
Ray Ryan CEO, Sai Kotha M.S., Flow Sciences Inc.
Douglas B. Walters, Ph.D., KCP Inc.
Traditional Fume Hood (100 FT/MIN)

- Energy Concerns 70’s
  - VAV Hood
    - Energy Concerns 90’s
      - Low Flow Hood (50 FT/MIN)
        - Containment Concerns
          - Modern Fume Hood
Typical Fume Hood

- Hood geometry
- Sash height
- Face velocity
- Operator presence
- Room air currents
- Equipment arrangement

Energy Crisis during the 70’s resulted in the development of VAV hoods
Performance Characteristics and CFD Modeling of a Typical Fume Hood

Rapid reversal of airflow behind the sash increases the chance of loosing containment and operator exposure.
VAV Hood

- Slow or NO response to upset at hood opening
- Indirect flow control measurement
- Primary design focus on energy
- Hood containment not improved by control system performance
- Does not address containment concerns in a laboratory hood

Increasing energy costs during the 90’s lead to the development of low flow hoods
Low Flow Hood

- Complex design
- Higher initial cost
- Complex control system required.
- Primary design focus on energy
- Exacerbates containment concerns
Permissible Exposure Limit (PEL)

![PEL Over Time for formaldehyde Graph]

**PEL Over Time for formaldehyde**

**TIME (years)**

**PPM**

- 0.5
- 1
- 1.5
- 2
- 2.5
- 3
- 3.5

- 75
- 88
- 97
- 2006
Modern Fume Hood Requirements

- A proactive engineering control system
- Virtually instantaneous response
- Increased level of containment protection
- Direct flow control measurement (pressure)
- Primary design focus on containment / safety
- Reduced energy consumption
- Direct coupling between hood design optimization and containment control system performance
Tracer gas test results from an initial prototype

Work area concentration validation

| Test Position | Significant > 95 – 97.5% reduction of “roll” |

<table>
<thead>
<tr>
<th>New Design ppm average</th>
<th>Traditional Design ppm average</th>
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<tbody>
<tr>
<td>40 ft/m</td>
<td>3</td>
</tr>
<tr>
<td>80 ft/m</td>
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</tbody>
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Dynamic Testing (SF6)

- Dynamic equipment re-arrangement test
- Dynamic hood operation test
Design Evolution
Final Design

Design Improvement
GLview 3D Plug-in
Questions?

www.flowsiences.com
1-800-849-3429