

Calculating Total Heat Transferred

August is typically the time of the year when customers are complaining that the system is just not keeping up during the hot part of the day.

After the technician has checked that the filter is clean, coils are clean, the grilles are not obstructed, the refrigerant pressures and temperatures are good and the systems amperages are all within tolerances, how much more can be checked?

There is another formula that can be used to evaluate total heat transfer, or in this case how much total heat is being removed from the home.

$$\text{CFM} \times \text{HD} \times 4.5 = \text{Total Heat}$$

To use this formula the technician will need to know what CFM is being generated by the blower. In past Tech Tips we have discussed getting this information using the external static pressure and the engineering data. We also discussed counting the LED control lights on variable speed units with adequate static pressure to calculate CFM. And finally we discussed using the heat strips to calculate temperature rise and apply that to CFM.

Example:
$$\text{CFM} = \frac{\text{Volts} \times \text{Amps} \times 3.413}{\text{Temp Rise} \times 1.08}$$

After establishing CFM, two additional readings are obtained using a psychrometer, the wet bulb temperature of the supply air and the wet bulb of the return air. By converting these Wet bulb numbers to Enthalpy using this total heat chart the Enthalpy difference can be found.

Remember Enthalpy is total heat content and the difference between the total heat of the Return and the total heat of the Supply is the HD or Heat Differential.

For our example the system is a typical 3 ton system and the calculated CFM is 1206.

The supply air WB is 50 degrees and the return air WB is 60 degrees. To get HD subtract 20.30 from 26.46.

$$\text{HD} = 6.16$$

To see if the 3 ton system is removing a NOMINAL 12,000 BTUs per ton, just plug the numbers into the formula.

$$\text{CFM} \times \text{HD} \times 4.5 = \text{Total Heat}$$

$$1206 \times 6.16 \times 4.5 = 33,430$$

This system seems to be doing pretty close to its maximum under these conditions. Remember that the more accurate the readings are the more accurate the final numbers will be.

Total Heat Chart



W.B.	Enthalpy	W.B.	Enthalpy
40	15.23	60	26.46
41	15.70	61	27.15
42	16.17	62	27.85
43	16.66	63	28.57
44	17.15	64	29.31
45	17.65	65	30.06
46	18.16	66	30.83
47	18.68	67	31.62
48	19.21	68	32.42
49	19.75	69	33.25
50	20.30	70	34.09
51	20.86	71	34.95
52	21.44	72	35.83
53	22.02	73	36.74
54	22.62	74	38.61
56	23.84	76	39.57
57	24.48	77	40.57
58	25.12	78	41.58
59	25.80	79	42.62

Psychrometers in Coburn's System

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Yellow Jacket

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