

# After-Market Spa Ozone

## Technical Training & Resource Guide

Updated October 2010

DEL  ozone™

The logo for Del Ozone features the word "DEL" in a grey, sans-serif font. To its right is a stylized "ozone" where the "o" is a yellow circle with a white center, the "z" is a yellow circle with a white center, and the "one" is in a grey, sans-serif font. A trademark symbol (TM) is located at the bottom right of the word "ozone".

Fact: there are over 3 MILLION expired spa ozonators in the field



## Introduction

This technical guide was created for spa technicians to help identify expired or inoperable DEL spa ozone generators, both past and current models.

This document is also helpful for distributors who cater to spa technicians so they may help identify a product for the technician who is on the other end of the phone.

To create this document, spa technicians and spa distributors were interviewed to find out what they knew, what they thought they knew, and what they have always wanted to know.

In reading this document, you will learn the pros and cons of the three types of ozone: UV, CD Chip, and CD Electrode. This knowledge will empower you to make the right replacement choice.

Misunderstandings about bubbles and smelling ozone brings us to the last section. Learn how to improve ozone injection which increases the quality of the spa water, while adding life to the cover, pillows, and fittings.

**Two new tools are available to enhance your business while increasing customer satisfaction: Ozone Test Kits and Service Stickers**

**[www.youtube.com/delozone](http://www.youtube.com/delozone) - SEE HOW EASY DEL'S SPA OZONE TESTS ARE TO USE**



## DEL's Spa Ozone Generators

- DEL has manufactured ozone generators for spa manufacturers (OEMs) since the early 90's (almost 20 years)
- Over the last 12 years, OEMs have overwhelmingly chosen DEL over the competition as their "factory-installed ozone"
- In order of years in the field, they include:

### UV



ZO-301 / ZO-312 – discontinued



ZO-300 / ZO-302 – discontinued

### CD Chip



CDS-16



Spa Eclipse

### CD Electrode



Platinum  
discontinued



MCD-50



T-3

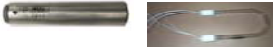




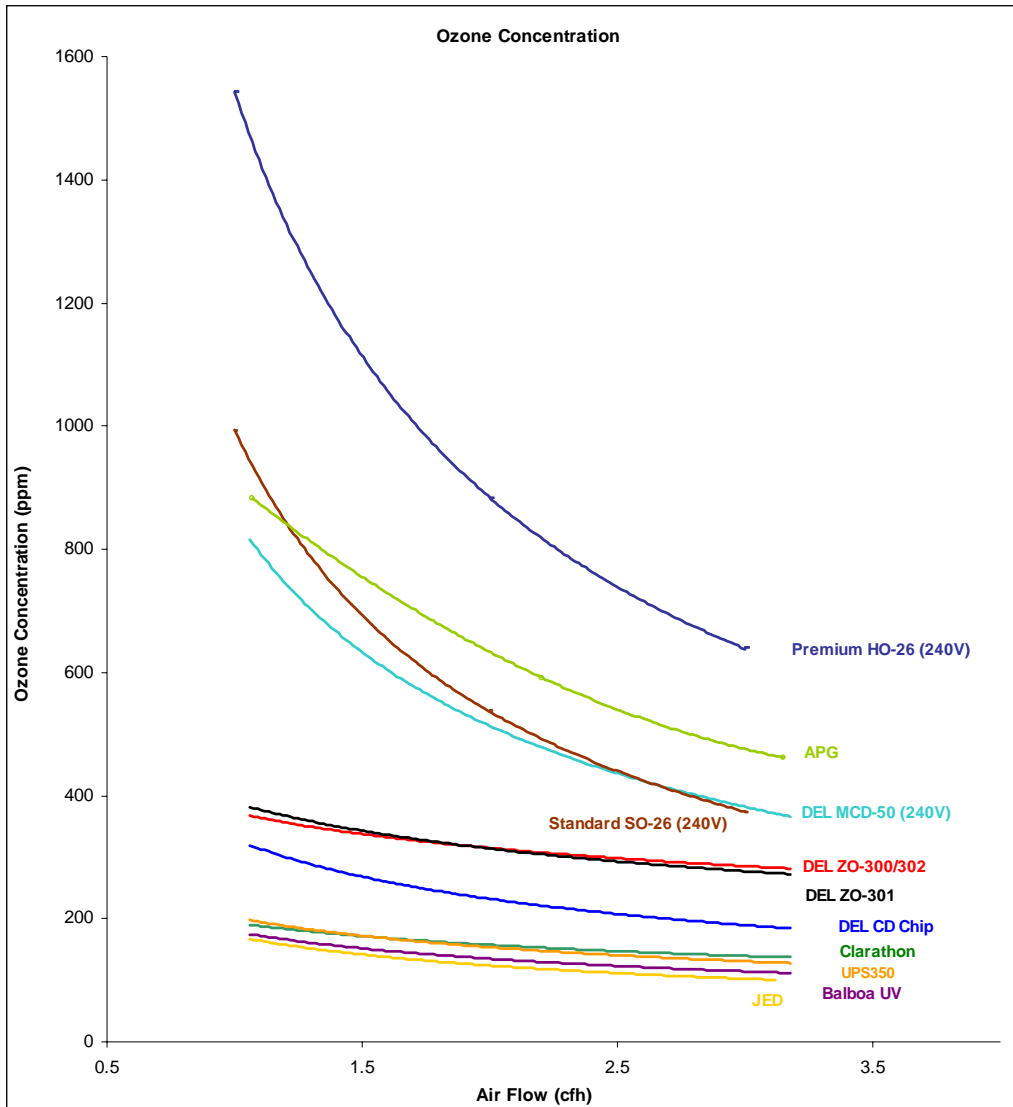
SO  
(Standard  
Output)



HO  
(High  
Output)

# DEL ozone™

<b>Full name</b>	Ultra Violet 	Corona Discharge Chip 	Corona Discharge Electrode 
<b>Common name</b>	UV Lamp or UV Bulb. This is not the same as UV Sterilization.	CD Chip	CD Electrode
<b>Introduced to market</b>	1984	1998	1998
<b>Average lifespan</b>	9,000 hours	9,000 hours	up to 45,000 hours
	Running 24/7, UV Lamp lifespan is 12-18 months. With timed circulation, unit lasts about 3 years	Running 24/7, CD Chip lifespan is 12-18 months. With timed circulation, unit lasts about 3 years	Running 24/7, CD Electrode lifespan is 3-5 years. With timed circulation, units have tested positive in the field up to 7 years
<b>Output rating</b>	With the exception of the ZO-300 and ZO-302, UV Lamps create low levels of ozone	CD Chips create low levels of ozone	CD Electrodes create high levels of ozone
<b>Electrical consumption</b>	ZO-300, 110V = 45 mA, 54W ZO-302, 240V = 45 mA, 108W	110V = 90 mA, 11W 240V = 50 mA, 12W	110V = 50 mA, 6W 220V = 35 mA, 9W
<b>Hazardous materials</b>	Mercury vapor lamps require special disposal	No special disposal required	No special disposal required
<b>Eco-friendly?</b>	Not as much as CD styles. They use more energy and the lamps contain Mercury which requires special disposal	Yes. Less power consumption than UV style, plus no hazardous materials to dispose	Yes. Less power consumption than UV style, plus no hazardous materials to dispose
<b>Unique Advantages</b>	None	Smallest footprint of all ozone generators on the market	Longest life of all ozone generators on the market, producing ozone for 3-5 years
		CD Chip Performance Viewing Window allows you to SEE when the chip in operation and when it needs to be replaced	Indicator light tells you when unit needs to be replaced
			High out put gives customer maximum chemical savings and best water quality
<b>Disadvantages</b>	UV lamps light for 10-18 years, but loss of ozone occurs typically around 3 years. The lamp acts as a 'false indicator light' making it difficult to convince customer it's time to replace	Customers often wait until the spa 5-year warranty is up before they read the manual. After finally buying a replacement chip, they learn the Spa Eclipse or CDS-16 still doesn't work. This is due to transformer failure. Customers need to replace the chip as early as 12 months if their spa is running 24 hours a day. If the spa runs on filtration cycle, lifespan increases often up to 3	None
	Lamps are expensive to replace		
	UV lamps are prone to failure with water back up		
	Voltage spikes are likely		
	Low ozone output = less sanitation + more chemicals		



**OZONE OUTPUT CHART:**  
 Ozone generators range in output with UV at the low-end of the ozone scale and CD electrodes at the high end

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## CDS-16

Renewable CD Chip Technology  
1998 - current



- This CD micro-chip technology was developed in 1998 for spa manufacturers (OEMs) as an advancement from old-style UV technology
- CDS-16 is a good choice when replacing a Z0-301
- OEMs choose DEL's CDS-16 because:
  - First reliable CD ozone generator for the OEM spa market - minimal warranty expenses
  - Compact size – smallest footprint
  - Robust and reliable - warranty rate is .01%
  - Low energy consumption - 90mA, 11 Watts
  - CD Chip Performance View Window for easy diagnosis
  - Low-cost replaceable CD Chip
  - Resistant to damage from water back flow (if back flow is repeated, could fail)
  - No ballast or starter to cause voltage spikes - CDS-16 and Spa Eclipse use isolated circuitry.
  - Substantially less heat than UV lamps
  - No Mercury (as in UV bulbs)
  - Optimized ozone concentration levels – 30 mg/hour @ 270 PPM
  - Our On-Time Delivery rate is 99%
  - OEMs rate DEL for the best customer service and technical support

90% of US Spa Manufacturers have chosen DEL over the past 12 years as their "factory-installed ozone" <sup>6</sup>

## CDS-16 Chip Technology

- The CDS-16 installed by the OEMs have no front label and the date code was applied to the back of the unit, making it hard to identify.



**CDS-16 OEM Unit  
(front & back)**  
date code is on back



**The most commonly  
found unit is the  
CDS-16DR**

- Date code will be one of two ways: 1) Letters indicating month (A for January, etc), and has the year of manufacture; or 2) actual date of manufacture (i.e. 11/5/08)
- The CDS-16 is rated for 9,000 of operation, like UV-style generators
- "Old" units have yellowed CD Chip Performance View Windows and yellowed and/or brittle tubing which can be used as an indicator of age. Yellowing *can* begin in the first year
- If the window has aged significantly, you will not be able to see the chip, or the glow. It is time to replace the CDS-16.
- CDS-16 produces 30 mg/hr of ozone at 270 PPM and 2cfh and is 5.75"H x 3"W x 2"D; 110V = 90mA; 11W

**Viewing window of an  
18-month old CDS-16**



## CDS-16 Chip Technology

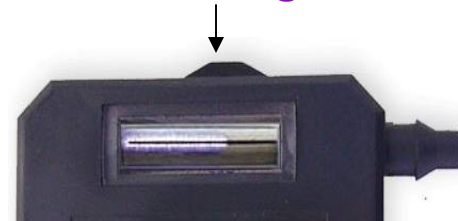
“How do I know if the CDS-16 is working?”

- The CDS-16 Chip Performance Window allows you to SEE ozone being created. “The Glow Knows.” If it is glowing, it is generating ozone; if it is not, time to service or replace
- Use DEL’s new Ozone Test Kit to prove it, unconditionally. See Ozone Test Kit in action: [www.youtube.com/com](http://www.youtube.com/com) where you can also see a CDS-16 glowing
- March 2008 DEL added this to the aftermarket label:  
“Purple Glow = Generating Ozone”  
“No Glow = Service Required”

See the CD chip glow purple here



Purple Glow = Generating Ozone







## CDS-16 Chip Technology

“What should I replace the CDS-16 with?”

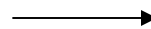
- The CDS-16 has been the most commonly installed ozone generator at the OEM level since 1998. There are over a MILLION in the field today; many in need of replacement
- The perfect replacement for the CDS-16 is the CDS-16 based on its small footprint. If the customer desires a higher-output generator, make sure there is enough space to install it (MCD-50 would be next choice)
- Spa techs prefer to install a product that is the same as what is in the spa. The customer is more likely to trust the spa tech if the ozone generator fits, and carries the same manufacturing name. Tell them you have a “DEL Genuine Replacement” on the truck

## CDS-16 Chip Technology

“When should they be Replaced vs Renewed?”

- When a spa repairman is called to a job, the spa is likely 3-5 years old and out of warranty. In most cases like this, the CDS-16 has expired.
- Generally speaking, CDS-16 generators should be replaced if they are 3 years or older.
- When purchasing a replacement CDS-16, the customer can also purchase their first Renewal Kit to keep on hand. As soon as chemical usage increases and water quality declines, it's time to replace the chip. It is important not to wait too long before replacing the chip; the longer you wait, the more likely the transformer will fail and replacing the chip will not work. In this case, a new unit must be purchased, but the new chip can be saved for future replacement.
- Customers can renew the chip, tubing and check valve approximately every 12-18 months which extends the need to replace the entire unit
- Most spa technicians are not likely to try replacing the chip due to time to perform the task and the likelihood replacing the chip won't work (which happens when the transformer keeps working after the chip burned out).

**Renewal Kit 9-0720-01  
includes 5-0561 CD chip,  
5' of tubing, 7-1140-01  
check valve, 4 hose clamps,  
and the NEW Service Stickers**



## Spa Eclipse

Renewable CD Chip Technology  
2001 - current



Spa Eclipse  
DUAL VOLTAGE  
Now available!

- The Spa Eclipse was introduced in 2001 as the Distribution version of the CDS-16. It has the same ozone output and similarly low electrical consumption. It was created out of demand from spa technicians who did not have access to purchasing the CDS-16 through OEMs (note: CDS-16 is now available through Distribution)
- Similarities in the CDS-16 and Spa Eclipse
  - Same replaceable CD Chip 5-0561 generating the same 30 mg/hr of ozone
  - Same Renewal Kit 9-0720-01
  - Same low electrical consumption
    - » Spa Eclipse 110V = 90mA 11W
    - » Spa Eclipse 220V = 50mA 12W
    - » Spa Eclipse Dual Voltage – see above-listed
- Differences from the CDS-16 to the Spa Eclipse include:
  - CDS-16 is only 110V; Spa Eclipse is offered in 110V, 220V or **Dual Voltage**
  - Spa Eclipse has a bigger enclosure to accommodate the transformer (6"H x 5"W x 2.5"D, 2 lbs)



## Spa Eclipse

“How do I know if the Spa Eclipse is working?”

- The same way you would if you had a CDS-16 (refer to the previous CDS-16 slides)



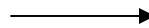
## MCD-50

Renewable CD High-Output  
Electrode technology  
2001 - current



- The MCD-50 High-Output generator has been factory-installed by OEMs since 2001. In the field now for nine years, consumers are ready to Renew or Replace, which leads this product to be available for after-market purchase through Distribution
- This reliable unit has a life expectancy of 45,000 hours (5 years)
- MCD-50 has an LED viewing window on the front bottom of the unit. Green means "good" and no light lit means it needs service
- Renewal Kit 9-0743-01 is available MCD-50 High-Output unit produces 50 mg/hr of ozone at 550 PPM and 2cfh and is 8.6"H x 6.1"W x 2.8"D
- They are available in both 110V and 220V (not Dual Voltage)
  - 110V = 50mA, 6W
  - 220V = 35mA, 9W

**Renewal Kit 9-0720-01**  
includes 5-0561 CD chip,  
5' of tubing, 7-1140-01  
check valve, 4 hose clamps,  
and the NEW Service Stickers



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## T3

CD High-Output  
Electrode technology  
2007 - current



- The T3 High-Output generator has been factory-installed by OEMs since 2007. They are NOT available through distribution at this time, but you may come across one in the field and need information about it
- This reliable unit has a life expectancy of 45,000 hours (5 years)
- A blue LED light illuminates the unit's clear shell to let you know that it is "good" and no light lit means it needs service
- There is no replaceable ozone electrode, but the check valve (7-1140-01) and tubing (7-0075) should be replaced annually
- T3 comes in Standard or Premium High-Output
- Standard unit produces 50 mg/hr of ozone at 420 PPM and 2cfh
- Premium unit produces 65 mg/hr of ozone at 600 PPM and 2cfh
- All units measure 5.75"H x 3"W x 2"D
- Available in 110V, 220V and Dual Voltage, current is 20-50mA, 4.6-6.0W

**\*DO NOT use T3 with Balboa spa packs. In close proximity, Balboa packs and T3s experience EMI interference issues**

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## SO & HO

CD High-Output  
Electrode technology  
1999 - current



SO  
Standard Output



HO  
High Output

- The SO and HO High-Output generators has been factory-installed by OEMs since 1999. They became available through Distribution in 2009.
- This reliable unit has a life expectancy of 45,000 hours (5 years)
- There is no indicator light; use Ozone Test Kit to verify ozone is working
- There is no replaceable ozone electrode, but the check valve (7-1140-01) and tubing (7-0075) should be replaced annually
- Standard unit produces 50 mg/hr of ozone which is enough ozone for 1,000-1,500 gallons
- Premium unit produces 65 mg/hr of ozone which is enough ozone for swim-spas up to 3,000 gallons
- Both units measure 9 ¼"H x 5 ½"W x 2"D
- Only available in 240V



# Ozone Test Kit

## In-Line Ozone Gas Indicator



- Now spa techs have a professional way to test for ozone

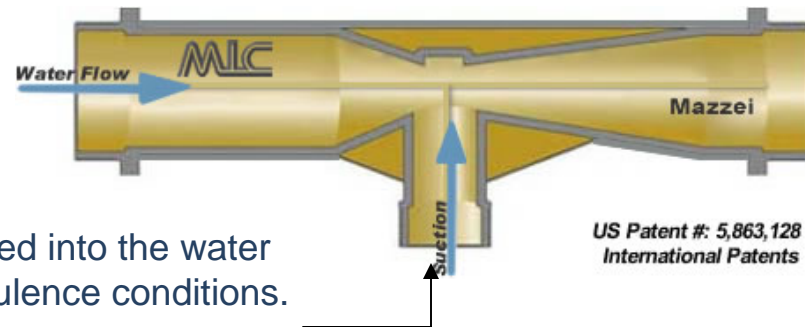
**SEE HOW EASY THEY ARE TO USE:**  
**[WWW.YOUTUBE.COM/DELOZONE](http://WWW.YOUTUBE.COM/DELOZONE)**

- DEL's new In-Line Ozone Gas Indicator confirms whether or not the ozone generator has adequate ozone for sanitizing the spa by turning the blue test to white in about 30 seconds.
- The best way to use the test is to remove the existing, installed check valve (which will most likely need replacing) and insert the ozone test. After preparing the test tube, test the ozone generator for 30 seconds and watch for results (blue=expired; white=good).
- The Ozone Test Kit video shows what a CD Chip and MCD-50 ozone generator look like in operation. Also, the video shows what the check valve and injector look like. The end of the video shows what properly-dissolved ozone should look like in the form of bubbles off the surface of the spa water.
- Remember, just because you have ozone, doesn't mean you have ozone in the water...see section on proper injection.



## Ozone Injection

- **Bubbles – what do they mean?**
  - “Do bubbles mean I have ozone?”
    - Not necessarily. They simply mean you have suction from where the ozone generator should be installed. There may not be an ozone generator installed at all, and you may still see bubbles.
    - You need both a working ozone generator AND good vacuum source (Mazzei injector) to get the ozone dissolved into the water where it comes in contact with bacteria, viruses, oils, and other contaminants.





## Ozone Injection

- Dissolved vs. Un-dissolved Ozone
  - Dissolved ozone cannot be seen – it becomes *aqueous*
  - Bubbles represent wasted ozone – there are no benefits to water quality
  - What you **want** to see is a fine mist of bubbles (like champagne or Sprite)
  - Old spas injected ozone into the foot well, where the un-dissolved, large ozone bubbles went straight to the surface and off-gassed. This is a poor way of introducing ozone to spa water, and ineffective in breaking down organics in the water
  - Bubbles (off-gas) are more likely to destroy spa covers, pillows and surrounding areas than dissolved ozone will. Effectively dissolved ozone, however, is virtually harmless.
  - Ozone off-gas is what you smell when you lift the cover



## Ozone Injection

- “Will I always see bubbles?”
  - Not if you have:
    - Clogged check valve
    - Clogged injector (possibly calcium build up)
    - Clogged ozone return line to spa (hair, bugs, etc)
    - Clogged air intake on the ozone generator

## Ozone Injection

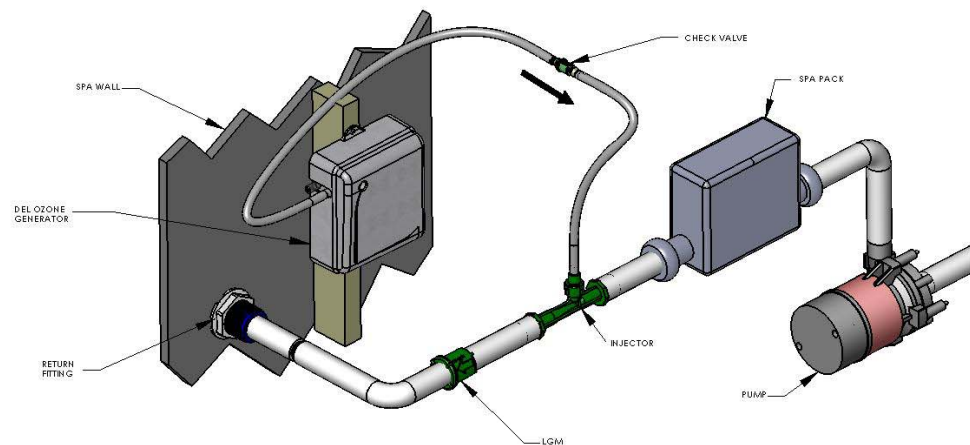
“Can I increase the amount of bubbles coming into the spa?”



- Yes, but you want tiny bubbles or **dissolved ozone**, not the off-gas
- Over 60% of the spas in the field today have an injector. If the spa contains an injector other than Mazzei, DEL recommends replacing the existing injector with a Mazzei. We base our opinion on 26+ years of experience
- With a Mazzei injector, there is more mass transfer of ozone into the water than any other we have tested. The more ozone transferred into the water, the higher the water quality with the fewest amount of chemicals or time-wasting chemical balancing
- If the spa has a 24-hour circulation pump, the Mazzei injector can be installed 12-18" from discharge of pump, with an LGM (see next page) installed 5-6' downstream, followed by 2-4' to the return jet(s).
- If the spa does not already have an injector, and is a two-speed pump application, you have to build a bypass to the Mazzei injector and loop it back to the main return line that would supply all the jets with ozonated water

## Ozone Injection

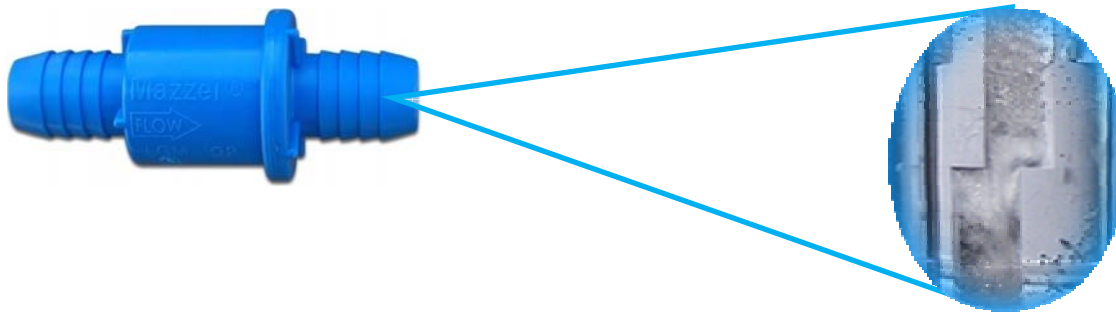
- “Can I increase the amount of bubbles coming into the spa?” (continued)
  - **LGM (Liquid Gas Mixer)**
    - If the spa has a 24-hour circulation pump, the Mazzei injector can be installed along with the LGM (Liquid Gas Mixer). The LGM is a secondary mixing device that can be installed in the return line (as stated above). See next slide for a picture of the LGM.
    - Using a Mazzei injector in conjunction with an LGM will raise the ozone concentration while lowering the Gas to Liquid Ratio.



## Ozone Injection

- The Mazzei® LGM

- The Mazzei® LGM (Liquid-Gas Mixer) is a patented mixing chamber that incorporates a re-direction and shearing of the gas/liquid mixture. This allows for a rapid dissolution of the ozone gas into the water.
- The result is high mass transfer efficiency with minimal time required.



- The Mazzei® Mixing Package

- The Mazzei® Mixing Package incorporates Mazzei's new green #984, LGM and Reducer Nozzle. This package is now available through Distribution.





## Ozone and Other Products

- **“What other products can be used with ozone”**
  - Ozone is versatile and can be used with Chlorine or Bromine, Nature 2, FROG, Spa RX, and Silk Balance



- **Your Customer Support Team**

- Jennifer M. Engelmeier
  - Manager, Aftermarket Spa Sales
  - 800-676-1335 x232
  - [jen@delozone.com](mailto:jen@delozone.com)
- Jim Brown
  - Customer Support
  - 800-676-1335 x225
  - [jbrown@delozone.com](mailto:jbrown@delozone.com)
- John Bell
  - Warranty & Repair
  - 800-676-1335 x278
  - [jbelle@delozone.com](mailto:jbelle@delozone.com)

Go to [www.delozonespa.com](http://www.delozonespa.com) to download brochures, manuals and specifications, along with basic ozone information.

Go to [www.youtube.com/delozone](http://www.youtube.com/delozone) to see how EASY DEL's Ozone Test Kits are to use.