

Advanced Thermofluid Dynamics

Matthew John Permintella | BEng
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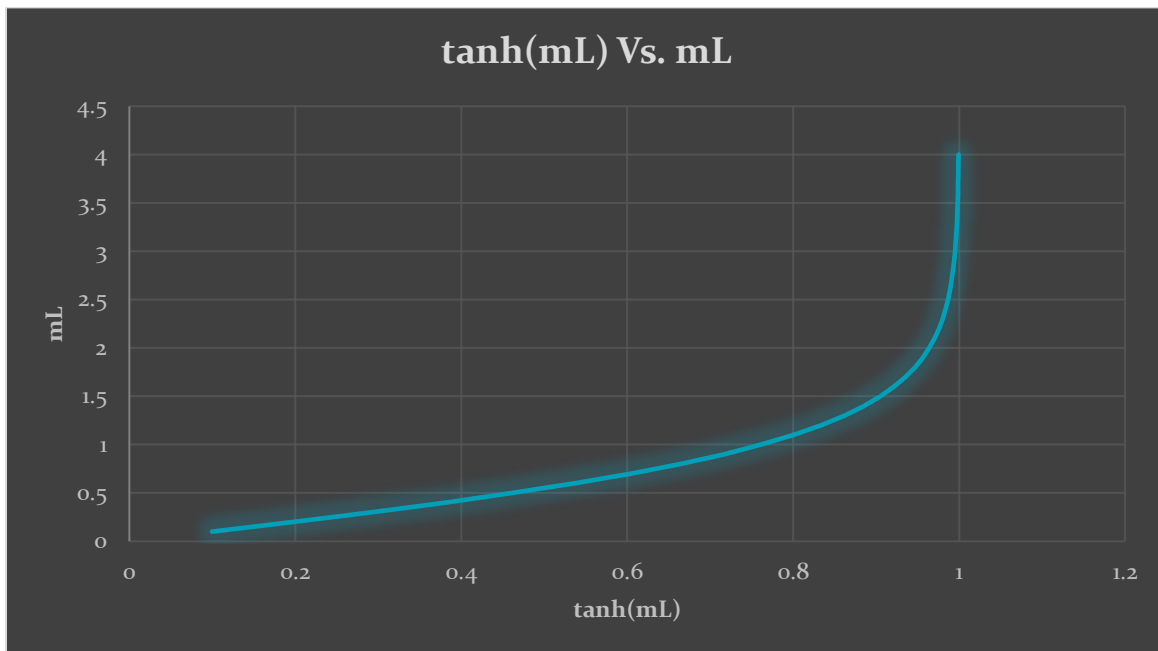
Task 2 (Proper length of a fin)

$$\frac{\dot{Q}_{finite}}{\dot{Q}_{\infty}} = \frac{\sqrt{hPkA_c}(T_b - T_{\infty})\tanh mL}{\sqrt{hPkA_c}(T_b - T_{\infty})} = \tanh mL$$

Below values are shown of tanh mL evaluated for a value of mL in table(1).

tanh(mL)	mL	tanh(mL)	mL
0.099668	0.1	0.970452	2.1
0.197375	0.2	0.975743	2.2
0.291313	0.3	0.980096	2.3
0.379949	0.4	0.983675	2.4
0.462117	0.5	0.986614	2.5
0.53705	0.6	0.989027	2.6
0.604368	0.7	0.991007	2.7
0.664037	0.8	0.992632	2.8
0.716298	0.9	0.993963	2.9
0.761594	1	0.995055	3
0.800499	1.1	0.995949	3.1
0.833655	1.2	0.996682	3.2
0.861723	1.3	0.997283	3.3
0.885352	1.4	0.997775	3.4
0.905148	1.5	0.998178	3.5
0.921669	1.6	0.998508	3.6
0.935409	1.7	0.998778	3.7
0.946806	1.8	0.999	3.8
0.956237	1.9	0.999181	3.9
0.964028	2	0.999329	4

Table(1): The variation of heat transfer from a fin relative to that from an infinitely long fin.



Graph(1): $\tanh(mL)$ against mL .

As seen from observing graph(1), it shows heat transfer from a fin increases with the value of mL is show as nearly linearly increasing at first, however the curve plateaus and therefore reaches a value for infinite long fin at about $mL=4$. It can also be seen by reducing the fin length by 1.4, so from 4 to 2.6 only causes a slight drop in heat transfer performance however vast amount of material can be saved by doing so, this slight drop is only about 1% which is a good trade-off for performance vs. fin size. As seen in table (1) and graph (1) a value of 2.6 is ruffly 99% effienct.