizes a variety of waterborne contaminants, like bacteria, mold and fungus, without leaving unwanted chemical byproducts behind. Its only byproduct is pure oxygen so it does not increase total dissolved solids (TDS) levels or cause shifts in pH.

Ozone is used to achieve a number of water treatment goals including disinfection, oxidation of inorganic contaminants such as iron and manganese, and oxidation of organic micro-pollutants. Table 1 illustrates ozone's oxidization power in relation to other oxidizing chemicals. Only fluorine, which is not really practical or available for commercial use, is more powerful.

**FIGURE 1: COMPARISON OF OXIDIZING POTENTIALS**

Oxidizing Agent	Oxidizing Potential
Fluorine	3.06
Hydroxyl Free Radicals	2.80
Atomic Oxygen	2.42
Ozone	2.07
Permanganate	1.67
Hypochlorous Acid	1.59
Chlorine	1.36

### The Problem

Of American Racing's three problem wastewater streams the coolant system was the most problematic. The water-based coolant used to lubricate and cool CNC lathes and mills is purchased in a concentrated form and delivered in 350-gallon steel containers. The concentrate is diluted at a ratio of approximately 20:1 with water treated by reverse osmosis and deionized. The 100 CNC machines at the plant consumed approximately 468,000 gallons of coolant per year, of which 187,000 was carried away with aluminum chips as a by-product of the manufacturing process. New coolant was continuously added to the coolant tanks in order to maintain acceptable volumes and concentrations.

Coolant was plagued by high levels of bacteria and a strong odor, which were a major concern. Bacteria pose health risks to machine operators, shorten machine life, and literally consume coolant. Because bacteria grow at exponential rates occurrences can quickly grow out of control. Manufacturers have traditionally used liquid biocides to kill bacteria and reduce odors in coolant, but many of these pose health and safety risks of their own. The coolant problem at American Racing was further exacerbated by tramp oil that was introduced into the coolant at the CNC machines. American Racing used liquid biocide in conjunction with ultra-filtration and centrifuge recycling systems with some degree of success, but the bacteria growth continued and the equipment required constant maintenance.

### The Solution

The key component of the turnaround of the coolant problem at American Racing was ClearWater Tech's ozone equipment. Ozone eliminated the bacteria and odor problems, forced the tramp oil out of the solution so it could be removed via skimming, and removed hazardous water treatment chemicals from the plant. Because the ozonated coolant can be reused, the new approach slashed waste removal and storage costs.

The system featured three portable ozone units and one stationary unit. Each of the 100 CNC machines has its own coolant reservoir with a capacity varying from 50 to 150 gallons. At regular intervals, the portable recycling system uses a special gear pump to draw coolant from the reservoir. Two pre-filters, located on the suction side of the pump, trap aluminum chips as small as five microns. The coolant then passes through an injector manifold and the ozone gas is drawn into the coolant. The ozone immediately oxidizes the bacteria and oils and the treated coolant is returned to the reservoir. Coolant containing aluminum chips is collected separately and pumped through the stationary unit, where it is cleaned in the same manner as in the portable units.

### The Results

Reports from an independent testing laboratory revealed very favorable results. A comparison of pre- and post-treatment coolant

samples (Table 2) indicates that bacteria were reduced to zero from 10x6, and tramp oil from .04 parts per million (ppm) to .01 ppm. The severe coolant odor condition was eliminated. It is important to note that coolant concentration remained at 9%, indicating that the treatment process did not degrade the coolant in any way.

Coolant use was significantly reduced, resulting in monthly savings between \$45,000 and \$50,000. Other benefits included a positive environmental impact, reduced water use and reduced wear on the CNC tooling. The recycling system continues to be efficient, cost-effective, and low-maintenance.

ClearWater Tech manufactures a complete line of mid-sized ozone equipment for a variety of water and air treatment applications. Call 800-262-0203 or email sales@cwtozone.com for more information, or visit our website at www.cwtozone.com.

**FIGURE 2: REPORT OF ANALYTICAL RESULTS**

Analysis	Pre-Treatment	Post Treatment
Concentration	9%	9%
pH	8.34	8.42
Odor	Severe	None
Bacteria	10 <sup>6</sup>	0
Tramp Oil	.04 ppm	.01 ppm



### ClearWater Tech, LLC

Ozone Systems for Water & Air Purification

800-262-0203 • 805-549-9724 • 850-E Capitolio Way, San Luis Obispo, CA 93401

e-mail: sales@cwtozone.com • www.cwtozone.com