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AUTOMOTIVE INTERIOR VOLATILE ORGANIC COMPOUNDS TOP-7 FAQs

ANSWERS TO SOME OF THE MOST FREQUENTLY ASKED QUESTIONS

Most people think that "new car smell" is a good thing, but in reality those odors inside the vehicle cabin can potentially be quite harmful to human health. Since many people have questions about automotive VOCs, we've compiled the Top-7 Frequently Asked Questions with answers from our experts.

1. What are VOCs?

VOCs is an acronym for Volatile Organic Compounds. VOCs are carbon-based gases that can evaporate from certain materials into the air at room temperature. VOCs are ubiquitous and are both naturally occurring (aromatic flowers) and synthetic (paint thinner). Most odors – both good and bad – are the result of VOCs. A few common VOCs are formaldehyde, styrene, limonene, and xylenes.

2. Why are VOCs a concern in automotive interiors?

Exposure to VOCs can cause discomfort and detrimental health effects such as eye, nose, and throat irritation, headaches and nausea, damage to the liver, kidneys and central nervous system, and in extreme cases, cancer.[1] VOC concentrations have been shown to be at higher levels in automobiles than building interiors and much higher than outdoor concentrations.[2] The off-gassing of VOCs is increased by heat, a common factor found in automobile cabins, making the automotive interior environment one of the highest in VOC concentrations that a person is exposed to in their typical day. Over the past two decades there has been an increasing awareness by consumers of the negative health effects of VOCs found in the auto interior.[3,4] This awareness has led to some consumers being put off by the traditional "new car smell" caused by high VOC concentrations. Decreases in VOC concentration in the auto interior will result in a healthier and more pleasant experience for the consumer.

3. Where do VOCs in automotive interiors originate?

VOCs originate from a wide variety of sources – both synthetic and natural. Nearly all components of a modern vehicle's interior (with the exception of metals, glass, and ceramics) emit varying levels of VOCs. These may result from intentional additions to automotive components, such as antioxidants and catalysts, or unintentional sources, such as decomposition reactions or low molecular weight oligomers. Below are examples of VOCs found in automotive interiors.

Material	VOC Source	Example Compounds
Polymers (Plastics & Rubbers)	Unreacted monomers	Styrene in ABS Formaldehyde in POM
	Volatile oligomers	C9-C15 hydrocarbons from polypropylene (PP)
	Plasticizer	Phthalates in vinyl
	Antioxidants	Butylated Hydroxytoluene (BHT)
	Processing chemicals	Siloxanes from mold release
Foam	Catalysts	Triethylenediamine (DABCO)
	Flame retardants	Tris Phosphates
Upholstery	Processing solvents	Dimethylformamide (DMF)
Adhesive	Arylic resins	Acrylic acid esters
Carpet	Unreacted monomer	Caprolactam from Nylon-6
Coatings	Solvents	Toluene Xylene
Composite Wood	Decomposition	Formaldehyde from polyurethane resin

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4. How are VOCs tested? How do I know which VOC test is needed for my part?

In general, VOC emissions are measured in a two-step process. The first step involves placing the test sample in a clean, sealed vessel and heating it to mimic the emissions of VOCs in a hot car. The gases emitted from the sample in the test vessel are then collected and analyzed for VOC content using gas chromatography / mass spectrometry (GC/MS) or high performance liquid chromatography (HPLC) for aldehydes. The vessel used – which depends on the OEM and test method – can vary in size from a 3 mm thermal desorption tube up to a 2,000 liter Tedlar bag and many different sizes in between. The VOCs are collected using specially designed sorbents that will retain VOCs in the range of interest and allow air to pass through. These sorbent tubes are then analyzed via thermal desorption GC/MS or HPLC.

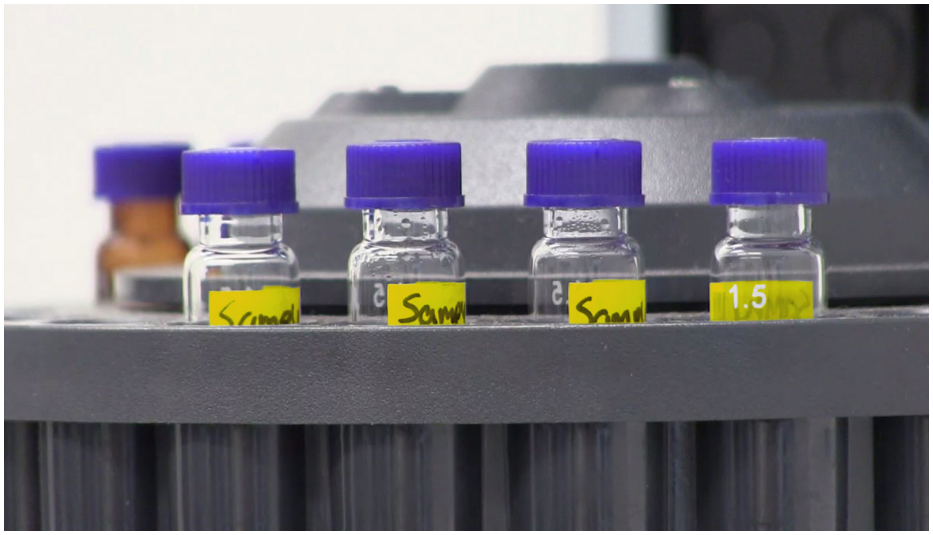
Testing requirements vary between automotive OEMs and are often listed in material specifications. To determine which testing is required for your part, contact the appropriate OEM or an Intertek sales representative.

5. What sample size is required for automotive interior VOC testing?

The sample amount required varies by test specification. There are two categories of VOC test specifications, one designed to test a single material and a second to test assemblies. The required sample amounts will be larger for assembly qualification testing than for material qualification testing. Depending on the test, we typically ask for 5-10 grams or 10 cm by 15 cm plaques for material testing or an entire assembly for assembly level tests. Exact sample size requirements can be verified by checking the test specification.

6. Are there any special packing requirements for shipping VOC samples?

Yes, there are special packing requirements for shipping samples for VOC testing. Proper packaging is crucial to achieve accurate test results for two reasons. First, the packaging protects the sample from being contaminated by oil/grease, VOCs off-gassing from other nearby materials, exhaust fumes, etc., that the sample could otherwise absorb. Since some VOC tests are very sensitive to any surface contamination, even direct contact with human skin and cardboard should be avoided as these contain oils that could cause an otherwise clean sample to fail. Second, proper packaging ensures the sample is not off-gassing VOCs prior to the test, which would result in inaccurate data.



Sample vials in gas chromatograph

Packing requirements vary between specifications. Good practice is sealing samples in mylar bags or wrapping samples in two layers of oil-free aluminum foil and then sealing inside a polyethylene bag. The bagged samples can then be packaged for shipment as normal. Most specifications require samples to be pulled directly from the manufacturing line while handling only with clean gloves and delivered within seven days of part production.

7. What are the requirements for VOC emissions in the automotive industry?

Currently, suppliers are subjected to each individual OEM's emission requirements. Since the test methods used differ between OEMs, the acceptance criteria also differs. The OEMs utilize the VOC test results from each component to estimate air quality in the finished vehicle to ensure compliance with regional requirements. The exact requirements for individual parts can typically be found in the part drawing or material specification provided by the OEM.

Citations

1. US EPA. Volatile Organic Compounds Impact on Indoor Air Quality. EPA Indoor Air Quality. [Online] April 17, 2017. https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality.

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3. Jaslow, Ryan. New car smell is toxic, study says: Which cars are worst? CBS News. [Online] February 15, 2012. [Cited: 05 03, 2017.] http://www.cbsnews.com/news/new-car-smell-is-toxic-study-says-which-cars-are-worst/.

4. Travers, Jim. Is new-car smell bad for your health? BBC News Autos. [Online] BBC, March 15, 2016. [Cited: May 3, 2017.] http://www.bbc.com/autos/story/20160315-is-new-car-smell-bad-for-your-health.

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