

Determining Blade Tip Speed (TS) and Mach Number (M)

GENERAL EQUATIONS:

Blade Tip Speed (TS):

$$\text{Blade Tip Speed, } TS \text{ (m/s)} = \text{rotor diameter (D)} * \pi * \frac{\text{rotor RPM}}{60}$$

Speed of Sound in Air:

$$v_{\text{sound in air}} \text{ (m/s)} \approx 331.4 + 0.6T_c \quad (T_c \text{ is air temperature in } ^\circ\text{C})$$

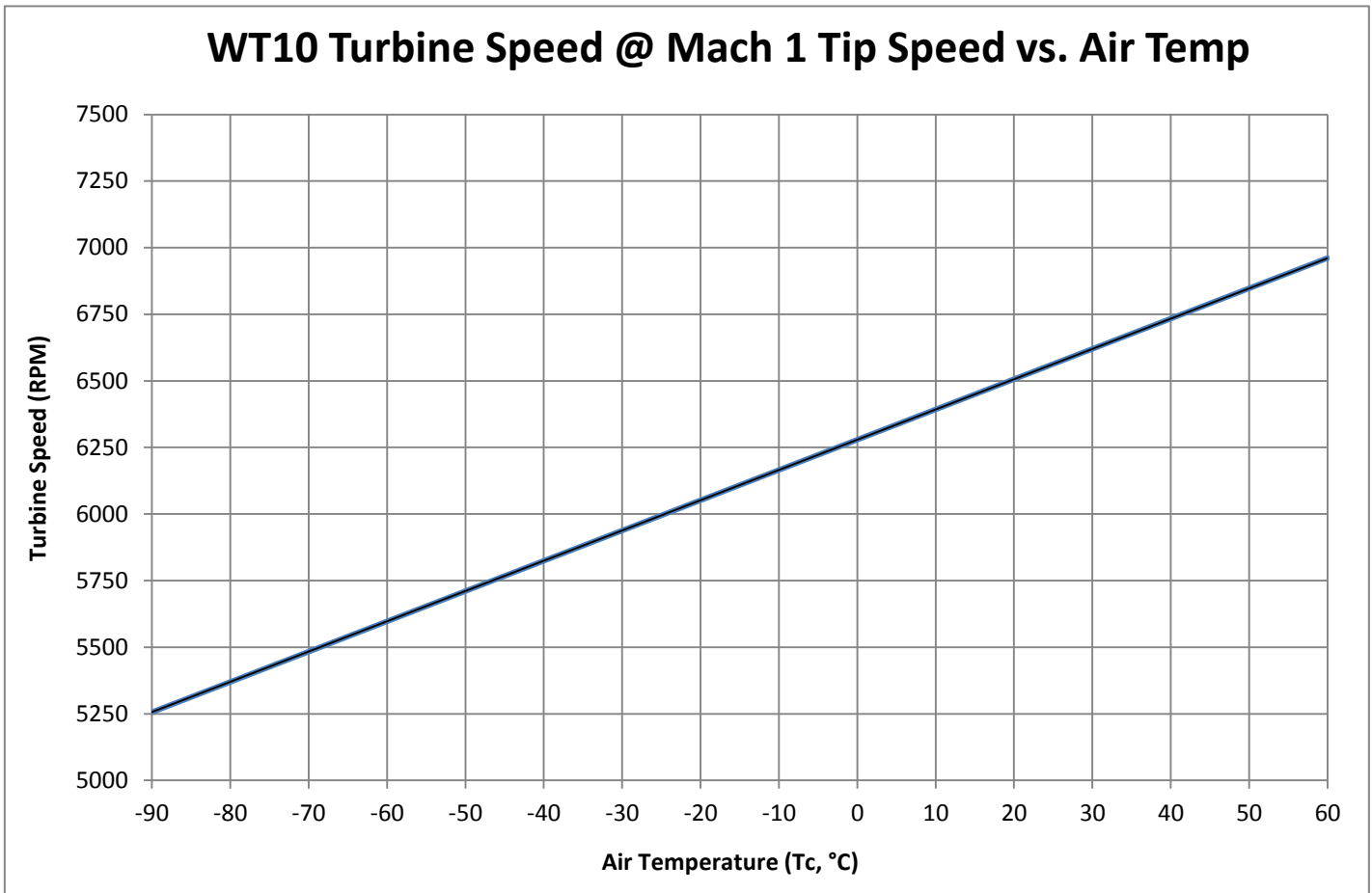
Turbine Blade Mach Number:

$$\text{Mach Number (M)} = \frac{TS}{v_{\text{sound in air}}}$$

WT10 SPECIFIC:

Tip Speed (Simplified) for WT10 Turbine:

$$TS \text{ (m/s)} = 0.053 * \text{rotor RPM}$$



$$\text{Turbine RPM @ Mach 1 TS} = 11.37 T_c + 6279$$