

AIR CONDITIONING AND REFRIGERATION Journal

The magazine of the Indian Society of Heating, Refrigerating and Air Conditioning Engineers

Issue : April-June 2002

A Systematic Approach for Reviewing the Selection of Ch. W. Fan Coil Units

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Consultants specify chilled water Fan Coil Units (FCUs) with due consideration to the cooling load calculations and what is available in the market. But, many times, the offered selections for FCUs that consultants receive for their review either during tender submission or project execution, deviate from the specified parameters. A typical deviation is that the offered FCUs would have higher than specified Total Capacity and lower than specified Sensible Capacity. Should one reject or approve such selections? Here is a systematic approach for reviewing the selections of chilled water Fan Coil Units (FCUs).

Specified Parameters

Let us first look at those parameters, which are specified by the consultants for the selection of chilled water FCUs:

1. Cooling capacities
 - Total Cooling Capacity (TC)
 - Sensible Cooling Capacity (SC)

2. Air side

- Air quantity (Q) ...generally at medium speed
- External Static Pressure (ESP)
- On coil temperature (dry & wet bulb)
- Off coil temperature (dry & wet bulb)

3. Water Side

- Chilled water flow rate
- Chilled water supply temperature
- Chilled water return temperature

Now, when it comes to reviewing a selection of chilled water FCU against the specified parameters, the following three steps could help to logically conclude the suitability of the offered FCU.



Step 1: Check Capacity Bearings

Before proceeding to check Q/ TC/SC, the offered FCU should first be checked for 'Capacity Bearings', 'Capacity Bearings' are those parameters, which are not FCU specific but have a bearing on its very performance. These are:

- On coil temperature (dry & wet bulb)
- Chilled water in temperature
- Chilled water flow rate

Any deviations from the above parameters, if ignored, could lead to misinterpretation of the cooling capacity of the offered FCU. How is that possible? The following examples demonstrate how each of these parameters can affect the capacity of a chilled water FCU:

1. Impact of on coil temperature: TC for Carrier FCU model 40LM060 increases from 11.8kW to 14.9kW (26% increase) when on coil temperature (dry & wet bulb) changes from 25.0/17.0° to 27.0/ 19.5°C (all other parameters remaining the same).

Obviously, if the offered FCU has been selected at a higher on coil temperature than the specified, its derived capacity, as shown in the selection, is inflated. It will perform at a lower capacity at the specified on coil temperature.

2. Impact of chilled water supply temperature: TC for Carrier FCU model 40LMO60 increases from 11.8kW to 12.7 kW(8% increase) when chilled water temperature is lowered from 7° C to 6° C(all other parameters remaining the same).

Obviously, if the offered FCU has been selected at a lower chilled water supply temperature than the specified, its derived capacity, as shown in the selection, is inflated. It will perform at a lower capacity at the specified chilled water supply temperature.

3. Impact of chilled water flow rate: TC for Carrier FCU model 40LMO60 increases from 11.8 kW to 12.7 kW (8% increase) when the chilled water flow rate is increased from 44 lps to 66 lps (all other parameters remaining the same).

Obviously, if the offered FCU has been selected at a higher chilled water flow rate than the specified, its derived capacity, as shown in the selection, is inflated. It will perform at a lower capacity at the specified chilled water flow rate.

So even before looking at the capacities of the offered FCU, it is important to look at the ‘Capacity Bearings’ in order to avoid accepting inflated capacities which later on can’t be attained in actual field conditions.

Step 2: Check Capacity

Once it has been ascertained that the offered FCU has been selected at the correct ‘Capacity Bearings’, it is time to look at the capacities which should satisfy the following conditions:

Sensible Capacity (SC): Offered SC should be equal or more than the specified.

Total Capacity (TC): Offered TC should be equal or more than the specified.

Air Quantity (Q): Offered Q should be at the specified External Static Pressure (ESP) and at medium speed (if specified). Q could deviate from the specified but it doesn’t matter so long as the FCU has been selected at the correct on coil temperature and it satisfies the specified TC and SC.

Step 3: Review Noise

If noise levels form part of the specifications, the offered FCU should be evaluated by an acoustic consultant for compliance with the specifications.

The above approach should help to review the selections in a systematic manner, identify deficiencies, if any, and more importantly, keep the occupants cool and comfortable by providing FCUs with correct capacities.