

## ETAP FAQ # 18

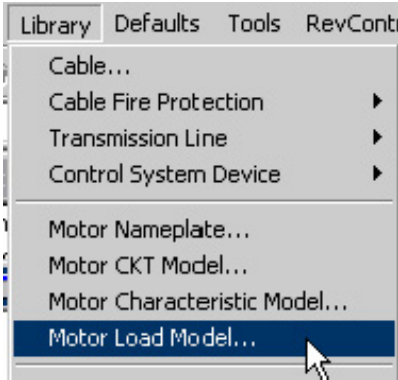
### Modeling Load Torque in ETAP

**Description:** How to model load torque in ETAP.

**Version:** ETAP 4.0 and higher

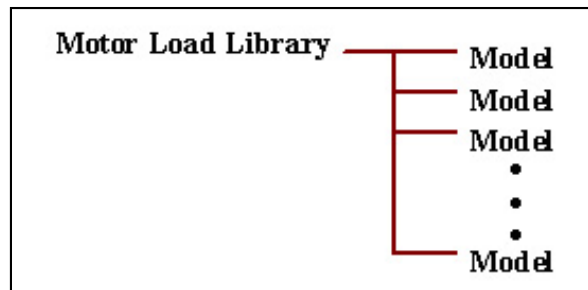
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Just as the performance of a motor is determined by its three basic characteristics: speed, torque and horsepower, the same three characteristics determine the requirements of the load.



These requirements can be modeled in ETAP and accessed via the "Motor Load Model" library.

The Motor Load Library is set up in a similar manner to a file directory system. You can have unlimited models within the library, as shown below.

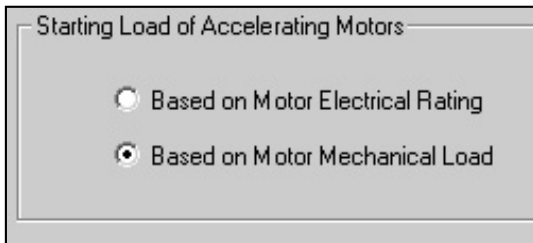


A screenshot of the 'Motor Load Library' dialog box. It shows the 'Model Type' set to 'Polynomial' and 'Model ID' as 'a k<sup>3</sup>3'. Below this, there are four input fields for coefficients A0, A1, A2, and A3, with values 0, 0, 100, and 0 respectively. A graph shows the resulting torque curve, with the equation  $\% \text{ Torque} = A_0 + A_1 w + A_2 w^2 + A_3 w^3$  and a table of data points.

% Speed	% Torque
0	0.0
25	6.2
50	25.0
75	56.2
100	100.0

The Motor Load Model Library selector is used to add, modify, and select mechanical load models based on torque curve characteristics.

Load models can be equation or point based curves. The load curve generated by either method are used by the Motor Starting and Transient Stability modules for dynamically modeling motor mechanical load.



The difference between the motor torque and the load torque changes the motor speed. In ETAP, the load torque model is specified as torque in percent as a function of normalized motor speed. This load torque may be based on motor electrical rating or on mechanical load.

When, motor electrical rating is used, it is assumed that the load torque model you selected in the Motor Editor only represents the shape of the load as a function of speed. The load torque values will be adjusted so that at the synchronous speed the torque is equal to 100%. This means that, with the modified load curve, the motor will consume the rated electrical power at 100% starting load, under the rated voltage, and at the rated speed.

To illustrate the implication of this selection, consider a motor that has a start load of 50%. On the Start Cat page of the motor, the load torque curve is such that at rated speed the load torque is 67%. In this case, the load torque curve will be shifted so that the torque at rated speed is 100% of the motor rated torque. This means that the torque at each point on the load curve will be multiplied by a factor of 1.5 (equal to  $1/0.67$ ). This modified curve will be used as the load torque curve for the study.

When motor mechanical rating is used, it is assumed that the load torque model you selected in the Motor Editor represents the actual load based on rated output. The load curve will be applied as it is without any adjustments. In this case, the load torque curve will not be shifted because it is assumed to represent the actual load. However, since the starting load is 50%, the load torque curve will be adjusted so that the torque at each point of the curve is multiplied by 0.5.