

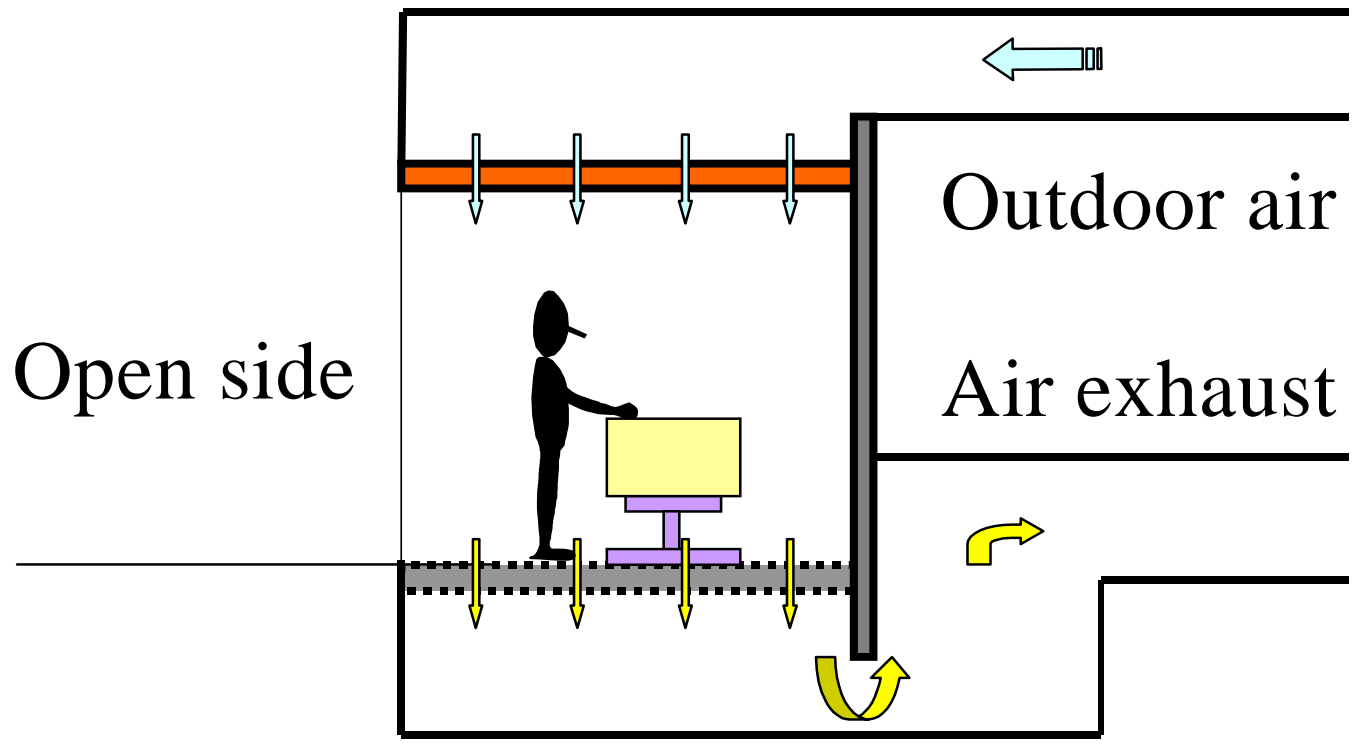
Open ventilated booths : which air flow pattern for stone working ?

J-M. Dessagne, R. Régnier
INRS, France

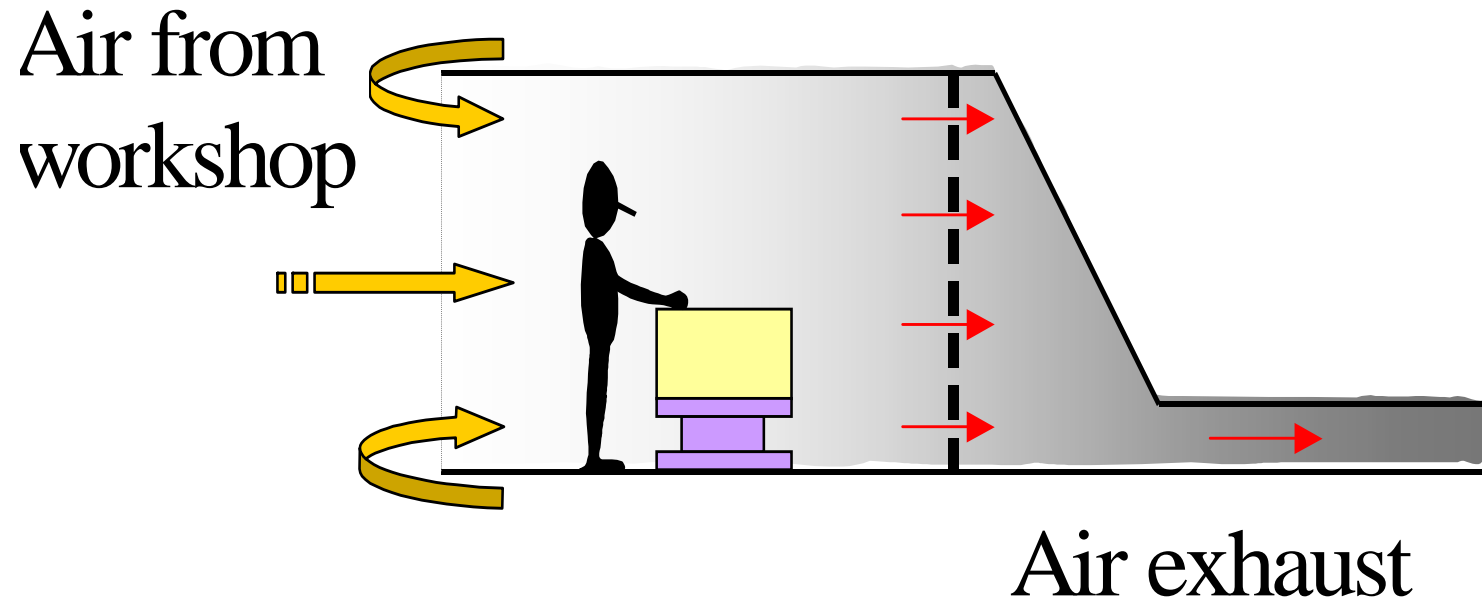
Content

- ⌘ Air flow patterns
- ⌘ Working operations
- ⌘ Method of assessment
- ⌘ Results
 - ☒ Vertical / horizontal
 - ☒ Vertical / oblique
- ⌘ Method for guiding selection
- ⌘ Conclusion

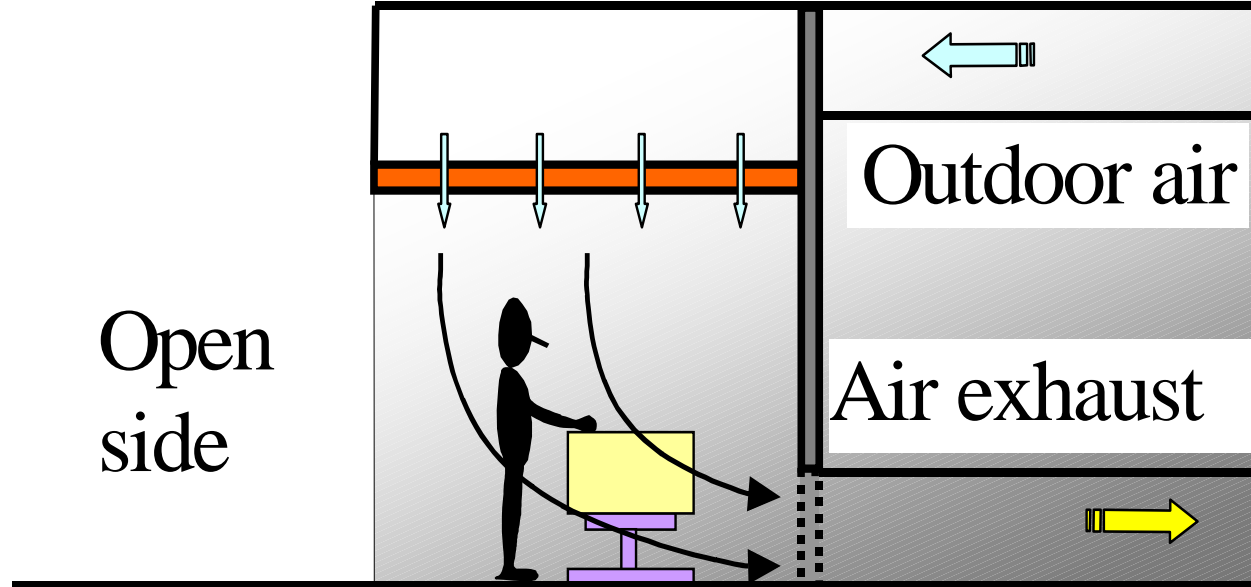
Vertical air flow



Horizontal air flow



Oblique air flow



Cutting-off



Polishing



VENT 2006 Conference May 14-15h 2006

Chiselling



Test conditions

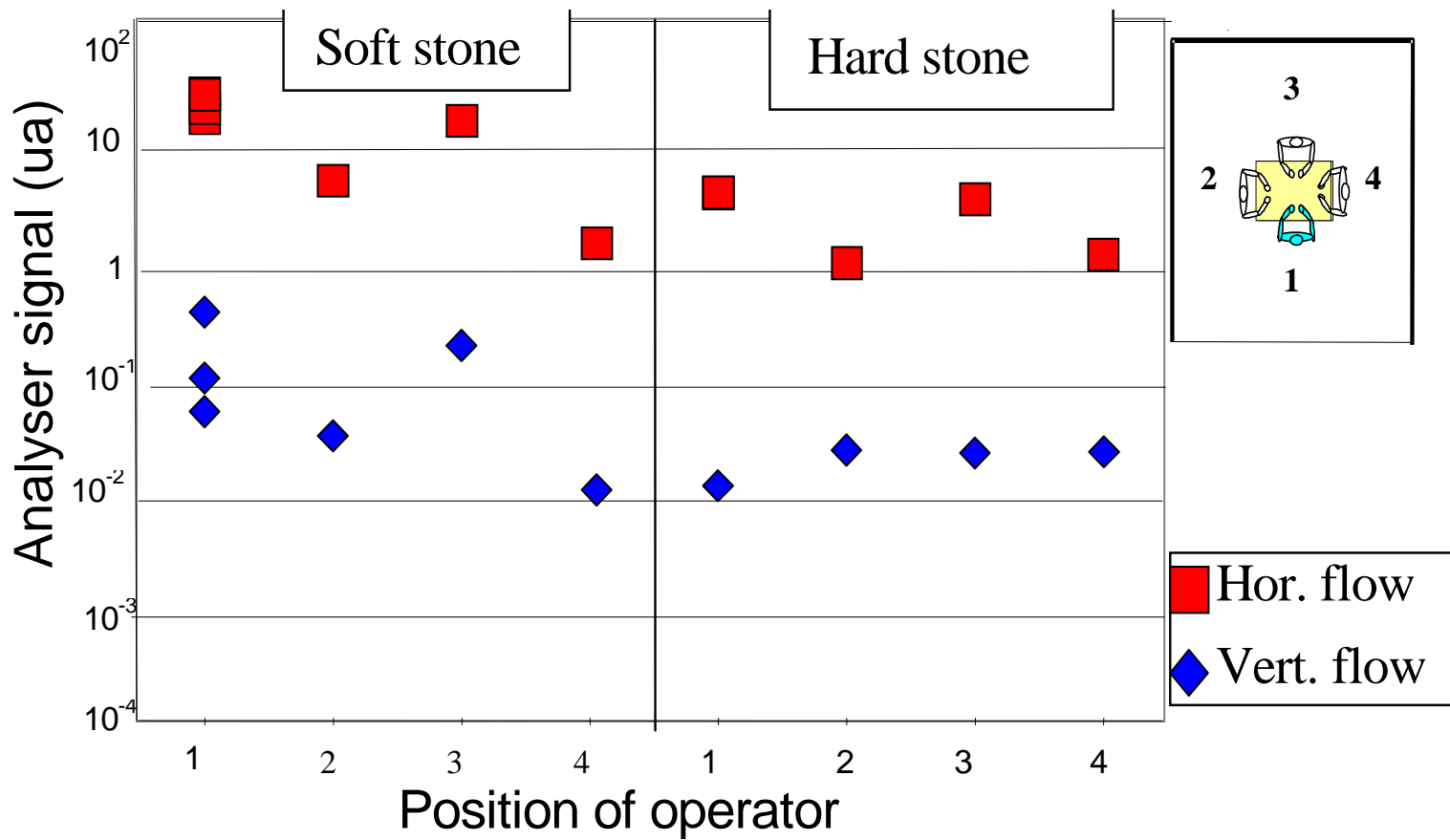
- ⌘ Experimental studies in the field
- ⌘ 5 booths, supply air velocity > 0.4 m/s
- ⌘ Soft limestone and marble
- ⌘ Position of the operator
- ⌘ Average dust concentrations over 12 or 20 min
 - ☒ using a photometer
 - ☒ in the breathing zone

Assessment criterion

$$au = \frac{1}{T} \int_{t_1}^{t_2} (u - u_r) dt$$

- u : tension delivered during test
u_r : tension resulting from ambient dust
t₁, t₂ : starting and ending times of test
T : duration of test T = t₂ - t₁

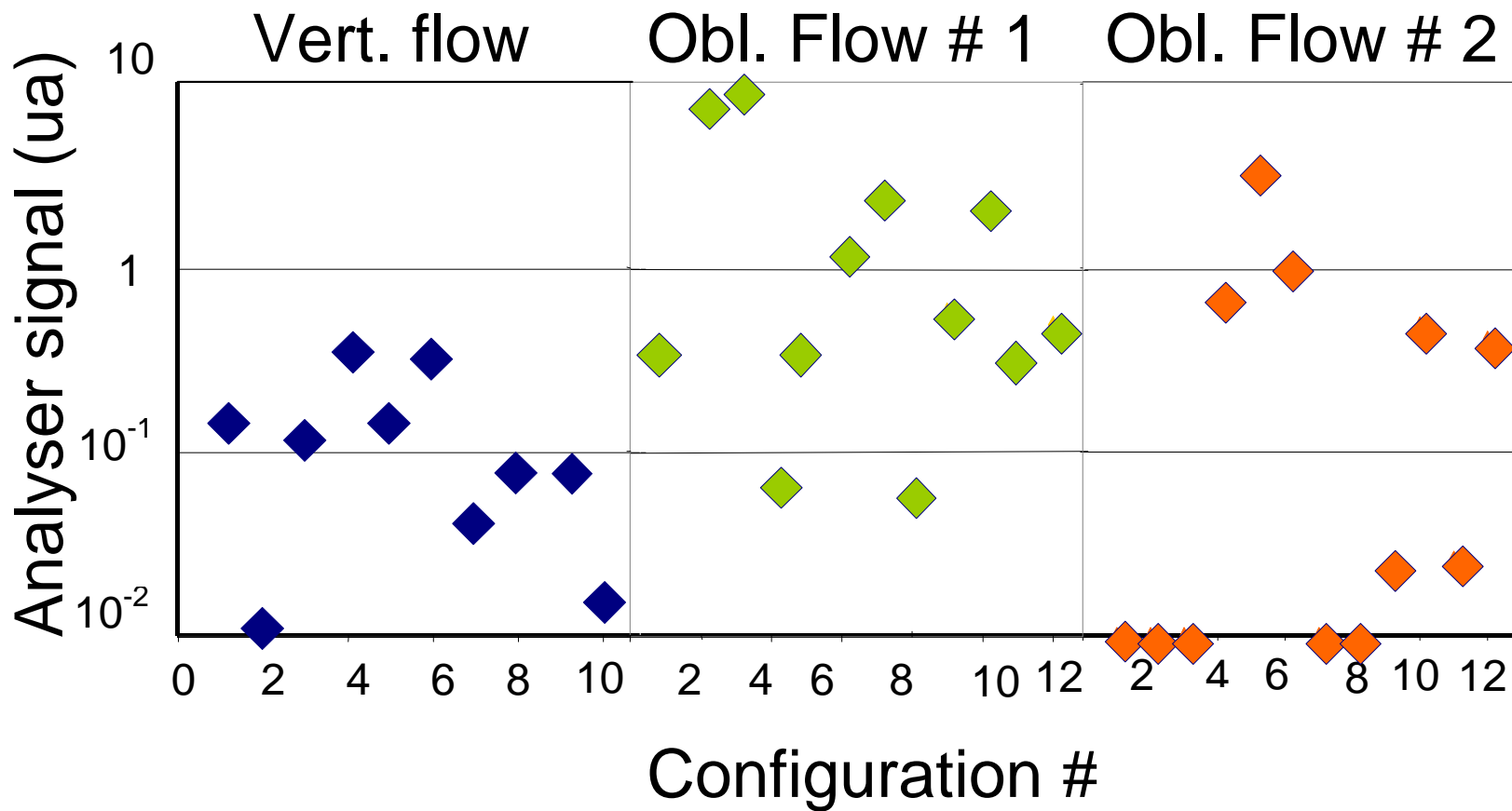
Horizontal / vertical flow (1)



Horizontal / vertical flow (2)

- ⌘ Results for polishing, with a single operator
- ⌘ Vertical flow more efficient (20 to 200 times)
- ⌘ Effect of position of the operator
 - ☒ V flow : quasi no effect
 - ☒ H flow : best position : **profile**
 - ☒ but in front of source or behind ~ equivalent
- ⌘ Higher dust release with soft and dry stone

Vertical / oblique flow (1)



Vertical / oblique flow (2)

- ⌘ Vertical flow : still most efficient solution
- ⌘ Oblique flow :
 - ☒ different for # 1 and 2 (2 operators ?)
 - ☒ higher scattering of results for each booth
 - ☒ globally poorer efficiency
 - ☒ but far better than horizontal flow
 - ☒ more sensible to position and machining procedures





Method for guiding selection

- ⌘ Types of flow classified according performance
 - ☒ Large number of combinations of 5 parameters
 - ☒ Contribution of each to exposure
 - ☒ Need of modelling
- ⌘ “scoring model” based on experimental data
 - ☒ Estimated performance rating
 - ☒ Compared to threshold limit values

Conclusion

Type of flow	Field of application
vertical	Except for soft dry stone with silica
oblique	Except for dry stone with silica
horizontal	Only for humid stone without silica