

Determination of Ultra-Trace Mercury Vapor Levels from Industrial & Military Metal Components

For many years, scrap metal reclaimers did not separate the materials containing mercury from other metals. Such things as mercury switches, dental amalgam, thermometers, and refining wastes from copper, gold and silver were processed along with the typical industrial metals. The result is that a significant portion of the Ferrous and non-Ferrous metals and alloys used today contain some metallic mercury.

The impact of mercury vapor toxicity has prompted many organizations, both military and private, to specify certain limits on the amount of mercury that out-gasses from a metal part. The Buck Model 400A Mercury Analyzer interfaced with the Buck Model 4 Mercury Enhancement Accessory can achieve levels as low as 0.01 micro-grams/m³.

- (1) Place part in a sealable bag (or vacuum oven if its small enough).
- (2) Evacuate the bag (or oven) and fill with dry Nitrogen to flush out any entrapped vapors. Evacuate, re-flush and re-evacuate.
- (3) Fill the bag (or oven) with a known volume of gas; by using a metering valve or roughly calculating the volume of the bag.
- (4) Let component stand at room temperature for at least 24 hours (or bring oven up to at least 60°C for at least 2 hours).
- (5) Attach the sampling line from the Model 400A to the Model 4 collection tube, then connect the tube to bag (or oven port).
- (6) Estimate the pumping time required to collect approximately 0.1 ug Hg; based on your limits and a pump rate of ~2 liters per minute.
- (7) Set Model 4 for "COLLECT" and start Model 400A pump for set time.
- (8) Remove sampling line from bag (or oven), set Model 400A for integration and set Model 4 for "ANALYZE".
- (9) Record the maximum scale reading for the volume of gas collected and calculate the $\mu\text{g}/\text{m}^3$ in the sample.
- (10) Calibrate with aqueous standards and the normal sparging vessel.

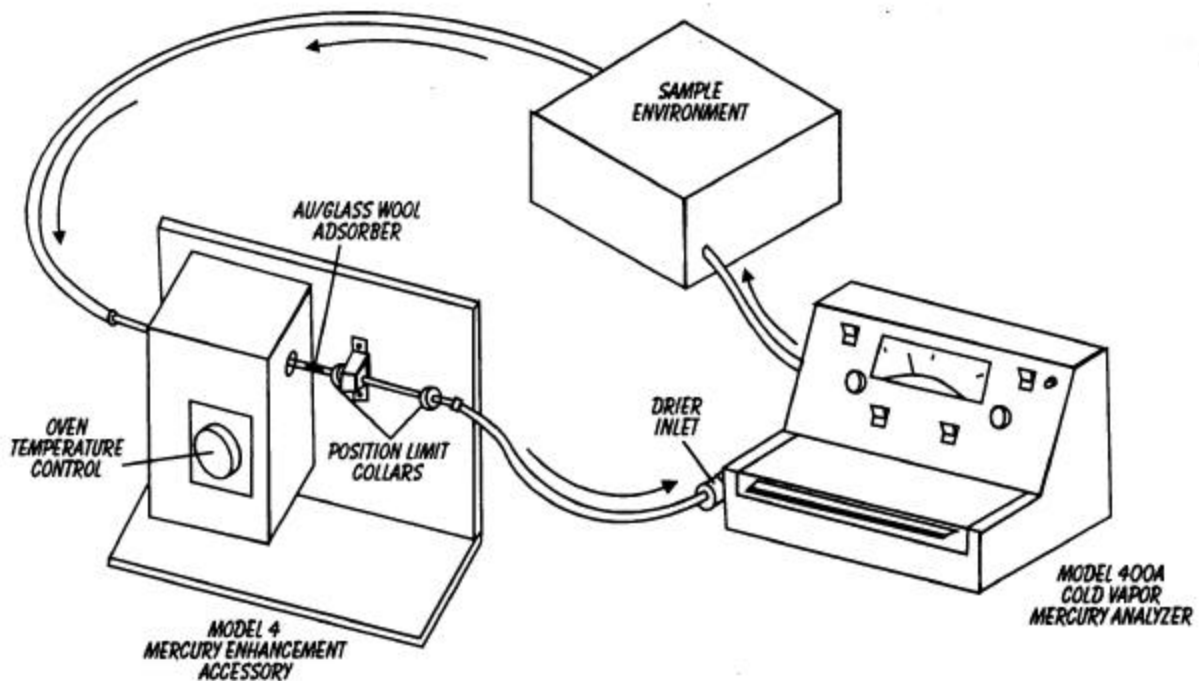
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Using the previous procedure, a typical limit of $1 \mu\text{g}/\text{m}^3$ can be easily achieved. An air sampling of 3 minutes will pass 6 liters of air over the special gold wool, where the Mercury vapor amalgamates with the gold in the “collect” mode, and is then released in the “analyze” mode. Example:

Sample: Engine turbine in a $\sim 150 \text{ ft}^3$ bag, purged and nitrogen filled
Specification: $0.01 \text{ mg}/\text{m}^3$ Mercury max (Note: $1 \text{ m}^3 = 1,000$ liters)
Results: Values below are calculated from triplicate runs in mg/m^3 :

Run #	Indiv. Readings	Average	R.S.D.
#1 / 3 min. = 61	.005, .008, .007	0.006^6	17.2%
#2 / 6 min. = 121	.007, .006, .008	0.007^0	9.5%
#3 / 18 min. = 361	.006, .007, .006	0.006^3	2.3%



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