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Subject: SV: On speed dependence
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Dear Experts,

A month ago I sent you the mail below. Let say that the proposal this is a bi-linear graph. Today I have uploaded to our web the document R55_10_09. There you find a theoretical derivation of speed dependence of vertical and longitudinal forces when traversing a sinusoidal wavy road, e.g. a series of pot holes.

There it can be seen that the forces under completely stiff conditions show a quadratic dependence on speed. The dependence will be less aggressive as flexibility in chassis and drawbars are accounted for. However a quadratic dependence of the dynamic forces (i.e. excluding the traction/braking part) will persist. I.e. a bi-linear relation as proposed may be made conservative. See also document R55-09_06 the three last slides. It is very much a matter of deciding where to set breaking point for the "low" speed region.

The traction forces is very soon coming down to low values. E.g. at 36 kmph (10 m/s) 50kN will correspond to 500 kW (680Hp) power. This force shall be propelling truck and trailer. Coupling forces in that case would be at most 30 kN generated by pure traction without any dynamic effect.

Hence my proposal is that we shall set the threshold speed at 36 kmph. Above that speed we apply $P_{cert} > P_{req} * ((V_o + V)/(2 * V_o))$, where "P" is either D or V requirements and V_o is 80 kmph. Then the issue is to set a requirement below 36 kmph. This shall be a constant value. One proposal may be to just say:

$P_{cert} > P_{req} * ((80 + 36)/(2 * 80)) = P_{req} * 0,725$. Another proposal may be to use the German formula as modified in document R55_05_06 for the D-value and the previous formula for the V-value if applicable (CAT usually not of interest at those high loads and low speeds).

Your ideas and comments are most welcome.

Best Regards

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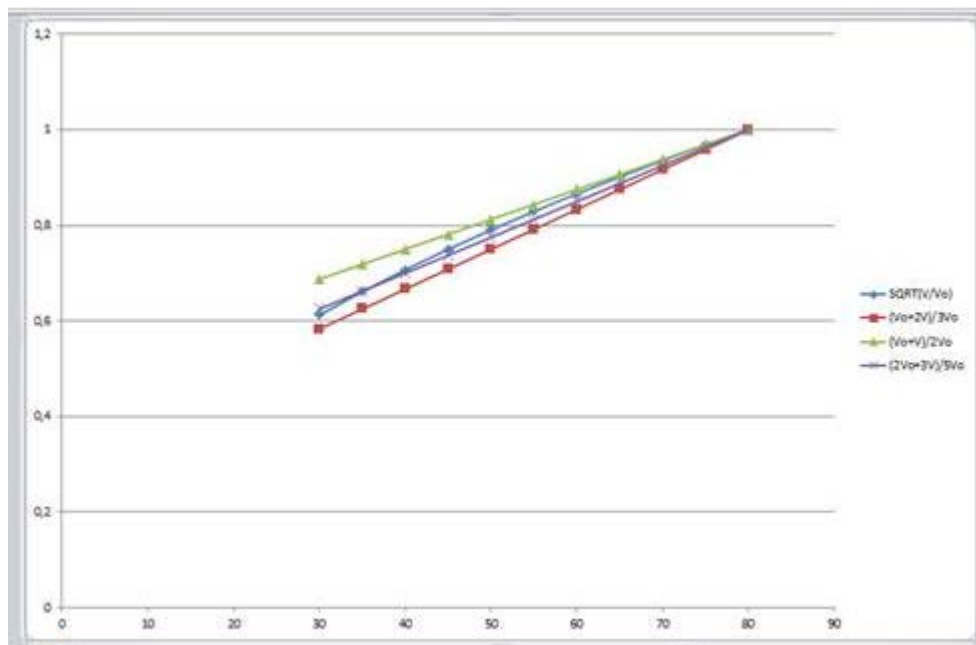
Ämne: On speed dependence

Dear Experts,

At our latest meeting I volunteered to try to assemble a formula speed dependence of the performance requirements.

Considering the document R55_09_06 and the different graphs that you get there I have just played around a bit and would like to get your feedback.

As you know from that document and what I have said to you, we may in operation split the forces in several components. In particular we have one group "Traction and Braking" (low-pass filter) and another group "Combination/Road profile interaction" (high-pass filter). We may possibly consider the low-pass part as not varying with speed while the high-pass part does vary with speed. Based on that thought I came up with a simple formula that may be put in different shapes. The formula is $P_{cert} = P_{req} * ((a*V_0 + b*V)/(a+b)*V_0)$. In the diagram below I have illustrated some different alternative values for the constant a and b. I have put them in comparison to a Square root rule that we have been using for ages.



The general structure is that you have given fraction $((a/(a+b)))$ of the requirement that is not effected by the speed at all. Than if you say this formula I valid between 40 kmph and 80 kmph you have something that has foundation in our measurements. I.e. Low-pass part constant and high-pass part varies.

Any comments?

Have a nice weekend!

Best regards

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