



Technical Note

Higher Flow Rates Expand Applications for The IOM Sampler

The IOM Sampler was the first sample collection device designed specifically to match ISO 7708 criteria for inhalable particulate mass. It remains the gold standard today. Since its release in the mid-1980s (*Mark and Vincent, 1986*), applications for the IOM Sampler have continued to expand and researchers have responded to meet the market demands.

In particular, there is a growing demand for higher flow inhalable sampling. The IOM Sampler at the specified flow rate of 2 L/min may not collect enough contaminant mass for quantitative analysis of compounds with very low occupational exposure limits. Consider the example of beryllium with an inhalable TLV of 0.00005 mg/m³ or the new inhalable TLV for hexavalent chromium of 0.0002 mg/m³. Similarly, professionals working in the pharmaceutical industry need to evaluate very low levels of unique target compounds; this requires higher flows.

The following studies provide powerful data to assist in this matter:

- **Researchers at Lovelace Research Institute** compared the IOM Sampler operating at 2 L/min and 10.6 L/min and found that performance at both flow rates was comparable at a relatively low wind speed of 0.56 m/s (*Zhou and Cheng, 2009*).
- **A group of scientists from the University of Iowa, University of Utah, and Colorado State University** introduced a modified IOM design that employs the IOM inlet with a 37-mm filter instead of the 25-mm filter specified in the original IOM Sampler. This modified inhalable sampler was tested in a wind tunnel and found to match the performance of the original IOM Sampler for all particle sizes at 2 L/min (*L' Orange et al., 2015*).
- **Based on the above-mentioned 2015 study, Stewart et al., 2017** tested the same modified IOM design at higher flow rates. The results indicated no significant difference in either the concentration sampled or the sampler efficiency when operating the sampler at 10 L/min and 2 L/min.
- **Another field study at a livestock production facility** found good agreement in side-by-side studies of the modified IOM design with 37-mm filter operating at 8.2 L/min and the original IOM Sampler with 25-mm filter operating at 2 L/min (*Anthony et al., 2016*).

These studies demonstrate that the original IOM Sampler with 25-mm filter and the modified IOM design employing the IOM inlet and 37-mm filter both show good agreement with the inhalable convention when operated at the original flow rate of 2 L/min and at higher flow rates of 8.2, 10, and 10.6 L/min. Most of the testing was done at low wind speeds, which are typical of an indoor work environment (*Baldwin and Maynard, 1998*). Based on these findings, SKC concludes that the original IOM Sampler or a similar design employing the IOM inlet can be used not only at 2 L/min, but also at flow rates between 8.2 and 10.6 L/min to provide good agreement with the inhalable convention. In addition, it is reasonable to assume that the performance of both the original IOM Sampler and the modified IOM design will also be at close agreement with the inhalable convention at flow rates between 2 and 8 L/min; however, this assumption needs to be proven experimentally before SKC can recommend that the IOM Sampler or IOM inlet-based designs be operated at flows between 2 and 8 L/min.

References

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SKC Inc. 724-941-9701

SKC South 434-352-7149

SKC Gulf Coast 281-859-8050

SKC-West 714-992-2780

www.skcinc.com