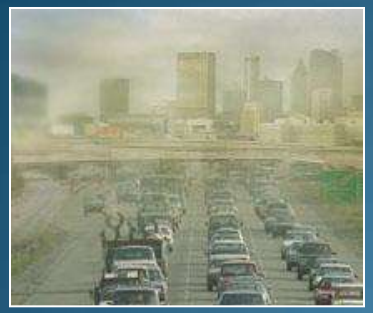


AIR FILTRATION IN SCHOOLS

Patricia Kwon

South Coast Air Quality Management District

Background

- In April 2006, AQMD Governing Board set-aside Rule 1173 mitigation funds to investigate effectiveness of air filtration systems at schools
- RFP released in July 2006 for pilot study of air filtration systems at three elementary schools near the Ports

Air Filtration Pilot Study

- Executed contract for $1.05M with Thermal Comfort Systems in Dec 2006
- Pilot study of air filtration systems at Hudson, Del Amo, and Dominguez ES in L.A. and Long Beach
- Schools selected close to refineries located in Carson and Wilmington from mitigation fees collected due to four VOC release events by two refineries

Air Filtration Technologies

- High performance panel filter
  - 2" thick
  - 5-9 times filter surface area than conventional filters
  - Nano-fiber technology

High performance panel filter

- Register filter
  - Device installed on HVAC register at air intake supply
  - Nano-fiber technology
  - Activated carbon gas phase filter cartridge for VOCs

Register filter

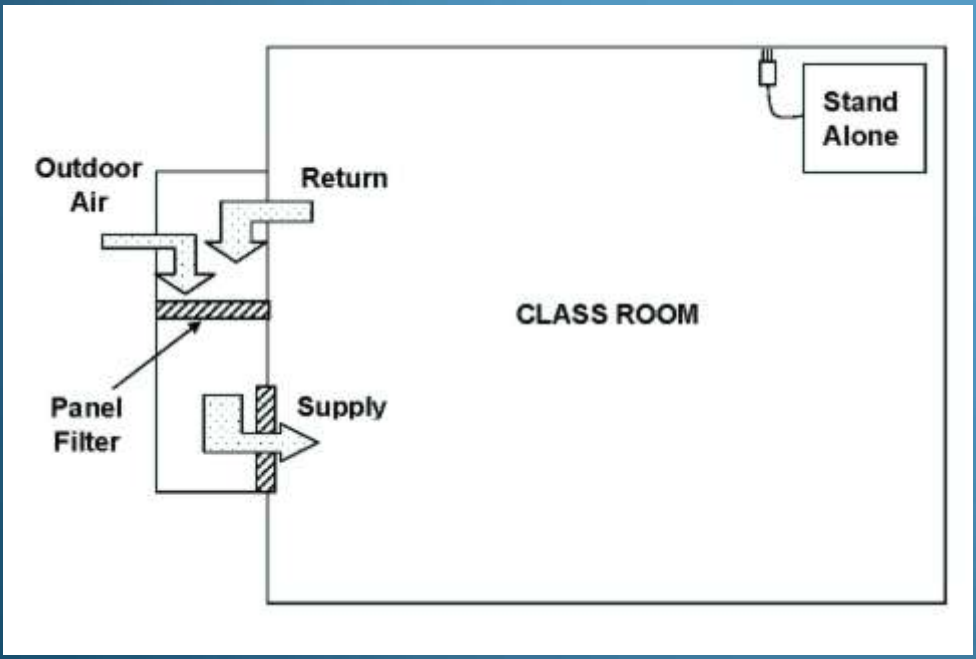
Air Filtration Technologies

- Stand-alone unit: self contained cleaning unit operating without HVAC system
  - 6 feet tall, 4 cubic feet footprint
  - <45 dba at high air flow operation
  - Nano-technology fiber, 12 high capacity gas phase cartridges

Stand-alone corner unit

PM and Air Flow in School Classrooms

- Installation of air filtration systems should not alter air flow pattern and flow rate
- Mobile air quality stations measure black carbon, ultrafine PM, PM2.5, PM10, VOCs
- Air flow measurements



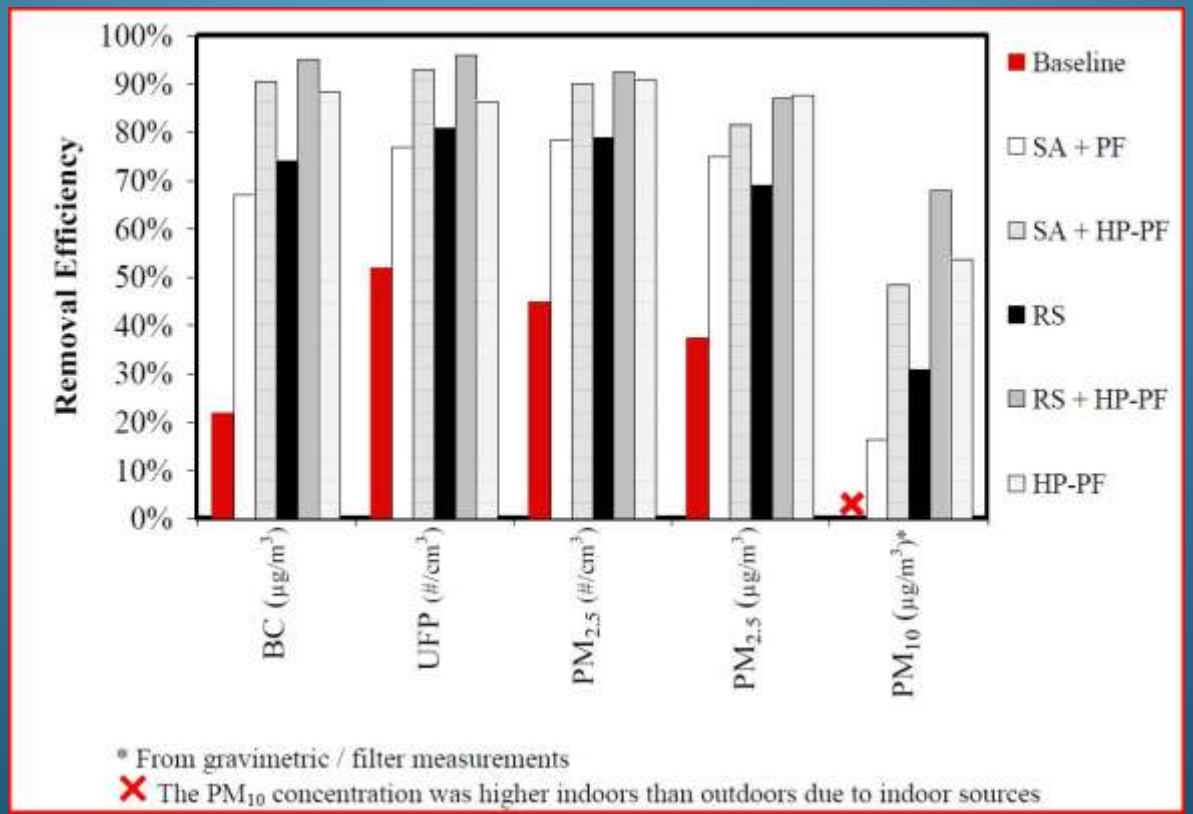
Air flow diagram for high performance panel filters

Mobile station monitoring indoor/ outdoor concentrations of PM

Results of Pilot Study

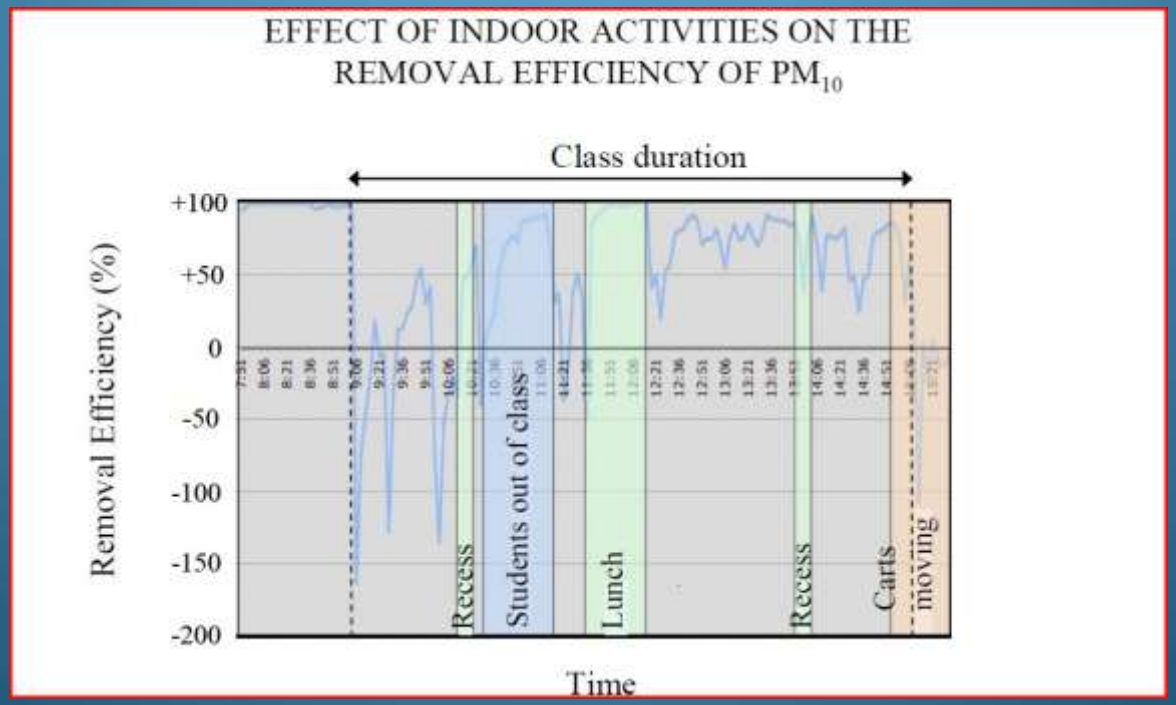
For Black Carbon, Ultrafine PM, and PM2.5

- Register + panel filter → 87% - 96%
- Panel filter → 90%
- Stand-alone + panel filter → 90%
- Baseline removal → 20% - 50%



Indoor Sources of PM10

- PM_{10} removal efficiencies affected by indoor sources of PM_{10}
- Likely due to indoor classroom activities such as walking or cleaning



Impact on Air Flow

- Filter technologies have minimal or no impact on air flow
- In some cases, duct modifications to install filters resulted in increased air flow for existing HVAC systems

Technology	Air Flow Reduction
Panel Filter	0%
Register System	9%
Register System + Panel Filter	1% - 3%

Conclusions

- PM removal efficiencies for black carbon, ultrafine PM, and $PM_{2.5}$ ~ 90%
- Panel filters most effective solution for removal efficiency and cost
- Filter technologies have minimal or no impact on air flow
- VOC removal efficiencies inconclusive due to insufficient detection limits on analytic methods employed

Air Filtration Implementation

- Based on pilot study, Governing Board authorized implementation program in Oct 2008
- $1.125M contract executed with IQAir in Feb 2009
- Air filtration to be installed in LA and Long Beach Schools within 10 mile radius of Valero Refinery (penalty settlement)
- 3 year implementation

First installation of air filtration systems completed at Del Amo Elementary, (LAUSD) in Jan 2010

TraPac Air Filtration RFP

- In Dec. 2009, AQMD Governing Board approved MOA and release of RFP to implement air filtration systems at schools in partnership with Port of L.A. and TraPac Appellants
- $6M RFP for installation and monitoring of air filtration systems at Wilmington schools
- RFP closes Feb 4, 2010