

Re: Heating air in a wind tunnel.

Source: <http://sci.tech-archive.net/Archive/sci.electronics.design/2005-11/msg00147.html>

- *From:* "John B" <spamlessj_baraclough@xxxxxxxxxxxxxx>
 - *Date:* Wed, 2 Nov 2005 10:09:32 -0000
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"John Larkin" <jjlarkin@xx> wrote in message news:jvsfm1t7dkms20qql0g6g1ml09tn8u99qh@xxxxxxxxxxx

> ..
> ..
>
>
> This from my COOL.TXT cheat-sheet file...
>
> =====
>
> If moving air removes heat from a volume, the exhaust air becomes
> hotter than the intake air.
>
> The forced-air cooling equation is...
>
> $P = 169 * Q_a * (T_2/T_1 - 1)$
>
> P = power, watts
> Q_a = air flow, CFM (cubic feet per minute)
> T₂ = outlet temp, K (absolute temperature, Kelvins)
> T₁ = inlet temp, K
>
> For 1 deg C rise at 1 CFM, we get...
>
> $P = 169 * 1 * (301/300 - 1) = 0.5633 \text{ w}$
>
> So, near room temp, an air flow of 1 CFM will be heated 1.775 deg
> c/watt.
>
>
> Since 1 cubic foot = 28.31 liters, for Q_m in LPM the equation becomes
>
> $P = 5.69 * Q_m * (T_2/T_1 - 1)$
>
> So one LPM has a heatsink capacity of 50.25 degC/watt
>
> =====
>

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>
> So, 250 lpm, 20 to 70 degrees C rise, takes
>
> $P = 5.69 * 250 * ((273+70)/(273+20) - 1)$
>
> = 260 watts,
>
> I think.
>

Thanks to John P, I found the following data (my figures are approximations):

Density of air at 70C 1kg/m³
Constant Pressure specific heat 1000J/kg.K

CPSH = 1000W.s/kg.K
= 1W.s/l.K
= 0.0167W.min/l.K

So for 250l/min and 50C rise in temperature

$250 * 50 * 0.0167 = 208.75W$

Pretty close.

Thanks to all for your help.

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John B

• **References:**

◆ **Heating air in a wind tunnel.**

◇ From: John B

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