*A Short Excerpt from a Technical Report*

The frequency response data acquired in this experiment are reported in Table 1. Assuming that the system can be modeled as a second-order system, the values of n and  are found by minimizing the standard error of estimate (SEE) between the data and the model.

|  |  |
| --- | --- |
| rad/s | dB |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

The results are n = 47.8 rad/s and  = 0.6. These are our best estimates of the system parameters using the assumed second-order model. Using these values, the transfer function *H*1(*s*) that models the experimental behavior is given by

|  |  |  |
| --- | --- | --- |
|  | . | (1) |

Figure 1 compares the response predicted by model *H*1(*s*) to the experimental response. The model is consistent with the experimental results except at higher frequencies. In this higher-frequency region (above 150 rad/s) the slope of the experimental response is greater than the slope of the model.

This behavior of the slope of the experimental response suggests the possibility of numerator dynamics. The simplest numerator term that might account for this slope change is a first-order term given by *s*+1. Adding this term to the numerator of *H*1 yields a new transfer function model given by *H*2(*s*) = (tau\*s+1)/(s^2/wn^2 + 2\*\*s/wn + 1). The next step in the analysis is to find the value of  that minimizes the standard error of estimate (SEE) comparing the data to the new model *H2*.