

Air Flow Measurement Techniques for Exhaust Hoods

#### Restaurant Air Balance is the Goal



## Exhaust Flow is the Challenge!



#### Airflow measurement at fan



#### 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 precalibrated 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 $\Delta P$ vs. Exhaust CFM



# Hood $\Delta P$ vs. Exhaust CFM



**RP-623** 

## Velocity measurement at hood face



# 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)



The 4 inch diameter works better for obvious reasons!

# Different traversing techniques



Discrete



Horiz. Continuous

#### Vert. Continuous



Results showed little difference (particularly for 4 inch RVA)

#### RVA velocity vs. distance from filter



# 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<sub>indicated</sub> (cfm) = Vel (fpm) x A (ft2)
- Correct indicated to actual by: Q<sub>actual</sub> = Q<sub>indicated</sub> x (k-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



# Testing Summary: (for 1 hood/filter type - 3 testers)

- Flush with filter face (0 in.)
- 2 inch off filter face (2 in.)
- 0.75 1.07 —

k-factor

# 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