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Fourier transforms applied to a hydraulic system

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Control valves (i.e. poppet valves) are commonly used in hydraulic systems for accurate control of the system response. These valves can only provide accurate responses for a limited frequency range. The bode plot is a graph that shows the dynamic response over a range of frequencies. Included in a bode plot are two separate graphs, magnitude and phase, both of which are plotted versus frequency on a log scale. The bode plot is constructed by inputting a sine wave into the system and observing the system response (sine wave) to this input. The output sine waves will usually have lower amplitudes then the input wave and have a different phase angle. The problem with doing the calculations to find the magnitude and phase angle is that the output sine wave is usually a noisy signal. Filters can be used to reduce the noise, but they can also negatively affect the output data. The Fourier series was applied to this noise problem because the assumption is that it will be able to obtain the amplitude of the required sine wave without too much corruption from the noise. The Fourier transform decomposes the signal into sinusoidal frequency components. After some calculation, the magnitude and phase information for the sine wave can be extracted from the Fourier transform and used to construct a bode plot. Bode plots were successfully created for the Vickers Valvistor poppet valve at different pressures.