ODOR NEUTRALIZATION:
ASSESSMENT AND REMOVAL

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About this Article

I find that beginning this article with a 101 class on what is an odor and its history is appropriate. The idea is to then build on history of oils and fragrances, move into olfactory senses followed by writing about investigations, assessment, health concerns and products.

Odors are put into two main classifications – good and bad. Restorers are sometimes hired to remove offensive (bad) odors from building and contents. Examples include smoke odors from fires; pipe, cigar and cigarette smoke in hotels and cars; lingering cigarette odors from nicotine buildup; cat and dog urine odors in carpet and building framing; dead body odors, skunk odors, and chemical residues.

For restorers, having an understanding about what makes up good and bad odors is critical. Also, knowing that not everyone will agree on what is a good or bad odor or what is acceptable to some people. An example is a barn with milk cows. I was brought up in a farming community where the smell of an old barn brings back good memories. That said, I don't want my house smelling like a barn. When a restorer is hired to remove offensive odors they are expected to have a foundation of science and practice that allows them to do their job properly.

This article is presented in three sections:

Part 1: Ancient Oils, Fragrances and Treatments

History of Ancient Oils and Fragrances

Fragrances have been used since antiquity to freshen air and mask odors. How they are perceived is based on our sense of smell. The ancient Egyptians believed the sense of smell and the ability to detect odors was the most important of our sensory abilities. In fact, they considered smell to be more important than sight for priests who worked in temples. This is because the sense of smell was critical for transforming Egyptians into the afterlife.

Products like lemon, cedar leaf, cloverleaf, cedarwood, geranium, jasmine, persimmon, musk, sage, moss, spikenard, cypress, gingergrass, frankincense, nutmeg, clove, cinnamon, kohl, henna, olives, sesame and other natural ingredients such as animal fat, were used in religious ceremonies; and aromatic lilies, lilac, roses and myrrh oils were used to scent tombs (The Ebers papyrus found in the temple of Edfu dates back to 1550 B.C.E.). The Ebers papyrus is the "Eye of Ra" that was found in the 1870's by George Ebers. Ebers translated the manuscript that identified over 850 botanical herbs, fragrances and aromatherapy remedies.

Biblical Writings about Oils and Fragrances

The Old Testament (BCE) and the New Testament Bible (CE) provide more than 200 references to aromatic plants, including essential oils. Examples of biblical aromatherapy include:

- Exodus 30:22-27 contains a recipe for an anointing oil. This recipe includes cassia, hyssop, frankincense, spikenard, galbanum, myrrh, cinnamon bark, and calamus.
- Matthew 2:11 tells that when the three Wise Men came to see the Christ child, "they offered him gifts of gold and frankincense and myrrh."
- John 12:3 tells of Mary Magdalene anointing the feet of Jesus with a pound of spikenard ointment.

Founding of Aromatherapy

In ancient Egypt, the principles of aromatherapy played a part in the building of towns. The town commissioned by Akhenaton (who is probably more famous for his marriage to Queen Nefertiti), had large spaces dedicated for the burning of herbs to keep the outdoor air fresh while lingering aromatherapy odors migrated in buildings, helping them to get rid of germs. In India, temples were built with sandalwood that helped monks become grounded and stabilized them in prayer, and it is believed King Solomon built his temple with cedarwood that also provided a calming effect. Today, science has shown that cedarwood is high in compounds called sesquiterpenes that help deliver oxygen molecules to the cells of the human body which apparently can erase or de-program miswritten codes in our DNA.

In ancient Greece, the temples of Aesculapis, the Greek god of healing, and of Aphrodite both contained marble tablets onto which the recipes for a number of medicinal perfumes were inscribed. Hippocrates was at Aesculapis. At both temples, it was the priestesses who dispensed oils of healing essences. Hippocrates' most famous aromatic quote – "The way to health is to have an aromatic bath and a scented massage every day."

The physician Marestheos recognized that aromatic plants usually had either stimulating or sedative properties. In his book, "Concerning Odors," the Greek philosopher and scientist Theophrastus (371-287 BC) discussed the effect of fragrance on the mind. This developed into the first treatise on what we now call aromatherapy.

In his practice, Theophrastus used olive oil to absorb the perfumes of flowers and wrote that perfumes should have medical properties. For example, the famous Megaleion perfume that was worn for its scent was also used to heal wounds and reduce inflammation.

Excerpts from the writings of Theophrastus include discussions about scent, their origins and the affect they have on man's moods and thoughts. He also wrote about the connection between odor and taste – which is commonly accepted today as important for understanding our perception of smells.

Treating Headaches with Aromatherapy

Migraine headaches are a particularly severe form of headache which can be triggered by offensive odors, dramatic changes in sound and light, and eating the wrong type of food that disagrees with the body such as some types of shell fish, peanuts, bananas, chocolate and caffeine.

A migraine headache occurs when there is an almost ‘excellent storm’ of triggers and reactions. The medical definition of a migraine headache is when blood vessels around the brain enlarge and bind the the chemicals being excreted by the nerves surrounding brain’s blood vessels. For some people, part of the cure is to lie down, close the eyes, relax, and breathe in fragrances. This treatment relaxes the body that stops pain signals from disturbing brain nerves. Essential oils like peppermint are known to assist with headache pain; and conjointly, chamomile and lavender are also helpful relaxation fragrances.

Using essential oils are not the same as using household sprays that freshen a room or house. Essential oils are far less offensive since typically those air freshener types of smells will make headaches worse. However by using small amounts of essential oils you'll be able to help to ease the pain of headaches. Sinus issues are another common reason behind headaches. Aromatherapy permits sinuses to be cleared and allows a person to breathe freely. Oils like peppermint, eucalyptus and pine work great for this. Soothing peppermint essential oils will help to freshen your mind, body and mood when used with a cool compress on your forehead or the back of your neck. The most important factor when treating headaches with aromatherapy is that the oils work best when incorporated with different homeopathic ways, like a dark quiet place to rest, a cool compress and drinking plenty of water.

Natron

In Egypt, archeologists uncovered the tombs of three ladies from the court of Tuthmosis III that contain jars of cleansing creams. The cream is believed to be a mixture of oil and lime (e.g., natural oils of lilies, lilac, rose, myrrh and Natron). Natron is a type of sea salt that came from the Dead Sea.

Natron salts--sodium carbonate decahydrate--is a kind of salty soda ash that was used as a cleansing product, a skin treatment, and odor remover from people and buildings. In fact, Cleopatra’s beauty may be attributed to taking Natron salt baths. Cicero wrote of Cleopatra in the first century BC: “Her character, which pervaded her actions in an inexplicable way when meeting people, was utterly spellbinding. The sound of her voice was sweet when she talked.” While this remedy has nothing to do with Natron salts, if you want, you too can feel like the Queen or Prince of the Nile, by adding whole milk or milk powder and some honey to your bathwater. Best, use goat’s milk, as it’s the only milk that contains capric-capryllic triglyceride that helps to moisturize and soften skin.

Another prescription for a body scrub of ancient sea salts from the Dead Sea: 1-part honey, 1-part Natron (use baking soda), 1-part Lower Egyptian salt (use bath salts or Dead Sea salts); and grind the mixture to a paste and rub it onto your body. In a formula made for cleaning, mix baking soda with table salt. Purists may use sea salt and then grind it with sodium carbonate (baking soda) that makes a fine powder. Try mixing 1-part salt to 2-parts baking soda. It may make a good poultice to remove stains; provide similar benefits to Epsom salt bath moisturizing; and the formula may act as a good degreaser.

Aromas, Fragrances and Distillation

In making your own authentic type of ancient aroma: Add frankincense and myrrh essential oils with baking soda. Scrub your body with this paste and let it sit for a few minutes and relax and enjoy before rinsing.

During the Byzantine Period of Christianity, the use of oils to clean with was discouraged since it was rejected as a form of vanity from the Greek and Roman periods. However, the elite class in Constantinople (including Empress Zoe) used oils as perfumes; and priests used myrrh in incense as a form of purification. When large congregations of people got together the smell of bad body odors was noticeable. Court perfumers were hired to scent the gathering crowd.

Through distillation the Egyptians and Mesopotamians (Assyrians) used cedarwood oil, myrrh (Commiphora myrrha resins mixed with honey) to make perfumes and ointments that helped to provide good personal hygiene and prevent disease.

Although crude forms of distillation to make oils and perfumes were practiced as early as 3500 BC, distillation as we know it today had its beginnings with the work of the Persian physician, Avidenna (980-1037 AD).That said, classical Greece saw the beginning of a distillation process where aromatic plants were steeped in hot or cold oils (a process called hot steeping and cold steeping). It's believed that the Greeks were the first manufacturers of liquid perfume throughout the ancient world (although it is not the liquid perfume that we know today).

Al-Kindi (c. 801–873 AD - also known as Alkindus in the west), a Muslim Arab philosopher and scientist, is considered by many to be the father of the modern perfume industry. He is known for his work in isolating alcohol and he was the first to describe the production of pure distilled alcohol from the distillation of wine. Al-Kindi invented many different scents by experimenting and combining different plants and other materials in order to produce perfume products. One of his books, the Kitab Kimiya' al-'Itr (Book of the Chemistry of Perfume) contains recipes for fragrant oils, salves and aromatic perfume water.

In 1370, the first alcohol-based perfume was created for Queen Elizabeth of Hungary who was known for her famous toilet water - also referred to as Hungary Water. The primary ingredient of this toilet water was believed to be rosemary. Some argue, this was the secret to Queen Elizabeth's beautiful skin, which she retained into old age. Perfumes during the early Renaissance period were primarily used for neutralizing the natural scent of leather accessories such as gloves, handbags and leather jackets (often made out of goat leather that the Moors used to import through Spain).

"Les Maitres Gantiers" (masters in glove making) were the only ones permitted by the king (as a result of a royal decree, April 4 1573) to make and trade fragrances. Their name eventually changed in the 17th century from Master Glove Makers to Master Perfumers.

When Catherine De Medici, known as the ambassador of perfume, moved to France from Italy to marry Henry II, she brought along her perfumer, René le Florentin. Among other things, René created poisonous jewelry for the queen to use against her enemies. Along with the poisonous jewelry, he also made the queen scented gloves that would mask the scent of poison. In the Medici Palace it was rumored, René had a laboratory that directly connected to her apartments by a secret route. Apparently this was to ensure that no perfume recipes could be stolen or copied. René later moved to Paris where he opened a successful perfume store.

Moving up to the 18th and 19th century, Napoleon was happy to bring back in style many of the old remedies, potions and fragrances. At one point over 100,000 acres of flowers were in bloom to make French perfumes. It was shortly after this point in time that the first attempt to synthesize (artificially, synthetically reproduce) the scents of plants and fruits took place (Schimmel, Haarman, Reimer). Around 1869 new scents were made including heliotropine, coumarin, artificial musk, vanilla and iodine. In 1921, synthetic aldehydes helped make up the perfume Chanel #5.

Conclusion

From what we know, ancient man and today's society use scents and oils for purifications and rituals, and they are widely used in food and cleansing products. They are used in healing remedies and some are valuable to prevent infection and treat various health disorders. But what are the senses that allow us to decide which odors are good or bad? These issues will be discussed in Part-2: Understanding Olfactory Senses.

Part-2: Understanding Olfactory Senses

The Olfactory Organ and Our Brain's Response

Olfactory is a medical term that describes the sense of smell or the contributing aspects that make up the sense of smell. As a noun, olfactory means the olfactory organ including the nose and nerves that are connected to the brain.

The olfactory system is the body's sensory system that detects smell. In brief, the nose takes in tiny particles of dust and molecules of aroma. Aroma molecules get trapped on hair-like nerves that pass the chemical signature on to receptors and then move through the olfactory bulb to the brain.

Good and bad odors are detected within a fraction of a second, causing our body to respond positively or negatively or not respond at all. Because we are aware of our environment and we are familiar with the smells that are around us, we don't respond at all, which for the most part is a good thing. As you walk from room to room minor variances in wind, vapor pressure, temperature or humidity can change how we perceive (sense the air with our olfactory system) the indoor environment.

A simple test is to stand 5 feet away from your closet and then walk to clean garments and smell several items of clothing. Sometimes you can smell the freshness in the garment or a cleaning compound. Next, go to your clothes hamper where dirty clothes are stored for cleaning. By smelling them you can detect skin and body odors. Our sense of smell is limited to detecting odors that are directly around us or on an object. We don't usually have a strong sense of smell that can warn us of bad odors that are coming towards us.

Once our brain registers the smell in our memory, both bad and good smells have the ability to help us think of prior times where we smelled a rose or it brought us back to a particular time in our life. Our memory may also remind us of a past traumatic situation. In other words, our memory is capable of storing millions of chemical signatures that remind us of good and bad thoughts.

As a result, retrieving old chemical signatures from the brain's memory can cause us to laugh, smile, cry or respond in an irrational manner. In an irrational state, the olfactory nerves react, causing nerves to respond to electrical signals and impulses that send this information to the rest of the body. Some people behave irrationally when they smell smoke and begin to panic and run wildly out of a building. Observing this behavior with the smell of smoke in the air can cause other people to panic and run out of a building. These irrational responses have trampled others who were not so lucky to get out of the smoke-filled building.

Olfactory Detection

What is the olfactory system trying to compute to the brain?

1. Odor detection;
2. Odor identification and concentration;
3. When multiple odors are present, odor segmentation;
4. Location of the smell;
5. Tasks required by the brain and memory that tells us how to respond.

Odor Detection

Detecting odors (chemical sensing) is a primitive function of the brain that protects us from dangerous situations, such as stopping us from eating harmful plants and food. For animals, odor detection is critical because it allows them to be aware of others that may want to harm them.

Odor Identification and Concentration

When only one odor is present we automatically want to identify what it is and whether it is strong or light; whether it is pungent, acrid or flowery; whether it is safe or harmful to us.

When Multiple Odors are Present, Odor Segmentation

When the brain is sending us conflicting signals to the body, more than likely there are multiple chemicals present. Sometimes our immediate reaction is to get away from the odor while other times we sneeze to expel chemical odors. Sometimes we do both, by sneezing as we leave. When our eyes form tears, this is an indication we are having a respiratory and a skin reaction.

Chemical products are made up of many compounds. Our sense of smell may not be able to distinguish or identify what compound is causing the olfactory system to respond.

Location of the Smell

Its common perception to believe we are facing the direction the odor molecules are coming from. This may be true when you are walking into a room that has an offensive odor. In other words, you identified the room as having the odor. However, as you are standing in the room you may not be able to tell where the odor is located or coming from.

In a cat and dog urine identification situation, getting close to the source of the odor with your nose is one method for identifying the source. Moisture testing and UV light detection systems are two other methods.

When the odor is offensive or possibly harmful to breathe, using scientific instruments like a TIF meter, multi-gas sensing monitor, FID/PID chemical analyzer, or sending samples of VOCs and PAHs to a lab for analysis may be required.

Tasks Required by the Brain and Memory that Tells Us how to Respond

Few of us are fearful that animals will eat us at night. Therefore, our primitive instincts of survival about larger animals that may want to eat us are not heightened. Yet, our primitive instincts continue to play a major role in our natural defense mechanisms. Within a nano-second, our olfactory senses tell brain receptors about a new chemical smell it found; our memory bank processes all the odors it knows about and sends a response to the rest of the body. That response may be nothing because the person you are sleeping with has a lingering perfume smell your memory bank is familiar with; or you may jump up in the middle of the night because your memory is telling you it detected smoke.

Gustatory and Olfactory Senses

Where does taste fall into the olfactory system? It is appropriate we consider gustatory (the sense of taste) and smell together because they are intertwined in our life experience. Much of food flavor is perceived through taste and smell. Most people are unaware that what they call taste is really an olfactory experience.

The sensations evoked by a substance put into the mouth are complex and involve much more than taste. For example, a mouthful of lemonade gives one a taste that is a combination of sour and sweet. In addition, the cold temperature evokes a complex touch sensation in the mouth. And finally, it smells like lemons. The only part of this complex of sensations that is taste in origin, i.e., resulting from receptors on the tongue, palate or pharynx is the sensation of sweetness from the added sugar or sourness of the lemon.

Anyone who has ever had a cold or flu should be able to remember the loss of taste. This is due to the fact that access of odorants to olfactory receptors is blocked by nasal congestion from mucus buildup.

The gustatory system is much simpler than the olfactory system. Different regions on the tongue exhibit different sensitivities to the four tastes. The tip of the tongue is the most sensitive to sweetness and saltiness. The sensation of sourness is experienced best on the lateral aspects of the tongue, and bitterness is experienced best and perhaps only on the back of the tongue.

Humans require a way to distinguish safe foods from dangerous substances. There are four gustatory receptors (senses) which are sweet, sour, salty and bitter. When people describe how food tastes, they are actually talking about food flavor and the olfactory senses that are produced; and not just the basic tastes of sweet, sour, salty and bitter. The range of flavor experiences also includes aroma, texture, and mouth ‘‘feel’’—and, some would say, even the pleasantness of some foods.

Scientists assumed that taste and smell would undergo dramatic declines with age, similar to that with vision and hearing loss. However, it appears that chemical senses of food are much more robust in older people than are vision, hearing, and even touch. Generally, age-related deficits in the sense of smell are more dramatic than taste deficits.

Conclusion

This brief discussion on olfactory senses helps the investigator understand the importance of their sense of smell. When we cannot see the cause, source and extent of contamination, having a good sense of smell is important to complete a thorough field investigation. The investigator or restorer is relying almost on 100% of their senses to tell them where the odor is, the intensity, is it a potentially toxic or hazardous odor, and so forth. Therefore, not having a good sense of smell can jeopardize the health and welfare of the investigator and possibly building occupant.

Part 3: Odors, Investigation and Counteractants

Understanding Odor Basics

To understand the process of odor control one needs to understand the compounds that create odors. There are generally three elements that cause odors: oxygen, nitrogen and sulfur. An odor containing oxygen molecule is usually sweet; however, odor containing nitrogen and sulfur compounds are usually acrid and foul smelling.

To detect odor compounds they need to be volatile and airborne. Once airborne, odors stimulate our olfactory glands causing a number of complex reactions that allow us to identify the odor. This process generally takes less than a second for our body to respond and attempt to identify the odor.

With some compounds only a few molecules are required to cause a sensory reaction. In high concentrations they become overwhelming, while in low concentrations they may be hard to sense. This situation can be dangerous if the compound is hazardous such as the presence of certain acids, flammable, explosive and toxic substances including carbon monoxide and hydrogen sulfide gas.

Odor counteractants are designed to eliminate or control bad or offensive odors in a building, room or container having odors like smoke odors, rotting food, sewer gases and stale air. Odor control is often achieved in one of three ways: chemical interaction, masking or repeated flushing with fresh air.

Most odor counteractants are made from organic chemicals and complex compounds that are biodegradable and water soluble, which are important factors to consider in today's green environment. As odor neutralizing compounds react, they break down molecules so that the odor is no longer present. The neutralizing product may be capable of reacting automatically on contact with a wide variety of compounds from acid producing odors (hydrogen sulfide, methyl mercaptan) to alkali odors (ammonia, trimethylamine). In order to abate the presence of fire odors and their gas-counterparts the VOC and PAH residues must be understood. The neutralization of fire odors involves removing a complex mixture of burned materials. Building fires generate carbonaceous materials and hydrocarbon-rich compounds that are sometimes difficult to capture, remove and neutralize.

When possible have your product distributor train technicians on what chemicals work best for different odor neutralization situations. In some cases complete odor neutralization may require more than one product and two or more applications.

Masking Agents

Masking agents are chemicals that cover up odors. Some deodorizers are masking agents. They overcome bad odors with a stronger odor for a period of time instead of breaking down odor molecules.

Investigation Steps

Introduction

The cleaning and restoration industry teaches how to safely remove contaminants, but when residual odors are present, some restorers don't understand how to mitigate the remaining odor.

Investigating an odor problem can become complicated when there are no visible signs of contamination and the restorer must identify cause and origin.

My description about what is required to complete an investigation that leads to odor neutralization is brief because there can be multiple variables to neutralize each project. This article follows the basic odor intensity investigation practices in ASTM E544-99 Standard Practice for Referencing Supra-threshold Odor Intensity. Even though I'm referencing ASTM E544-99, it's important to discuss that E544-99 involves the investigation of ambient air in communities and not buildings. I've also consulted with various government agencies and industry associations in compiling the information below.

The steps I've outlined below are for dog and cat urine inspections and assessments, skunk odors and tear gas in and under buildings, fire damage and fire odor control areas, dead body odors, as well as more complicated fuel spills under buildings and in basements. In my career I've had to mitigate the following situations and the steps I'm outlining were helpful in assessing damage caused by trucks, cars, and planes that crashed into buildings, managing illegal methamphetamine drug labs, drums of chemicals spilled outside a building, fire damage and the release of toxic chemicals in industrial plants, release of mercury and PCB's, tracing chemical residues through a building's ventilation system, assessing high-rise building damage from a broken sprinkler system, following migrant fume problems from drain-line plumbing, fumes created by uncured paint, and biological problems that could only be identified and traced through lab culturing such as infectious TB, Legionellae, mold in ventilation systems and inside walls.

Health Danger:

Completing an odor investigation with the use of your senses is a dangerous business. Restorers and indoor environmental professionals face possible and severe health risks every time they investigate an odor problem.

Restorers and investigators can be unaware of the chemicals they are being exposed to when they conduct an odor investigation. Temporary, accumulative and long-term olfactory nerve damage can be caused by breathing in dangerous substances.

For some people, the repeat exposure to one of the least dangerous smells like cat and dog urine can desensitize some senses of smell. In more severe cases where restorers are exposed to dangerous chemicals and fire damage toxins, they stand the chance of permanently losing some of their smell receptors. Olfactory damage can rob individuals of the sense of taste. Investigators have an increased potential to experience upper respiratory tract infections and allergic reactions, suffer from paranasal sinus disease and inflammation of nerve tissue. And while doing future investigations, the loss of smell can cause increased harm because investigators have lost some of their ability to sense dangerous chemicals and environmental hazards.

Steps that Help the Investigation

Each building odor identification and remediation project has many of the same basic odor defining investigation steps:

1. Identify the date and cause of the odor episode.
2. Document all parties involved including:
    a. Building owners and managers;
    b. Insurance adjusters;
    c. Occupants that experienced exposure;
    d. Occupants that may in the way of cleanup and deodorization;
    e. Other persons who may be indirectly affected such as highly sensitive and immune compromised individuals.
3. When fire, paramedics or hazmat were contacted, document their findings and reports.
4. When government agencies are involved:
    a. Make sure the site or scene is OK to complete the remaining cleanup and deodorization.
    b. In homicides and crime scenes, make sure investigators have finalized their investigation.
    c. In fires of suspicious origin, make sure investigators have completed their investigation.
    d. In explosions and fire damaged buildings, make sure the building is safe for entry.
5. Determine if the odor is from a regulated or hazardous material.
    a. If yes, identify hazards, such as the amount of spill or leak, CAS #'s
        i. Determine if a hazardous materials expert must be contracted;
        ii. Determine if a qualified indoor environmental professional (hazmat or industrial hygienist) must take over the investigation and damage assessment;
        iii. Based on the intensity of the odor, and its potential to be toxic, flammable or explosive, determine what testing procedures must be put in place and what engineering controls need to be established:
            1. Before doing additional investigation;
            2. Before allowing workers to complete odor control work;
            3. Before allowing occupants to reenter the building.

6. When occupant or public health complaints exist:
    a. Determine whether occupant or public complaints exist "before" the spill or the presence of a bad odor;
    b. Determine if the odor is just a nuisance problem or there is the potential the odor can result in more severe health consequences for some persons;
    c. Describe area(s) of the building where other complaints existed prior to the current odor complaint.
7. Describe the type of:
    a. Building construction (e.g., all wood framing, concrete, steel and metal studs);
    b. Finishes including plaster and drywall, carpet, paint, blown acoustic, paneling;
    c. Furnishings.
8. When hazards are present:
    a. Define building safety, security and odor control containment measures;
    b. Determine what must be done with building occupants (e.g., stay or go);
    c. Determine if the building's HVAC system is affected and should it be turned off;
    d. In office buildings and commercial properties, determine if the neighboring tenant or business is affected.
9. Create a decision logic tree for "ruling out" where "odors are not present" such as crawlspaces, basements, attics, neighboring rooms, ventilation systems, elevators, ventilation shafts, stairwells, hallways, etc.
10. Identify chemicals causing the odor to exist:
    a. In cat and dog urine odor situations some of this document does not apply. However, following the same investigation guidelines will help with better recordkeeping.
    b. In mildew odor situations, identify sources of water intrusion.
11. HD video and digital photos can't identify smells but taking video and photos of the contaminated and/or odor containing area are important to the investigation.
12. Determine if the odor is recent or it is a more long-term lingering problem.
    a. For lingering odor problems determine:
        i. When was the odor problem first noticed;
        ii. Does the odor come and go over a period of time and what is that time;
        iii. Does it come once a day or cycle over many days;
        iv. Are only certain people affected by the odor and other people do not recognize its existence;
        v. The odor only become noticeable when the wind direction comes from the west;
        vi. Odors are only present on high humid days or when it's about to rain;
        vii. The odor is only in the corner of two rooms next to the floor.
13. Define the odor characteristics that are present.
    a. The restorer should determine if the odors they smell are the same as what building occupants smell;
    b. Do some occupants have different descriptions about the cause and what chemicals make up the odor smell?
14. Define the odor's intensity.
    a. From your smell and that of building occupants, is the odor description:
        i. Slight, light, lingering, moderate, heavy, overwhelming, or the odor comes and goes away.

   b. Based on the intensity, are there signs of tingling or burning of the eyes and skin, causes of respiratory distress?
15. What has been done so far (by others) to identify, remediate or mitigate the odor problem:
   a. Review all reports generated by others;
   b. What cleaning, neutralizing or odor counteractant chemicals did they use and what concentrations were the chemicals applied:
      i. Determine if "their" chemicals currently mask your ability to smell the underlying chemical odor problem;
      ii. Determine of "their" odor counteractants are complicating the remaining odor identification and removal process.
16. Determine what building materials and contents are involved:
   a. Do contents need to be separated from the affected areas;
   b. Do contents need to be cleaned and/or deodorized before, during, or after the building's odor control process is complete.
17. Create an indoor air quality odor map of the affected and non-affected rooms or areas.
18. When a spill is involved (including dog and cat urine), create a spill map of affected and adjacent areas.
19. When required, check CAS # and find the MSDS, and then strategize a chemical neutralization process.
20. In some odor neutralizing situations it may be important to acquire scientific clearance that the odor or chemical residue no longer exists.

Insurance Coverage and Liability

As one can see, completing a thorough and objective odor control investigation requires expertise and time to complete the investigation. These services generally come at a cost to the customer because the investigator may not be hired to do the actual cleanup.

Investigators and restorers completing the odor investigation should have general liability, pollution and errors and omissions insurance coverage. In some situations the customer only wants information about the cause and extent of odor contamination. And based on the restorer's findings and estimated cost to mitigate the odor control problem, the customer may want to get quotes from other restoration professionals.

Your contract should have language in it that protects you in case other parties use your information in their attempt to complete the job.

A Word about Industry Products

Odor counteractants come in a variety of products from aromatic sprays, gels, powders, foams, granules, concentrates and ready to use water-based chemicals. Each product has its advantages. The mentioning of a particular product's name is not a product endorsement.

- Some sprays use a blend of citrus-based odor counteractants that are capable of neutralizing organic odors including sewer smells and smoke odor such as 3M Air Freshner.
- Some water-based chemicals are fortified with enzymes such as UltraZyme. Some odor counteractants bind with the odor molecule and oxidize the odor.
- Some granular odor counteractants contain absorbents that neutralize and encapsulate odors while producing its own long-lasting odor such as Chemspec Smoke-Solv granules.
- Some smoke odor sealers act as a deodorizer such as Chemspec Smoke Odor Sealer.
- Some products say they have a patented unique chemistry which neutralizes odors on contact which requires users to look at the MSDS to find its properties like Buckeye Scenturion.
- There are floor finishes which have odor counteractant claims such as Blue Sky #10 with Perma's Sunrise counteractant neutral cleaner.
- Some odor counteractants are gels used as stickups in bathrooms such as Waxie Gel Cups
- Some odor counteractants are in liquid that can be mopped and leave a fragrance of potpourri behind such as Blender 45.
- Some odor counteractants can safely be added to disinfectants that are USDA authorized such as PPC concentrate odor counteractant.
- Some products are all-in-one odor counteractant that acts as a cleaner, disinfectant, and tuberculocidal agent, such as Oxyquat Disinfectant and Odor Counteractant.
- Carpets having odors can be powder-treated with an odor counteractant such as SSS Spring Green.
- Some odor counteractants are specific to the type of odor they are removing such as MasterBlend Skunk Odor Control.
- When working in hospitals where a cleaner and odor control product is required and be USDA C2 approved, products include Claire, Amphyl, Clorox and Lysol disinfecting cleaners.
- Some products need to be gentle to the surface it is deodorizing such as foaming products including Arm and Hammer Carpet Foam Deodorizer
- When nothing else seems to work as an odor counteractant some people turn to Unsmoke's Last Resort.
- As a cleaner of clothing most all laundry detergents are good deodorizers.
- As a hard and semi-porous cleaner, most detergent cleaning products act as good deodorizers.

Hazards in Applying Chemicals in Today's Buildings

Introduction

It was not too long ago we used solvents to clean and deodorize the interior of buildings. Today many solvents have been removed from cleaning and deodorizing products. One reason, there is an increasing numbers of people that became allergic to chemical cleaners and deodorizers. A persons' response is usually shown as an allergic reaction to a product. However, when nighttime janitors and building service employees clean an office, the person occupying the suite is unaware of the chemicals used to clean an office. They may not know their allergic reaction is caused by a cleaning compound.

Research by the California Department of Health estimates that up to 34% of Americans report symptoms of chemical sensitivity. Of this number up to 80% also have chronic fatigue syndrome; 65% have fibromyalgia, and over 85% have digestive and immune disorders. And according to a study by the National Academy of Sciences, 95 percent of chemicals used in fragrances are synthetic compounds derived from petroleum. It is believed chemical manufacturers can add synthetic fragrances without revealing what the fragrances are or how they affect humans.

FIFRA, EPA and Restorers

FIFRA is the Federal Insecticide, Fungicide and Rodenticide Act that regulates the registration, distribution, use and sales of pesticides within the United States. (Many chemicals used in the cleaning and restoration industry have the ability to kill microorganisms and insects, and as such they must be compliant within the guidelines of FIFRA). EPA is the Environmental Protection Agency that is charged with protecting human health and the environment by writing and enforcing laws passed by Congress. EPA is responsible for enforcing FIFRA regulations, chemical spills and chemical usage that falls outside of FIFRA.

It is the responsibility of each restorer to ensure the products they use to remediate chemical residues and neutralize odors: (1) complies with FIFRA requirements; the product is EPA registered; (2) the product meets federal, state and local codes and regulations for use and disposal (some states and cities ban the use of certain chemicals); (3) the product is properly applied to chemical manufacturer's specifications; (4) the product leaves behind no harmful residues.

Green Cleaning and Deodorizing

In Industry's attempt to move away from solvent-based cleaners and deodorizers, they've established new guidelines that describe eco-friendly cleaning. One of the newest members of the green clean society is the Natural Products Association (NPA). Products that meet NPA requirements must contain 95% natural ingredients (excluding water), use safe chemistry and be biodegradable.

Other organizations in the forefront of green cleaning includes but is not limited to the U.S. Green Building Council, Green Seal, Hospitals for a Healthy Environment and the Healthy Schools Campaign.

One excellent resource in finding green cleaning products for cleaning, remediation and odor control restorers is at the ISSA website. Other excellent resources can be found through national restoration distributors such as Jon-Don, Bridgepoint Systems, Abatix and Aramsco.

Closing Comments

Surprisingly, some cleaning and odor counteractant products do not do what they are advertised to do. Some of this dilemma has to do with chemistry. Meaning, while green eco-friendly water-based chemicals are here to stay, some of them have limited cleaning and deodorizing ability. I was told by a chemist: "What made a product work is no longer friendly to the environment, and it was taken out of the formulation." Everyone agrees that compounds that are harmful to the environment and people must be removed. However, for the restorer who has traditionally relied on the product, today, the product no longer works as well as it once did.

What's a restorer to do? The best answer is investigate and understand the contaminate that caused the odor to exist. Once we know the cause we can find a cure. Once we know the chemistry of the contaminant, an opposing chemistry should be able to neutralize its affect. Sometimes it's as simple as using an acid to neutralize an alkaline. Other times its dilution, while in other cases its understanding the odor molecule and how to break apart and dissolve it. In a few instances it will be more cost effective to remove and replace contaminated building materials and soils.

The days of going into a contaminated building and haphazardly spraying and fogging chemicals just to see their effect are gone. Today's restorer runs a greater chance of being sued for improper chemical application than ever before. Further, OSHA inspections have a greater chance of becoming a cited violation costing the restorer tens of thousands of dollars and facing possible criminal prosecution when the restorer knowingly allowed an employee to become sick or injured on a job through chemical exposure.

In the recent editions of the ANSI/IICRC S500 and S520 Standard involving water damage restoration and mold remediation, the duties and need for an independent indoor environmental professional and industrial hygienist are growing. Their tasks involve assessing and sampling potentially hazardous conditions; writing restorer's scope of work; completing occupant and worker safety audits; overseeing various parts of the project; and providing clearance and closure.

Finally, as the Restoration Industry Association (RIA) formerly known as ASCR, is developing their standard for fire damage restoration over the next couple of years, one would expect that some of the topics covered in this article will be addressed in their standard.

About Patrick Moffett:

Patrick is a senior environmental/industrial hygienist, a California registered environmental assessor, a California licensed general contractor and an industry certified master restorer in water and fire. Patrick is employed by Environmental Management & Engineering, Inc. (EME) in Huntington Beach, CA.

Patrick has over 20 years of experience assessing fire and wildfire damaged properties, including:

- Environmental assessment and testing of hazardous chemicals and waste and interpreting state and federal regulations that apply to mitigate damage;
- Consulting with state and local agencies including EPA, Fish and Game, Air Quality Management District, California Department of Toxic Substance Control, fire marshals, forensic specialists, health departments, abatement and remediation contractors;
- Designing scope of work plans for removing smoke, soot and ash that affects buildings and contents followed by clearing restorers work and the building;
- Writing technical articles and teaching industry professionals and adjusters about methods and procedures required to cleanup fire and wildfire caused damage and contamination.
    - *Soot Particles: A Procedural Guide for Containing and Removing Wildfire-Caused Soot in Buildings, 2008*
    - *Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land, 2008*

