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Databank **–Technical Note**

Utilising adaptive filter2 on J3B Servo Amplifiers

Introduction

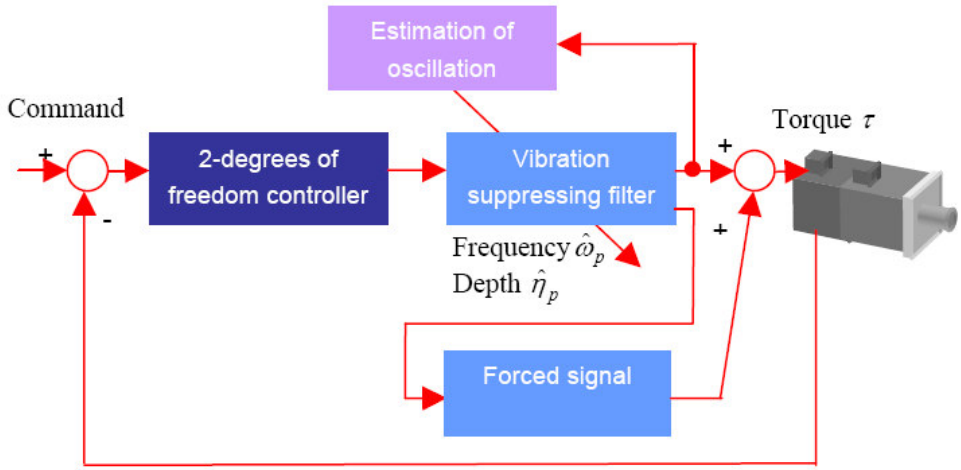
On most applications users can use the auto tune functions of J3B Servo amplifiers.
The auto tune facility automatically determines the inertia ratio between the servo motor and the machine and determines the speed and position loop parameter settings to obtain the best dynamic response. The settings are determined initially and adjusted continually to maintain a critical response as mechanical or process conditions change.

However some machines have a low damping characteristic and this can lead to difficulties when setting the auto tune parameters with the required response level.
The machine components break into resonance at low response level settings and this prevents the user from entering the required response level.
This results in an unacceptable dynamic performance.

This application note details the use of the adaptive filter2 function. This function can be used to automatically set a notch filter which prevents machine resonance occurring in most cases.

Content

Fig 1



Keywords: Notch filter, resonance,auto tune,Servo,parameters

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Fig1 shows a schematic representation of the adaptive filter function.
When the adaptive function is enabled a small additional signal is added to the torque demand of the servo system. This signal should produce the resonance (vibration) within the system.
The resulting oscillation is analyzed by an algorithm within the function and the appropriate filter frequency and depth is selected.
The additional signal is removed and the filter tuning function is disabled.
The complete process will last approximately 2.5 seconds.
Fig2

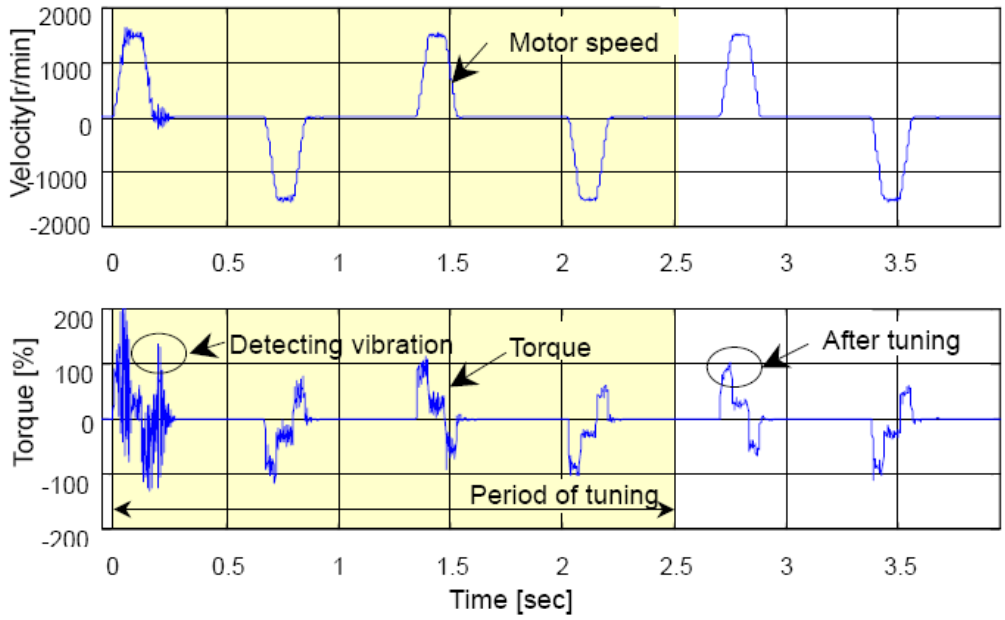

Fig2 shows the application of the filter function and the speed and torque waveforms as the filter auto tune operates.
During this test it can be seen that the motor is being driven in a forward and reverse direction as the filter function operates.
Operating the axis through its normal movement or where the oscillation most occurs whilst the filter tuning is operated will give the best results.
The effects of the additional signal can be seen on the torque waveform. This produces the vibration on the torque and speed waveforms.
After 2.5 seconds the tuning is complete and the oscillations have been removed from the torque waveform.

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Method

It is assumed that the operator is familiar with MR-Configurator Servo setting software and is able to operate the Servo as required during this procedure.
With Auto tune mode 1 selected (PA08). Operate the axis through the area of travel where the oscillations are occurring and gradually Increase the response level (PA09) to obtain the desired response.
If high frequency vibrations occur and the response level is not at the required level then we can use the adaptive filter2 function.
Reduce the response level so the vibrations are still apparent but not violent.
With the Servo enabled and in the area where the vibrations are evident set PB01 to 1 to start the adaptive filter auto tune function.
You will hear the oscillation increase as the function searches for the frequency it selects to filter.
After 2- 3 seconds PB01 will change from 1 to 2 this indicates the end of the tuning function. The frequency selected and the depth of this filter is set in PB13 and PB14 respectively.
With PB01 set at 2 further manually adjustment is possible. This also allows an additional notch filter to be set if required using the machine analyzer functionality.

Its important to transfer the settings determined in the above procedure to your position control configuration (example QD75) as the settings which have just been determined will be overwritten when the external controller is initialised.
To do this, read the configuration of the external controller (example QD75 using GX-Configurator QP) save this as your current project and write it to the controller, save this configuration to EEPROM.

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