

OZONE LAUNDERING

Presentation to IHEA 25 mins

Slide 1

Welcome all, and thank you for the opportunity to speak today. For the next 30 mins you are going to hear about a new technology that goes well beyond being just a concept.

Ozone technology is currently being used in more than 15,000 laundries throughout the world and here in Australia there are already more than 20 installations around the country.

Slide 2 (3 molecules)

In 1840 Swiss scientist Christian Schoenbein discovered ozone. Although the properties of ozone have been known and studied since the mid-19th century, it is only during the last two decades that it has been successfully applied to commercial and industrial laundry applications. Ozone is a gas that is formed by the breakdown of elemental, diatomic Oxygen and the recombination of a percentage of the oxygen atoms into a triatomic molecule known simply as O₃.

Slide 3 (Ozone in nature)

Whilst normal oxygen is a powerful oxidizing agent in its own right, ozone has much stronger oxidizing properties. Ozone reacts more quickly with a wider range of substances. Ozone is created by nature in the lower levels of the atmosphere typically by lightning. The sweet smell after a heavy electrical storm is a combination of ozone and the elimination of odours as it is an exceptional deodoriser. This deodorising ability is reflected with ozone laundering.

Slide 4 (NASA)

Initially, in 1906, ozone was used as a clarifying, deodorizing and purifying agent in drinking and wastewater treatment plants in Europe, where it gained a level of acceptance over the years. In the late 1970's, the Jet Propulsion Laboratory NASA and various military departments in the U.S investigated its properties. The main studies undertaken by NASA evolved due to the fact humans need water to survive, and back in the 70's they were still talking about the possibilities of us colonising the moon. These studies formed the basis of investigations into the disinfecting and resource conservation benefits of ozone in industry.

Slide 5 (On site generation)

Because ozone reacts so easily with other elements and has a very short life span, it exists for only a short time before combining with another substance or reverting to normal oxygen. Accordingly, **it must be generated on-site at the point of use at the time it is to be used.** Ozone cannot be stored in containers and distributed like chlorine and peroxide.

Once ozone has fully reacted with substances in water or air, excess gas decomposes quickly to normal oxygen and is reabsorbed into the atmosphere or remains dissolved in the water.

Slide 6 (Other applications)

Today Ozone is used in many applications including:

Cooling Tower treatment

Drinking water and waste water treatment.

Dallas, San Francisco, Paris, Shanghai, and Mexico City are just a few cities that utilise ozone for treatment of drinking water and/or treatment of wastewater. The anti pathogen effects of ozone have been substantiated for several decades. Its killing action upon bacteria, viruses and fungi serve as the basis for its increasing use in disinfecting municipal water supplies in cities worldwide.

Bottled water (next time you buy a bottle of Pump water, check the label on the side, it say's ozonated water)

Ozone is also used extensively in Aquaculture, fishing farms
Swimming pools, spas and aquariums just to name a few

Slide 7 (Health & Saftey)

Unlike chlorine and other hazardous disinfectants, ozone does not need to be handled, transported or stored, thereby posing little hazard to personnel at the facility.

This chart represents a sample of monitoring performed at Churches of Christ Oak Towers in Oakleigh in January this year. The testing was commissioned and overseen by Sustainability Victoria, The testing showed peak levels of ozone in the workplace were at least 8 times lower than the allowable level. The highest reading obtained was 0.014 ppm. The Australian Occupational Heath and Safety regulations limit exposure over an eight-hour working day of 0.1 ppm. As you can clearly see, ozone laundering falls well under the permissible level. Independent air quality testing at several sites has continually recorded levels between 0 and .02 in the workplace.

Whilst most ozone laundry systems are simply not large enough to produce levels higher than the allowable, it is comforting to know that ozone can be typically smelt at .01 ppm which is 10 times lower than the TWA.

In laundry we are dissolving ozone in the wash water only, we are not pumping ozone into the workplace. The only ozone that can find it's way to the laundry workplace is through some small amounts of residual ozone produced through the venting of the washer extractors.

In extreme cases, where ventilation is unavailable, it may be beneficial to utilize ozone destruct devices on washer vent points, which is an easy and inexpensive exercise.

Slide 8 (laundry pics)

Every laundry is different. Aged care laundries vary from hospital, hospitality, work wear etc.

We have different degrees and types of soiling and stains. We have to deal with different textiles. Laundry is a challenge; it's definitely not as easy as some would think.

So far ozone has proven to show great benefits to Hospitality and Healthcare, and in most commercial laundry applications.

Ozone suits Healthcare laundry perfectly, later in the presentation we'll have a look at a selection of case studies to confirm this.

Slide 9 (Does ozone really work)

As mentioned earlier, there are now more than 20 ozone laundry sites around Australia, most of which have been installed in health care laundries. Many operators have purchased another system for another site following their satisfaction with the results they have been able to witness 1st hand.

Great savings and quality are continually being repeated. References speak for themselves.

Slide 10 (washer benefits)

To date we have been able to establish the following:

Wash cycles are much shorter, traditional hot temperature wash times in healthcare are approx 60 mins. With Ozone we get these times down to around 35 minutes, because we use less fills and we don't have to wait for temperatures to be achieved. This equates to 40% less water and trade waste. Traditional wash programs consist of Prewash, mainwash and 3 rinses. With Ozone we are achieving a great result with 1 mainwash, and 2 rinses for normally soiled textiles.

Slide 11 (Trade waste)

For those of you here today familiar with water and trade waste costs, you will be aware of the cost impact of high levels of certain minerals and metals. These costs are rising significantly as we speak, with ozone laundering we have been able to demonstrate the following.

Chemical oxygen demand 41% reduction

Suspended solids 41% reduction

TDS 42%, Sulphur 52%, Magnesium 52%, Sodium 61%.

Slide 12 (Trade waste)

Phosphorous 66%, Nitrogen 35%, and Salinity 52%. It's fair to say, that your water providers are very excited about the benefits ozone has for laundry.

An independent test report is available on request, which I'm happy to pass on.

Slide 13 (energy & heating)

All sites are washing with cold water only which has resulted in 95-100% less cost to heat water via gas hot water services and/or steam boilers
Where electric heating elements are utilized in smaller laundries, they are disconnected, or reprogrammed not to heat.

Slide 14 (clean towels)

Yes, this is all great, short wash times, less water, no heating costs, but what does the linen look like after it's washed.

Empa swatch test results provided by several chemical suppliers have consistently shown the following:

Increased whiteness value, Intrinsic greying and yellowing results have all been excellent, in fact usually better than what has been achieved pre ozone, and much better than any industry standards in Australia.

There is no doubt linen is whiter, and colours come up brighter, especially with personal clothing.

Other results for Mineral oil/carbon, blood, milk/chocolate, and red wine etc have consistently come up excellent.

These results have been achieved with approx 50% less chlorine bleach, and we eliminate completely, the use of peroxide. Rewash levels have not yet exceeded 5% in any installation we have completed. Typically rewash levels are in the 1-3% range which is exactly the same as traditional laundering.

Slide 15 (Dryers)

Ozone also reduces your drying costs by 30-40%.

One of ozone's terrific attributes is its ability to open textile fibres, which allows greater dewatering in extraction. Ozone also, because of its tremendous specific properties will oxidise minerals still present in the wash bath. These minerals, when present impede dewatering of linen.

Lower moisture retention in linen means faster drying times.

Slide 16 (productivity)

Ozone laundering means reduced labour costs. If we can wash faster and dry faster, surely we have some gains to be made in productivity. Of course the achievable level will vary from laundry to laundry due to many factors, but if managed well, your laundry can reduce labour significantly.

(if you look carefully at the photo, taken at Churches of Christ Aged Care in Oakleigh, yes the staff are actually smiling, even though management has reduced their hours.

Slide 17

Longer linen life

Ozone allows shorter wash cycles in cold water, with less bleach. Shorter drying times without any chlorine residual present in the linen.

Linen must last longer with Ozone laundering, by how much? Obviously this saving whilst significant, is a little too subjective to quantify. Estimations range from 20%-30%. Nevertheless we have the data, which indicates tensile strength loss is significantly less than traditional washing. Common sense says, cold water, shorter wash times, less bleach, shorter drying times must mean longer linen life.

Slide 18 (AS4146)

Does ozone laundering comply with Australian Standard AS4146-2000.

This is a question that comes up regularly.

The answer is Absolutely and categorically YES.

Let me give you an understanding of how.

Ozone is one of the most effective biocides known to science, far quicker and more effective than chlorine, bromine and other commonly used disinfectants. Unlike the latter substances, however, it does not form hazardous disinfectant by-products (DBP's) such as dioxins and nitrites that are harmful to the environment.

Ozone will inactivate viruses on contact, even at very low residual concentrations. Viruses have no protection against oxidative stress. As an example, polio subjected to ozone at only 0.012 ppm, is destroyed in less than 10 seconds. Mould and mildew are easily controlled by Ozone present in the air and in water. Giardia and Cryptosporidium are very susceptible to Ozone whereas normal levels of Chlorine in potable water are not affected.

Bacteria are microscopically small single-cell creatures having a primitive structure. They take up foodstuffs and release metabolic products, and multiply by division. The bacteria body is sealed by a relatively solid cell membrane. Ozone interferes with the metabolism of bacterium cells, through inhibiting and blocking the operation of the enzymatic control system.

A sufficient amount of ozone breaks through the cell membrane, and this leads to the destruction of the bacteria.

Viruses are small, built of crystals and macromolecules. Unlike bacteria, they multiply only within the host cell. Ozone destroys viruses by diffusing through the protein coat into the acid core, resulting in damage of the viral RNA. Ozone destroys the exterior protein shell by oxidation.

Hepatitis A, B and non-A non-B, among many others, are susceptible to the virucidal actions of ozone.

Most research efforts on ozone's virucidal effects have centred upon ozone's propensity to break apart lipid molecules. Once the envelope of the virus is fragmented, its DNA or RNA core cannot survive.

Fungi families are inhibited and destroyed by exposure to ozone. The walls of fungi are multi layered and are composed of approximately 80% carbohydrates and 10% proteins. Ozone has the capacity to diffuse through the fungal wall thus disrupting cellular activity.

Indicator bacteria in effluents, namely coliform and pathogens such as Salmonella show high sensitivity to ozone. Other bacterial organisms susceptible to ozone's disinfecting properties include Streptococci, Shigella, Legionella, Pseudomonas, enterocolitis and E-coli to name a few. Ozone

destroys both aerobic and importantly, anaerobic bacteria, which are mostly responsible for the devastating sequel of, complicated infections, as exemplified by unhealable ulcers and the onset of gangrene.

AS4146 allows for thermal disinfection and or chemical disinfection.

With ozone, we are washing in cold water, so obviously we are using the chemical disinfection method.

The standard states that if we rely on chemical disinfection, we must validate the process, which we do for every healthcare installation, by taking last rinse water samples and getting them lab tested for bacteria counts.

A report is generated, and can be kept for accreditation purposes.

4 ozone laundry sites have already passed accreditation with excellent marks.

In fact, the aged care agency is very positive about ozone laundering, as they recognize it is impossible to thermally disinfect everything we launder.

Try washing all personal clothing, blankets and curtains at 71 deg for 3 minutes, or 65 degrees for 10 minutes.

An ozone system for health care should include a fail-safe delivery system option that will guarantee ozone delivery for every single wash cycle, every day. So it's not possible to wash without the correct dose of ozone.

Slide 19

CASE STUDIES, Please feel free to contact any of the following facilities mentioned. They have all given approval to do so.

The Mews

60 bed facility

18 month payback- client has reduced labour further and now believes a payback of 12 months is more accurate

Slide 20

CASE STUDY (RSL Pinjarra Hills)

100 bed facility

payback less than 2 years

Slide 21

CASE STUDY (Eastside Care ~ Lillian Martin ACF)

60 beds

Tas does not pay for water, but payback still less than 3 years

Slide 22

CASE STUDY (RSL Alexandra Headland)

80 beds

payback approx 2 yrs

Slide 23

CASE STUDY (Churches of Christ Oakleigh)

90 beds, but catering for extra facilities, approx 3500 kgs per week, payback less than 2 yrs, or less if they do more laundry. COC have installed another system at their new Arcadia site in Nth Essendon.

A report on this installation, commissioned by Sustainability Victoria will be available any day now. The report includes data collection of water use, trade waste quality, electricity use, gas, labour, chemicals, air quality monitoring, bacteria testing and wash quality results all pre and post ozone. This is the first time the government has been involved in an ozone laundry project in Victoria, and it will be great to have that data once available.

Slide 24

Freemasons Homes Tas

120 beds, another free water scenario, payback less than approx 2 yrs

Slide 25 Central Park VIC

190 high care beds, with only a 45 kg and 30 kg washers. Laundry was operating 7 days week, 10 hrs a day. Labour costs were frightening. No room to add more washing capacity. Some of the most expensive personal clothing ever seen in an aged care facility.

Payback approx 12 months.

Slide 26 RSL War Veterans Syd

40 bed hostel, personals only, 1 x 16 kg washer only, payback approx 4.5 yrs, but have ordered 4 more systems for the rest of the sites. They were having major issues with wash quality and damage to personal clothing.

Slide 27 Vasey RSL VIC

State of the art laundry, with Barrier laundry design. Payback estimated at approx 2 yrs.

Slide 28 Sunshine Coast Commercial Laundry Qld

15 tonne week commercial laundry, 15-30 yr old machinery. Certainly our biggest challenge to now, please to say all is working fantastic, client is one of our best references.

Slide 29 Sunshine Coast

As you can see, significant savings were made with a payback of approx 2 yrs

Slide 30

For the record, we are not the only distributor of ozone laundry systems in Australia, there are actually more than 20 manufacturers around the world, and several Australian distributors are now trialling systems for release to the market as we speak.

There is no doubt ozone laundering will become the norm for health care laundries in Australia in the very near future.

Thankyou very much for the opportunity to present today. If you have any queries, I'll be on the forum later on to answer any questions. Thankyou