

Pavement Sealant Solvent Screening Method

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Abstract

In 2006, the City of Austin banned the use and sale of coal tar-containing parking lot sealants. The Environmental Resource Management (ERM) Division of the Watershed Protection Department was tasked with enforcement of the ban. Enforcement was complicated by difficulties in visually distinguishing applied coal tar sealants from other sealant types on parking lots. Laboratory analysis of polycyclic aromatic hydrocarbon (PAH) concentration of a sample of sealant can be used to identify coal tar containing pavement sealant, but is too expensive and time consuming to be performed on the high number of potential ban violations encountered. ERM staff used qualitative analysis techniques to develop a screening method which is fast, inexpensive, and can be used in the field. The resulting solvent screening method can generally distinguish between coal tar sealants, asphalt sealants, and sealants with a blend of coal tar and asphalt.

Introduction

City of Austin scientists, collaborating with the United States Geological Survey, identified coal tar-based pavement sealants as a significant source of PAH contamination in Austin area stream sediments, resulting in the implementation of a ban on the use and sale of coal tar containing parking lot sealants within the City's planning jurisdiction in January of 2006. In order to enforce this ban, routine inspections are conducted on any identified newly sealed parking lot surfaces. Visual field determinations of applied parking lot sealant types prove difficult as alternative sealants resemble banned sealants with only minor discernible differences. Laboratory analysis of pavement sealant product can be done to identify the concentration of PAH's to aid in determination of ban compliance. However, this can be costly and time consuming. Therefore, a method was developed to allow presence/absence screening for the coal tar based dried pavement sealant type at a much lower cost. This document discusses the procedure for use of this solvent method and provides guidance to the analyst conducting the procedure.

The screening method was developed using qualitative analysis techniques on known samples of asphalt pavement sealant coal tar pavement sealant. Samples of asphalt and coal tar sealants were found to have different solubility and color characteristics when exposed to a Stoddard Solvent based paint thinner. The screening method has been found to be reliable in the detection of coal tar in dried pavement sealants via color change and solubility. The screening is sensitive enough to distinguish between coal tar sealants,

asphalt sealants, and blends containing both materials. This tool is a useful first step in identifying potential violations of the ban during inspection of recently sealed parking lots.

Materials and Methods

Overview:

A sample of the pavement sealant is collected and placed into a glass vial. Solvent is added to the vial and resulting sample solubility and color changes are observed.

Materials:

1. Nitrile Gloves
2. Eye protection
3. 10-ml glass vial with Teflon coated cap
4. 10-ml Dropper
5. **Stoddard Solvent-based paint thinner containing mineral spirits, aliphatic petroleum distillates, and white spirits to be used as solvent. ERM has conducted all screenings using Klean-Strip brand paint thinner as a solvent.**
6. Paint scraping knife with disposable single edged razor blade; a new blade should be used for each sample to prevent cross contamination.
7. Absorbent material such as clay sorbent for spill prevention and cleanup of spent solvent.
8. Shallow solvent resistant pan (e.g. stainless steel).

Method:

1. Put on gloves.
2. Put on safety glasses.
3. Add absorbent material to solvent resistant pan.
4. **Collect a small piece of the sealant material by scraping it from the surface using the knife. Care must be taken to acquire only the layer you wish to screen as older lots may have multiple layers of varying materials. Look for typical residual areas such as in depressions or cracks, along concrete curb lines, and along the edges of the lot.**
5. Place a pea-sized amount of sample into glass vial.
6. Add 5-ml of solvent via the dropper to the vial. All work with solvent should be performed above or in solvent resistant pan to prevent spills.
7. Gently agitate sample solvent for 5-30 minutes. Inconsistencies with the manufacturing of the solvent, the age of the sealant, low ambient temperatures during the screening, and fortifiers within the sealant may cause slight color and reaction time differences. When a result is in question, waiting an additional 30 minutes can be beneficial.
8. Color changes will occur depending on the constituents of sample.
 - a. A translucent amber/yellow color with no significant degradation to the particles is indicative of coal tar sealant. This sample will remain in this state for months with little to no changes.
 - b. A translucent red/brown color with no significant degradation to the sample is indicative blended coal tar and asphalt materials. This sample will darken over time but will remain translucent.
 - c. An opaque brown/black color and degradation of the sample material is indicative of asphalt sealant.
9. Dispose of sample into a ventilated waste container containing clay sorbent. Dispose of contaminated sorbent in accordance with local and federal regulations.

Discussion

This solvent screening is a qualitative technique, which is useful as a first step in identifying violations of the City of Austin coal tar sealant ban. While it has been found to be accurate, positive results should be verified via laboratory analysis. This field screening is designed for people knowledgeable and comfortable with solvents, and capable of adding solvent to small vials while working in an outdoor setting. Individuals not comfortable in this setting or having conflicting health problems, should inform their supervisor and refrain from this activity.

The two most common problems found when using this solvent screening technique are highlighted in the Materials (item 5) and Methods (item 4) above. First, using the correct solvent is of great importance. Using a non-Stoddard Solvent based paint thinner will likely not give results as described above. Other paint thinners were noted to give false positives or false negatives. Second, the technique involved in sample collection is important. Many paved surfaces have had a number of layers of sealant applied. Sample collection should only include the layer of interest (typically the top, most recent seal coating).

Overall, this solvent screening is just one of many tools that can be used in enforcement of the City of Austin coal tar ban. It, along with other field observations such as creosote odor, or empty containers of sealant can be used as an initial presence/absence screening for coal tar in pavement sealants. A positive result in the solvent screening should always be followed by interviewing of property owner and sealant applicator, laboratory analysis, or other methods to properly verify any violations of the coal tar sealant ban.

Definitions

Coal tar – a tar formed during the distillation of bituminous coal; among the by-products when coal is carbonized to make coke or gasified to make coal gas.

Pavement Sealant – a uniform coating applied on top of asphalt paving; pavement sealant forms a hard coating on the porous surface of asphalt paving.

Total PAH – summed concentration of 16 commonly measured un-substituted PAHs.

Safety Considerations

The EPA has classified seven PAH compounds as probable human carcinogens. Coal tar contains significant levels of PAHs.

The paint thinner used as a solvent has a National Fire Protection Association (NFPA) flammability rating of 2. Appropriate precautions should be taken.

Analyst should review the Material Safety Data Sheet (MSDS) specific for the solvent used for any additional safety precautions.

The screening should be performed outdoors or in a suitably ventilated area such as a fume hood.

Appropriate use of gloves and safety glasses is necessary for eye and skin protection during both the sample collection and the solvent screening.