



Looking for high quality of indoor air

My PhD dissertation topic:
**„Analysis of indoor air quality
in residential buildings in Poland”**

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What happens with the air in existing buildings?

How do the building breath?

- ❑ **Natural ventilation** in most of multi family buildings in Poland
- ❑ **Sick building syndrome** – number of unacceptable conditions of indoor air quality – it causes huge danger to our health and life
- ❑ Intensity of air exchange depends on many different parameters, increasing and decreasing in the same time power of natural ventilation
- ❑ Supporting natural ventilation – intake air grilles/ gaps, hibrid ventilation (air launchers)

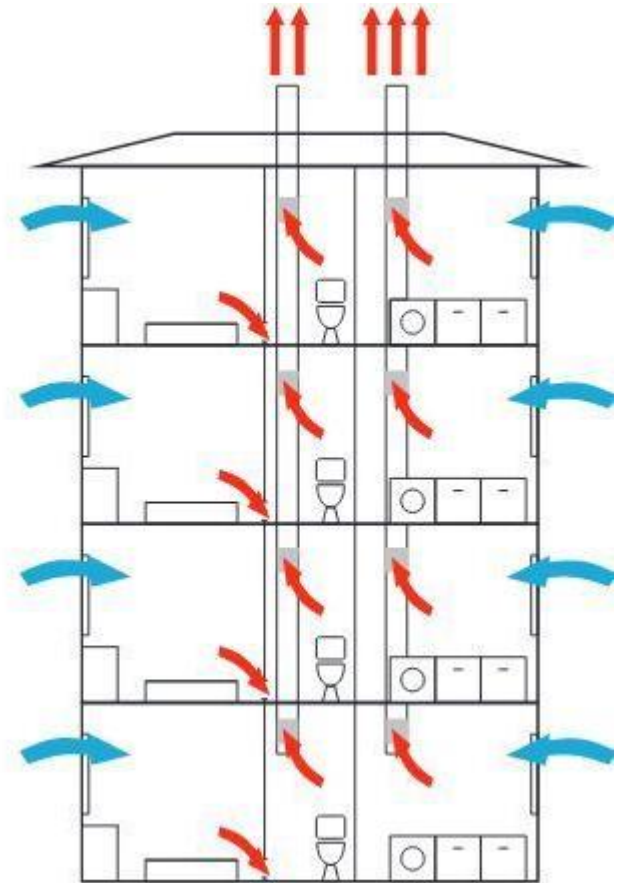


Fig.1. Natural ventilation in residential building

Current situation in residential buildings

- ❑ **saving energy in new and modernised buildings** – using thermal insulation with higher insulation efficient, new materials, well- sealed doors and windows
- ❑ buildings equipped in new, well regulated heating installations, **automation of heating processes in buildings**
- ❑ huge disproportion between heating and ventilation systems
- ❑ **Natural ventilation efficiency +/- 250%**
- ❑ **Conflict:** heating and environmental aspects of ventilation in buildings – **no solution,**
- ❑ **Sick Building Syndrome**

PROBLEM:

- ❑ We don't know how bad is the situation in residential buildings
- ❑ We don't have such a long term measurements
- ❑ We can't afford to change the buildings or change the system

- ❑ **Main goal:** long-term measurements in existing residential building



Fig. 2. Sick Building Problems: humidity, mold and fungus in buildings

Analysis/ measurements:

- ❑ Residential building
- ❑ Location: Ruda Śląska, Magazynowa Street
- ❑ 3 stairway
- ❑ 5 platforms/ floors

natural
ventilation

hibrid
ventilation



Fig. 3. Residential building in Ruda Śląska, Magazynowa Street

Air quality measurements:

- Measurements equipment:
- - ST-171 – for temperature, humidity and CO2 concentration



Pomiar temperatury	
Zakres pomiaru	-40 - 70°C
Jednostka pomiarowa	°C
Rozdzielczość	0,1
Dokładność	w zakresie -40 – 10 °C ±2,0 °C w zakresie -10 – 40 °C ±1,0 °C
Pomiar wilgotności	
Zakres pomiaru	0 – 100 % RH
Jednostka pomiarowa	% RH
Rozdzielczość	0,1 % RH
Dokładność	w zakresie 0-20 % RH i 80-100 % RH ± 5% w zakresie 20-40 % RH i 60-80 % RH ± 3,5% w zakresie 40-60 % RH ± 3%
DATA LOGGER	możliwość zapisu do 32000 wyników w pamięci urządzenia; 16000 wpisów dla temperatury, 16000 wpisów dla wilgotności
Czas próbkowania	2, 5, 10, 30sek; 1, 5, 10, 30min; 1, 2, 3, 6, 12, 24 godz.

- - EL-USB-CO EASY LOG - for CO concentration



Fig. 4. Measurement equipment for air quality in buildings

Results from air quality measurements published in COW, June 2018 introduced at ISMO Conference, Białystok, May, 2019

- CO analysis: 8th of May, 2017, sampling time: 5min

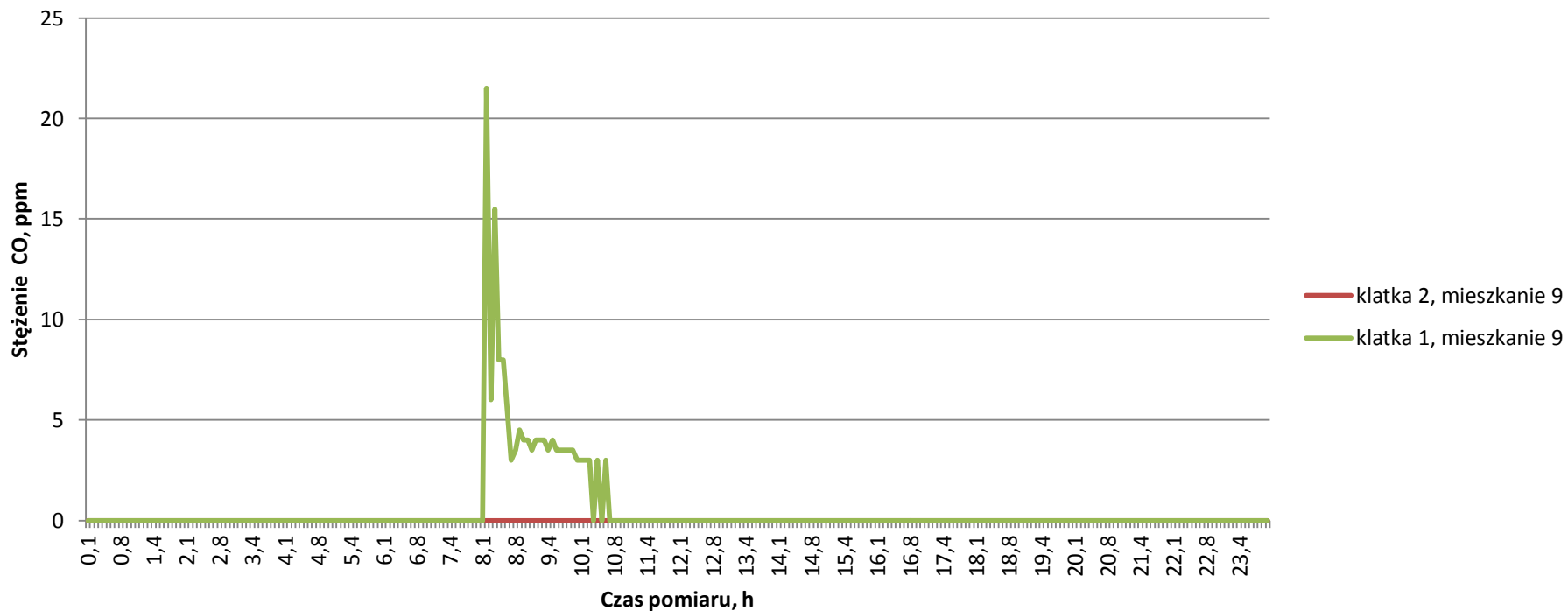


Fig. 5. CO measurements in building with natural and hybrid ventilation

Results from air quality measurements published in COW, June 2018 introduced at ISMO Conference, Białystok, May, 2019

- CO2 analysis: 8th of May, 2018, sampling time: 5 minutes (300 sek)

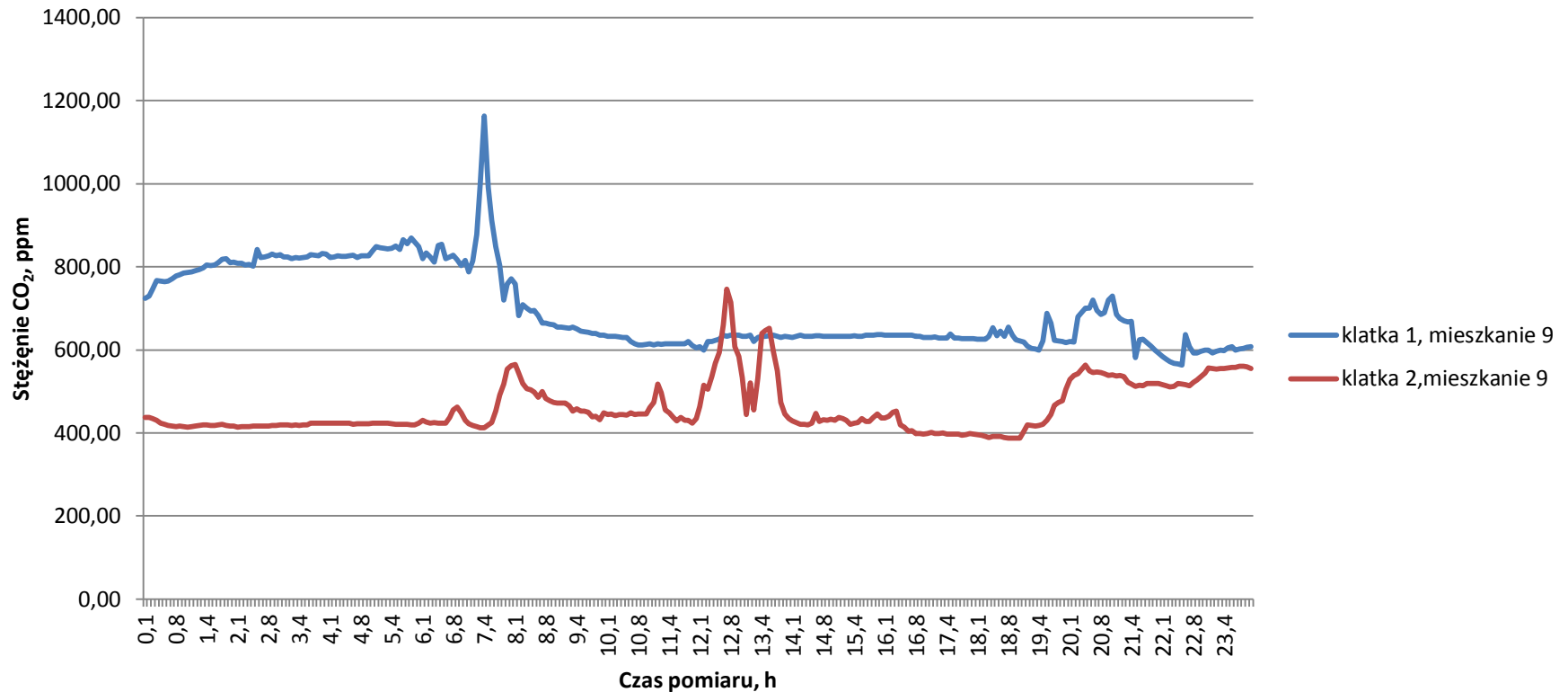


Fig. 6. CO2 measurements in building with natural and hibrid ventilation

SUMMARY:

- ❑ We can observe increasing range (level) of CO and CO₂ contaminations in existing building, especially equipped in gas heaters (boilers)
- ❑ We had to solve the problem without serious rebuilding
- ❑ Applying hybrid ventilation with balance range of pressure in buildings equipped in gas heating boilers could
- ❑ Polish technical regulations are restricted to these propositions – it isn't allowed so far
- ❑ But it occurs one of the most easy way to improve indoor air quality in our buildings



Fig. 7. Buildings with hybrid systems