Institute for Research and Technical Assistance

The Alternative

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Navy invents "Environmentally Friendly" Solvent Containing Carcinogen and Developmental Toxin

The Navy has "invented" a solvent called NavSolve that is touted to be environmentally friendly for cleaning and degreasing aircraft and automotive parts. The solvent is intended to replace conventional petroleum based solvents that are used today. The solvent was "invented" by Dr. El Sayed Arafat, a chemist with the Materials Engineering Division at the Naval Air Warfare Center Aircraft Division. The Navy has licensing agreements with two companies, Armick Chemicals LLC and Ecolink Inc., to sell the new solvent. The solvent complies with the low VOC requirements of the South Coast Air Quality Management District (SCAQMD) and contains no EPA listed Hazardous Air Pollutants (HAPs).

According to the MSDS, the solvent is a blend of five different materials, four of them solvents. It contains 50 to 70 percent decamethylcyclopentasiloxane or D5 and 20 to 40 percent octamethylcyclotetrasiloxane or D4. D5 is a carcinogen and D4 is a developmental toxin. D5 is used by some 900 dry cleaners under the tradename Green Earth and has been used for many years for this purpose. D5 is also used in parts cleaners in auto repair and industrial facilities. The Navy indicates it would like to foster technology transfer of its "invention" to industrial applications where the major component of the blend has been used for years.

The Navy should not market this solvent blend. While it may be environmentally friendly, it poses a cancer and developmental toxicity risk to workers and communities surrounding military facilities where it is used. The Navy should instead promote the use of water-based cleaners that are widely available and safer for the intended applications.

For more information, call Katy Wolf at IRTA at (323) 656-1121.

LVP Solvents Cause Significant VOC Emissions from Consumer Products

Based on data from the California Air Resources Board (CARB), the South Coast Air Quality Management District (SCAQMD) estimates that emissions from consumer products will account for 25 percent of VOC emissions in the South Coast Basin in 2020. This is a particular problem for SCAQMD because the air district must still make massive emission reductions to achieve attainment over the next several years. SCAQMD has heavily regulated industrial sources of VOC emissions but the California Air Resources Board (CARB) is the agency with authority to regulate consumer product emissions. CARB currently has no firm plans to make the reductions that would be necessary for SCAQMD to achieve attainment.

IRTA worked on a project, sponsored by Cal/EPA's Department of Toxic Substances Control (DTSC), to identify, develop, test and demonstrate low-VOC, low toxicity alternative paint thinners and multi-purpose solvents which are used to thin paint and clean up paint application equipment. These solvents are used by consumers and also by many businesses. IRTA found alternatives that performed well and are cost effective to use. The report can be accessed on IRTA's website at www.irta.us.

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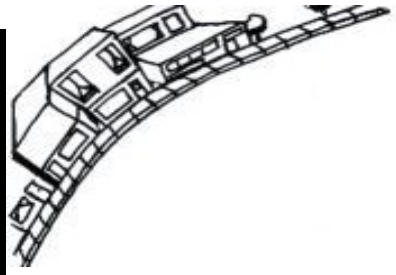

Small Business Corner

SCAQMD Again Proposes Exempting Toxic Solvents in Metal Coating

In an article in an earlier issue of The Alternative (Fall 2011), IRTA described a South Coast Air Quality Management District (SCAQMD) proposal to exempt tert-butyl acetate (TBAC) from VOC regulations in Rule 1107 "Coating of Metal Parts and Products." The District is again proposing to exempt TBAC and another chemical, dimethyl carbonate (DMC), from VOC regulations in the rule. The Governing Board hearing for the rule is scheduled for November 2012.

TBAC forms a metabolite, tert-butyl alcohol (TBA), which is a carcinogen. DMC is a developmental toxin. It forms a metabolite, methanol, which is a developmental toxin and may also be a carcinogen. The District contends that the chemicals can be used safely if the risk they pose to the surrounding community and the off-site workers is below a certain threshold value. On this basis, the District has established numerical values for the amount of each chemical that can be used by a facility each year. The annual allowed use of TBAC is 560 pounds and the annual allowed use of DMC is 180,000 pounds. In the proposed rule, the two chemicals can be used to meet the lower future VOC limits established in the rule for January 1, 2015 and January 1, 2018.

The District has modified the proposed rule to require coatings containing TBAC and DMC to be used in a booth or a ventilated enclosure. In these cases, as long as the ventilation systems are operating properly, the worker should be protected. In fact, however, workers in painting operations often thin the paints and clean up the application equipment with solvents either outside the booth or inside the booth without activating the ventilation system. Almost certainly, these practices will occur in facilities with a valid permit and they will expose workers to a high risk.

The District visited several facilities that were not operating with a valid permit during the rule development process. These and hundreds of other facilities in the District jurisdiction are applying paints to metal parts on a daily basis without a permitted booth or enclosure. Under normal circumstances, there is expected to be a high noncompliance rate since the District inspectors cannot find every illegally operating facility. In this case, however, it is even worse because of the high number of facilities and workers that could be affected.

Several years ago, the Hazard Evaluation System and Information Service (HESIS) calculated the risk to workers using TBAC at the current Occupational Safety and Health Administration (OSHA) PEL of 200 ppm. The risk was estimated to be 380,000 in a million, an extremely high risk.

There are other technologies that already achieve or could be used to achieve the lower proposed rule limits. These are waterborne and acetone based coatings. If the District exempts TBAC and DMC, suppliers will substitute coatings containing TBAC and DMC for the other exempt chemicals and waterborne formulations. The suppliers have clearly indicated their intention to do this by arguing that the threshold for TBAC should be raised to a higher level so their entire customer base

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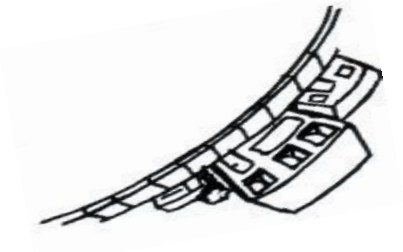

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could use TBAC based paints. If the proposed rule is adopted, there will be a wholesale conversion to technologies that pose a carcinogenic or developmental toxicity risk.

The District, by exempting these toxic chemical, is promoting and sanctioning their use and, in fact, is encouraging suppliers to formulate with these chemicals instead of with water and safer chemicals. As a result, the workers in permitted and illegally operating facilities will face a very high cancer risk or a developmental toxicity risk because of a deliberate District directed policy.

The District's mission is to protect public health. Exposing hundreds of workers in metal coating facilities to a cancer or developmental toxicity risk is not good public policy. Once the chemicals are exempt for operations covered by this rule, the District will not be able to control the use of the materials. The proposed exemption is very dangerous and the District should not go forward with it.

For more information on the rule, call Katy Wolf at (323) 656-1121.

New and Emerging Approaches for Controlling Boat Hull Fouling

Boat hulls are generally painted with a copper antifouling paint to prevent attachment of marine organisms. Nonbiocide alternatives to copper paint have been and are being investigated. The most common alternatives are soft nonbiocide paints which are based on silicon and fluoropolymer compounds and hard nonbiocide paints which are based on epoxy and ceramic materials. The soft nonbiocide paints are foul release paints; they present a smooth surface that makes it difficult for marine life to attach.

MIT recently announced it had developed a material that could be used on the inside of bottles for getting the last globs of ketchup, honey or jelly out of the bottle. The slick coating is called LiquiGlide and is reportedly made of FDA approved materials. The coating can be applied to many different substrates and it could be suitable as an ingredient for a boat hull coating. Some suppliers have indicated an interest in obtaining samples of the material for testing in the hull coating application.

Another approach to protecting boat hulls from fouling is to use a physical barrier. Two new barrier concepts that seem to have a similar aim are available for testing. The first barrier, called Thorn-D, is made by Micanti Netherlands in collaboration with Avery Dennison. It is a microfiber surface that comes in a self-adhesive foil which is applied to the boat hull. The company has used the material for static applications like fish cages and is starting to apply it to boat hulls in the U.S.. For more information, access the website at www.micanti.com.

Knight & Carver boatyard in the San Diego area applied the Thorn-D barrier to a customer's 40 foot boat on June 7. The surface of the boat was prepped and the barrier material was applied over the old copper paint. The barrier has been on static structures for more than five years. Micanti expects the barrier to last at least three years on boats and estimates that the diver hull cleaning cost will be lower than it is for a copper paint.

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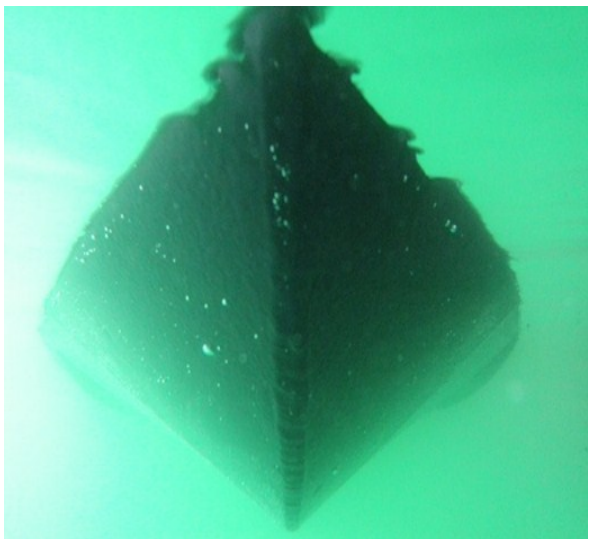
The second barrier material is made by Nitto Denko Corporation in Japan. Like the other barrier material, it is applied to the boat hull by using an adhesive backing. In this case, the material is impregnated with a silicon compound. The company is just starting to explore applying the paint to boat hulls.

For more information on these new and emerging materials, contact Katy Wolf at IRTA at (323) 656-1121.

How Should Nonbiocide Boat Hull Paints Be Cleaned?

As part of a project sponsored by EPA and Cal/EPA's Department of Toxic Substances Control (DTSC), IRTA investigated the cleaning frequency of boats painted with soft nonbiocide paints. In an earlier EPA sponsored project IRTA conducted with the Port of San Diego, the team also investigated cleaning practices for alternative biocide paints and soft and hard nonbiocide paints. IRTA developed a fact sheet that describes the best diver maintenance practices for nonbiocide paints during the DTSC project. The fact sheet, entitled "Diver Maintenance Practices for Nonbiocide Alternative Boat Hull Paints" can be accessed on IRTA's website at www.irta.us.

Diver maintenance practices have become controversial, primarily for boats with copper antifouling paints. These paints are designed to leach the copper out over time to protect the boat hull from fouling. The leaching action deposits copper in the water. In Southern California, divers maintain (clean) copper painted boat hulls an average of 15 times per year, every four weeks in the winter and every three weeks in the summer. The other source of copper loading in the water results from this boat hull cleaning. There is significant debate about the contributions to the copper loading from the leaching on the one hand and the diver maintenance on the other hand. Not surprisingly, paint suppliers claim the diver contribution is high and divers claim it is low. This issue is increasingly important since the copper levels in many basins and marinas in California are very high and a bill that could phase out copper paint will be introduced again in the California legislature next year.



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During the two EPA sponsored projects, IRTA worked with a diving company in San Diego called San Diego Diving Service. During the Port/IRTA project, two divers from the company cleaned all of the boats with the alternative paints for the project duration. In the case of the biocide and zinc containing alternative paints, the divers found that gentle tools were required for cleaning and that the boats with these paints frequently did not require cleaning during every three week inspection. In the case of the nonbiocide paints, the soft nonbiocide paints could be cleaned with soft tools no more often than a copper painted boat. The hard nonbiocide paints did require more frequent cleaning in the summer than a copper painted boat and these coatings should be cleaned periodically with a power tool to completely remove all fouling.

During the DTSC/IRTA project, IRTA worked with the same diving company to further examine the frequency of cleaning for the soft nonbiocide paints. IRTA and San Diego Diving Service deliberately delayed the cleaning of two of the boats painted with different emerging soft nonbiocide paints by five and six months. Although the boat hulls had heavy fouling after this long period, the diver was able to remove the fouling easily. A third boat, also painted with a nonbiocide paint, was painted in December of 2011. The boat owner recently indicated that he has not cleaned the boat and that it has very little fouling on the hull. These examples demonstrate that it may be possible to extend the cleaning cycle significantly for soft nonbiocide paints.

During the DTSC/IRTA project, IRTA worked with a supplier of a new and emerging paint called BottomSpeed to paint one of the San Diego Diving Service work boats. Alex Halston, San Diego Diving Service's owner, decided he would delay the hull cleaning for 135 days, or almost five months after the boat was painted. Although the fouling appeared to be heavy, he was able to remove the it with only his hand. A video showing the "hand" cleaning is available at http://youtu.be/kiD3IjMWiOo. As the video demonstrates, the fouling was removed easily after the extended period with minimal hand pressure. In addition, the paint appeared to be in very good condition in spite of the fact that the cleaning was delayed for such a long period.

The fact that the cleaning may be able to be delayed for soft nonbiocide paints indicates that boat owners who decide to adopt these paints could reduce their costs of maintenance considerably. The cost of maintaining a 30 foot boat ranges from about $650 to $750 per year assuming the 15 times per year cleaning schedule. If, instead, the boats are cleaned only three times per year, the maintenance cost would be reduced to less than $150 per year.

The fact sheet that describes the practices that are best for nonbiocide paints is on IRTA's website at www.irta.us. For information on hull cleaning practices, call Katy Wolf at IRTA at (323) 656-1121 or Alex Halston at San Diego Diving Service (619) 977-8668 or (619) 977-0490.

Need help finding an alternative?
IRTA assists firms in converting to suitable alternatives in cleaning, paint stripping, coating, thinning, dry cleaning and other applications.

IRTA Starts New Project on Isopropyl Alcohol

IRTA recently initiated a project sponsored by the Bay Area Air Quality Management District (BAAQMD), that focuses on finding alternatives to isopropyl alcohol (IPA) for biocidal control. Several different types of operations, including medical device manufacturers, pharmaceutical companies, biotechnology firms and hospitals, rely on IPA as a biocide. IPA is classified as a VOC that contributes to smog.

In the past, IRTA worked with medical device manufacturers and became aware that they were using IPA for biocidal control. In the cleanrooms where the devices were assembled, the IPA was used to wipe down the surfaces, including table tops, walls, ceilings, floors and benches, in the cleanrooms on at least a daily basis. The IPA was emitted during the process and, as a result, the IPA emissions from a particular facility could be very high, especially if there were multiple cleanrooms where assembly was taking place. IRTA is currently recruiting facilities using IPA for biocidal control that are located in the Bay Area. IRTA plans to work with the participating facilities to characterize their operations and to test low-VOC alternatives to determine whether they are appropriate. Alternatives that will be tested will depend on the operation but will almost certainly include water-based inorganic materials. IRTA also plans to evaluate the cost and feasibility of using any alternatives that perform well during the testing.

The project is intended to be a green chemistry collaborative effort that establishes a public private partnership among the BAAQMD, IRTA and the participating companies. Bay area companies that are interested in participating in the project should contact Katy Wolf at (323) 656-1121.

Senator Kehoe Drops SB 632 Copper Bill

SB 632 focused on the copper paint that has been used for many years for protecting boat hulls from fouling attachment. The paints are designed to leach out over the two to three year life of the paint. In addition, boaters use diving companies and the divers clean the boat hulls. Both the leaching and the in-water hull cleaning have led to copper loading in many of the basins and marinas in California.

Other bill supporters included the Port of San Diego and the San Diego Coastkeeper. A Total Maximum Daily Load (TMDL) has been established for the Shelter Island Yacht Basin; it requires a reduction in copper loading of 76 percent by 2022. The only way the reduction can be achieved is if three-quarters of the boats in the Basin are painted with non-copper paints. The Department of Pesticide Regulation (DPR) has taken samples from other basins and marinas in California and many of them have high copper loading as well. Over the next several years, TMDLs may be established for these other water bodies.

The reason given for dropping the legislation is that unfinished studies that are currently ongoing may change the way the copper concentrations are viewed. Senator Kehoe is termed out in California so she will not be able to sponsor a new bill. The problem is not going to go away, however, and legislation to remedy the situation is likely to be introduced again next year.

For more information, call Katy Wolf at IRTA at (323) 656-1121.

Visit our website: www.irta.us

Read back issues of The Alternative and

recently completed reports.

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In 2009, SCAQMD adopted Rule 1143 "Consumer Paint Thinners and Multi-Purpose Solvents." The SCAQMD regulation required a VOC content for these products of 25 grams per liter or about three percent and prohibited the sale of noncompliant products in stores like Home Depot and Lowe's in the South Coast Basin. Rule 1143 resulted in a VOC reduction of 9.75 tons per day. Shortly afterward, CARB adopted a similar statewide regulation which they claimed resulted in a VOC reduction of more than 20 tons per day.

CARB provides an exemption for Low Vapor Pressure (LVP) solvents in their consumer product regulations. An LVP solvent is defined as a solvent with a vapor pressure less than 0.1 mm Hg or a boiling point of more than 216 degrees C or a material that is composed of 12 or more carbon atoms. Numerous solvents considered VOCs by the local air districts are included in this definition. Examples of LVP solvents are many glycol ethers and several different types of hydrocarbons like odorless mineral spirits. IRTA began looking at this issue several years ago during projects that involved tests and demonstrations of low VOC alternatives to lithographic and screen printing cleanup materials, lubricants, consumer product paint strippers and paint and lacquer thinners.

It turns out that there are still many high VOC content products on the store shelves throughout the state even though these regulations have been adopted. The reason is that suppliers of the paint thinners and multi-purpose solvents are using a preemption clause in the regulations to exercise the LVP exemption. In small letters on a one gallon can of Odorless Mineral spirits, the supplier states that the category for the product in the can is "general purpose degreaser", a CARB consumer product category where the LVP exemption applies. Thus, even in the South Coast Basin, where the SCAQMD regulation does not allow the sale of LVPs, suppliers are exercising this loophole. It's worth noting that the alternatives IRTA demonstrated in the consumer product paint thinners and multi-purpose cleaners alternatives work were not LVP solvents and they meet a 25 gram per liter VOC limit. This demonstrates that LVP solvents are not necessary for this consumer product application.

Over the last few years, SCAQMD has conducted a detailed investigation of solvents to determine whether LVP solvents as defined in the CARB regulation are actually VOCs. The findings indicate that many of these solvents are unequivocally VOCs and are contributing to smog. In particular, odorless mineral spirits, the solvent being sold to avoid the SCAQMD regulation, is definitely a VOC and evaporates very quickly. In the next issue of The Alternative, IRTA will describe the SCAQMD LVP solvent investigation and results in more detail.

The net effect of this circumvention is that the VOC reductions claimed through adopting SCAQMD Rule 1143 and the CARB consumer product regulation on paint thinners and multi-purpose solvents have not been achieved in practice. VOC emissions in the state are actually higher by 20 tons per day than CARB claims.

This issue is important for other categories in the CARB consumer product regulations as well. Over the last several years, CARB has taken credit for emission reductions in many categories where LVP solvents are allowed to be used. These LVP solvents are actually VOCs and the reductions CARB has claimed have not been achieved. The only reasonable way to remedy the situation is for CARB to remove the LVP exemption from the consumer product rule.

For more information, call Katy Wolf at IRTA at (323) 656-1121.

Calendar

July 18

South Coast Air Quality Management District Rule 1107 "Coating of Metal Parts and Products" Public Consultation/CEQA Scoping Meeting, 9:00 AM, SCAQMD headquarters, Diamond Bar, CA. For information, call Mike Morris at SCAQMD at (909) 396-3282.

September 17 -23

National Pollution Prevention Week. This year's theme is "What's your footprint?" Cal/EPA's Department of Toxic Substances Control (DTSC) and the Western Sustainability and Pollution Prevention Network (WSPPN) are asking people to make a short video that shows how making small changes in our daily lives can have a positive impact on the environment. For information, access www.dtsc.ca.gov.

November 2

South Coast Air Quality Management District Rule 1107 "Coating of Metal Parts and Products" Governing Board Hearing, 9:00 AM, SCAQMD headquarters, Diamond Bar, CA. For information, call Mike Morris at SCAQMD at (909) 396-3282.

IRTA is working together with industry and government towards a common goal, implementing sensible environmental policies which allow businesses to remain competitive while protecting and improving our environment. IRTA depends on grants and donations from individuals, companies, organizations , and foundations to accomplish this goal. We appreciate your comments and contributions!

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