

Motor Acceleration Analysis

The purpose of this tutorial is to introduce the Motor Acceleration module of ETAP. It will show the static and dynamic models that can be used to simulate real motor characteristics. The minimum amount of data necessary to run each type of study will be entered. You will need to contact OTI with your Return Key Code so that you can activate this module. For this section of the tutorial you should select "Example Project (ANSI)" option when starting ETAP Demo.

Running a Static Motor Starting Study

Switch to Motor Acceleration Analysis mode by clicking on the Motor Acceleration Analysis button on the Mode toolbar.

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From the Study Case toolbar, open the Motor Starting Study Case editor. From here you can add and modify conditions for your study.



On the Event page, change the Total Simulation Time to 10 seconds. The output plots will now graph the results of the study from time 0 to 10 seconds.

Motor Starting Study Case							
Info Event Model Adjustment Alert							
Event ID Time * Event 1 0.100 * Event 2 0.800 * Event 3 4.000	Act Load St Cate Ra kV Bus ID Start Syn1 Design 1250 HP13.2 kV Sub2A Start Pump 1 Design 500 HP 4 kV Sub3 Sw						
Add Edit Delete							
	Action Statting Categ Busit)					
Add Edit Delete	Delete						
Total Simulation Time	Action by Load Transitioning						
MS-Dyn	Cancel						

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- Now you can add an unlimited number of events to simulate switching actions in a single Motor Starting simulation. You can start or switch off individual loads or categorized motor groups with the Action by Load and Action by Starting Category features, respectively. You can also change the operating load by clicking the Load Transitioning option to change from one loading category to another.
- You can add an event by selecting the Event page and clicking on the Add button under the Events heading. Actions occurring at each event time can be added, modified, or deleted by selecting the event and modifying the respective Action heading (by Element, by Starting Category, by Load Transitioning). Click OK the save the changes you made in the study case editor.
- Open Syn1's editor by double-clicking on the element graphic in the OLV, and go to the Load Model page. In the Acceleration Time (Static Starting) fields, enter 1 second as the no load acceleration time, and 3 seconds as the full load acceleration time. Click OK to save and exit.



Note: Once the calculation has completed, plots and output reports are accessible.

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32



Running a Dynamic Motor Starting Study

Now a Dynamic Motor Starting study will be performed using the same Study Case conditions and events as the Static study. However, additional data is necessary for a Dynamic Study. Double-click the Syn1 element graphic to open its editor, and go to the Model page. Under the Dynamic Model heading, a category other than "None" must be selected. Clicking on the Typical Data button will fill the necessary fields based on the ratings specified under the Nameplate page.

Synchronous Motor Editor - Syn1						
Start Cat Starting Mode Info Nameplate Model L	Cable/Vd Cable .R Model Inertia I	Amp Reliability Protection Exciter	Remarks Comment Load Model Start Dev			
1 1250 HP 13.2 kV 1-3/C 4 AWG/kcmil 15 kV Impedance Xd" Tolerance Xd" Tolerance						
Xd '' 15.385 X/R 27.535	Xo 15.385	×2 15.385	± 0 %			
Application	Rotor Type	IEC Ex	citer Type			
Motor 💌	Round-Rotor 🔽	Turbine 130%	~			
Dynamic Model						
🔿 None 🛛 Equ	ivalent 🔿 Tra	ansient 🧿) Subtransient			
Xd 110 Xq	108 Tdo'	5.6 S	ibreak 0.8			
Xd' 23 Xq'	23 Tdo''	0.002	S100 1.07			
X L 11 Xq"	12 Tqo'	3.7	S120 1.18			
Typical Data	Tqo"	0.002 Da	mping 2			
🗈 🖻 🖍 🔇 Syn1			? OK Cancel			

Now go to the Load Model page to view the load model. Ensure that a Load Model is entered for this motor. If a Load Model needs to be entered, click the Load Model Lib button, and accept a Motor Load by clicking OK in the window that appears.



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Also, go to the Inertia page and enter 0.2 into the motor inertia (H) field, and click OK. The motor WR^2 will automatically be updated. Exit the Syn1 Synchronous Motor editor by clicking OK.

Synchronous Motor Editor - Syn1						
Start Cat S	tarting Mode Cal	ble/Vd Cable /	Amp Reliability	Remarks	Comment	
Info Namepi	ate Model LR N	dodel Inertia F	Protection Exciter	Load Model	Start Dev	
1 1250 HP	1 1250 HP 13.2 kV 1-3/C 4 AWG/kcmil 15 kV					
- Load Coupling]					
Motor Coupling Load						
- Inertia Calcula	itor	Courties	1 4	Tatal		
	1900	1000	1900	1000	_	
	1000	1000	1000	1000		
WR ²	312.8	40	600	952.8		
н	0.2	0.026	0.384	0.609		
Include Torsion Effect						
Þ 🖻 🖻	Syn1		<u>></u>	? ОК	Cancel	

- Now you can run a Dynamic Motor Starting study. Click the Run Dynamic Motor Starting button on the Motor Starting toolbar to perform the study.
- To view the plots that are generated as a result of a study, click the Motor Starting Plots button on the Motor Starting toolbar. The Motor Starting Plot Selection window will appear to allow you to choose which plots will be displayed. Select the plots you wish to view, or click OK to show all plots.

Motor Starting Plot Selection					
Device Type	Device ID	Plot Type			
Gen / Grid Motor MOV StLoad / Capacitor Bus	Syn1 Pump1 Syn2	 ✓ Slip ✓ Current ✓ Vt (Motor Base) ✓ Vt (Bus Base) ✓ V Bus ✓ V Bus 			
Combine Plots		Accel, Folgue Motor Torque Load Torque KW, Electrical kvar kvar kud, Machanical			
Close All Plots	Cancel	Check All Uncheck All			

The Motor Acceleration Analysis module of ETAP is an excellent tool to simulate and investigate motor acceleration scenarios.