TECHNICAL UPDATE # 004

Torque, Power and Speed – other power sources

In a previous update we discussed how the fundamentals of power, torque and speed are related by the equation Torque= 9550 x Power/rpm

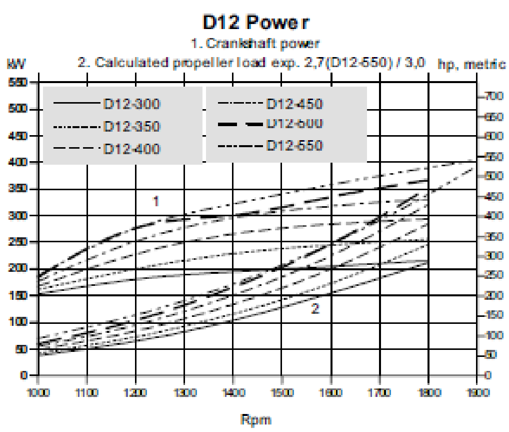
This linear relationship only holds true while ever power is constant, such as in a single or multi-phase electric motor running at synchronous speed. It also holds true when a fixed speed reduction device is used such as a gearbox or vee belt drive where the torque can be easily evaluated.

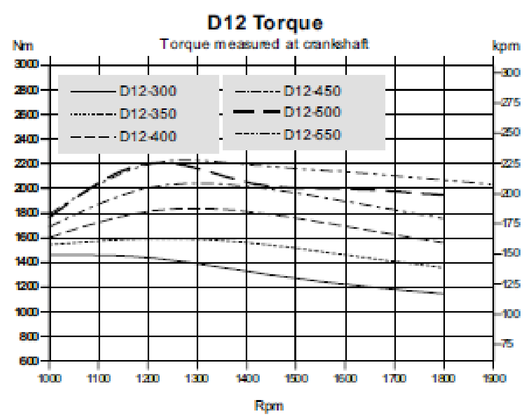
But what happens when the power is not constant across a prime movers speed range?

Consider for example a diesel engine of either single or multi cylinder configuration. An internal combustion engine such as this will generate its peak power at a certain rpm point. Either side of that point the power, and also torque, will diminish. One cannot expect the same torque relationship as previously mentioned to be applied to such a machine.

So when trying to size a suitable shaft coupling for a diesel drive to, say a fire fighting pump, what torque value does one choose for its size?

The solution we adopt is to study the specific performance curve particular to the engine in question. Engine manufacturers publish their own power, speed and fuel consumption curves for each model. By studying these curves one can select the point of operation where peak torque occurs, which is not the same as the peak power point. For instance Volvo Penta publish the following curves for their D12 range of marine inboard diesel engines:





While peak power is developed at crank speed of 1800 rpm or more the peak torque is found to occur at around 1200-1300 rpm. Trying to apply the linear equation for power and torque would give an erroneous answer in the engine torque at peak power. Thus to size an appropriate coupling based on its torque capacity one must start with the engine peak torque from its specific curve.

The same logic applies to other non-linear power sources such as gas turbines or even wind power generators where understanding the whole system is the key to successfully sizing a suitable shaft coupling.

At Thompson Couplings Ltd we have developed a sophisticated method for calculating the effects of various power sources speeds and torque patterns to enable us to design the correct coupling to suit individual applications.

David Farrell – B.E. Mech (hons)☺

(David Farrell is Chief Engineer for Thompson Couplings - designers and manufacturers of The Thompson Constant Velocity Joint. David has more than 30 years as a professional mechanical engineer involved in a wide range of mechanical engineering designs and maintenance projects. He was one of the key founders of Thompson Couplings Ltd since 2001 and continues to design the range of TC products as well as support the engineering community with specific applications for power transmission and shaft couplings.) www.thompsoncouplings.com