ABATEMENT OF PAINT ODOR USING BIOFILTERS

We currently have a community odor problem with our paint finishing line that we believe can only be solved by add-on air emission controls. We are afraid of the operating cost of thermal or catalytic incinerators and we think that concentrators or carbon adsorbers are too maintenance-intensive for our very lean operations. Someone told us that a biofilter might be the answer to our odor problem but we don’t know anything about them. Is it practical to use a biofilter on paint finishing solvent emissions?

A biofilter may solve your problem, but you need to consider several important factors before selecting this technology.

1. Will a biofilter reduce emissions enough to solve the community problem?
2. Can the biofilter supplier guarantee to reduce odorous emissions that much?
3. Have they already installed a biofilter on a similar paint finishing operation?
4. Do you have space available for biofilter installation close to the line?
5. Is your paint overspray emission control system adequate for a biofilter?
6. Are there adequate resources in your facility to do the biofilter maintenance?
7. Will the air pollution regulatory authorities accept biofiltration technology?

If you can answer the above questions affirmatively, you should look at biofiltration; however, it is very important to evaluate all the technologies that will solve your odor problem side-by-side to ensure which is most cost-effective.

This question was answered by Robert Kenson, rkenson@msn.com, an associate of Ron Joseph & Associates Inc., www.ronjoseph.com.

CALCULATING PERCENT (%) WEIGHT SOLIDS FROM PERCENT (%) VOLUME SOLIDS

We are a Tier I automotive supplier. We mold (using injection molding) and paint exterior plastic parts. Our suppliers buy paint material in pounds and we receive the paint in drums measured in pounds. If the drums fall within the specified range of lb/gallon (55-gal drum) then they are acceptable. The more solids in the paint, the more it weighs per gallon.

Our problem is that we purchase the paint material (including solvents) by the gallon and not by the pound. We’ve been unable to get our suppliers to convert to selling it by the pound. The cost detail that we receive is based on gallons, and the solids are given as volume solids in the form of a percentage, and not in weight.

We need to ensure that the paint we actually receive is equal to what we pay for. Since the price is based on percent solids, are we paying more per gallon than we actually receive? How can we convert volume solids to weight solids, or how can we compare what we receive in pounds to what is quoted in volume?

In most cases the conversion is relatively easy. From the MSDS you should have the approximate percent weights for each of the volatile ingredients. By subtracting from 100 you can determine the approximate percent weight solids.

If you want a precise measurement, your in-house QC lab can easily perform test ASTM D-2369 on the coatings you purchase. If you don’t have an in-house lab, then an outside lab can easily perform the test. Here are hypothetical values that you might get off an MSDS:

<table>
<thead>
<tr>
<th>Solvent</th>
<th>% Weight</th>
<th>WPG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>10%</td>
<td>9.2 lbs/gal</td>
</tr>
<tr>
<td>Toluene</td>
<td>15%</td>
<td></td>
</tr>
</tbody>
</table>

You can now calculate the approximately weight of solids per gallon as follows:

% Weight solvents (volatiles) = (10% + 15%) = 25%
Therefore % Weight solids = (100 -25%) = 75%
Actual weight solids/gal of coating = 0.75 x 9.2 lbs/gal = 6.9 lbs/gal

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Therefore, if you purchase a 55-gal drum of the coating, the weight of solids will be approximately 6.9 lbs/gal \times 55 \text{ gals} = 380 \text{ lb}.

**ABRASION TESTING OF COATINGS**

Can you please tell me the appropriate ASTM test for performing an abrasion test on supermarket steel shelving. Metal shelving is typically coated with one or more organic materials (e.g., epoxy, acrylic, powder coating, etc.) and the shelves are subject to extensive abrasion while food cans are slid across the surface. I am trying to find an appropriate test for measuring coating abrasion resistance. In addition, I want to find either the equipment to do the testing or a provider of testing services.

One of the most common tests for evaluating the abrasion resistance of a coating is the Taber Abraser test, ASTM D-4060, “Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.”

The instrument(s) can be purchased by going to www.byk-gardner.com or www.gardco.com. If you intend to perform the test only a few times, you might want to send the coatings to a laboratory. On the other hand, if you intend to perform the test often, you might want to purchase one of these instruments and perform the test in-house. You will find a complete description of the instruments both in the ASTM standard and also on the vendors’ websites, respectively.

**CAPTURE EFFICIENCY OF WATER-WASH SPRAY BOOTH**

Does it seem reasonable to you that the PM/PM10 removal efficiency of a water curtain could be as high as 90% (or higher)?

I have been on the Internet for the better part of the morning and there is hardly anything on the subject. I'm writing a Part 70 operating permit for an organic coating operation that has water curtains controlling several spray booths claiming 95%. It's not that I don't believe it is possible, I just have to document those sorts of things in my permit supporting material so that the U.S. EPA will sign off on it and not require testing (although I can't see how you would stack test something like this).

The efficiency of a water-wash spray booth depends on many factors, including the design, pressure differential across the venturi (the gap between the water level and the vertical sheet above the water), the chemicals in the water, the amount of sludge deposited in the exhaust section, the baffles in the exhaust plenum, the efficiency of the demisters (a series of baffles designed to remove water droplets from the air stream), and more. By the way, not all water-wash booths have a water curtain. Large automotive water-wash downdraft spray booths are designed differently from the more generic booths used in industry.

A properly running and well maintained water-wash spray booth can exceed 95% particulate capture efficiency, but I have visited umpteen facilities where the booth was not properly maintained and...
the efficiency was well under 90%. I’ve been to some very poorly maintained booths where I doubt that the efficiency was 50%. In one case, there was less water in the water trough than there is water in the Sahara Desert during a dry year! You can guess what the capture efficiency of the booth was.

For regulatory purposes the owner/operator can get a letter from the spray booth manufacturer in which he provides you with the particulate capture efficiency. If the owner/operator doesn’t know the name of the vendor, or if the booth is old and he can’t find the name plate, then you or he might want to find a comparable booth and get the vendor’s literature to support the permit application.

There is no easy or inexpensive method for determining the capture efficiency experimentally. It can be done by performing stack tests, but these are expensive and do not necessarily represent the efficiency for all coatings, or all of the application scenarios.

As a permit writer, you might want to give the owner/operator the benefit of the doubt by assuming a high efficiency, but write permit conditions that mandate that the booth be maintained according to the vendor’s instructions ... and spell them out in the permit. If I were the permit engineer (and because I know about spray booths) I would be specific about the maintenance that is required. The conditions would be written to be federally enforceable.

If you don’t really care about these issues, then perhaps simply issue the permit according to the vendor’s literature. After you’ve done calculations for PM10 emissions you might find that they are not sufficiently high to spend so much time on this. On the other hand, if the particulates contain inorganic HAPs, such as chromates from corrosion-resistant primers, then my comments don’t apply.

If you would like to get more details of booth efficiency you might speak to Richard Thelen of JBI Booths (www.jbibooths.com). There are other vendors of water-wash spray booths and you should be able to find them on the Internet.
Solvents are a significant part of manufacturing and cleaning operations. Most users have been trained in many aspects of handling solvents. Some have not.

The purpose of this, and the next two columns, is to provide some basic guidance in managing the normal hazards of using solvents or chemicals.

This column will review the two basic hazard classification systems for solvents. The first is primarily based on flash point (and to some extent on boiling point), and the second is based on an overall view of the hazards of a solvent.

The July/August and September columns will cover two topics that don’t receive strong coverage: generation and dissipation of static discharge (July/August) and fire hazards of aerosol mists (September). If enough users contact me (jdurkee@precisioncleaning.com) I will also separately cover three other subjects: fire safety and flash points, ignition and flammable limits, and skin contact and dermatitis.

HAZARD RATING BY FLASH POINT (OSHA/DOT/NFPA)

Many feel flash point is the most important property of a cleaning solvent.

There is a common system for classification of ignition hazards based on flash point data. It is supported by two U.S. government and one private agencies: Department of Transportation (DOT); Occupational Health and Safety Association (OSHA); and the National Fire Protection Association (NFPA), through the National Electrical Code (NEC).

These agencies have requirements for users of all chemicals, including cleaning solvents, based on the flash point of the used solvent. These requirements have at least as much effect on the choice of cleaning solvent as does its solvency power.

Their requirements include the following issues about a cleaning solvent: packaging, shipping, storage, equipment design and features, location relative to other equipment, fire fighting procedures, operating practices, waste disposal; and management practices.

Suppose your solvent of choice for parts cleaning can be ignited under conditions below which water will freeze. Will you still plan to use it? If so, you must comply with ALL regulatory requirements associated with a Class IA Flammable Liquid. This would apply if you continue, for example, to use acetone (flash point -4°F (+15.5°C)).

These requirements are all derived from the classification of a solvent based on its flash point (and to some extent on its boiling point). Please note these two points: (1) the classification applies to all liquids, not just liquids used for cleaning, and (2) the closed cup method is used for all determinations of flash point. The classification system is published in 1910.106(a)(18)* and is:

- Class IAI - Flash Point less than 73°F; Boiling Point less than 100°F
- Class IB - Flash Point less than 73°F; Boiling Point equal to or greater than 100°F
- Class IC - Flash Point equal to or greater than 73°F, but less than 100°F
- Class II - Flash Point equal to or greater than 100°F, but less than 140°F
- Class IIIA - Flash Point equal to or greater than 140°F, but less than 200°F
- Class IIIB - Flash Point equal to or greater than 200°F

This information is collected in Figure 1.

Please note that boiling point is only used to distinguish between Class IAI and Class IB solvents. Class IAI liquids are extremely volatile, but there are few liquids that are so classified.

Theoretically, there is no upper limit to Class IIIB, except that liquids with a closed cup flash point above 200°F dry slowly and are poor choices for cleaning solvents.

The U.S. Department of Transportation (DOT) has a system only slightly different. Because they are partners in a world-wide network of regulations about hazardous materials, DOT has changed its definition of “flammable liquid” by raising the upper limit to 141°F (60.5°C). However, DOT regulations include a so-called “domestic exemption” that allows


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