

ENVIRONMENTAL TOBACCO SMOKE IN A RESTAURANT NON-SMOKING AREA: A CASE STUDY

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Purpose of Study

- Test the performance of a directional-flow energy recovery ventilation system in a pub that segregates smoking and non-smoking areas, and its effectiveness in providing *non-smoking areas* *ETS concentrations* comparable to the ETS concentrations in similar facilities where indoor smoking is prohibited.

Target Facility



- Black Dog Pub located in Scarborough, Ont. (Suburb of Toronto)
- Seating for 45 patrons in bar plus 90 in dining area
- Serves drinks and food
- Segregated smoking and non-smoking sections
- Use of a energy-recovery ventilation system.

Interior

Non-smoking
section



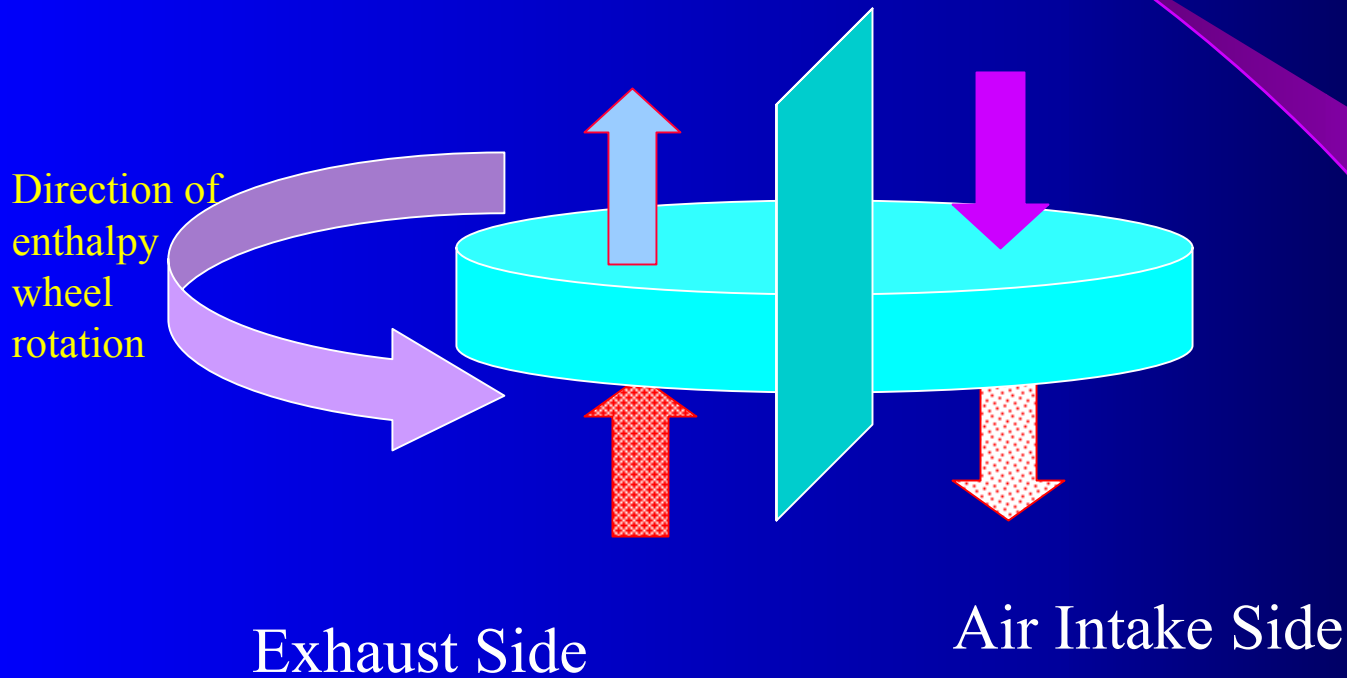
Boundary



Ceiling
diffuser



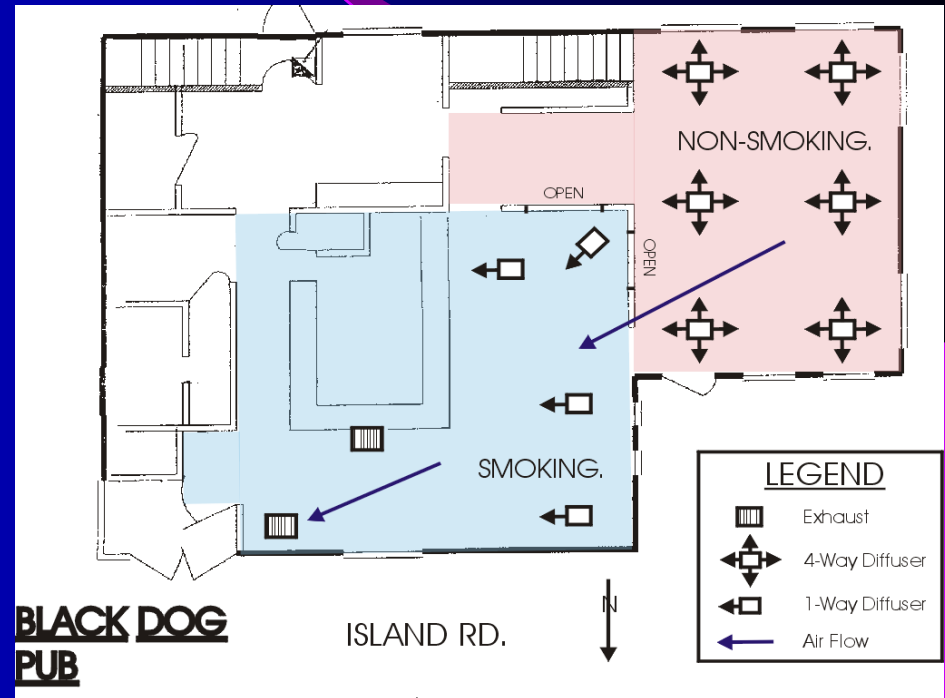
Conceptual Schematic of a Heat Recovery Ventilation System



Estimated fraction of Black Dog heat recovered: 78%

Other Features of the Black Dog Pub Ventilation System

- Heat recovery ventilation system at 3100 cfm
- Directional air flow from non-smoking to smoking section.
- 1600 cfm added on west side NS section
- 1500 cfm added at S/NS boundary through three ceiling diffusers.
- All air exhausted from smoking section.



“Comparative” Facilities

Regulated Non-Smoking Establishments



Food court in a large mall



Indoor sports complex and bar

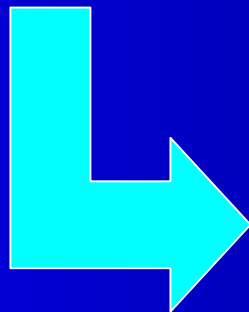
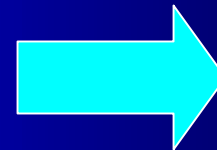


Multi-level bar in an historic hotel

**Provide an
intuitive
air quality
benchmark**

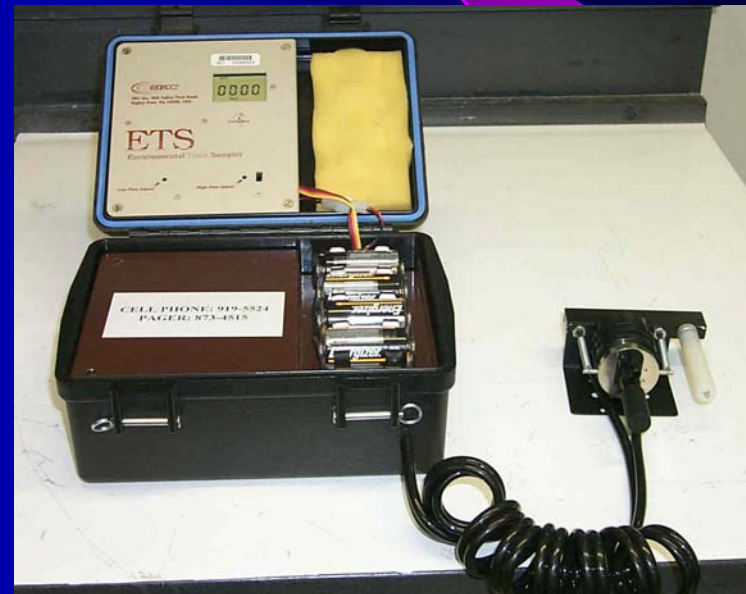
Indoor Air Constituents Measured

- Real Time
 - Temperature, RH, CO₂ (YES-206LH Falcon)
 - Particulates (DustTrak)

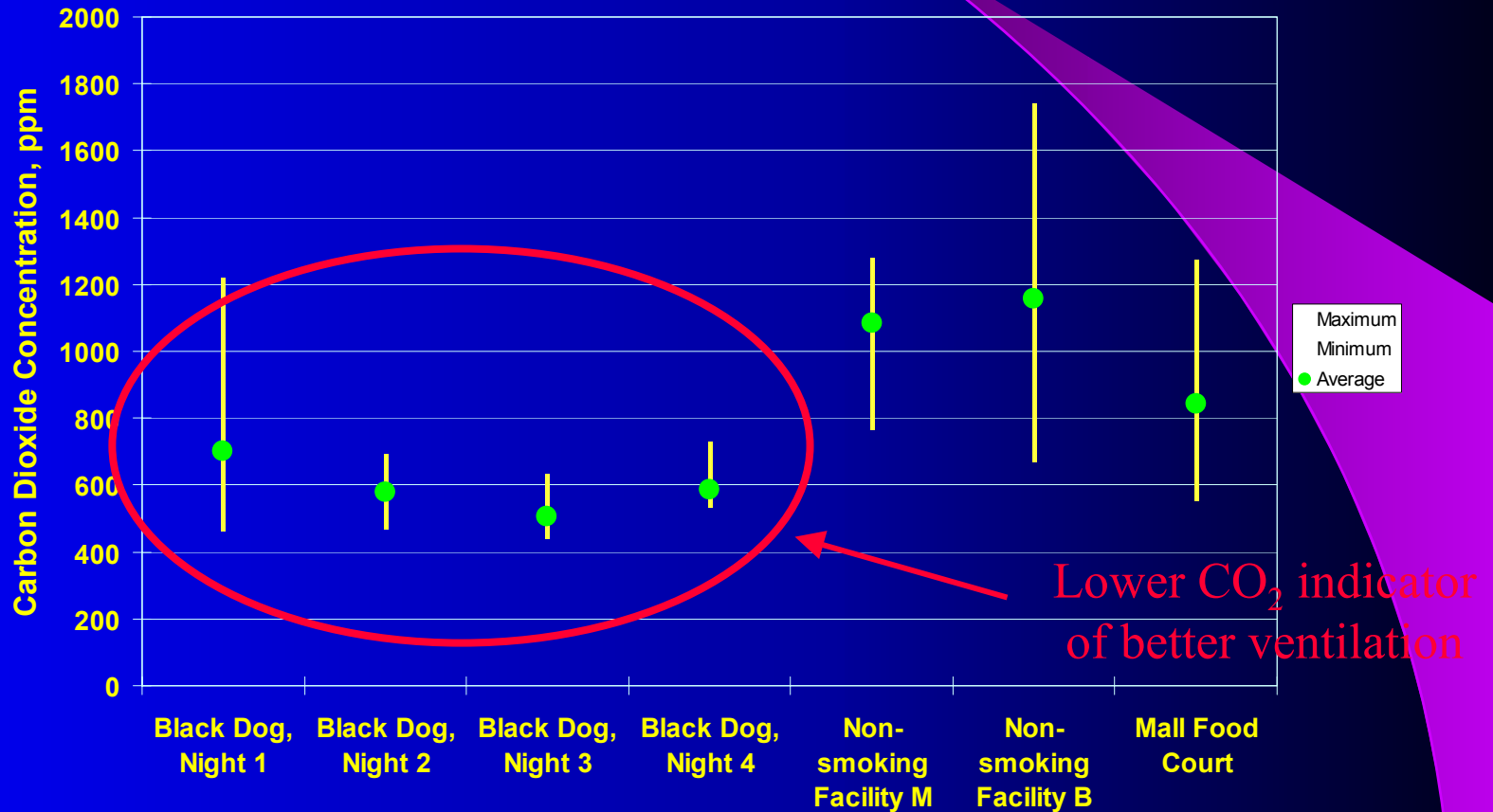


Indoor Air Constituents Measured (continued)

- Integrated Samples
 - UVPM, FPM, Solanesol, Nicotine, 3-EP

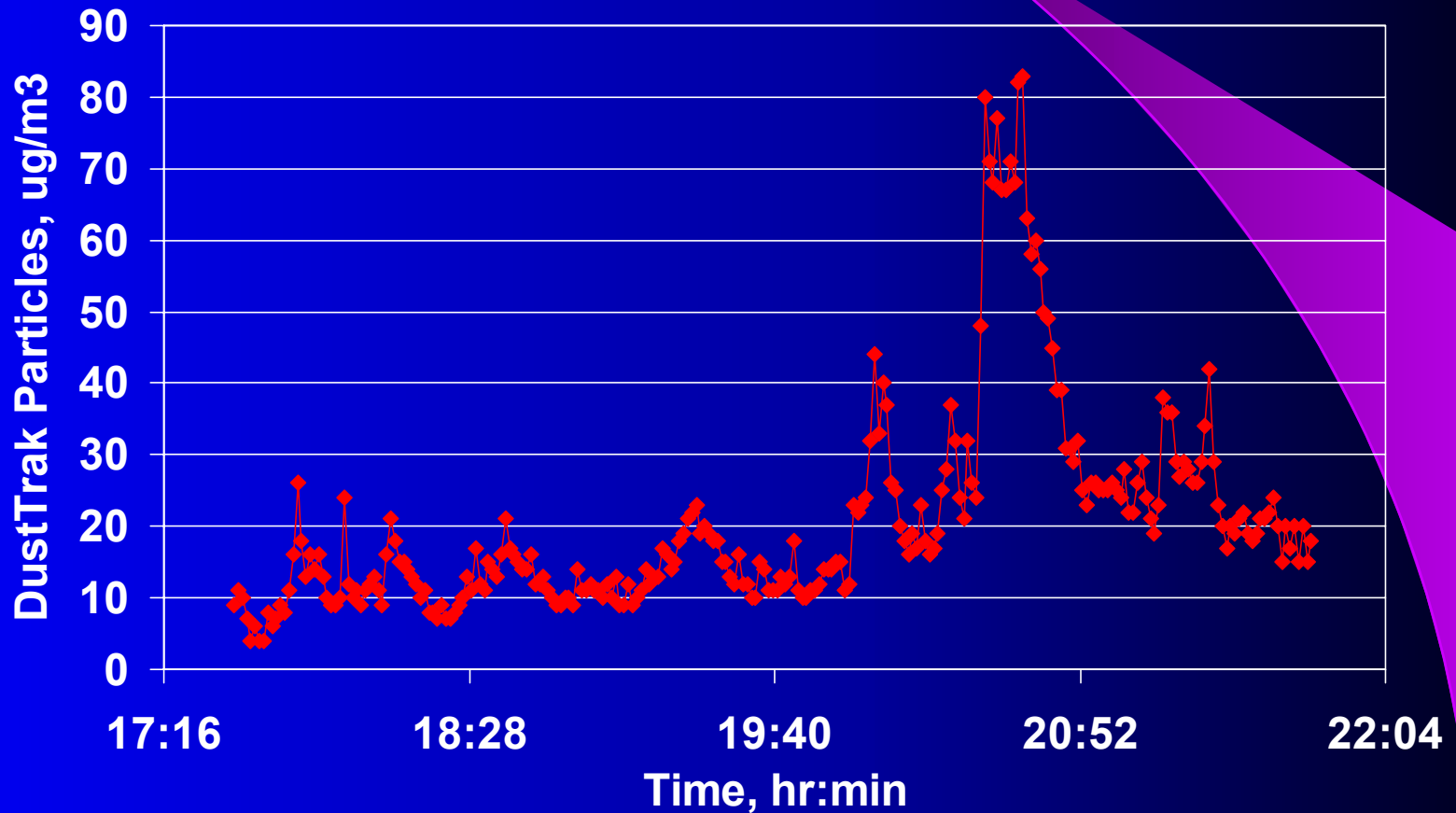


CO₂ Concentrations in Test Facilities



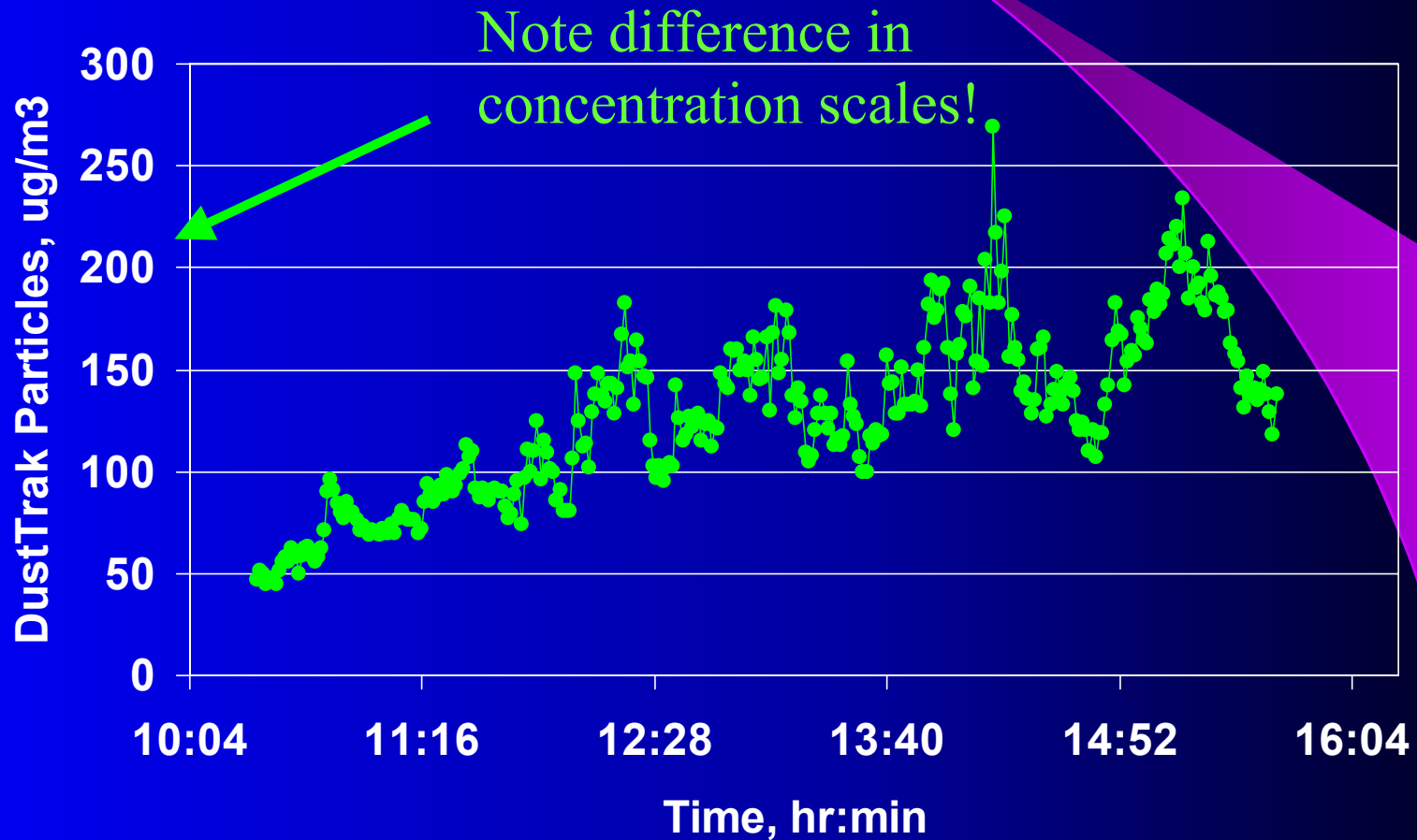
Real Time Particle Concentration

Black Dog, December 30



Real Time Particle Concentration

Mall Food Court at Lunchtime



ETS Concentrations in the Smoking Section of the Black Dog Appear Similar to those in Other Taverns

	Concentrations, $\mu\text{g}/\text{m}^3$ Mean \pm Std. Dev.				
	UVPM	FPM	Sol-PM	Nicotine	3-EP
Black Dog Smoking Section	95 \pm 32	153 \pm 32	165 \pm 49	12.2 \pm 19.3	1.7 \pm 2.7
Knoxville Single Room Bars (N = 26)	146 \pm 107	133 \pm 104	123 \pm 113	21.9 \pm 17.1	5.2 \pm 3.3

Concentrations of ETS in Non-Smoking Areas Black Dog Pub vs Comparative Facilities

		Concentrations, ug/m ³				
		UVPM	FPM	Sol-PM	Nicotine	3-EP
Black Dog Non- Smoking Areas N = 12	Median	3.4	5.4	0.0	0.00	0.18
	Mean	3.5	5.8	2.5	0.44	0.23
	Std Dev	1.8	2.5	3.7	0.76	0.28
	95 th %ile	6.4	9.6	8.1	1.75	0.70
Non- Smoking Tavern & Food Court Areas N = 13	Median	5.2	8.6	1.5	0.00	0.00
	Mean	4.6	7.2	2.6	0.21	0.07
	Std Dev	2.3	4.0	5.5	0.28	0.10
	95 th %ile	7.9	12.1	7.1	0.64	0.23

Conclusions and Policy Implications

- ETS levels in the non-smoking section of the Black Dog Pub statistically indistinguishable from those in similar regulated non-smoking facilities.
- If one is thoughtful about the design of a ventilation system for a hospitality venue, one can achieve with an HVAC system what otherwise might require the passage of legislation.
- Cost effective HVAC modification should include attention to layout, robust air exchange rates, directional airflow, and appropriate energy recovery systems.