Note 11

Peak Power condition

From Eqn. 3 of Note 10:-

$$P = \frac{MDR \times V \times N \times ASE \times EV \times EC \times EM}{23{,}550} \quad \text{HP. on Petrol; at STP.}$$

For a given engine

$$P = \text{Constant} \times N \times (EV \times EC \times EM)$$

For convenience let Constant = K and (EC x EV x EM) = ECOM, so

$$P = K \times N \times ECOM$$

Take logs:-

$$\text{Log } P = \text{Log } K + \log N + \text{Log } ECOM$$

and differentiate, so that:-

$$\frac{dP}{P} = \frac{dN}{N} + \frac{dECOM}{ECOM}$$

At P = Peak Power, PP, by definition $\frac{dP}{P} = 0$

so

$$\frac{dN}{N} = \frac{-dECOM}{ECOM}$$

Therefore, at Peak Power the %age increase in N RPM is just offset by the %age decrease in the combined efficiencies.

EC is shown in the Honda paper ref.(453) to be independent of N, provided that there is a suitable adjustment of ignition advance, so it is the decline of EV and EM which is significant in setting a Peak to Power.

Sample Power Curve

A sample Power Curve is shown on P.2, with the data made relative to the Peak Power (PP) point so as to illustrate the sensitivity of Power to Speed. In this example exceeding the RPM for PP by about 7% causes a drop of about 5% of Power.

COSWORTH HB3

NA; 75V8; B = 94mm x S = 63mm; B/S = 1.492; V = 3,498cc.

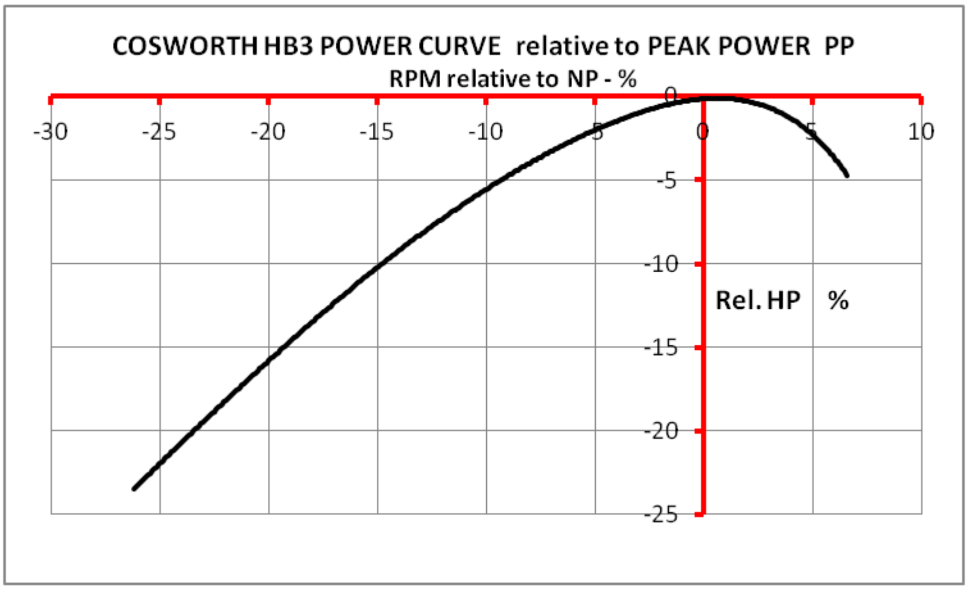
Start 1990

Peak Power (PP) =633 HP @ Peak Speed (NP) = 12,200 RPM.

BMPP = 13.3 Bar @ MPSP = 25.6 m/s

(See "3rd NA Era , Part 1")

								Datum		
RPM	9000	9500	10000	10500	11000	11500	12000	12200	12500	13000
Rel RPM%	-26.2	-22.1	-18	-13.9	-9.8	-5.7	-1.6	0	2.4	6.6
Power HP	484	517	547	576	599	617	630	633	630	603
Rel HP%	-23.5	-18.3	-13.6	-9	-5.4	-2.5	-0.5	0	-0.5	-4.7



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