



Global Energy Partners, LLC
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**OPERATIONS EVALUATION REPORT –
PRESSURIZED OZONATION SYSTEM, NORTH
MISSISSIPPI MEDICAL CENTER LAUNDRY
OPERATIONS
– FINAL REPORT –**

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REPORT SUMMARY

This report describes ozone and the benefits of its use in healthcare laundry operations. In particular, case studies of two ozone applications – one in a 650-bed regional medical center and another in a 131-bed skilled nursing and rehabilitation facility – highlight and quantify ozone’s benefits.

What is Ozone?

Ozone is a form of oxygen formed by the breakdown of elemental, diatomic oxygen and the recombination of a percentage of the oxygen atoms into a gaseous triatomic molecule (O₃).

Although diatomic oxygen is a powerful oxidizing agent in its own right, ozone has much stronger oxidizing properties and reacts more quickly, often in fractions of a second, with a wide range of substances. In addition, ozone is one of the most effective biocides known to science, better even than chlorine, bromine, and other commonly used disinfectants.

In its role as a powerful oxidant and biocide, ozone works in the context of laundry facilities to boost the cleaning activity of the various chemicals and chemical compounds. It accomplishes this by:

- Replenishing oxygen in the wash water;
- Purifying and disinfecting the wash water;
- Softening the wash water;
- Decomposing fats, oil, and grease (FOG); and
- Preventing redeposition of soils.

The Benefits of Ozone Laundry

The benefits of ozone’s use in laundry can be categorized as either measurable or non-measurable. Measurable benefits typically accrue to the laundry system’s owner and can be valued and measured in dollars. Non-measurable benefits are typically qualitative in nature, but some can be quantified.

The measurable benefits of ozone in hospital laundry are relatively well documented and may include reduced:

- Energy costs,
- Drying time,
- Chemical and detergent costs,
- Water and sewer costs,
- Labor costs, and
- Linen replacement costs.

Most of the non-measurable benefits of ozone are highly subjective, but they can be significant. The following non-measurable benefits are often mentioned in testimonials of ozone laundry system owners:

- Increased fabric softness,

- Improved fabric smell,
- Eliminated static cling,
- Reduced acidity,
- No reaction with CHG antiseptic present on fabrics to cause permanent stains,
- The ability to mix white and colored linens, and
- Improved linen availability.

Large Rural Hospital Application

Several entities, including the Tennessee Valley Authority (TVA) the City of Tupelo (MS) Water & Light Department cooperated in the implementation of an ozone laundry system on a tunnel washer at the 650-bed North Mississippi Medical Center (NMMC) in Tupelo, MS. TVA identified Alliance Laundry, which had expertise in tunnel washers, and IndustrOzone, a manufacturer of ozone laundry systems, as partners in the demonstration.

In February 2004, Alliance installed three corona discharge ozone generators manufactured by IndustrOzone. With the ozone generators costing \$84,900, the total cost of the ozone system was \$126,900, which includes the \$42,000 cooling tower (but does not include Tupelo Water & Light Department’s \$50,000 contribution towards the project).

Table RS-1 shows that the estimated annual impacts on operating costs at NMMC, based on the savings documented during the first few months of operations, decreased by about 13 percent. This figure is especially remarkable considering that even though there were no energy savings at NMMC, the ozone system should pay for itself in about eight months.¹

Table RS-1 Estimated Annual Operating Cost Impacts of Ozone Laundry System at NMMC

Estimated Annual Operating Costs				
Operating Costs	Before Ozone	After Ozone	Change	Percent Change
Chemicals	\$72,000	\$61,200	– \$10,800	– 15%
Labor	725,000	652,500	– 72,500	– 10%
Replacement linens	700,000	595,000	– 105,000	– 15%
Totals	\$1,497,000	\$1,308,700	– \$188,300	– 13%

All the parties involved or affected by the use of IndustrOzone’s ozone laundry system at NMMC have been very pleased with the results. The benefits expected of the system materialized early on and have exceeded expectations. The only tweaking in the implementation was the balancing of the water temperature and the continued use of oxygen bleach in the wash water. After a couple of short weeks, those issues were settled and the system has been running flawlessly since, providing cleaner, odor-free linens.

¹ Not including the \$50,000 contribution from the Tupelo Light & Water Department.

Nursing Home Application

Another application of ozone in healthcare laundry was sponsored by TVA at Community Care of Rutherford County, a 131-bed skilled nursing and rehabilitation facility in Murfreesboro, Tennessee. Community Care of Rutherford County installed an IndustrOzone ozone system in January 2002 at a cost of \$18,000.

The resulting savings have been significant, considering the relatively small investment. Table RS-2 shows the annual impacts on operating costs at Community Care of Rutherford County. Chemical costs have also been reduced, but variable. Based on the below figures, the simple payback for this system, was just over six months.

Table RS-2 Annual Operating Cost Impacts of Ozone Laundry System at Community Care of Rutherford County

Operating Costs	Annual Savings
Energy	\$13,200
Replacement linens	21,600
Totals	\$34,800 / year

Non-financial impacts have also been very favorable at Community Care of Rutherford County. There has been a dramatic decrease in sheer burns and a tremendous improvement in linen odor, improved linen softness, and decreased volume of re-wash items.

1 BACKGROUND

1.1 What is Ozone?

Ozone is a form of oxygen found naturally in the Earth's atmosphere. In its most stable form, oxygen exists as a gaseous diatomic molecule (O_2). Ozone is formed by the breakdown of elemental, diatomic oxygen and the recombination of a percentage of the oxygen atoms into a gaseous triatomic molecule (O_3). Ozone is unstable and will begin to degrade to diatomic oxygen within a few minutes. Ozone has an odor that has been described as clean and similar to the smell after a lightning storm or the smell of clothes after being outside on a clothesline.

Although diatomic oxygen is a powerful oxidizing agent in its own right, ozone has much stronger oxidizing properties and reacts more quickly, often in fractions of a second, with a wide range of substances. In addition, ozone is one of the most effective biocides known to science, better even than chlorine, bromine, and other commonly used disinfectants. Unlike the latter substances, however, ozone does not form hazardous disinfectant by-products (DBPs) such as dioxin and nitrites that are harmful to the environment or are toxic to animals and humans. Once ozone has fully reacted with substances in water or air, excess gas decomposes quickly to normal oxygen and is reabsorbed into the atmosphere.

Ozone is created in nature by electric discharge in oxygen, such as lightning, and by the interaction of ultraviolet (UV) light with oxygen, as in the case of the upper atmosphere. Synthetically, ozone is created in the same ways, either using a corona discharge or UV lamps. Most ozone for laundry applications is created using the corona discharge method.

The corona discharge method involves passing dried air through an electrical field or corona. The electrical current causes diatomic oxygen molecules (O_2) to "split" into two oxygen atoms. These unstable oxygen atoms combine with diatomic oxygen molecules to form triatomic ozone molecules. The air feeding the ozone generator must be very dry because the presence of moisture affects ozone production and causes the formation of nitric acid, which is highly corrosive and can damage the ozone generator itself, as well as laundry equipment.

1.2 Ozone's Use in Laundry

In its role as a powerful oxidant and biocide, ozone eliminates or alleviates a variety of common laundry problems. Although the properties of ozone have been known and studied since the mid-19th century, it is only recently that the utility of this substance for the commercial and industrial laundry industries has been discovered.

To be used in laundry operations, ozone must be introduced into the wash water. There are a variety of ozone laundry systems available on the market today, as well as a variety of different methods for introducing the ozone into the wash water. The solubility of ozone – or its ability to dissolve in water – depends on the water temperature and the ozone concentration in the gas phase. The higher the concentration of ozone in the gas being introduced into the water, the more soluble it is. However, the reverse is true of water temperature. The higher the water temperature, the less soluble ozone is. In addition, as

shown in Table 1-1, the life of ozone molecules is shorter in warmer water. For these reasons, colder wash water is preferable for ozone systems.

Table 1-1 Typical Ozone Half-Life as a Function of Water Temperature

Water Temperature	Ozone Half-Life
59°F	30-minutes
68°F	20-minutes
77°F	15-minutes
86°F	12-minutes
95°F	8-minutes

Source: Ozone Solutions, Inc.
www.ozoneapplications.com.

Once the ozone generated, how it is introduced into the wash water is the primary factor in determining the efficacy of the system. There are two basic ways of introducing the ozone into the water:

- **Bubbling**
This method involves pumping the ozone gas directly into the wash drum while the cleaning cycle takes place. Bubbling limits the contact time between the ozone and the water to the time it takes the bubble to rise from the bottom of the drum to the top. Mixing of the ozone gas and water is minimal due to the lack of pressure within the washer drum. As a result, this method leads to the release of a significant volume of ozone into the work environment.
- **Dissolving**
This method uses a venturi to create a vacuum that educts (pulls) the ozone gases into the delivery stream of cold water being sent to the washer. Dissolution of the ozone gas is facilitated by increasing the water pressure.

Ozone works in the context of laundry facilities to boost the cleaning activity of the various chemicals and chemical compounds. It accomplishes this in several ways:

- Replenishes oxygen in the wash water,
- Purifies and disinfects the wash water,
- Softens the wash water,
- Decomposes fats, oil, and grease (FOG), and
- Prevents redeposition of soils.

The benefits of using ozone in laundry are many and are discussed in the next section.

2 THE BENEFITS OF OZONE LAUNDRY

A properly designed and installed ozone system will have an almost immediate positive impact for its owner, its operators, and users of the linens it launders. Ozone offers institutions valuing quality the opportunity for consistently cleaner, fresher linens through a technologically superior laundry process that works in concert with other laundry components and produces significant benefits that can be re-applied and invested in enhancing customer relationships.

The benefits of ozone in the laundry can be categorized as either measurable or non-measurable. Measurable benefits typically accrue for the system's owner and can be valued and measured in dollars. Non-measurable, yet still altogether valuable benefits accrue for the personnel operating the system and patients who use the linens. Non-measurable benefits are typically qualitative in nature, but some benefits can be quantified.

2.1 Ozone's Measurable Benefits

The measurable benefits of ozone in hospital laundry are relatively well documented and typically include the following:

- **Reduced Energy Costs**
Using ozone allows laundry to be washed in cold water, eliminating the need to heat water for sterilization purposes and resulting in significant energy savings. This benefit includes the energy used to dry the linens (see following benefit).
- **Reduced Drying Time or Lower Dryer Temperature**
Dissolved ozone in the wash water expands the fiber of the linens. This allows freer airflow through the linens. As a result, operators can either shorten the drying time or reduce drying temperature. Either practice reduces energy consumption in the dryer and increases overall productivity.
- **Reduced Chemical and Detergent Costs**
Ozone is such an effective disinfectant that fewer chemicals are required during the wash cycle. This can amount to significant annual savings on chemical costs and a safer work environment.
- **Reduced Water and Sewer Costs**
With less chemicals injected into the wash, fewer rinse cycles are needed to flush linens of chemical residuals. This reduces water consumption and discharge to the sewer. In tunnel washers, operators can either reduce cycle times, which speeds up the wash process, or they can reduce the number of chambers used.
- **Reduced Labor Costs**
Since ozone cleans more effectively, re-washes of heavily soiled or stained items are needed less frequently, which reduces the labor necessary to separate these items and re-wash them.

- **Reduced Linen Replacement Costs**

Using ozone extends linen life by reducing the length of the laundry process and, in tandem, the time the linens are exposed to chemicals throughout the laundry process. The reduced wear on the linen also decreases lint production in the dryer.

There is a considerable range of benefit values, as shown in Table 2-1. The shaded benefit examples in Table 2-1 are from actual installments of ozone laundry systems. These values, although few in number, indicate that reduced energy costs are likely to be the greatest of the measurable benefits of ozone use in laundry.

Table 2-1 Summary of Measurable Benefits of Ozone in Hospital Laundry

Measurable Benefit	Decrease	Source
Reduced energy costs	20 - 100%	Equipment manufacturers' claims ^{1,2}
	95%	370-bed senior citizen's home ²
	75%	200-bed hospital ³
	91%	120-bed nursing home ³
Increased linen life	15 - 50%	Equipment manufacturers' claims ^{1,2}
	66%	242-bed nursing home ⁴
	60%	120-bed nursing home ⁴
Reduced drying time	10 - 30%	Equipment manufacturers' claims ^{1,2}
	13%	200-bed hospital ³
	22%	120-bed nursing home ³
Reduced chemical/detergent costs	35 - 70%	Equipment manufacturers' claims ^{1,2}
	92%	370-bed senior citizen's home ²
	43%	200-bed hospital ³
	36%	120-bed nursing home ³
	43%	120-bed nursing home ⁴
45%	1,112-bed hospital ⁵	
Reduced water/sewer costs	10 - 75%	Equipment manufacturers' claims ^{1,2}
	27%	200-bed hospital ³
	35%	120-bed nursing home ³
	25%	1,112-bed hospital ⁵
Reduced wash cycle time (reduced labor costs)	10 - 45%	Equipment manufacturers' claims ^{1,2}
	46%	370-bed senior citizen's home ²
	20%	1,112-bed hospital ⁵

Sources: 1) IndustrOzone: www.polarwash.com or www.industrozone.com; Alliance Commercial Equipment: www.ozonelaundrysystems.com or www.alliancelaundryequipment.com; Agrimond: www.agrimond.com; Ozonet: www.ozonet.com; EnviroCleanse Systems: www.envirocleanse.com.
 2) E Technologies Ltd: www.etechnologies.com.
 3) EnviroCleanse Systems: www.envirocleanse.com.
 4) Innovative Chemical Systems, Inc.: www.icschemicals.com.
 5) North Carolina Division of Pollution Prevention: www.p2pays.org.

2.2 Non-Measurable Benefits

Most of the non-measurable benefits of ozone are highly subjective, but they can be significant. The following non-measurable benefits are often mentioned in testimonials of ozone laundry system owners:

- Increased fabric softness, fluffiness, and brightness due to reduced chemical residues
- Improved fabric smell due to the elimination of soil odors
- Eliminated static cling after drying
- Reduced acidity and the accompanying reduction of decubitus ulcers (bedsores) due to reduced chemical residues
- Unlike chlorine, ozone does not react with CHG antiseptic present on fabrics to cause permanent stains
- The ability to mix white and colored linens in the same batch due to the ability to eliminate bleach
- Improved linen availability due to the reduction in re-washes

3 LARGE RURAL HOSPITAL APPLICATION

The first case study involves the use of ozone in a tunnel washer at a large regional medical center – the first hospital tunnel washer with a pressurized, dissolved ozone system in the U.S.

3.1 Players

Several entities – including healthcare, utility, and manufacturer – cooperated in the implementation of an ozone laundry system on a medical center tunnel washer.

3.1.1 North Mississippi Medical Center

North Mississippi Medical Center is a 650-bed regional referral center in Tupelo, Mississippi. It holds the distinction of being the largest hospital in Mississippi and the largest non-metropolitan hospital in America. The medical center serves more than 650,000 people in 22 counties in north Mississippi, northwest Alabama, and portions of Tennessee.

3.1.2 Tennessee Valley Authority

Established in 1933, the Tennessee Valley Authority (TVA) is a federal corporation and the nation's largest public power company. As a regional development agency, TVA supplies affordable, reliable power, and stimulates sustainable economic development in the public interest. Their goals in that respect are to increase capital investment and attract and retain better-paying jobs for the people TVA serves. TVA sells wholesale power to the Water & Light Department of the City of Tupelo, Mississippi.

3.1.3 Tupelo Water & Light

The City of Tupelo's Water & Light Department provides electric, water and wastewater services to approximately 15,000 residential, commercial, and industrial customers in Tupelo and parts of Lee County. The Tupelo Water & Light Department provides many services to its commercial and industrial customers through its Comprehensive Services Program (CSP) with TVA. Through the CSP, TVA and Tupelo Water & Light Department provide engineering and technical assistance for commercial and industrial customers at no charge. CSP covers all areas of energy use, including technical services, energy use, and predictive maintenance.

As part of its involvement in this effort, the Tupelo Water & Light Department along with TVA contributed \$50,000 towards the cost of the ozone system at NMMC.

3.1.4 IndustrOzone/Alliance Commercial Equipment

IndustrOzone Technologies, LC of Raleigh, NC was founded in 1994 and is a leading manufacturer and provider of ozone laundry systems. By offering a better alternative to traditional laundry systems, IndustrOzone provides the best laundry improvement solutions for the hospitality, healthcare, institutional, and commercial laundry industries.

IndustrOzone is a market leader by being a perpetual student of not just ozone technology, but laundry technology as well. Working cooperatively with its customers, IndustrOzone

assesses each customer's laundry needs and tailors its ozone technology systems to meet those needs.

From the beginning, IndustrOzone has strived to safely apply ozone in a manner best suited to optimize the customer's benefits for the short- and long-term. IndustrOzone's first prototype was field tested for over a year before entering the market. IndustrOzone then sought to learn more about the laundry industry by working with the top laundry equipment dealers in the country – such as Alliance Commercial Equipment (Alliance) of Salt Lake City, UT – to ensure they were exceeding the needs of commercial laundry facilities.

IndustrOzone studied the impact of ozone on washing equipment by working with engineers from Unimac and other washing equipment companies to set system design criteria that assured there would be no short- or long-term equipment damage. These criteria involved dissolved ozone in measurable levels and the removal of undissolved ozone to help guarantee a safe and environmentally friendly system.

Specializing in tunnel washers, Alliance has been providing experienced consultation for the commercial laundry business since 1944. Due to the complexity of tunnel washer applications, IndustrOzone and Alliance work in tandem on all tunnel applications to assure the ozone systems meet the customers' needs and deliver the best long-term results to the customer. By working with Alliance as its sole dealer on all tunnel washer jobs, IndustrOzone and Alliance are able to apply their accumulated expertise to every ozone tunnel application.

3.2 Goals and Purpose

TVA and its distributors actively work to demonstrate environmental electrotechnologies that bring added value to the operations of large commercial and industrial customers. In that regard, TVA has implemented ozone projects in the past, including ozonation in food processing and ultraviolet germicidal irradiation for indoor air treatment.

Although ozonation had been used successfully in commercial conventional washing machines, its use in tunnel washers had not been demonstrated in TVA's service region. After locating Alliance Laundry, which had expertise in tunnel washers, TVA sought a hospital that would be interested in partnering on such a demonstration. NMMC expressed an interest in pursuing this project, and all the parties were brought together.

3.3 Approach

IndustrOzone began by working with Alliance to study NMMC's needs and implement a system that was appropriate for NMMC's operation. The laundry operations at NMMC are collocated in the Service Center – a building separate from the main medical campus – with NMMC's supply service and central kitchen. NMMC's laundry facility handles laundry from 58 healthcare facilities in northern Mississippi and northwest Alabama, including: six hospitals, four nursing homes, 38 clinics, and ten other facilities, six of which are unaffiliated with NMMC. On the whole, these 58 facilities house 1,162 patient beds and produce 6.7 million lbs of laundry per year, or 18,350 lbs per day. As a result, the NMMC laundry facility operates nine-hours-per-day, seven-days-per-week.

There are four washing machines in the NMMC facility – three washer/extractors and one tunnel washer. The tunnel washer is a Lavatec Lavatrac, shown in Figure 3-1. Tunnel washers are continuous process washers used by institutions and commercial laundries that process large amounts of laundry on a relatively continuous basis. It is not unusual for tunnel washers to be capable of processing loads greater than 100 pounds and to be able to process several thousand pounds of laundry per hour.



Figure 3-1 Side (l) and Loading Chute (r) of Lavatec Lavatrac Continuous Batch Washer at NMMC

Tunnel washers use large amounts of hot water and chemicals for processing laundry and, depending on the nature of the facility, operate for extended hours. Fundamentally a continuous batch washer, or CBW – since they wash several loads of laundry simultaneously, they clean laundry based on a balance of time, temperature, chemicals, and mechanical agitation.

Examining this balance, there are several opportunities to make this process more efficient, enhance customer value, and enhance sales for an electric utility. Most ozone system manufacturers routinely work on strategies to reduce water consumption in tunnel washers. Because the throughput is directly related to time and capacity, manufacturers also focus their efforts on increasing capacity and reducing the amount of time required for each cycle.

From the energy and environmental perspectives, two major measurable benefits of ozone in laundry systems are water heating and chemicals use. Both areas can be influenced significantly by the use of ozonation. Ozonation of wash water makes it possible to clean

and sterilize materials using lower temperature water and fewer chemicals. Both of these offer significant benefits to owners and operators of laundries.

However, in the case of NMMC, energy savings were not possible. In the past, wash water was not heated using boilers, as is the typical method in large laundry operations. Historically, wash water at NMMC was heated using waste heat from an innovative 83-ton heat exchange system utilizing closed-loop, water-cooled heat pumps that cooled the laundry room. However, since ozone works better in cold water, NMMC needed to another way to discharge half the waste heat from the laundry room. This was accomplished by installing a 42-ton cooling tower at a cost of \$42,000. Now, the system produces sufficient hot water the washer/extractors, while the remainder is discharged via the cooling tower.

In February 2004, Alliance installed three corona discharge ozone generators manufactured by IndustrOzone – one of which is shown in Figure 3-2. Alliance used three ozone systems to maximize the use of ozone throughout the wash cycle. All systems use only dissolved ozone with pressurized water systems, which have the ability to measure ozone levels. This made the tunnel washer at NMMC the first hospital tunnel washer with a pressurized, dissolved ozone system in the U.S. Since some initial tuning and balancing of the system to accommodate the continued use of reduced amounts of oxygen bleach, the ozone system has been operating flawlessly.



Figure 3-2 Alliance/IndustrOzone Ozone System (l) and Corona Discharge Tubes (r)

With the ozone generators costing \$84,900, the total cost of the ozone system was \$126,900, which includes the \$42,000 cooling tower (but does not include Tupelo Water & Light Department's \$50,000 contribution towards the project).

3.4 Results

The three major benefits from the operation of the ozone system at NMMC were reduced chemical and detergent costs, reduced labor costs, and reduced linen replacement costs. How each of these benefits is detailed as follows:

- **Reduced Chemical and Detergent Costs**
 Chemical costs were reduced, but not eliminated entirely at NMMC because of the desire to retain some oxygen bleach use while the ozone system is being calibrated and the staff is getting used to its operation.
- **Reduced Labor Costs**
 Labor costs due to overtime were reduced ten percent because of the volume of laundry items needing to be re-washed because stains, odors, or soils were not adequately removed in the first washing had decreased 93 percent, from 600 lbs to 43 lbs per day.
- **Reduced Linen Replacement Costs**
 The cost for replacement linens was estimated to be the largest cost savings for NMMC, comprising just over one-half the operating cost savings.

Table 3-1 shows the estimated annual impacts on operating costs at NMMC, based on the savings documented during the first few months of operations. Overall, costs decreased by about 13 percent. This figure is especially remarkable considering that there were no energy savings at NMMC. Therefore, even without any energy savings, the ozone system should pay for itself in about eight months.²

Table 3-1 Estimated Annual Operating Cost Impacts of Ozone Laundry System at NMMC

Estimated Annual Operating Costs				
Operating Costs	Before Ozone	After Ozone	Change	Percent Change
Chemicals	\$72,000	\$61,200	– \$10,800	– 15%
Labor	725,000	652,500	– 72,500	– 10%
Replacement linens	700,000	595,000	– 105,000	– 15%
Totals	\$1,497,000	\$1,308,700	– \$188,300	– 13%

The cost reduction figures in Table 3-1 are even better than the benefits predicted prior to the installation of the system. Those figures predicted annual savings of just over \$102,000 with a resulting simple payback period of 15 months.

In addition to NMMC management’s positive response the measurable cost savings, the response to the results of the ozone system of NMMC staff has been overwhelmingly positive as well. Robert Watson, the Director of Laundry Services at NMMC, states that

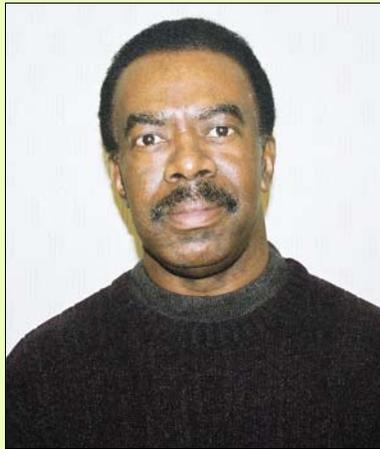
² Not including the \$50,000 contribution from the Tupelo Light & Water Department.

even after just a short operating period, several other benefits have been realized due to the ozone system, including:

- Complaints by nursing staff about fabric roughness have been eliminated due to the increased fabric softness and fluffiness resulting from reduced chemical residues
- Complaints by nursing and housekeeping staffs about poor fabric odor have been eliminated
- Complaints by laundry staff about static cling after drying have been eliminated;
- Many have remarked that the white linens – especially sheets – were noticeably whiter
- Bacteriostatic test results have shown no decrease in the cleanliness of laundry cleanliness due to the use of ozone
- The operation of the ozone system is simple, requiring only that the system be turned on in the morning, off at night, and that the system be told what type of laundry each load contained for the proper ozone settings to be carried out automatically
- NMMC’s maintenance supervisor concluded that the ozone system is less labor intensive than the balance of NMMC’s laundry system, both in terms of required maintenance

The ozone system installed at NMMC “is probably less labor intensive than the rest of the laundry system.”
“I was sold on the system two years ago having looked at other ozone laundry systems and doing my own research.”

Phillip Hartley,
Maintenance Supervisor,
North Mississippi
Medical Center



“Since we began using the ozone, we’ve had fewer complaints about fabric softness, fabric smell, and static. We’ve also had a lot of comments about the linens looking newer.”

Robert Watson,
Director,
Laundry Services,
North Mississippi
Medical Center

3.5 Lessons Learned

All parties involved or affected by the use of IndustOzone’s ozone laundry system at NMMC have been very pleased with the results. The benefits expected of the system materialized early on and have exceeded expectations. The only hitch in the implementation was the balancing of the water temperature and the continued use of oxygen bleach in the wash water. After a couple of short weeks, those problems were settled and the system has been running flawlessly since, providing cleaner, odor-free linens.

4 NURSING HOME APPLICATION

Another application of ozone in healthcare laundry was sponsored by TVA at a skilled nursing facility in Murfreesboro, Tennessee.

4.1 Players

Community Care of Rutherford County is a county-owned nursing home in Murfreesboro, Tennessee, which is located about 35 miles southeast of Nashville. This 131-bed skilled nursing and rehabilitation facility has a laundry staff of 5 to 6 persons who operate two Unimac 60 lb capacity washer extractors, as pictured in Figure 4-1. Water for the washer/extractors is heated electrically. Drying is provided by four gas-fired Unimac dryers (three 75 lb capacity and one 55 lb capacity).



Figure 4-1 Two Unimac 60 lb Capacity Washer/Extractors at Community Care of Rutherford County

4.2 Approach

Community Care of Rutherford County installed an IndustrOzone KA32 ozone system in January 2002 at a cost of \$18,000. The KA32 system, pictured in Figure 4-2, is designed for light to medium soil conditions and can accommodate up to 250 lbs of washer capacity and instantly deliver in excess of one part per million of dissolved ozone with little or no ozone residual odor. These models also feature the Clear-View™ piping system that allows operators to see the ozone gas as it enters through the patented ozone injection system, and watch as the ozone gas completely dissolves in to the water before it enters the washer/extractors.



Figure 4-2 IndustrOzone KA32 Ozone System with Capacity of up to 250 Lbs.

4.3 Results

Table 4-1 shows that the annual impacts on operating costs at Community Care of Rutherford County have been significant and quickly achieved, as is the case in most ozone laundry installations. Since the installed cost of the system was \$18,000, the simple payback, based on the figures in Table 4-1, was just over six months. Unlike most ozone laundry systems, Community Care of Rutherford County has not realized any water savings due to the very short wash cycles used prior to installation of the ozone system.

Table 4-1 Annual Operating Cost Impacts of Ozone Laundry System at Community Care of Rutherford County

Operating Costs	Annual Savings
Energy	\$13,200
Replacement linens	21,600
Totals	\$34,800 / year

Non-financial impacts have also been very favorable at Community Care of Rutherford County. There has never been a history of bedsores at the facility, but there has been a dramatic decrease in sheer burns.³ Community

“Since the date of installation we have seen a drastic reduction in kilowatts used. The savings will easily recover the purchase cost. I asked and received approval from the State of Tennessee to use this system prior to its installation.

*“Several other cost benefits to be or being derived from its use are:
 1) Longer linen life/usefulness;
 2) Shorter drying time;
 3) Linen does not smell, and
 4) Washing cycle (time) was reduced.*

Charles M. King,
 Administrator,
 Community Care of
 Rutherford County

³ A type of burn most often associated with the rubbing of skin across fabric as when transferring a patient from a bed to a chair or vice-versa – analogous to a “rug burn.”

Care of Rutherford County has also reported tremendous improvements in linen odor, improved linen softness, and decreased volume of re-wash items.

4.4 Lessons Learned

Mr. Charles “Mark” King, Administrator of Community Care of Rutherford County, has stated that he would “recommend any and all to try this radical equipment.” He also states that maintenance has been minimal on the system and that he is very pleased with its performance.