



Air Toxics – TO-15 for IAQ Problems

Can TO-15 Help Solve Your Next IAQ Problem?

Do you have a client complaining of odors at home or in the workplace? Do they get headaches or feel nauseous? You may want to conduct testing for a general Volatile Organic Compound (VOC) scan. TO-15 is the best way to sample the widest range of compounds with the greatest of ease. This article will guide you through the process of implementing TO-15 testing.

The sampling of air in the field has long been a problem for the industrial hygienist and project scientist. Should we use a sampling pump with a sorbent tube or is there a better approach to use?

There is a better approach. With the advances made in instrumentation design and sensitivity, an analytical tool has emerged which provides the best and easiest way to determine the concentration and identity of as many organic compounds with a simple and easy sampling technique.

TO-15's history

Over 30 years ago the United States Environmental Protection Agency (EPA) authored a series of 'Toxic Organic Compound' methods in ambient air, more commonly referred to as the 'TO' methods.

The first pair of methods were TO-1 and TO-2. Organic compounds were collected on sorbent traps and introduced into a specially designed cryogenic focusing interface connected to a GC/MS (gas chromatograph/mass spectrometer). These methods were the methods of choice for the EPA for determining organic compounds in ambient air at Superfund and other toxic sites. To sample TO-1/TO-2, the investigator needed to use an air pump to draw large volumes of air through these sorbent traps. These pumps needed to be calibrated accurately and added to the complexity of the sampling event.

Many years later, TO-14 began to replace TO-1/TO-2 as the method of choice. The main difference to the sampling method employed with TO-1/TO-2 was that a stainless steel vessel that resembles a basketball with a metal frame and valve was used to collect the sample. The vessel, also known as a 'SUMMA Canister' was cleaned and evacuated in the laboratory. The SUMMA canister was sent to the field where the investigator attached an optional flow restrictor, and opened the valve so the sampling event would begin. The sampling event would end when the valve was closed.

More recently, a new flavor of TO-14 has emerged as TO-15. TO-15 uses more sophisticated canister and instrument technology. TO-15 allows for the analysis of more polar volatile compounds, establishes more quality control criteria, and is limited to the use of GC/MS for analysis. The analytical equipment of today that TO-15 runs on is capable of seeing parts per trillion of certain volatile organic compounds. The GC/MS scan mode also makes it possible to look for and make tentative identifications of 'unknown compounds'. This versatility makes TO-15 one of the most powerful tools that an investigator can use for any initial evaluation.



Advantages of TO-15 over Conventional Sorbent Tube Collection Methods

TO-15 stands out from other air sampling and analysis methods in several ways. The TO-15 sampling protocol is very easy to perform, particularly when using quick connect connectors for the can and flow controller. It also produces more reliable data than most methods, with strong quality control requirements and canister checks for cleanliness. TO-15 can be used for a wide breadth of volatile compound types as well. Many important toxic volatile organic compounds are best handled by the TO-15 whole air approach as some compounds aren't easily desorbed after adsorbing onto the sorbent media, such as the ones outlined in TO-1/TO-2 and most NIOSH methods.

Alternative approaches to whole air analysis in canisters are thermal desorption and solvent desorption. In the thermal desorption approach, the chemist inserts the collection tube into a specially designed GC/MS interface, and heats the tube to drive the toxic compounds and introduce them into the GC/MS instrument. Losses can occur if the compounds are thermally unstable and decompose during heating. Other losses can be seen with low molecular weight and extremely volatile compounds such as propane and the freons just to name a few. The solvent desorption method, such as many NIOSH methods utilize, dilute out the toxic compounds with solvent preventing low level detection. Either you thermally decompose your analytes or you dilute them out. Either choice has major drawbacks that affect your data.

TO-15 collection and analysis affords the best approach to the isolation and identification of your problem toxic volatile organic compounds. Your odor-causing compound simply may not be seen with the other techniques.

TO-15 Sampling Considerations

The TO-15 analysis as written by the EPA refers to a specific 63 compound list of regulated compounds. These compounds may or may not be important for your project, as the list was developed to support the Clean Air Act. Several amendments have been added to the Clean Air Act that include several subsets of additional compounds. Check with your lab to inquire which compounds they can report and their reporting limits of detection. Your particular project may only require a subset of full list, which may result in analysis cost savings.

If your project does not require TO-15's full list and you want to know 'what is in my air sample?', or some of your compounds are not on our list you can request a library search with your analysis. This will give you a listing of up to 10-20 extra compounds that were not targets along with estimated concentrations. These compounds are referred to tentatively identified compounds (TICs) and are as their title states, tentative. This analysis may cost more but can provide you with information that best serves your project goals.

TO-15 Analytical Considerations

The analytical equipment used to perform the TO-15 analysis constitutes a rather large capital investment. The instrument and related sampling equipment can cost between \$150 and \$250k before any analysis has begun. The sophistication of the laboratory's analytical equipment has a direct correlation as to the usefulness and the quality of the analytical data produced. Your project needs may require state of the art instrumentation and methodologies. Consult with your laboratory and ask how they can service your project needs.

Applications

TO-15 can be used for most IAQ applications. You can use it for odor identification, general investigation, and clearance.

TO-15 can also be used to identify microbial volatile organic compounds (mVOCs). This may be useful in identifying specific mold organisms.

Conclusion

Give TO-15 a try for your next IAQ project where VOC analysis is required. You will be pleasantly surprised with the ease of use and reliable results.

