Air Flow Measurement Techniques for Exhaust Hoods
Restaurant Air Balance is the Goal
Exhaust Flow is the Challenge!
Airflow measurement at fan

... just isn’t practical
Pitot tube or hot wire traverse in welded duct

- Recommended by a national balancing association.
- Drilling holes in liquid tight ductwork can be an issue.
- Accessing ductwork can be difficult.
- But results can be accurate!
Hood/filter static pressure measurement

- Can only work for pre-calibrated hood/filter combinations.
- Also subject to variation due to installation and ability to measure true static pressure.
- No intuitive connection between reading and cfm.
- Investigated by RP-623.
Hood ΔP vs. Exhaust CFM
Hood $\Delta P$ vs. Exhaust CFM

RP-623
Velocity measurement at hood face

Included in RP-623, but just not practical for velocity range and stability
Velocity measurement at filter face

- This was the focus of RP-623
- 5 hood/filter combinations tested
- Velocity measured using RVAs
- k-factor method applied and validated
4 inch and 2.75 inch RVA

Rotating Vane Anemometer (RVA)
4 inch vs 2.75 inch:

The 4 inch diameter works better for obvious reasons!
Different traversing techniques

Results showed little difference (particularly for 4 inch RVA)
RVA velocity vs. distance from filter

![Graph showing RVA velocity vs. distance from filter face, with markers for distances 0", 2", and 4" from the filter face. The graph includes lines for Series 1 through Series 6.}
k-factor method:

- Measure “effective” area presenting itself to the flow at the filter face.
- Measure an area-weighted velocity.
- Calculate indicated flow rate: $Q_{\text{indicated}} \text{ (cfm)} = \text{Vel (fpm)} \times \text{A (ft}^2\text{)}$
- Correct indicated to actual by: $Q_{\text{actual}} = Q_{\text{indicated}} \times (k\text{-factor})$

Example: 245 fpm x 2.6 ft² = 660 cfm (indicated)  
245 cfm x 0.75 k-factor = 495 cfm (actual)
K-factor determined by AMCA exhaust flow measurement vs. RVA measurement
K-factor increases with distance
2 inch from filter

Used 16-sec. averaging mode
Testing Summary:
(for 1 hood/filter type - 3 testers)

- Flush with filter face (0 in.) 0.75
- 2 inch off filter face (2 in.) 1.07
Correlates with RP-623 k-factors
RVA tips for airflow at filter face:

- Area for calculation must be the same as the swept or traversed area.
- Distance from filter is critical in selecting k-factor.
- Always apply k-factor if using flush traverse.
- Each filter in the hood must be tested.
- Traverse technique is a factor; patience is a virtue!
- 4 inch better than 2.74 inch RVA.
- If 2 .75 inch head - go across, not with, the slots.
- Spin up the RVA before commencing traverse.