

Zone or pre-cooling



Outside air			by Cooler	Supply air	Cooling capacity for target air	
Temp. [°C]	Relative humidity [%]	Duration [Hours]	Temp. [°C]	Temp. [°C]	Cooling capacity with SHC [kw th.]	Cooling capacity without SHC [kw th.]
16,9	51	174	16,9	17,8	15	15
16,9	85	104	16,9	17,8	15	15
17,0	32	64	17,0	17,9	17	17
17,0	70	346	17,0	17,9	17	17
18,2	18	1	18,2	19,1	39	39
18,7	84	61	16,8	17,7	27	54
18,9	30	60	8,5	17,0	0	54
18,9	50	214	11,8	17,0	0	54
18,9	69	315	14,7	17,0	0	53
20,4	83	26	18,2	19,1	105	142
20,8	68	248	16,2	17,1	2	89
20,9	11	3	6,1	17,0	0	93
21,0	50	251	13,5	17,0	0	94
21,1	33	58	10,6	17,0	0	96
22,1	80	1	19,3	20,2	167	215
22,6	19	1	8,7	17,0	0	125
22,7	65	105	17,4	18,3	59	127
22,9	51	232	15,2	17,0	0	129
23,0	34	85	12,1	17,0	0	133
24,4	63	13	18,7	19,6	133	194
24,9	49	238	16,4	17,3	6	167
25,0	34	95	13,4	17,0	0	170
26,8	46	137	17,3	18,2	57	202
26,9	33	79	14,5	17,0	0	205
28,8	43	71	18,4	19,3	115	239
29,0	33	91	15,9	17,0	0	244
29,4	19	4	12,6	17,0	0	254
30,5	18	4	12,9	17,0	0	275
30,5	41	11	19,3	20,2	167	271
30,9	32	68	17,1	18,0	44	279
32,8	28	60	17,4	18,3	59	315
34,4	26	13	18,1	19,0	95	344
36,6	22	1	18,2	19,1	106	385

Comparison (cooling period)		
Electricity:	-94.167 kWh/a	-20.717 €/a
Operating costs:	-84%	-19.430 €/a
CO2:	-89%	-21,3 to/a

Calculated values for the cooling period		
Freecooling:	689 h/a	21%
2-stage adiabatic:	2.545 h/a	79%
Air volume cooled:	56.000 m³/h	
Total air volume:	56.000 m³/h	
Temperature above:		after cooling
18,0 °C	137 h	4,2%
19,0 °C	12 h	0,4%
20,0 °C	0 h	0,0%

Consideration of water use (supra-regional)	
oling water use Power generation:	10 l/kWh
SHC (electricity consumption):	112 m³/a
SHC (evaporation):	643 m³/a
SHC (Total):	755 m³/a
Chiller (electricity consumption):	1.054 m³/a
Water use (supra-regional):	-28 %

Frame/Simulation Parameters	
Year weather data:	2025
Weather data location:	Vienna Schwechat
min. supply air temperature:	17,0 °C
Cooler Release:	18,5 °C
CO2 equivalent electricity:	0,226 kg/kWh
CO2 equivalent water:	0,000 kg/m³
Electricity price:	0,22 €/kWh
Water price:	2,00 €/m³
Conductivity water:	150 µS/cm
Consumption values calculated for:	
Refrigeration	
Design data chillers	
EER:	3,40 kW/kW
Reference temperature:	35,0 °C
ΔEER:	3,00 %/K
Calculate hybrid cooling? (always at target air temperature)	No
erf. add. KM power for min. supply air temp.:	167 kW th.
Sustainable Hall Conditioning consumption values	
Water use:	643 m³/a
Electricity consumption:	11.198 kWh/a
CO2:	2,5 to/a
1286 €/a	2464 €/a
Consumption values chiller (comparison system)	
Same performance (real)	
Required power:	346 kW thermisch
Electricity consumption:	105.365 kWh/a
CO2:	23,8 to/a
23.180 €/a	

Hall conditioning



In the building				Outside air			by Cooler	Supply air
Temp. [°C]	Relative humidity [%]	Comfort [-]	Satisfaction [%]	Temp. [°C]	Relative humidity [%]	Duration [Hours]	Temp. [°C]	Temp. [°C]
23,0	43	Slightly cool	83	16,9	51	174	16,9	17,8
23,0	59	Slightly cool	86	16,9	85	104	16,9	17,8
23,1	35	Slightly cool	83	17,0	32	64	17,0	17,9
23,1	51	Slightly cool	86	17,0	70	346	17,0	17,9
24,4	30	Comfortable	92	18,2	18	1	18,2	19,1
24,5	60	Comfortable	94	18,7	84	61	16,8	17,7
24,5	35	Comfortable	93	18,9	30	60	8,5	17,0
24,5	44	Comfortable	93	18,9	50	214	11,8	17,0
24,5	52	Comfortable	94	18,9	69	315	14,7	17,0
24,6	65	Comfortable	95	20,4	83	26	18,2	19,1
24,5	57	Comfortable	94	20,8	68	248	16,2	17,1
24,5	29	Comfortable	92	20,9	11	3	6,1	17,0
24,5	48	Comfortable	94	21,0	50	251	13,5	17,0
24,5	40	Comfortable	93	21,1	33	58	10,6	17,0
25,7	65	Comfortable	94	22,1	80	1	19,3	20,2
24,5	35	Comfortable	93	22,6	19	1	8,7	17,0
24,5	62	Comfortable	94	22,7	65	105	17,4	18,3
24,5	54	Comfortable	94	22,9	51	232	15,2	17,0
24,5	44	Comfortable	94	23,0	34	85	12,1	17,0
25,2	64	Comfortable	95	24,4	63	13	18,7	19,6
24,5	58	Comfortable	94	24,9	49	238	16,4	17,3
24,5	48	Comfortable	94	25,0	34	95	13,4	17,0
24,5	62	Comfortable	94	26,8	46	137	17,3	18,2
24,5	52	Comfortable	94	26,9	33	79	14,5	17,0
25,2	63	Comfortable	95	28,8	43	71	18,4	19,3
24,5	57	Comfortable	94	29,0	33	91	15,9	17,0
24,5	46	Comfortable	94	29,4	19	4	12,6	17,0
24,5	47	Comfortable	94	30,5	18	4	12,9	17,0
26,2	63	Comfortable	92	30,5	41	11	19,3	20,2
24,5	61	Comfortable	94	30,9	32	68	17,1	18,0
24,5	62	Comfortable	94	32,8	28	60	17,4	18,3
25,3	62	Comfortable	95	34,4	26	13	18,1	19,0
25,5	62	Comfortable	94	36,6	22	1	18,2	19,1

Comparison (cooling period)		
Electricity:	-283.087 kWh/a	-62.279 €/a
Operating costs:	-94%	-60.993 €/a
CO2:	-96%	-64,0 to/a
more fresh air:	28.000 m³/h	

Calculated values for the cooling period		
Freecooling:	689 h/a	21,3%
2-stage adiabatic:	2.545 h/a	78,7%
Max. fresh air volume cooled:	56.000 m³/h	
max. total fresh air volume:	56.000 m³/h	
Max. relative indoor humidity:	65 %	

Comfort		
Cool	0 h	0,0%
Slightly cool	688 h	21,3%
Comfortable	2.546 h	78,7%
Slightly warm	0 h	0,0%
Warm	0 h	0,0%

Comfort rated according to EN-16798 with:		
Light standing activity (assembly, soldering, ...)		
Shorts, short shirt		

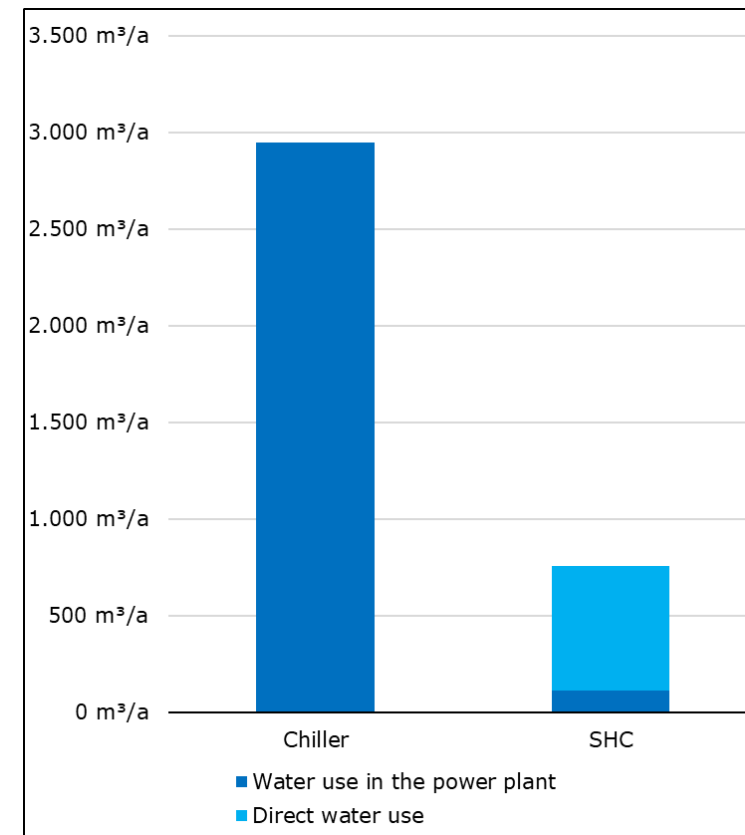
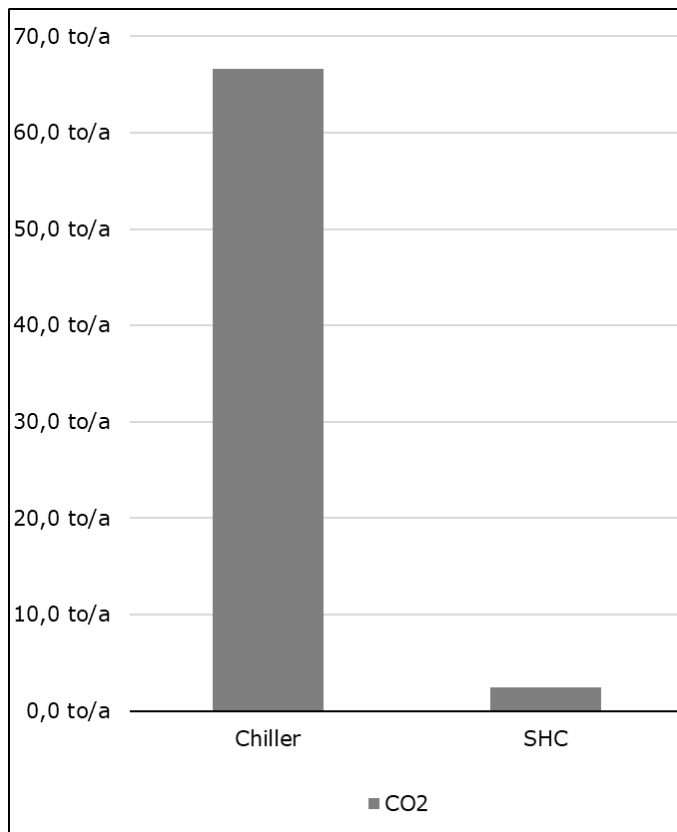
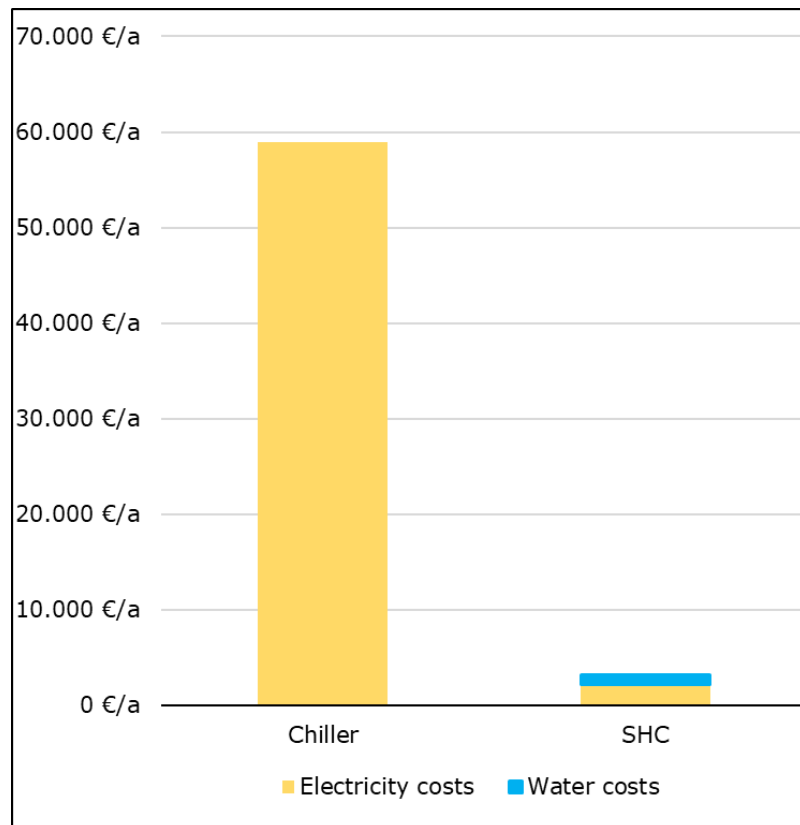
hours with hall temperature over		
24,5 °C	136 h	4,2%
25,5 °C	12 h	0,4%
26,5 °C	0 h	0,0%

hours with indoor humidity over		
50 %	2.220 h	68,6%
55 %	1.248 h	38,6%
60 %	506 h	15,6%

Consideration of water use (supra-regional)	
Cooling water use Power generation:	10 l/kWh
SHC (electricity consumption):	112 m³/a
SHC (evaporation):	643 m³/a
SHC (Total):	755 m³/a
Chiller (electricity consumption):	2.943 m³/a
Water use (supra-regional):	-74%

Frame/Simulation Parameters		
Internal heat load:	162 kW	
Heat load solar/external max.:	88 kW	
Year weather data:	2025	
Weather data location:	Vienna Schwechat	
Max. humidity in the building:	65%	
Min. hall temperature (active cooling):	24,5 °C	
Min. hall temperature (freecooling):	23,0 °C	
min. supply air temperature:	17,0 °C	
Cooler Release:	18,5 °C	
max. delta to the outside:	Nicht angewendet	
CO2 equivalent electricity:	0,226 kg/kWh	
CO2 equivalent water:	0,000 kg/m³	
Electricity price:	0,22 €/kWh	
Water price:	2,00 €/m³	
Conductivity water:	150 µS/cm	
Consumption values calculated for:		
Refrigeration		
Consumption values comparison system calculated for:		
Recirculating air + fresh air identical conditions (real)		
Sustainable Hall Conditioning consumption values		
Water use:	643 m³/a	1.286 €/a
Electricity consumption:	11.198 kWh/a	2.464 €/a
CO2:	2,5 to/a	
Consumption values chiller (comparison system)		
Required power:	354 kW thermisch	
EER:	3,40 kW/kW	
Reference temperature:	35,0 °C	
ΔEER:	3,00 %/K	
Fresh air volume:	28.000 m³/h	
Electricity consumption:	294.285 kWh/a	64.743 €/a
CO2:	66,5 to/a	

The potential



Hall conditioning with hybrid cooling



In the building				Outside air			by Cooler	Supply air
Temp. [°C]	Relative humidity [%]	Comfort [-]	Satisfaction [%]	Temp. [°C]	Relative humidity [%]	Duration [Hours]	Temp. [°C]	Temp. [°C]
23,0	43	Slightly cool	83	16,9	51	174	16,9	17,8
23,0	59	Slightly cool	86	16,9	85	104	16,9	17,8
23,1	35	Slightly cool	83	17,0	32	64	17,0	17,9
23,1	51	Slightly cool	86	17,0	70	346	17,0	17,9
24,4	30	Comfortable	92	18,2	18	1	18,2	19,1
24,5	60	Comfortable	94	18,7	84	61	16,8	17,7
24,5	35	Comfortable	93	18,9	30	60	8,5	17,0
24,5	44	Comfortable	93	18,9	50	214	11,8	17,0
24,5	52	Comfortable	94	18,9	69	315	14,7	17,0
24,5	65	Comfortable	95	20,4	83	26	18,2	19,1
24,5	57	Comfortable	94	20,8	68	248	16,2	17,1
24,5	29	Comfortable	92	20,9	11	3	6,1	17,0
24,5	48	Comfortable	94	21,0	50	251	13,5	17,0
24,5	40	Comfortable	93	21,1	33	58	10,6	17,0
24,5	65	Comfortable	95	22,1	80	1	18,1	19,0
24,5	35	Comfortable	93	22,6	19	1	8,7	17,0
24,5	62	Comfortable	94	22,7	65	105	17,4	18,3
24,5	54	Comfortable	94	22,9	51	232	15,2	17,0
24,5	44	Comfortable	94	23,0	34	85	12,1	17,0
24,5	65	Comfortable	95	24,4	63	13	18,0	18,9
24,5	58	Comfortable	94	24,9	49	238	16,4	17,3
24,5	48	Comfortable	94	25,0	34	95	13,4	17,0
24,5	62	Comfortable	94	26,8	46	137	17,3	18,2
24,5	52	Comfortable	94	26,9	33	79	14,5	17,0
24,5	65	Comfortable	95	28,8	43	71	17,7	18,6
24,5	57	Comfortable	94	29,0	33	91	15,9	17,0
24,5	46	Comfortable	94	29,4	19	4	12,6	17,0
24,5	47	Comfortable	94	30,5	18	4	12,9	17,0
24,5	65	Comfortable	95	30,5	41	11	17,6	18,5
24,5	61	Comfortable	94	30,9	32	68	17,1	18,0
24,5	62	Comfortable	94	32,8	28	60	17,4	18,3
24,5	64	Comfortable	95	34,4	26	13	17,3	18,2
24,5	64	Comfortable	95	36,6	22	1	17,2	18,1

Comparison (cooling period)		
Electricity:	-176.089 kWh/a	-38.739 €/a
Operating costs:	-90%	-37.453 €/a
CO2:	-93%	-39,8 to/a
more fresh air:	28.000 m³/h	

Calculated values for the cooling period		
Freecooling:	689 h/a	21,3%
2-stage adiabatic:	2.409 h/a	74,5%
Hybrid:	136 h/a	4,2%
Convection:	0 h/a	0,0%
Reheating required:	0 h/a	0,0%
Comfort		
Cool	0 h	0,0%
Slightly cool	688 h	21,3%
Comfortable	2.546 h	78,7%
Slightly warm	0 h	0,0%
Warm	0 h	0,0%
Comfort rated according to EN-16798 with:		
Light standing activity (assembly, soldering, ...)		
Shorts, short shirt		

hours with hall temperature over		
24,5 °C	0 h	0,0%
25,5 °C	0 h	0,0%
26,5 °C	0 h	0,0%
hours with indoor humidity over		
50 %	2.220 h	68,6%
55 %	1.248 h	38,6%
60 %	506 h	15,6%

Additional required reheating:		
Performance:	0 kW thermisch	
Heating energy costs:	0,22 €/kWh	
Energy requirements:	0 kWh/a	0 €/a

Consideration of water use (supra-regional)	
Cooling water use Power generation:	101/kWh
SHC (electricity consumption):	123 m³/a
SHC (evaporation):	643 m³/a
SHC (Total):	767 m³/a
Chiller (electricity consumption):	1.884 m³/a
Water use (supra-regional):	-59 %

Frame/Simulation Parameters Hybrid Cooling		
Internal heat load:	162 kW	
Heat load solar/external max.:	88 kW	
Year weather data:	2025	
Weather data location:	Vienna Schwechat	
Indoor humidity target:	65%	
at max. hall temp. (active cooling):	24,5 °C	
Min. hall temperature (freecooling):	23,0 °C	
min. supply air temperature:	17,0 °C	
Cooler Release:	18,5 °C	
CO2 equivalent electricity:	0,226 kg/kWh	
CO2 equivalent water:	0,000 kg/kWh	
Electricity price:	0,22 €/kWh	
Water price:	2,00 €/m³	
Conductivity water:	150 µS/cm	
Consumption values calculated for:		
Refrigeration		
Recirculation operation permissible?		
No		
Position of cooling coil and adiabatic air volume:		
Cooling coil position:	after adiabatic coolers	
Max. fresh air volume cooled:	56.000 m³/h	
of which uncooled outside or circulating air min.:	0 m³/h	
Max. fresh air volume uncooled:	0 m³/h	
Design data chillers		
EER:	3,40 kW/kW	
Reference temperature:	35,0 °C	
ΔEER:	3,00 %/K	
Sustainable Hall Conditioning consumption values		
Required power chiller:	77 kW thermisch	
Water use:	643 m³/a	1.286 €/a
Electricity consumption:		
Freecooling:	0 kWh/a	0 €/a
2-stage adiabatic operation:	10.600 kWh/a	2.332 €/a
Hybrid operation (adiabatic + chiller):	1.734 kWh/a	381 €/a
Recirculation mode (chiller only):	0 kWh/a	0 €/a
Total electricity consumption:	12.334 kWh/a	2.713 €/a
CO2:	2,8 to/a	
Consumption values chiller (comparison system)		
Required power:	362 kW thermisch	
Fresh air volume:	28.000 m³/h	
Electricity consumption:	188.422 kWh/a	41.453 €/a
CO2:	42,6 to/a	
Limited chiller power:		

Hybrid cooling: Minimal energy consumption with high effect



Erforderliche hybride Kühlleistungen über die Dauer
Required hybrid cooling capacity over the duration

