General Motor Knowledge
Part 32

Motor Performance

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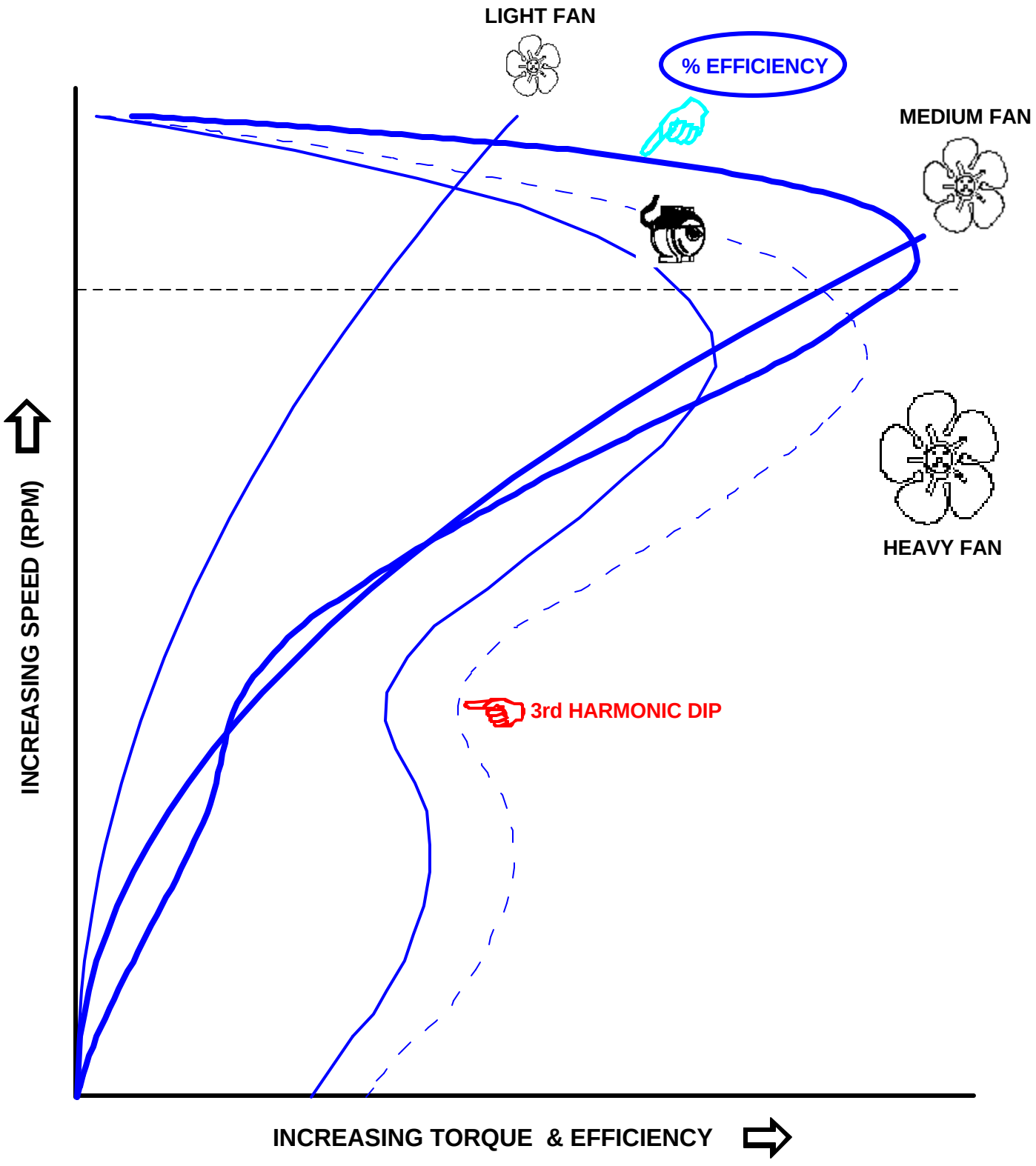
GMK32.wp5

Remember our motor speed-torque curve. Speed starts at 0 RPM in the lower left corner and increases up the page. Torque starts at 0, at the same place and increases to the right across the page. Remember also, a fan blade requires torque in an amount proportional to the square of the speed. The speed-torque requirements for three fan blades are shown drawn on top of the motor speed-torque curve. The motor fan combination will operate where the fan curve crosses the motor curve. A light fan requires very little from the motor. A heavy fan may not allow the motor to develop its full potential. We decided that a medium fan is the best choice. Let's see why.

At any point along the motor speed-torque curve, torque multiplied times the speed, multiplied times a conversion number to get the units right is equal to WATTS OUTPUT. WATTS OUTPUT divided by the WATTS INPUT then times 100% is equal to the PERCENT EFFICIENCY. I have done the arithmetic and calculated a percent (%) efficiency curve for our motor performance curve. Percent efficiency starts at 0 in the lower left corner and increases to the right just as we did for torque. Note the speed where the medium fan curve and the motor performance curve cross. I have drawn a dotted line through this point. The motor efficiency at this speed (continue along the dotted line until it crosses the % efficiency curve) is very nearly maximum. At this point we are getting the MOST out of our motor/fan combination for the LEAST amount of power input. By following a similar process you can see that both the light fan and heavy fan will cause the motor to operate at a point of lower efficiency. This kind of graphical analysis is used to aid our customers in selecting desirable motor/fan combinations.

They say that a picture is worth a thousand words. Over the last few articles, I have used exactly one thousand and one words in an attempt to explain this picture.


LIGHT FAN
% EFFICIENCY
MEDIUM FAN
HEAVY FAN
3rd HARMONIC DIP
INCREASING SPEED (RPM)
INCREASING TORQUE & EFFICIENCY