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HMS-FLUX VECTOR SPEED ACCURACY/SPEED RESPONSE

Speed accuracy and speed response are two areas that always tend to get misunderstood or confused. To help better understand these control characteristics we will provide some examples as to how they affect the operation of the VFD.

- **Speed regulation** is defined as the accuracy at which the speed is held to some set point and it is specified as a percentage of base speed.
- **Speed response** is defined as the drive's reaction time to recover to a change in load.

Keeping in mind that speed regulation and speed response discussed in this note only apply to the flux vector control mode (closed loop). The HMS-FLUX specification states that the speed regulation in flux vector control is +/- .02% of the base speed. Let's assume that we have a 1750RPM motor. This means that with a 1750RPM motor we can expect a speed variation of .35RPM or .02%. Lets take a look at the following example to see what variations we can expect to see at different speeds. We will use the following formula for our exercise.

$$\text{Formula: } \frac{\text{Commanded Speed} - \text{Actual Speed}}{\text{Commanded Speed}} \times 100 = \%$$

$$\frac{1750\text{RPM} - 1749.6\text{RPM}}{1750\text{RPM}} \times 100 = .02\%$$

Now lets see the variance when the drive is run at 50% speed. Keep in mind that we still have +/- .35RPM regulation.

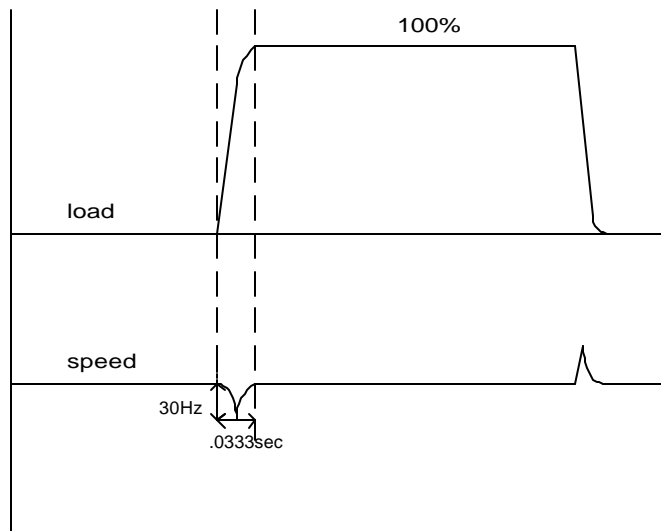
$$\frac{875\text{RPM} - 874.6\text{RPM}}{875\text{RPM}} \times 100 = .04\%$$

Lets see what happens if we were to run the drive at a lower speed.

$$\frac{1.75\text{RPM} - 1.4\text{RPM}}{1.75\text{RPM}} \times 100 = 20\%$$

In conclusion, the HMS-FLUX maintained a .35RPM speed regulation of the set speed, but the speed regulation percentage increased as we ran the drive at lower speeds. For loads equal to or less than full load, speed regulation will be maintained.

Speed Response or how quick the drive reacts to a change in load is also sometimes misunderstood. To better understand this concept lets take a look at the following graph.



When the load is applied, the speed will drop; the HMS-FLUX's (closed loop) speed response is specified as 30Hz. We can determine the time by using the following formula.

$$\text{Formula: } T = \frac{1}{F} \qquad \frac{1}{30 \text{ Hz}} = .0333$$

In conclusion the HMS-FLUX's (closed loop) speed response time is .0333 sec (30Hz).

The above specifications assume a HMS-FLUX inverter properly Auto-Tuned with the motor and a digital speed reference (keypad input). Factors that may affect the speed regulation include low resolution analog references, noisy reference or encoder signals, etc. Factors that may affect the Speed response time include high inertia loads, elliptical or cyclical loads, parameter settings, etc. For proper parameter settings concerning speed response, refer to the ASR parameters (C5 Group) in the HMS-FLUX programming manual.