

# Extremely Low Level Mercury Vapor Analysis

## Gold Coil Dosimeters and the Jerome® 431-X

Some applications require the analysis of mercury at very low levels, for example 100nanograms/cubic meter ( $\text{ng}/\text{m}^3$ ) or 0.0001milligrams/cubic meter ( $\text{mg}/\text{m}^3$ ) level. For this testing, a variation on the standard flow rate of 5cc/minute may be more practical in order to shorten the sample collection time.

**NOTE:** Arizona Instrument recommends a flow rate of 5cc/minute for most industrial hygiene applications. Specifications are written based on such a flow rate. The following is a suggested alternative and should be verified by using your own internal quality control standards. Direct injections of mercury vapor, using the Jerome Mercury Functional Test Kit should be used in the Q.C. program.

Testing by customers has shown that a flow rate of 50cc/minute will provide almost a 100% collection efficiency. Typically, a flow rate of 750cc/minute will provide about an 80% collection efficiency.

Assuming this, use the following equation for the Jerome 431-X mercury vapor analyzer:

$$\frac{\text{MR} \times 87.5}{\text{V} \times \text{CE}} = [\text{C}]$$

**MR** = Meter response in  $\text{mg Hg}/\text{m}^3$ ; optimum is 10ng (meter response of 0.110); should not exceed 60ng (meter response of 0.660) in order to avoid over-ranging the instrument when performing final analysis.

**87.5** = A conversion factor in  $\text{mg}/\text{m}^3$ ; a constant used to convert the meter reading to ng.

**NOTE:** Use 125 with the Jerome 411

**V** = Total volume of air through dosimeters during collection; ( $\text{FR} \times \text{T}$ ) where:

**FR** = Flow rate of sampling pump

**T** = Time Sampled

**CE** = Collection efficiency factor (0.8 at 750cc/minute or 1.0 at 50cc/minute).

**[C]** = Concentration of environment sampled.

**NOTE:**  $1\text{ng}/\text{cc} = 1\text{mg}/\text{m}^3$

### Example:

To measure an atmosphere with an expected concentration of  $0.0001\text{mg}/\text{m}^3$  ( $0.0001\text{ng}/\text{cc}$ ) at 750cc/minutes, to get a meter response of  $0.110\text{mg}/\text{m}^3$ , it is necessary to sample for approximately 2.7 hours. Solving for time, in this case:

$$\frac{0.110 \times 87.5}{750 \times \text{T} \times 0.8} = 0.0001\text{mg Hg}/\text{m}^3 \text{ (100ng}/\text{m}^3\text{)}$$

$$\text{T} = 160.4 \text{ minutes} = 2.7 \text{ hours}$$

For this application, two, or even three, dosimeters should be used in tandem to improve collection efficiency.



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