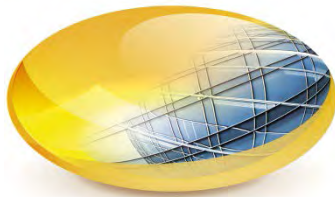




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Ventilative Cooling Case Studies



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Residential Building Lorenz Reiter Straße

- Built by Heimbau GmbH,
a Viennese non-profit developer
- located in Vienna's 11th district
- inhabited since summer 2016
- 137 flats in two separate buildings
- flat sizes of 43 to 130 m²_{NFA}
- concrete building + thermal insulation
- Interior corridors,
adjacent to staircases at each sides



Fig.: Exterior view of building 2
source: Peter Holzer



Residential Building Lorenz Reiter Straße

- Net Heating Demand (HWB)
17,1 kWh/m²a (building 1)
18,5 kWh/m²a (building 2)
- Heat supply by district heating
- Comfort ventilation
via central exhaust unit
together with noise-insulated
façade-integrated
supply-air-vents



Exhaust ventilator on roof
source: Peter Holzer

Night Ventilation concept

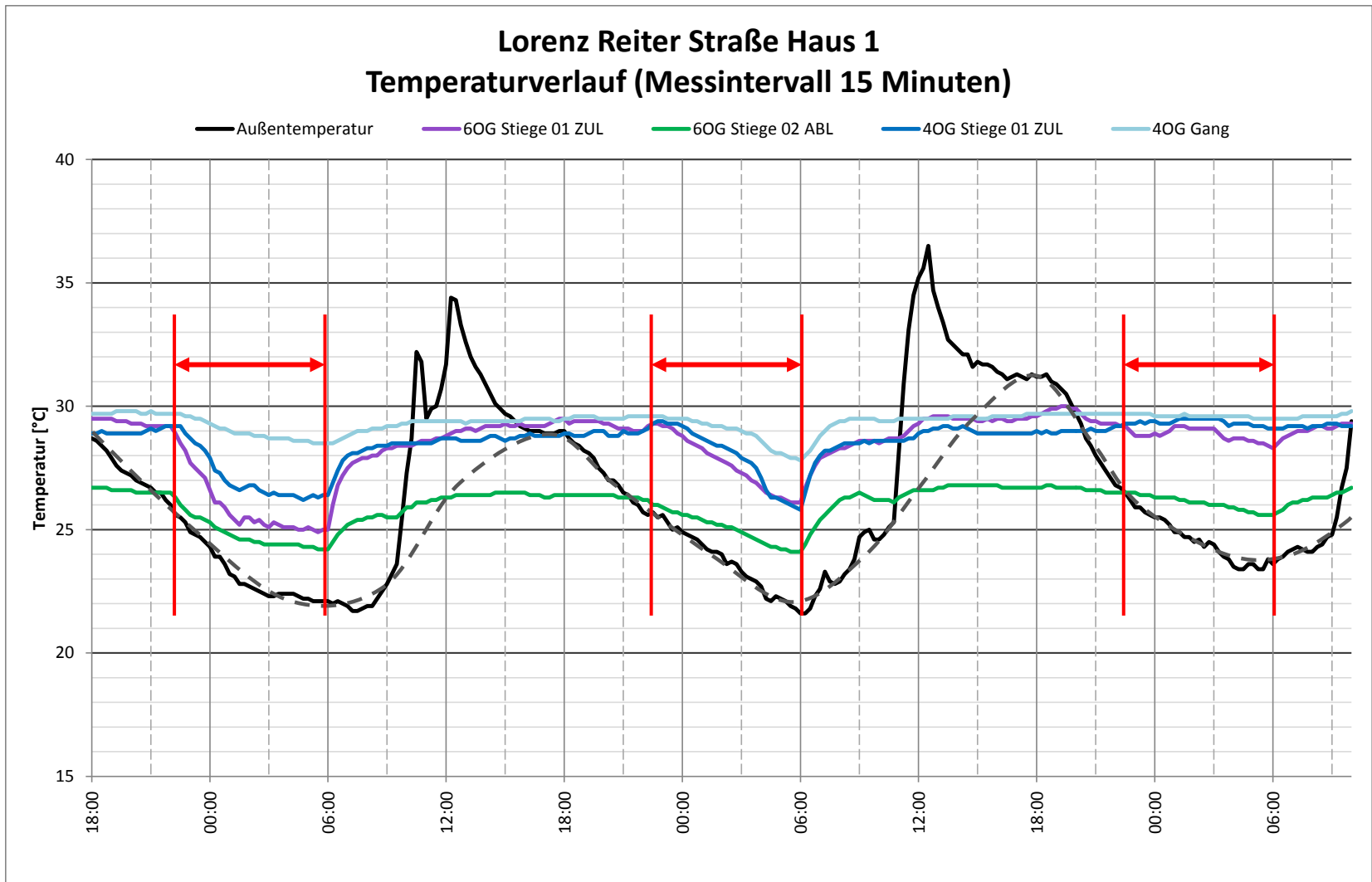
- Air intake via automated top-hung windows in the supply-air-staircase, one at each floor
- Overflow through the interior corridors, via magnetic opened fire-protection-doors
- Air exhaust through extract-air-staircase and roof-mounted mechanical exhaust vent with sound damper
- VC operation between 11 pm and 6 am if $\Delta T_{(i-e)} \geq 2K$ and if $T_i > 22^\circ C$

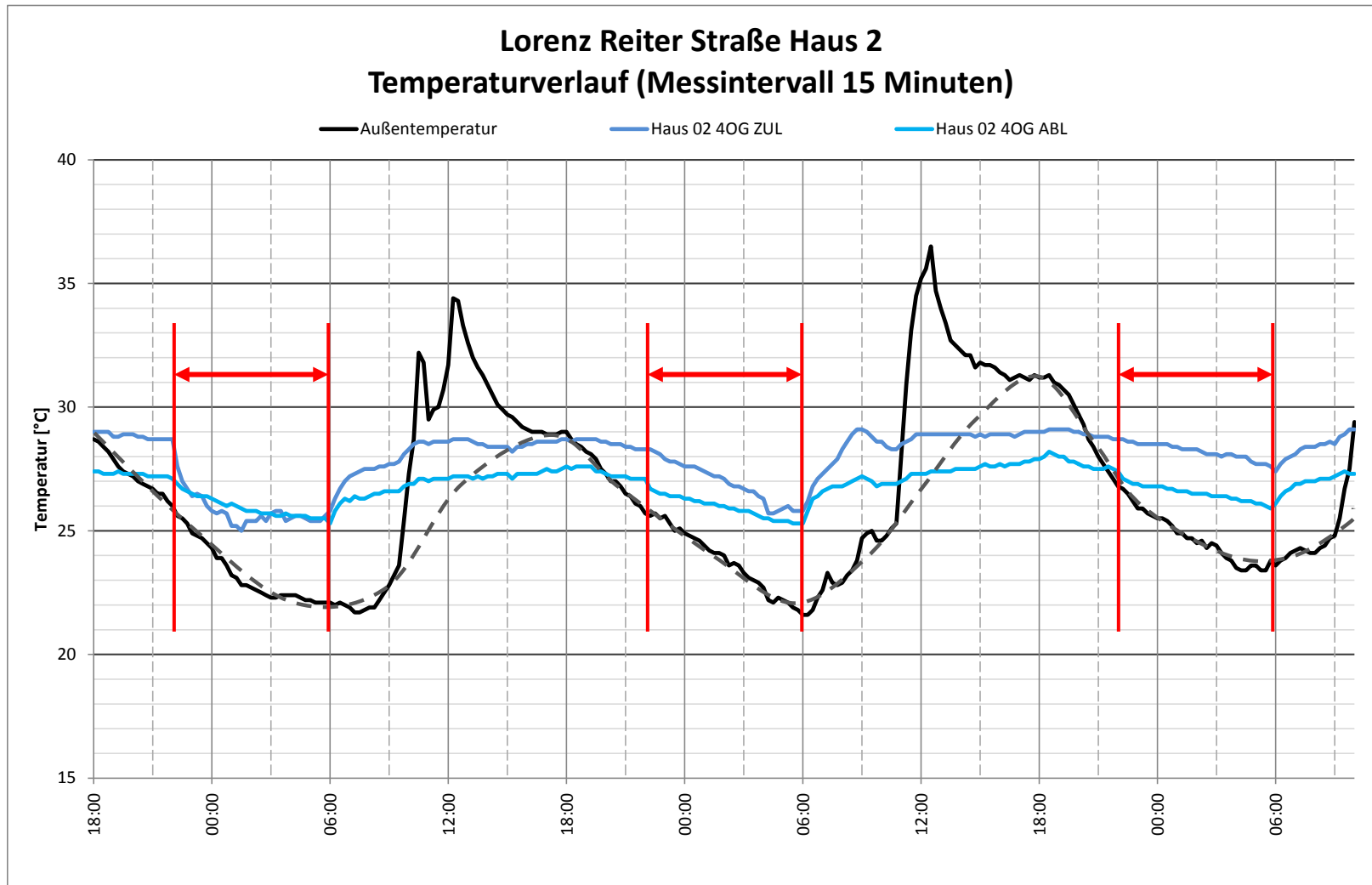


Extract ventilation unit and supply air window
 source: Peter Holzer

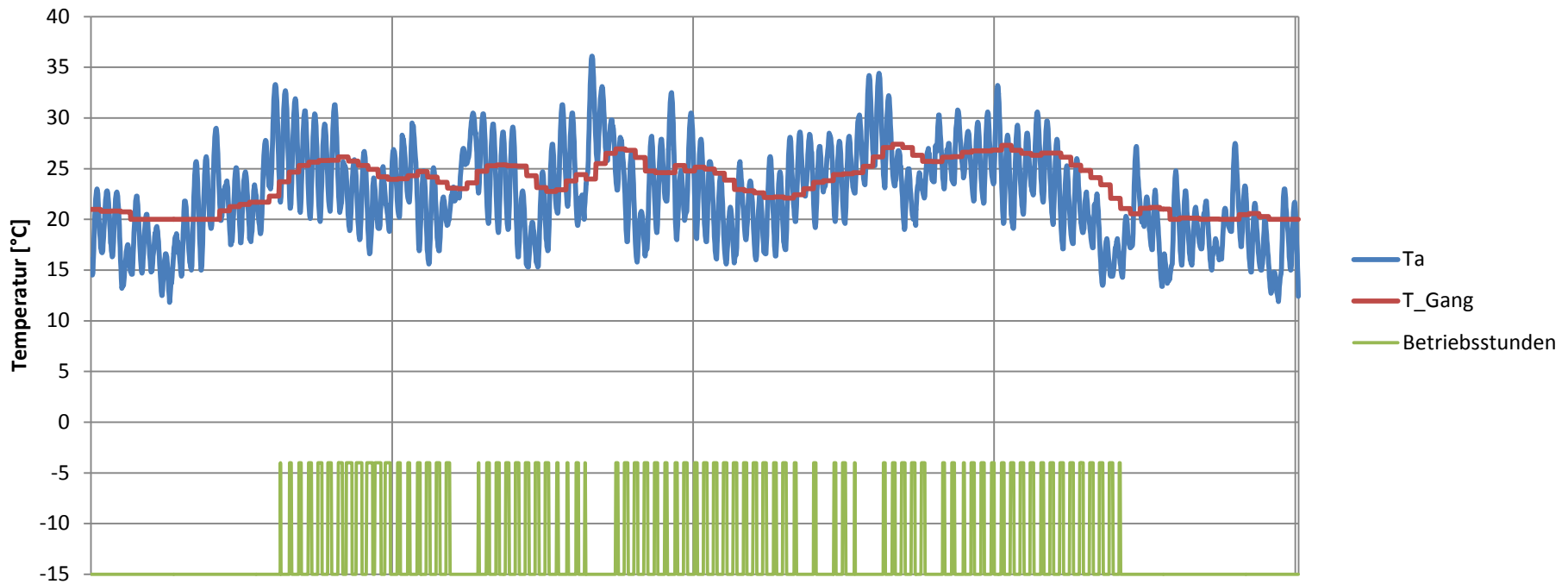
VC System Indicators

	building 1	building 2
Number of air inlet windows	6	6
Nominal geometric cross section per inlet window	0,8 m ²	0,8 m ²
VC effected floor area (corridors only)	996 m ²	750 m ²
Total inlet ross section per VC affected floor area	0,5 %	0,6 %
Volume flow of Ventilative Cooling	22.000 m ³ /h	11.000 m ³ /h
Ceiling height	2,6 m	2,6 m
Air change rate of Ventilative Cooling	8,5 h ⁻¹	5,6 h ⁻¹





VC Annual Performance Extrapolation



Hourly outdoor temperature from Meeonorm Vienna 2050 extreme

Indoor temperature based on min 20°C and correlation to outdoor running mean temperature

source: Peter Holzer

VC Performance Indicators

	building 1	building 2
Volume flow Ventilative Cooling	22.000 m ³ /h	11.000 m ³ /h
Electrical power drain of ventilators	1.040 W	520 W
Electric efficiency of Volume flow	0,05 W/(m ³ h ⁻¹)	0,05 W/(m ³ h ⁻¹)
Annual operating hours	601 h/a	601 h/a
Annual Discharged cooling energy	23,2 MWh/a	11,6 MWh/a
Discharged cooling energy in relation to corridor area	23,3 kWh/m ² _{NF} a	15,5 kWh/m ² _{NF} a
Annual electrical power consumption of ventilators including controls	974 kWh/a	487 kWh/a
Seasonal Energy Efficiency Ratio	24	24

Learnings

- Good stuff.
- Creative finger protection at the automated supply-air-windows by coupling them with the corridors' motion sensors

Office in mixed residential+office building

- located in Vienna's 2nd district
- inhabited since 1971
- concrete building structure
together with 16cm thermal insulation
- Net floor area of 150 m², roomheight of 2,80m
- Organized in one big working area,
separate meeting room and
separate kitchen and restrooms

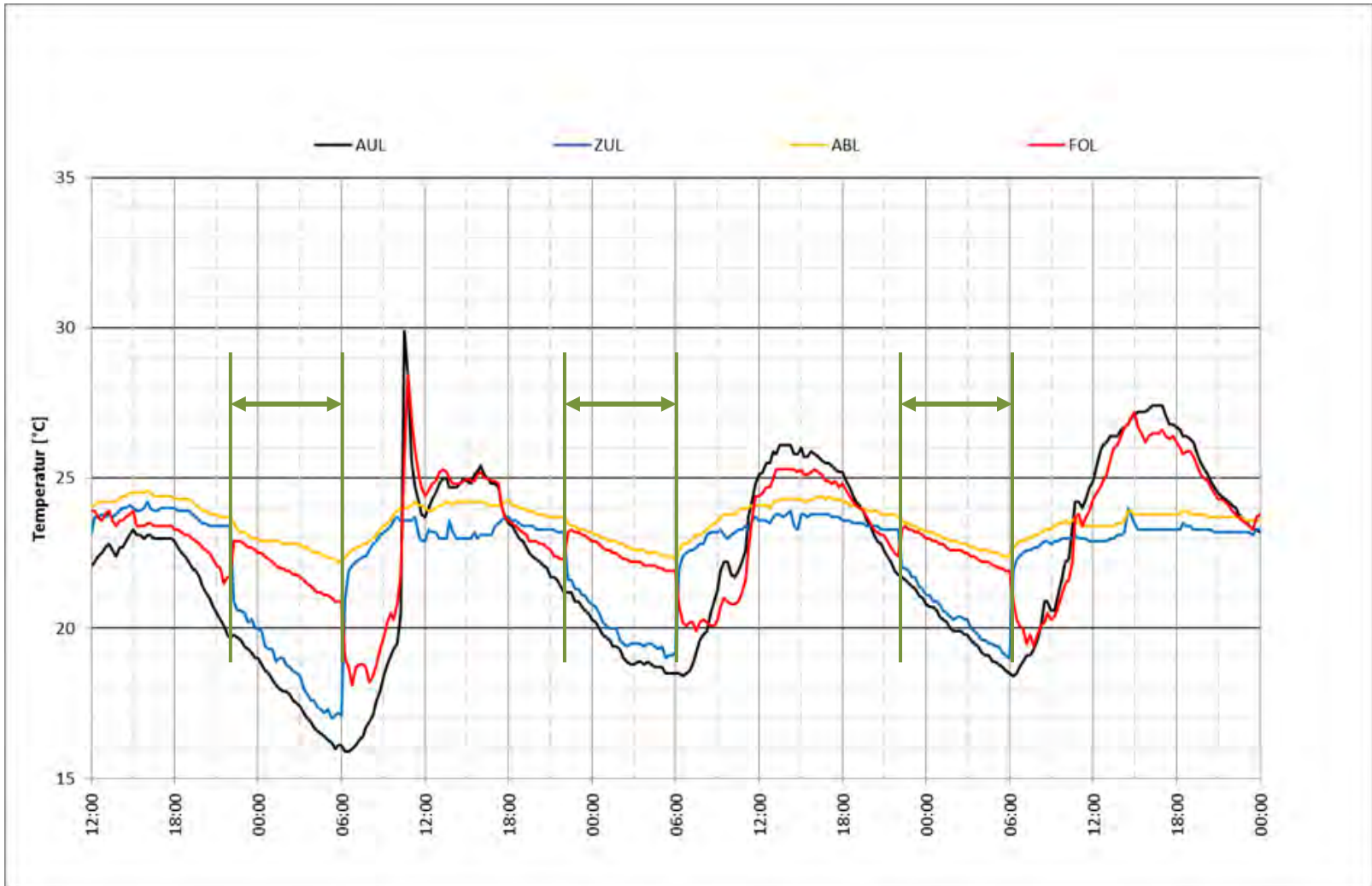
HVAC Concept

- Heat supply by district heating
- Balanced comfort ventilation with heat exchanger and with mechanical cooling to a setpoint of $T_i = 26^\circ\text{C}$
- Night Ventilation with both a mechanical supply air ventilator, including louver, duct system and sound dampers and a mechanical extract air ventilator, again including louver, duct system and sound dampers
- VC operation between 10 pm and 6 am
if $\Delta T(i-e) \geq 2\text{K}$ and if $T_i > 22^\circ\text{C}$

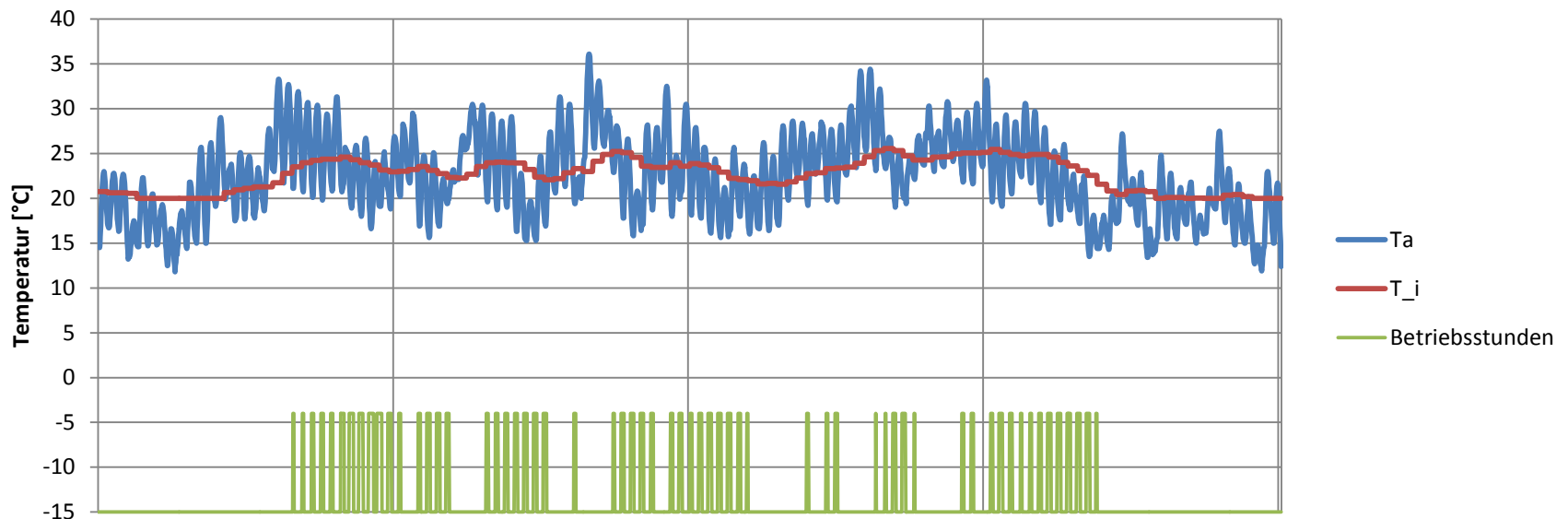
VC System Indicators

Nominal geometric cross section per inlet window	0,16 m ²
VC effected floor area	150 m ²
Total inlet ross section per VC affected floor area	0,1 %
Volume flow of Ventilative Cooling	1.800 m ³ /h
Ceiling height	2,8 m
Air change rate of Ventilative Cooling	4,3 h ⁻¹

Temperature Measurements



VC Annual Performance Extrapolation



Hourly outdoor temperature from Meteonorm Vienna 2050 extreme
 Indoor temperature based on min 20°C and correlation to outdoor running mean temperature
 source: Peter Holzer

VC Performance Indicators

Volume flow Ventilative Cooling	1.800 m ³ /h
Electrical power drain of ventilators	590 W
Electric efficiency of Volume flow	0,33 W/(m ³ h ⁻¹)
Annual operating hours	428 h/a
Annual Discharged cooling energy	1,2 MWh/a
Discharged cooling energy in relation to corridor area	8 kWh/m ² _{NF} a
Annual electrical power consumption of ventilators including controls	279 kWh/a
Seasonal Energy Efficiency Ratio	4,3



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Checks an improvements planned

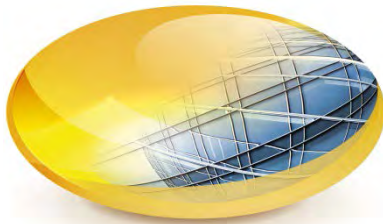
- Control measurement of electrical power drain of ventilator
- Measurement of pressure rise of both SUP-vent and EXT-vent
- Possibly dismantling of supply air components such as ventilator and dampers



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Thank You



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