

2B Technologies, Inc.

An InDevR Company

Technical Note No. 012

Effect of Inlet Tubing on Ozone Measurements Using the Model 205 Ozone Monitor

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Overview

Users of 2B Tech Ozone Monitors™ often use long inlet tubes for air sampling. We recommend use of 1/4" o.d., 1/8" i.d. Teflon-lined Tygon tubing, which combines the advantages of the inertness of Teflon and the flexibility of Tygon. This tubing also is used for all plumbing connections inside the instrument prior to the detection cell.

Procedure

Experiments were carried out using a calibrated Model 205 Ozone Monitor™, Serial No. 613DB. Ozone was sampled for concentrations in the range 0-300 ppbv from the 2B Tech calibration manifold with and without the presence of 50 feet (15.2 meters) of 1/4" o.d., 1/8" i.d. Teflon-Lined Tygon tubing, and the measured concentrations were recorded. Ten measurements were made at each concentration. The effect of the tubing on cell pressure and flow rate also were measured.

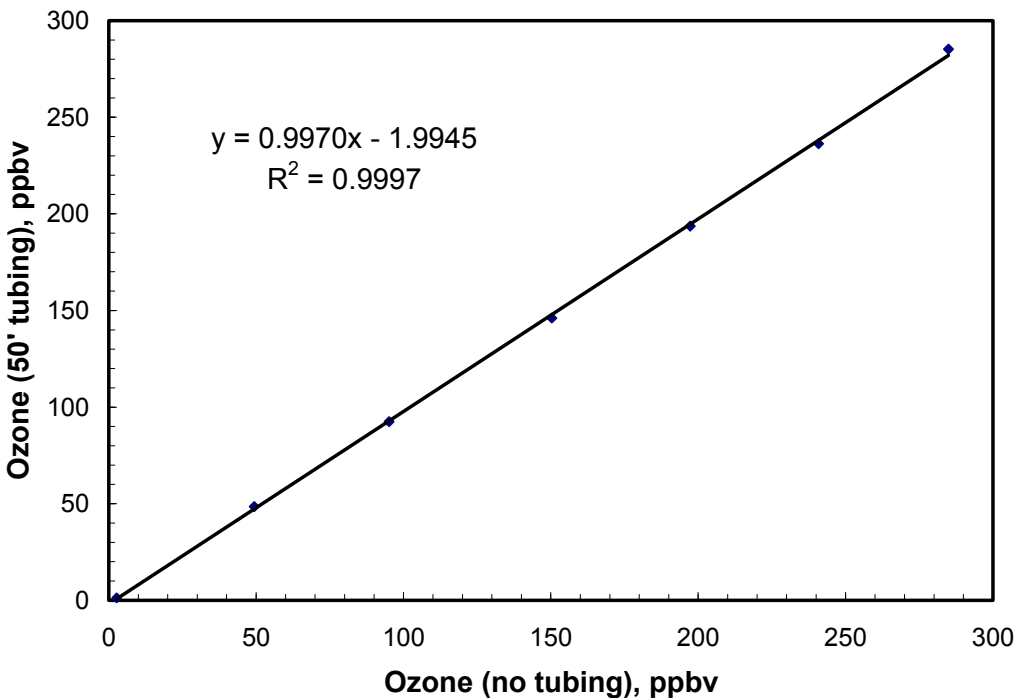
Results

The 50 feet of 1/8" i.d. inlet tubing on the inlet of the Model 205 Ozone Monitor caused the detection cell pressure to drop from 811.8 mbar to 752.8 mbar, corresponding to 7.3%. Thus, the pressure drop is 0.15% per foot of tubing or 0.48% per meter. The measured volumetric flow rate decreased from 2.67 L/min to 2.37 L/min, corresponding to a decrease of 11.2% or 0.22% per foot or 0.74% per meter.

The ozone concentration measured with 50 feet of tubing on the inlet is plotted against the measured ozone concentration with no inlet tubing in the following graph. The slope of 0.9970 indicates an insignificant loss of 0.3% of ozone. This is within experimental measurement error. This length of tubing causes a negative offset of 2.0 ppb. This offset is thought to be real, as large inlet restrictions also cause negative offsets. This small offset can be corrected by zeroing the instrument using an external ozone scrubber on the inlet of the sampling tube.

The average precision of all measurements without the inlet tube in place was found to be 0.67 ppbv and 0.78 ppbv with the 50-ft inlet tube attached.

Effect of 50 ft (15.2 m) of 1/8 in (3.2 mm) i.d. Teflon-Lined Tygon Tubing on Ozone Measurements by a Model 205 Ozone Monitor



Conclusions

Fifty feet of new inlet tubing caused no significant loss of ozone. The only significant effect was a negative offset of 2.0 ppbv, which can be corrected for by proper zeroing of the instrument. The inlet tubing caused a very slight decrease in measurement precision of 0.1 ppbv, which is not statistically significant and well within the instrument specification.

Although these data suggest that 50 feet (15 meters) of tubing can be used with little or no degradation of performance, inlet tubing will slowly become contaminated with UV-absorbing organic compounds and compounds that react with ozone. In addition, under some conditions water can condense within the inlet tube. As a result, long inlet tubes can cause a zero offset and loss of sensitivity to ozone. We recommend that instruments with long inlets be calibrated frequently with zero and span gases introduced at the tubing inlet.