Outdoor Telecom Cabinet Air Conditioner, heat Exchanger & TEC Proposal Calculation

1. Cabinet Air Conditioner Proposal Calculation

1) Dimension and Specification of Cabinet A

Width：800mm,Depth：800mm,Height：1800mm

Thickness of plate material：45mm，material：PU

Plate square dimension：

Front/Back side：1.8m*0.8m=1.44m2

Top/Bottom side：0.8m*0.8m=0.64m2

Left/right side：1.8m*0.8m=1.44m2

2) Cabinet Heat leakage calculation

Cabinet with air conditioner：

The target temperature in the cabinet is required to 30℃，the highest ambient temp is 35℃,the highest temp of solar collineation is 65℃.

The square of solar collineation side:1.44m2+0.64m2=2.1m2

Heat leakage:2.1*3.5*（65-30）+ (2*1.44+1.44+0.64)*3.5*（35-30）

=257+86

=343W

3) Heat load of equipment in the cabinet

Supposing that there’re 4 pcs of BBU and 1pcs of 6kw power supply module installed in the cabinet, the heat load is 4*100+6000*0.04=640W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage + heat load of equipment=343+640=943W

According to the cooling capacity curve line of 1.3KW air conditioner, the cooling capacity is 1000W,when the internal temp is 30℃ and ambient temp is 35℃.

(Note: the configuration is reasonable, if the cooling capacity is a little higher than the total heat load.)

2. Cabinet Air Conditioner Proposal Calculation

1) Dimension and Specification of Cabinet B

Width：800mm，Depth：800mm，Height：1400mm

Thickness of plate material：45mm,material：PU

Plate square dimension：

Front/Back side：1.4m*0.8m=1.12 ㎡

Top/Bottom side：0.8m*0.8m=0.64 ㎡

Left/right side：1.4m*0.8m=1.12 ㎡

2) Cabinet Heat leakage calculation

Cabinet with air conditioner：

The target temperature in the cabine is required to 30℃，the highest ambient temp is 35℃,the highest temp of solar collineation is 65℃.

The square of solar collineation side=1.12+0.64=1.76 ㎡

Heat leakage:1.76*3.5*（65-30）+ (2*1.12+1.12+0.64)*3.5*（35-30）

=216+70

=286W

3) Heat load of equipment in the cabinet

Supposing that there’re 4 pcs of BBU and 1pcs of 6kw power supply module installed in the cabinet,the heat load is 4*100+6000*0.04=640W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage+ heat load of equipment=286+640=926W

According to the cooling capacity curve line of 1.3KW air conditioner, the cooling capacity is 1000W,when the internal temp is 30℃ and ambient temp is 35 ℃.

(Note: the configuration is reasonable, if the cooling capacity is a little higher than the total heat load.)

3. Cabinet Air Conditioner Proposal Calculation

1) Dimension and Specification of Cabinet C

Width：850mm，Depth：650mm，Height：1000mm

Thickness of plate material：45mm,material：PU

Plate square dimension：

Front/Back side：1.0m*0.85m=0.85 ㎡

Top/Bottom side：0.85m*0.65m=0.55 ㎡

Left/right side：1.0m*0.65m=0.65 ㎡

2) Cabinet Heat leakage calculation

Cabinet with air conditioner：

The target temperature in the cabinet is required to 30 ℃,the highest ambient temp is 35 ℃,the highest temp of solar collineation is 65 ℃.

The square of solar collineation side=0.85+0.55=1.4 ㎡

Heat leakage:1.4*3.5*（65-30）+ (2*0.85+0.65+0.55)*3.5*（35-30）

=172+51

=223W

3) Heat load of equipment in the cabinet

Supposing that there're 4 pcs of BBU and 1pcs of 6kw power supply module installed in the cabinet, the heat load is 4*100+6000*0.04=640W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage+ heat load of equipment =223+640=863W

According to the cooling capacity curve line of 1.3KW air conditioner, the cooling capacity is 1000W, when the internal temp is 30 ℃ and ambient temp is 35℃.

(Note:the configuration is reasonable, if the cooling capacity is a little higher than the total heat load.)

4. Cabinet Heat Exchanger Proposal Calculation

1) Dimension and Specification of Cabinet A

Width：800mm，Depth：800mm，Height：1800mm

Thickness of plate material：45mm,material：PU

Plate square dimension：

Front/Back side：1.8m*0.8m=1.44 ㎡

Top/Bottom side：0.8m*0.8m=0.64 ㎡

Left/right side：1.8m*0.8m=1.44 ㎡

2) Cabinet Heat leakage calculation

Cabinet With Heat Exchanger：

The target temperature in the cabinet is required to 40 ℃,the highest ambient temp is 35 ℃,the high

solar collineation is 65 ℃.

The square of solar collineation side=1.44+0.64=2.1 ㎡

Heat leakage:2.1*3.5*（65-40）+ (2*1.44+1.44+0.64)*3.5*（35-40）

=184-87

=97W

3) Heat load of equipment in the cabinet

Supposing that there’re 4 pcs of BBU and 1pcs of 6kw power supply module installed in the cabinet, the heat load is 4*100+6000*0.04=640W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage+ heat load of equipment =97+640=733W

As a result, use a 200W/K heat exchanger, the cabinet internal temp can be kept at 35+(733/200)=38.7℃ in summer.

(Considering the bad weather, it’s reasonable to choose the above heat exchanger proposal.)

5. Cabinet Heat Exchanger Proposal Calculation

1) Dimension and Specification of Cabinet B

Width：800mm，Depth：800mm，Height：1400mm

Thickness of plate material：45mm,material：PU

Plate square dimension：

Front/Back side：1.4m*0.8m=1.12 ㎡

Top/Bottom side：0.8m*0.8m=0.64 ㎡

Left/right side：1.4m*0.8m=1.12 ㎡

2) Cabinet Heat leakage calculation

Cabinet With Heat Exchanger：

The target temperature in the cabinet is required to 40 ℃,the highest ambient temp is 35 ℃,the high

solar collineation is 65 ℃.

The square of solar collineation side=1.12+0.64=1.76 ㎡

Heat leakage: 1.76*3.5*（65-40）+ (2*1.12+1.12+0.64)*3.5*（35-40）

=154-70

=84W

3) Heat load of equipment in the cabinet

Supposing that there're 4 pcs of BBU and 1pcs of 6kw power supply module installed in the cabinet, the heat load is 4*100+6000*0.04=640W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage+heat load of equipment =84+640=724W

As a result,use a 200W/K heat exchanger ,the cabinet internal temp can be kept at 35+(724/200)=38.6 ℃ in summer.

(Considering the bad weather, it's reasonable to choose the above heat exchanger proposal.)

6. Cabinet TEC (Thermoelectric Cooler) Proposal Calculation

1) Dimension and Specification of Cabinet A

Width：800mm，Depth：800mm，Height：1800mm

Thickness of plate material：45mm,material：PU

Plate square dimension：

Front/Back side：1.8m*0.8m=1.44 ㎡

Top/Bottom side：0.8m*0.8m=0.64 ㎡

Left/right side：1.8m*0.8m=1.44 ㎡

2) Cabinet Heat leakage calculation

Cabinet With TEC：

The target temperature in the cabinet is required to 30 ℃,the highest ambient temp is 35 ℃, the highest temp of solar collineation is 65 ℃.

The square of solar collineation side=1.44+0.64=2.1 ㎡

Heat leakage: 2.1*3.5*（65-30）+ (2*1.44+1.44+0.64)*3.5*（35-30）

=257+86

=343W

3) Heat load of equipment in the cabinet

Supposing that there’s a 600AH battery pack installed in the cabinet, when it’s being charged ,the heat load is 50*600/100=300W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage+ heat load of equipment =343+300=643W

Cooling Capacity< Total heat load

7. Cabinet TEC (Thermoelectric Cooler) Proposal Calculation

1. Dimension and Specification of Cabinet B

Width：800mm，Depth：800mm，Height：1400mm

Thickness of plate material：45mm,material：PU

Plate square dimension：

Front/Back side：1.4m*0.8m=1.12 ㎡

Top/Bottom side：0.8m*0.8m=0.64 ㎡

Left/right side：1.4m*0.8m=1.12 ㎡

2. Cabinet Heat leakage calculation

Cabinet With TEC：

The target temperature in the cabinet is required to 30 ℃,the highest ambient temp is 35 ℃,the high

solar collineation is 65 ℃.

The square of solar collineation side=1.12+0.64=1.76 ㎡

Heat leakage: 1.76*3.5*（65-30）+ (2*1.12+1.12+0.64)*3.5*（35-30）

=216+70

=286W

3. Heat load of equipment in the cabinet

Supposing that there's a 400AH battery pack installed in the cabinet, when it's being charged ,the heat load is 50*400/100=200W

4. The total heat load of cabinet

Total heat load=Cabinet heat leakage+ heat load of equipment =286+200=486W

Cooling Capacity< Total heat load

8. Cabinet TEC (Thermoelectric Cooler) Proposal Calculation

1) Dimension and Specification of Cabinet C

Width：850mm，Depth：650mm，Height：1000mm

Thickness of plate material：45mm,material：PU

Plate square dimension：

Front/Back side：1.0m*0.85m=0.85 ㎡

Top/Bottom side：0.85m*0.65m=0.55 ㎡

Left/right side：1.0m*0.65m=0.65 ㎡

2) Cabinet Heat leakage calculation

Cabinet With TEC：

The target temperature in the cabinet is required to 30 ℃,the highest ambient temp is 35 ℃,the high

solar collineation is 65 ℃.

The square of solar collineation side=0.85+0.55=1.4 ㎡

Heat leakage: 1.4*3.5*（65-30）+ (2*0.85+0.65+0.55)*3.5*（35-30）

=172+51

=223W

3) Heat load of equipement in the cabinet

Supposing that there’s a 500AH battery pack installed in the cabinet, when it’s being charged ,the heat load is

50*500/100=250W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage+heat load of equipment =223+250=473W

Cooling Capacity< Total heat load

9. Cabinet TEC (Thermoelectric Cooler) Proposal Calculation

1) Dimension and Specification of Cabinet D

Width：1000mm，Depth：650mm，Height：300mm

Thickness of plate material：20mm,material：steel plate+ thermal insulation cotton

Plate square dimension：

Front/Back side：1.0m*0.3m=0.3 ㎡

Top/Bottom side：0.65m*1m=0.65 ㎡

Left/right side：0.65m*0.3m=0.195 ㎡

2) Cabinet Heat leakage calculation

Cabinet With TEC：

The target temperature in the cabinet is required to 30 ℃,the highest ambient temp is 35 ℃,the high

solar collineation is 65 ℃.

The square of solar collineation side=0.3+0.65=0.95 ㎡

Heat leakage: 0.95*3.2*（65-30）+ (2*0.195+0.65+0.3)*3.2*（35-30）

=106+21

=127W

3) Heat load of equipment in the cabinet

Supposing that there’s a 100AH battery pack installed in the cabinet, when it’s being charged ,the heat load is 50*100/100=50W

4) The total heat load of cabinet

Total heat load=Cabinet heat leakage+ heat load of equipment =127+50=177W

Cooling Capacity>Total heat load