

Questions and Answers about Ozone

QUESTION: WHAT IS OZONE?

ANSWER: Ozone, sometimes called "activated oxygen", contains three atoms of oxygen rather than the two atoms we normally breathe. Ozone is the second most powerful sterilant in the world and its function is to destroy bacteria, viruses and odors in nature. Interestingly ozone occurs quite readily in nature, most often as a result of lightning strikes that occur during thunderstorms. In fact that "fresh, clean, spring rain" smell that we notice after a storm most often results from nature's creation of ozone. Ozone is also created by water falls. However, we are probably most familiar with ozone from reading about the "ozone layer" that circles the planet above the earth's atmosphere. Here ozone is created by the sun's ultra-violet rays. This serves to protect us from the ultra-violet radiation. Additionally, each of us is exposed to high levels of ozone daily for short periods of time. This happens in heavy traffic conditions or during times when the weather forces the industrial gases to remain lower to the ground than is otherwise normal. The combination of these two factors can result in ozone readings as high as 4 or 5 times the "regulatory" levels for continuous exposure with absolutely no adverse effects as our exposure is for such short periods, and the ozone itself decays back to normal oxygen so rapidly.

QUESTION: HOW DOES OZONE WORK?

ANSWER: While ozone is very powerful, it has a very short life cycle. When it is faced with odors, bacteria or viruses the extra atom of oxygen destroys them completely by oxidation. In so doing, that extra atom of oxygen is destroyed and there is nothing left...no odor...no bacteria...no extra atom, only oxygen. In addition to the effectiveness of ozone, we also know that it is safe to use. We know this from our own safe exposures daily to ozone, weather, as noted earlier, resulting from being locked in traffic, or passing through industrial areas. These exposures have no effect on us beyond our acknowledging the unpleasant odor associated with this "filthy air". It is the very unpleasantness of this air that provides ozone with its "built in" safety mechanism. Ozone is safe because we notice its unpleasant odor at very residual levels. By residual we mean, the amount of ozone that is produced in excess of the required amount to eliminate whatever contamination that may be present in the room. This equipment, when installed correctly will not exceed government guidelines for continuous safe exposure. Even if installed incorrectly, ozone provides its own protection, as ozone warns us in a manner similar to smoke in a room. Ozone does this by becoming so offensive at 1.5 parts per million that we would not be able to stay in the environment for any more than a short period. This is much like what would happen if we entered a smoke filled room. However, while smoke might harm us, research has proven that such a limited exposure to such a low level of ozone would have no serious long term effect on us just as it does not affect us when caught in a traffic jam during rush hour. Carrying that example one step further, this equipment is incapable of producing ozone in sufficient quantities even if installed incorrectly and left running continuously, to cause any long term risks to your health even assuming that you could stand there and be exposed to it (remember the smoke example).

QUESTION: HOW IS OZONE PRODUCED?

ANSWER: There are basically two methods of producing ozone...ultra-violet and corona discharge. Most equipment uses the corona discharge method, simulating in essence, lightning. Equipment utilizing UV is now hard to find because it is inefficient, expensive to operate, unreliable, and very costly to service compared to the modern corona discharge equipment now available.

QUESTION: HOW LONG DOES THE OZONE LAST?

ANSWER: As soon as ozone is formed in the generator and dispersed in a room some of it decays back into oxygen. This step occurs by several processes including the following: Natural decay (or reversion to oxygen) due to ozone's chemical instability. Speeding up of the above process by the presence of such as walls, carpets etc. stimulating the decay process. Oxidation reaction with odor causing organic material, which removes ozone. Reactions with bacteria etc., which again consumes ozone by oxidation reactions. Additionally ozone itself has a half life which means that "residual" ozone created (extra unneeded ozone) will return to oxygen within at most 30 minutes, in amounts equal to half its level. What this means is that after each subsequent 30 minute period there would be half as much residual ozone left at the end of the period as was present at the beginning of the period. This is similar to a geometric progression of 16;8;4;2;1. In practice the half life is usually less than 30 minutes due to temperature, bacterial, and other contaminants in the air. Therefore, ozone while very powerful doesn't last long...just does its job and disappears.

QUESTION: WILL THE ODOR COME BACK?

ANSWER: No. If ozone is applied properly it destroys (oxidizes) the source of the odor. However, in the case of mildew the odor will return if you are unable to get rid of the moisture that is the source of the mildew.

QUESTION: HOW DOES OZONE HANDLE TOBACCO SMOKE?

ANSWER: It eliminates the irritation caused by phenol gasses, by oxidizing them. Phenol gasses are the invisible part of tobacco smoke that causes such discomfort to one's eyes and create the offensive odors. Ozone rids any environment of the effects of smoke completely, rather than merely filtering out some of the visible particles like an "electronic air cleaner".

QUESTION: WILL OZONE REMOVE STAINS AND NICOTINE BUILD UP

ANSWER: No, ozone will not remove the stains or nicotine build up. Ozone will deodorize and help to decontaminate the problem but will not remove the actual substance.

QUESTION: WHAT IS THE RIGHT LEVEL OF OZONE?

ANSWER: The right level is when all the generated ozone is being used up accomplishing its job. However, this is difficult to obtain because it becomes a balancing act. Initially the machine's output is set high to get rid of the problem odor as quickly as possible. As this is being accomplished less ozone is required for the diminishing odor etc., thereby leaving some residual ozone in the air. If the machine output is not turned down after awhile then more residual ozone will be in the air. If there is a heavy smell of ozone, then there is more ozone present than is required to do the job. Simply turn the rheostat (output level control) down. This is a case where more is not considered better. Sales successes result when the dealer ensures that the results are what the customer expects. The most successful dealers usually install equipment on a trial basis and return to the trial location 24 hours later to ensure that residual ozone levels are not too high and that the customer knows how and when to regulate the machine to avoid a strong ozone smell.

QUESTION: IS OZONE HARMFUL AND WHAT IF ANY ARE THE LONG TERM EFFECTS?

ANSWER: Ozone has been known for almost a century now, so quite a lot is known about it. Several regulatory agencies, including OSHA - Occupational safety and health agency - have stipulated that the safe allowable level of residual is .08 ppm. based upon the historical safety of ozone. Note that this permissible level is for continuous exposure throughout an entire 8 hour day for 5 days a week. If anyone is exposed to that concentration of ozone, it is usually as the by product of an industrial process like arc-welding. The temporary effects of such a low exposure would range from headaches, to sore throats, irritation in the eyes, nose and the like, similar again to what we would experience in a traffic jam.

QUESTION: HOW CAN YOU TELL THE LEVEL OF OZONE?

ANSWER: There are a number of mechanical methods available, the most common and effective being the Draeger tube. Residual ozone becomes apparent to sensitive humans in the range of .01 - .03 ppm. or well below the permissible levels for continuous exposure. As noted previously, this residual ozone is extra ozone that is not required to eliminate the contamination. Adjustment of the rheostat is all that is required.

QUESTION: WHAT ARE THE APPLICABLE REGULATIONS REGARDING OZONE?

ANSWER: In Canada the Worker's Compensation Board of B.C. guidelines stipulate that continuous exposure 8 hours a day for 5 days per week in an environment containing .08 ppm. of ozone is safe. The normal concentrations that we will be using will be in the range of .01 - .03 ppm. well within the guidelines.

QUESTION: CAN OZONE BE HELPFUL IF THE CUSTOMER PURCHASES CRYOVAC'D BEEF?

ANSWER: Yes. If the premises where meat is hung, cut and eventually cryovac'd, are treated with ozone, then this meat will be virtually contamination free as it is being packaged in the cryovac. And will consequently retain its good looks and stay fresh much longer before being sold or used than meat packed in an ozone free room where both odors and bacteria count will be high. Treatment of coolers and cutting packaging rooms with ozone ensures not only a contaminant free environment, but also a clean smelling room that customers and employees alike associate with a caring and progressive management.

QUESTION: HOW OFTEN DO THEY REQUIRE MAINTENANCE:?

ANSWER: Under heavy duty use, or severely polluted areas CRYSTAL AIR ozone generator should be inspected every 2 to 3 weeks for fine dust or oily residue collecting on surfaces of generator unit or plates. Light duty use requires cleaning every 2 to 6 months depending on severity of pollution. NOTE# If a fine dust or oily residue appears, it is time to follow the recommended cleaning procedures. IMPORTANT NOTE ON OZONE It is not necessary that you even smell the sweet smell of ozone (compared to fresh country air following a thunderstorm) for it to be effective. Even roses are an objectionable odor to some people, when in excess.

A BASIC GUIDE TO DEODORIZATION USING OZONE

GENERAL OZONE SHOCK TREATMENT PROCEDURE :

Recommended equipment:

Commercial PRO 3600-1, PRO 3600-5, PRO 5,000, or PRO 10,000

Residential PRO 420, PRO 700, PRO 3400-1, or PRO 3600-1, or PRO 3600-5

The idea of an ozone shock treatment procedure is to eliminate the initial odors and contamination from the air and surfaces and then provide continuous control over recurring contamination by way of ozone. First we must assess the extent of the odor problem in order to determine the size of the Crystal Air ozone generator which would be required to sufficiently eliminate the problem odor in a reasonable period of time. Once we have chosen the ideal size of ozone generator for the particular treatment area, the ozone generator should be placed pointing in the direction of the problem area. Strong fans must be placed throughout the area being treated to provide good ozone distribution. Operate the ozone generator at it's highest capacity for as long as it takes to eliminate the odor problem. In most cases it takes only a few minutes to do a shock treatment. If it is a type of odor that is absorbed in furniture, walls and bedding, for example, cigarette smoke, takes only 30-120 minutes with the proper sized ozone generator. After the shock treatment procedure is complete, air out the room, if the odor is expected to continue place a Crystal Air ozone generator and monitor controller permanently in the area operating at a low level. Severe cases may require a 24 + hour treatment. Milder cases may need a smaller unit or use lower output setting.

If your goal is to reduce or eliminate a toxic contamination, bacteria, etc. a test should be performed to ensure that the application was successful.

NOTE# while performing a shock treatment, make sure that all people, pets, plants and other animals are vacant from the area to be treated. Also while using HIGH concentrations in a room, be sure that ozone does not leak into connected or occupied rooms by way of furnace vents or wall cracks etc.

HOTEL AND MOTEL ROOM DEODORIZING.

Recommended equipment:

PRO 420, PRO 700, or for larger rooms use a PRO 3400-1 or 3600-1

Odors left behind by guests can quickly and efficiently be eliminated by the use of Crystal Air ozone generators and liquid deodorizers.

These rooms can generally be deodorized in 30 to 60 minutes for cigarette or alcohol etc., by using a PRO 420, PRO 700, PRO 3400-1, or PRO 3600-1. Air out room by opening windows for 2-4 hrs before re entering.

House keeper should also wet/dry vacuum the contaminated areas, (ex. vomit, spilled milk, spilled beer) with a good detergent solution 24 hrs before deodorization procedure is performed.

Application procedure:

After the room has been cleaned, place the ozone generator on a counter and turn on, allow to run approximately 30-60 min. Remove the generator and allow the room to sit unoccupied for about 2-4 hours. If there are any lingering odors, retreat for 1 hour.

GROCERY STORE STORAGE AREAS:

Recommended equipment:

PRO 420, PRO 700, PRO 3400-1 or PRO 3600-1. PRO 3600-5, PRO 5000, PRO 10,000

To reduce odors and reduce cross contamination of foods to other foods, install a Crystal Air ozone generator in an out of the way place, with an additional fan to circulate the ozone efficiently throughout the entire area to be treated. Next install an ozone generator monitor controller in the center of the treated area to ensure the levels of ozone do not exceed the limits set by the Workers Compensation Board Of BC which are .08 ppm. averaged over an eight hour work period. The controller will cycle on and off as needed to maintain and control the ozone at the proper levels.

SMOKING LOUNGES:

Suggested Size: PRO-3600-1, PRO 3600-5, PRO 5000, PRO 10000. Dependent on the size of room and contamination level.

The Crystal Air ozone generator should be properly sized for the specific area and number of possible smokers. The Ozone generator should be hooked into the air handling system in order to ensure proper distribution. (Mounting brackets are available for the PRO 3600, 5000, & 10000). An ozone controller should also be used in order to ensure safe levels are not exceeded.

If a controller is not used adjust Crystal Air ozone generator so that can not detect the ozone or the problem odor. Begin with the ozone generator on low setting and work your way up slowly. One person at the establishment should be in charge of adjusting the ozone generator output as the number of smokers increase or decrease. If ozone is set for 40 smokers and 30 vacate, then the ozone generator should be adjusted to lower setting, otherwise the air will become excessively ozonated and possibly cause sore throat or headache.

OFFICES AND STORE FRONTS:

Recommended equipment:

PRO-360, CA-15, CA-55-1, 3400-1 Dependent on the size of room and contamination level.

The same procedures are used here as in the smoking lounges with one exception, That usually there is no smoking in offices and store fronts, therefore a smaller ozone generator may be required.

ITEM DEODORIZATION (Mattress, couch, cloths, books, etc)

Most obnoxious odors such as mold, mildew, smoke, etc. can easily be removed from Mattress, couch, cloths, books, etc etc.

You can easily make or utilize a room of proper size to accommodate all the articles to be deodorized. Place circulating fans in the room to vigorously blow the ozone around the room to penetrate the porous materials. If possible route fresh air into the ozone generator to reduce oxidation of the components. Place the items to be deodorized in the room and operate the ozone generator on full. This procedure may go on for 1-72 hrs depending on the circumstances.

Recommended equipment: PRO 420, PRO 700, PRO 3400-1 or PRO 3600-1. PRO 3600-5, PRO 5000, PRO 10,000 & C20 liquid deodorizer

For commercial restoration ozone rooms you should use .5-2 g/hr ozone for every 100 sq/ft, depending on how fast the job needs to be done and how bad the problem is. With .5 g/hr / 100 sq/ft you should treat for 12-24 hours +, with 2 g/hr / 100 sq/ft it should only take about 4-8 hours.

For the do-it-yourself home owner, the treatments can be done in a smaller room to allow the use of a much smaller unit. Just calculate the size of your largest room to come up with the size of unit that you will require. Also most home owners are not in as much of a rush to do the job, if this is so you can probably do the job with 1/4 of the above recommended ozone production.

Application procedures:

The PRO 420 and the PRO 700 are ideal for doing small shock treatments. Simply place the item in a room that will not allow ozone to leak into occupied areas. Place an appropriately sized ozone generator in the room along with a circulation fan and set the level control to full. Turn the generator on, close and lock the door. Allow to operate for the above recommended times. Turn the ozone generator off and close the door once again for about 3-4 hours before returning to the room to allow the remaining ozone to convert back to oxygen.

The PRO 3400-1 is functionally the same but has a higher output and is upgradeable.

The PRO 3600-1, PRO 3600-5, PRO 5000, and PRO 10,000 are the best units for commercial shock treating items in a room. These units allow the use of a hose to rout the ozone into the ozone room or fresh air into the ozone generator, this keeps the generator from oxidizing itself. The PRO 3600-1 is also upgradeable, if more ozone is needed for a specific job or you need to do the treatment faster, just add an extra generator plate.

For this reason this is the best unit suited to a commercial application.

Important:

-If the odor was caused by a liquid contamination such as musty odor from a leak, you must first fix the leak or the problem will come back.

-If the odor was caused by a liquid contamination, the area needs treated with C20 to ensure that the odor will not come back.

DECOMPOSED PROTEIN:

Recommended Equipment:

PRO-3600-1, PRO-3600-5, PRO 5000, PRO 10000 Depending on the size of room to be treated.

Protein contamination is the result of food products such as milk, fish, meat, eggs etc. Other sources are from human or animal bodily discharge (like blood, urine, feces etc), decomposed meat, decomposed animal within a crawl space, death scene (decomposed body). In all cases of decomposed protein, the source of the odor must be removed as the first step to deodorization. (It is recommended that gloves and a respirator be worn to reduce the exposure to fleas and deadly contamination). Next treat the contaminated surfaces of the floor or any other items the protein was contacting with a liquid sanitizing solution to kill the contamination. Then a good liquid deodorizer like C20 or equivalent should be applied to all contaminated surfaces. Once the liquid sanitizing and deodorizing has been applied and has had time to dry 100%, the Crystal Air ozone generator may be placed in the treated area at a setting of medium to high to eliminate the gaseous odor absorbed by the walls and furniture etc. Use a strong fan to help force ozone into the pores of walls and furniture fabric. **Note # Ozone may be set on a low setting before the technician enters the room to deodorize the air in order to make the environment more comfortable to work in.**

FIRE AND FLOOD RESTORATION.

Fire & flood odors are easily taken care of with a Crystal Air ozone generator & C20 liquid deodorizer. C20 liquid deodorizer is a non fragrance deodorizer ideal for use in fire & flood restoration prior to ozonating. All Crystal Air Ozone generators utilize corona discharge technology, creating a reliable long lasting ozone generator that will last for years to come. Click here to go to the Crystal Air Home Page for information on our ozone generators and liquid deodorizers.

In cases of small fire and smoke damage (e.g.: Grease Fire on stove, Severe toaster fire, fire place back through, mattress fire, electrical fire etc). With smoke fumes the premises should be thoroughly cleaned including the forced air furnace system before deodorization begins. Place a Crystal Air ozone generator on each level of the building accompanied with a good blower fan to force the ozone through the small pores of the walls, carpet, and furniture. This process may take up to 24-72 hours for adequate results to be achieved. Furniture and mattresses may need additional treatment by draping a sheet of plastic over them and placing an ozone generator underneath for approx. 1_2 hours.

Note: Odors created in a hot environment are embedded deeper in the pores of the materials such as curtains, furniture, wallboard etc. This is due to pores expanding when hot and closing when cold. A warm environment will always produce better results than a cold one when deodorizing a gaseous odor.

Recommended equipment: PRO 3600-1, PRO 3600-5, PRO 5,000, or PRO 10,000 & C20 liquid deodorizer

For commercial type restoration jobs you should use .5-2 g/hr ozone for every 100 sq/ft, depending on how fast the job needs to be done and how bad the problem is. With .5 g/hr / 100 sq/ft you should treat for 3-4 days +, with 2 g/hr / 100 sq/ft it should only take about 12-24 hours.

For the do-it-yourself home owner, the treatments can be done one room at a time to allow the use of a much smaller unit. Just calculate the size of your largest room to come up with the size of unit that you will require. Also most home owners are not in as much of a rush to do the job, if this is so you can probably do the job with 1/4 of the above recommended ozone production.

Application Procedures:

Site preparation:

1. All damaged items need to be removed from the area as well as any carpet, wall board, or other building materials that are to be replaced.
2. Thoroughly clean all areas possible, and deodorize with C20 liquid deodorizer (4oz/gallon of water). Allow the C20 to completely dry, It does its job as it dries. The odor may actually seem to get worse until it dries due to the fact that C20 is a true deodorizer and contains no fragrance to "cover" the odor.

FIRE NOTES: It will be much more difficult to deodorize if Inorganic items such as plastics etc. were burnt in the fire. The C20 works mainly against organic odors, if the odor is from an inorganic item like plastic, repeated ozone applications may eliminate it.

FLOOD NOTES: If it is a flood, a spill, or any damage from a liquid, do not miss this step. Also ensure that the area is soaked in C20 to the same degree as the original flood or spill, this will ensure that the C20 penetrates to the same depth as the damage is.

Ozone application:

Place the ozone generator in an area that will provide the best circulation and distribution of the ozone. Run an extension cord from all generators to the receptacle closest to the exit door. Use auxiliary fans to help with circulation, this will also help to drive the ozone into the pores of the materials. Turn the generator/s to full output and to the on position. Leave the premises and lock all entrances. Allow the ozone application to operate for the above recommended time. If the problem is especially bad increase the amount of ozone used or the length of the application accordingly. Upon returning to the premises, turn off the ozone generators by unplugging the extension cord. Leave the premises and lock all entrances. Allow the building to sit for 4-8 hrs, this allows the remaining ozone to convert back to oxygen and reduce ozone exposure.

MOLD AND MILDEW REDUCTION

Mold, mildew, and fungus can be oxidized with ozone. Crystal Air ozone generators reduce or eliminate the ability for the exposed mold, mildew and fungus to grow as well as oxidizing the existing mold. Mold and mildew grow in dark and humid places where there is a lack of fresh oxygen. In all cases the moisture and humidity in the walls, floor etc., must first be removed or solved permanently to effectively eliminate the problem mold and odor. Once moisture is removed, all visible mold and mildew should be removed, then a shock treatment procedure can be performed lasting for 24-72 hrs. A small ozone generator can be used to help control continuous mildew problem odors if they persist.

Recommended equipment:

Commercial:

PRO 3600-1, PRO 3600-5, PRO 5,000, or PRO 10,000

For commercial mold treatments jobs you should use .5-2 g/hr ozone for every 100 sq/ft, depending on how fast the job needs to be done and how bad the problem is. With .5 g/hr / 100 sq/ft you should treat for 1-2 days +, with 2 g/hr / 100 sq/ft it should only take about 6-12 hours.

For the home owner:

PRO 420, PRO 700, PRO3400-1, PRO 3600-1, PRO 3600-5, PRO 5,000

For the do-it-yourself home owner, the treatments can be done one room at a time to allow the use of a much smaller unit. Just calculate the size of your largest room to come up with the size of unit that you will require. Also most home owners are not in as much of a rush to do the job, if this is so you can probably do the job with 1/4 of the above recommended ozone production.

Application Procedures:

Site preparation:

1. Mold usually occurs because of a leak or humidity problem. This leak or humidity problem must be fixed or solved or the problem will continue to persist.
2. All damaged or rotten items should be removed from the area as well as any carpet, wall board, or other building materials that are to be replaced.
3. Thoroughly clean all areas possible, remove any visible mold, mildew, etc.

Ozone application:

Place the ozone generator in an area that will provide the best circulation and distribution of the ozone. Run an extension cord from all generators to the receptacle closest to the exit door. Use auxiliary fans to help with circulation, this will also help to drive the ozone into the pores of the materials. Turn the generator/s to full output and to the on position. Leave the premises and lock all entrances. Allow the ozone application to operate for the above recommended time. If the problem is especially bad increase the amount of ozone used or the length of the application accordingly. Upon returning to the premises, turn off the ozone generators by unplugging the extension cord or use timers available at your local lumber store for less than \$20. Leave the premises and lock all entrances. Allow the building to sit for 4-8 hrs, this allows the remaining ozone to convert back to oxygen and reduce ozone exposure.

Special notes on mold, mildew, etc.

- Crystal Air ozone generators help to reduce or eliminate the ability for the exposed mold, mildew and fungus to grow. However mold and mildew grow in dark and humid places where there is a lack of oxygen and is usually caused by a leak, improper drainage, or high humidity. In all cases the moisture and humidity in the walls, floor etc., must be removed permanently to effectively eliminate the problem.

- In all cases you must do a test to know the effectiveness of your ozone application. If you do not test before and after the treatment you will not know whether it was effective. This test should be done on a regular schedule to ensure that the contamination does not return.

MUSTY BOOKS: Suggested Size: PRO-3600-1, PRO-3600-5

Books must be placed in a room and be opened as wide as possible. Arrange Crystal Air ozone generator and fan to blow over the books. This process should take no more than one hour. Repeat if necessary.

PET ODORS!

Pet odors are easily eliminated with the proper application of C20 and ozone. If you have a pet odor from urine on the carpet, etc. Crystal air has the only complete solution available. C20 deodorizer and an ozone generator will totally eliminate the odor for good.

Recommended Equipment:

Commercial

PRO 3600-1, PRO 3600-5, PRO 5,000, or PRO 10,000

For commercial pet odor treatment jobs you should use .5-2 g/hr ozone for every 100 sq/ft, depending on how fast the job needs to be done and how bad the problem is. With .5 g/hr / 100 sq/ft you should treat for 1-2 days +, with 2 g/hr / 100 sq/ft it should only take about 6-12 hours.

Residential

PRO 420, PRO 700, PRO3400-1, PRO 3600-1, PRO 3600-5, PRO 5,000

For the do-it-yourself home owner, the treatments can be done one room at a time to allow the use of a much smaller unit. Just calculate the size of your largest room to come up with the size of unit that you will require. Also most home owners are not in as much of a rush to do the job, if this is so you can probably do the job with 1/4 of the above recommended ozone production.

Application Procedures:

Site preparation:

1. All damaged items need to be removed from the area as well as any carpet, pet beds, wall board, or other building or pet bedding materials that are to be replaced.
2. Thoroughly clean all areas possible, and deodorize with C20 liquid deodorizer (4oz/gallon of water). Allow the C20 to completely dry, It does its job as it dries. The odor may actually seem to get worse until it dries due to the fact that C20 is a true deodorizer and contains no fragrance to "cover" the odor.

Important

Ensure that the area is soaked in C20 to the same degree as the original pet urine, this will ensure that the C20 penetrates to the same depth as the damaging odor is.

Ozone application:

Place the ozone generator in an area that will provide the best circulation and distribution of the ozone. Run an extension cord from all generators to the receptacle closest to the exit door. Use auxiliary fans to help with circulation, this will also help to drive the ozone into the pores of the materials. Turn the generator/s to full output and to the on position. Leave the premises and lock all entrances. Allow the ozone application to operate for the above recommended time. If the problem is especially bad increase the amount of ozone used or the length of the application accordingly. Upon returning to the premises, turn off the ozone generators by unplugging the extension cord. Leave the premises and lock all entrances. Allow the building to sit for 4-8 hrs, this allows the remaining ozone to convert back to oxygen and reduce ozone exposure.

Special notes on pet odors.

1. If the odor originated from urine it is VERY important to treat with C20 first and make sure that it is soaked in well.
2. If the pets bed is the source of the odor, or if the pets lived in the area for a long time all porous floor areas should be treated with C20 prior to the ozone treatment. This will help in deodorizing the pet dander and body oils that have fallen through the carpet to the floor board, if this step is not done the odor may come back and require re treatment.

GARBAGE ROOMS:

Recommended Equipment:

PRO Series 3600-1, 3600-5, Depending on the size of garbage room Place the Crystal Air ozone generator on a shelf above the door entrance positioned so the air stream blows away from the sensitive entrance area. An additional osculating fan will greatly enhance the deodorization results by mixing all the contaminated air efficiently with the generated ozone. A shock treatment procedure may be required as the first step to treatment in a garbage room. (Refer to OZONE SHOCK TREATMENT PROCEDURE above), depending on the severity of odors prior to placement of Crystal Air ozone generator. Humid rooms may need dry air routed to the ozone generator with a four inch pipe or hose.

COMPACTOR BINS:

Recommended Equipment:

PRO 3600-1, 3600-5, 5000 Depending on severity of odor.

Crystal Air PRO series ozone generator have a hose adapter as a standard feature and can be ordered with secure SS mounting brackets. The ozone generator should be securely mounted to the compactor in such an area that is accessible for maintenance but not accessible to public or workers. Next cut a 4" hole in front of the ozone generator for the ozone to be routed through. Using a 4" PVC sewer pipe elbow, route the ozone through the hole that was cut out of the compactor in front of the ozone generator. Place an ozone controller in the compactor room to ensure that the ozone concentration does not exceed the maximum safe levels.

AUTOMOBILE DEODORIZATION

Most obnoxious odors such as mold, mildew, smoke, etc. can easily be removed from cars, trucks, RV's etc. Cigarette smoke and most other organic odors can be removed from a car, truck, boat, motor home etc in 1-2 hours. First you should clean the vehicle thoroughly. If the odor is known to be caused by a liquid such as milk or urine you should first treat the area with a high quality non fragrance liquid deodorizer like C20. Ensure that the vehicle is completely 100% dry prior to ozone application, failure to do so may cause damage to the interior components. Place a Crystal Air ozone generator in car or truck, if the vehicle has air conditioning set the heater/AC to recirculate the air and adjust vent fan to full. Operate ozone at half to full for 1-2 hours. Open the doors and air out car or truck, check for lingering odors a couple of hours later. Repeat the procedure if necessary.

Note: Caution in areas of treatment using high levels of ozone. Treat all exposed natural rubber with a silicone spray or Vaseline in order to prevent cracking. This is not the case with fabric covered rubber cushions.

CAUTION: Some car and truck odors are a result of chemical fragrance deodorizers that are non ozone depleting and therefore are very difficult to eliminate. Animal dander and oils embedded under the carpet, must sometimes be lifted and cleaned with C20 or equivalent liquid deodorizer before treatment with ozone.

Recommended equipment:

Autozone, PRO 420, PRO 700, PRO 3400-1, or PRO 3600-1. & C20 liquid deodorizer

Application procedures:

The Autozone runs on 12vdc for use where you can not get AC wall voltage or when you need it on the go. Smokers can keep the unit on low 24 hours per day and always come back to a fresh smelling car. Turn it up to full for 1-2 hours and do a low level shock treatment. If you are a smoker or have a smoker in the family, you can't go without one!

The PRO 420 and the PRO 700 are ideal for auto detailers and dealers that need to shock treat 1-2 cars per day. They are the two lowest priced AC ozone generators that we offer yet they are powerful enough to deodorize a small RV.

The PRO 3400-1 is functionally the same but has a higher output and is upgradeable to a higher output.

The PRO 3600-1 Is the best unit for shock treating a car, truck, RV, etc.. The PRO 3600-1 allows the use of a hose to rout the ozone into the vehicle or fresh air into the generator, this keeps the generator from oxidizing itself. The PRO 3600-1 is also upgradeable, if more ozone is needed for a specific job or you need to do the treatment faster, just add an extra generator plate.

For this reason it is the best unit suited to a detailer or auto dealer that is treating several auto's every day.

Important:

-If the odor was caused by a liquid contamination such as musty odor from a leak, you must first fix the leak or the problem will come back.

-If the odor was caused by a liquid contamination such as pet urine, the area needs treated with C20 to ensure that the odor will not come back.

BOAT AND YACHT DEODORIZATION

Most obnoxious odors such as mold, mildew, smoke, bilge odors, etc. can easily be removed from boats and yachts. Boat & yacht bilge odors are easily taken care of with a Crystal Air ozone generator & C20 liquid deodorizer. Just place ozone generator in bilge or living quarters when at dock and operate on full for 24 hrs. Ensure that all plants pets and people are removed for the duration of the deodorization process. Air out the living quarters of the boat or yacht before re entering. For heavy boat & yacht bilge odors use C20 liquid deodorizer prior to ozone application.

Recommended Equipment:

Autozone, PRO 420, PRO 700, PRO 3400-1 or PRO 3600-1. & C20 liquid deodorizer

Application procedures:

The Autozone runs on 12vdc for use where you can not get AC wall voltage or when you need it on the go. If you are away from dock for extended periods of time and/or do not have AC voltage on board, then the Autozone is the unit for you. (120 VAC wall adapter also available).

The PRO 420 and the PRO 700 are ideal for shock treating boats and yachts at dock or away if you have AC power. They are the two lowest priced AC ozone generators that we offer yet they are powerful enough to deodorize the bilge of a 40-50ft yacht.

The PRO 3400-1 is functionally the same but has a higher output and is upgradeable to a higher output.

The PRO 3600-1 Is the best unit for shock treating large boats and yacht at dock. The PRO 3600-1 allows the use of a hose to rout the ozone into the bilge or other contaminated areas. The PRO 3600-1 is also upgradeable, if more ozone is needed for a specific job or you need to do the treatment faster, just add an extra generator plate.

Important:

-If the odor was caused by a liquid contamination such as musty odor from a leak, you may need to first fix the leak or the problem will come back.

-If the odor was caused by a liquid contamination, the area needs treated with C20 to ensure that the odor will not come back.

REDUCING CONTAMINATION IN OCCUPIED AREAS

If you wish to use an ozone generator as an air purifier, cleaner, deodorizer, etc. in an occupied area you must first realize that ozone will NOT completely sterilize any environment at a level that is safe for people, plants and pets. It may however reduce the contamination when used properly, if you are trying to sterilize the surfaces of an environment please refer to the shock treatment section.

(Setting Ozone Level) The right level is when all the generated ozone is being used up accomplishing its job. However, this is difficult to obtain because it becomes a balancing act. Initially the machines output is set high for a short time to get rid of the problem odor as quickly as possible. As this is accomplished less ozone is required for the diminishing odors, thereby leaving some residual ozone in the air. If the machines output is not turned down after a short while then more residual ozone will be left in the air. If there is a heavy smell of ozone, there is more ozone present than is required to do the job. Simply turn the rheostat (output level control) on the ozone generator down to reduce the ozone output. This is a case where more is not considered better. The levels of ozone required to deodorize most environments are from .03 ppm to .1 ppm.

The Crystal Air ozone generator should be properly sized for the specific area and number of possible smokers or other contaminants. The Ozone generator should be hooked into the air handling system in order to ensure proper distribution. (The Ductzone is designed to be mounted on the ductwork or if higher output is required, mounting brackets are available for the PRO 3600, 5000, & 10000). An ozone controller should also be used in order to ensure safe levels are not exceeded.

If a controller is not used (not recommended) adjust Crystal Air ozone generator so that the ozone or the problem odor can not be detected. Begin with the ozone generator on low setting and work your way up slowly. One person should be in charge of adjusting the ozone generator output as the contamination increases or decreases. If ozone is set for 40 smokers and 30 vacate, then the ozone generator should be adjusted to lower setting, otherwise the air will become excessively ozonated and possibly cause sore throat or headache.

Recommended equipment:

An ozone generator capable of approximately 20 mg/hr / 100 sq/ft of space and an ozone controller to ensure that the ozone is kept at a safe level. The amount of ozone needed is different for every installation due to several factors:

1. High humidity reduces the output of the ozone generator.
2. The level of odor or other contamination. The stronger the problem the more ozone is needed.
3. Air exchange, if the room or building has an exhaust, air exchange, etc. this must be taken into account.

Application procedures:

All Crystal Air ozone generators with the exception of the Ductzone are of a commercial design, the output is higher than .05ppm

Wherever possible the ozone generator should be run through the air handling system to ensure that people are not exposed to high concentrations from the ozone generator output.

All procedures are basic. For more intense and extensive procedures, consult Crystal Air or refer to fire and flood manual for comprehensive procedures

RULES OF THUMB:

a. Odors created in a hot environment are embedded deeper in the pores of the materials such as curtains, furniture, wallboard etc. This is due to pores expanding when hot and closing when cold. A warm environment will always produce better results than a cold one when deodorizing a gaseous odor.

b. Humidity always enhances an odor. Existing odor causing contaminants like bacteria and fungus flourish in warm and humid environments.

c. Overkill and persistence is the successful way to deodorizing.

d. An additional fan of high output is necessary in all ozone treatments for optimum results. The fan will force the ozone into the small pores of the material to remove the odors absorbed.

e. In all decomposed protein, use a powerful sanitizer or bactericide and a powerful liquid deodorizer like C20 or equivalent.

f. Always use respirator and gloves when handling contaminated materials like rotten meats or dead animals.

g. Caution in areas of treatment using high levels of ozone. Treat all exposed natural rubber with a silicone spray or Vaseline in order to prevent cracking. This is not the case with fabric covered rubber cushions

h. Humid air supplied to the ozone generator will result in less ozone production. Dry air supplied to a generator will result in optimum ozone production.

Caution:

. The water in moist or wet surfaces of fabrics combined with high ozone may create Hydrogen Peroxide and result in bleached material. Avoid high humidity situations combined with high ozone concentrations.

COMMON ODORS ELIMINATED WITH OZONE

- Aged Books
- Hospital odors
- Alcohol Beverages (Bars, Lounges etc.)
- All organic waste
- Pet Odors
- Auto Exhaust
- Bacteria
- Kitchen Smells
- Oils and Greases
- Bathroom Odors
- Body Odors
- Burned Hair
- Burned Food
- Carbon Monoxide
- Methyl Mercaptan (Pet Urine)
- Mildew
- Mold
- Cigarette Smoke
- Rotting and Decaying Substances
- Most Organic Chemicals
- Paint Fumes
- Diesel Fumes
- Ripe or Rotten Foods
- Sewer Odors
- Fish Odors
- Smoke
- Stale or Stuffy Rooms or Buildings

MARKETS FOR CRYSTAL AIR OZONE EQUIPMENT

OFFICE AND ENVIRONMENT (*Unoccupied Areas*)

- Garbage rooms
- Cigarette Smoke
- Mold odors
- Pet odors
- Mildew odors
- Maintenance rooms
- Damp basements
- Storage rooms
- Smoking lounges
- Restrooms
- Meeting rooms

SHOPPING MALLS

- Food court garbage areas
- Garbage compactors

HOTELS & MOTELS

- Garbage compactors (Unoccupied areas)
- Garbage areas
- Linen rooms
- Change rooms (Pool)
- Kitchens
- lounges
- Health clubs (Weight rooms, locker rooms, dirty linen rooms)
- Restaurant or commercial industrial exhaust stack and gas stream.

AUTOMOBILES & RVs

- Cigarette Smoke
- Pet odors
- Mildew odors

PROPERTY MANAGEMENT

- Rental houses (Unoccupied)
- Apartments (Unoccupied)
- Deodorizing between rentals for (tobacco, ethnic food cooking odors, pet odors)
- Garbage rooms
- Garbage compactor
- Common recreation rooms