Synchronous Motor Starting

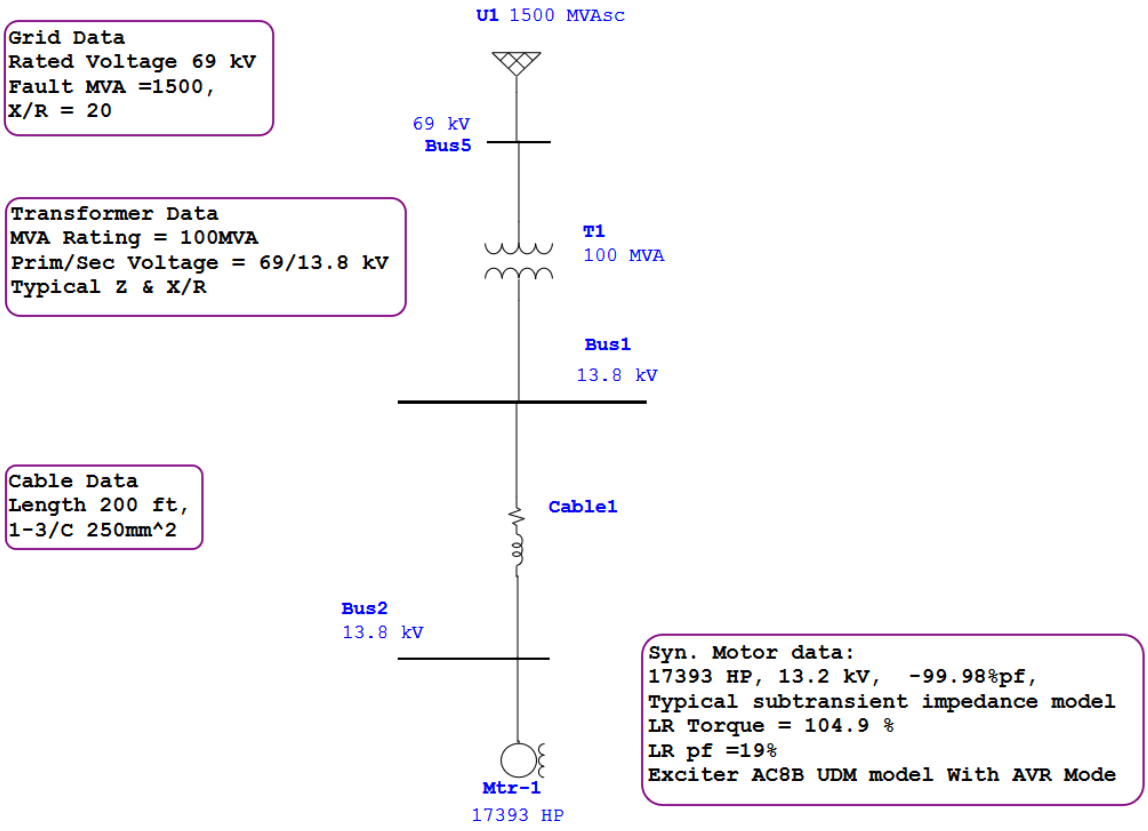
Purpose and Description

The purpose of this exercise is to model the synchronous motor and study its effects during the motor start.

Procedure:

OTI File Location:-TS-Case20 Syn Mtr starting -> Sync Mtr Starting ->Syn_Mtr_start.oti
ETAP Library from C: -> ETAP 1410 -> lib -> etaplib1410.lib
UDM file location: TS-case20 Syn Mtr starting->Sync Mtr Starting->UDM Models-> MTR-1_EXC_AC8B.udm

Review System details as below



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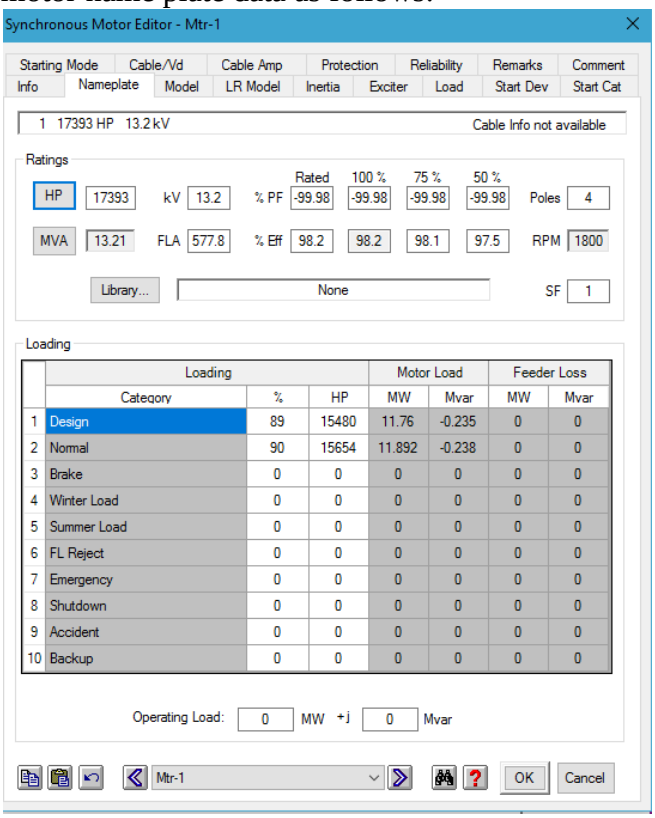
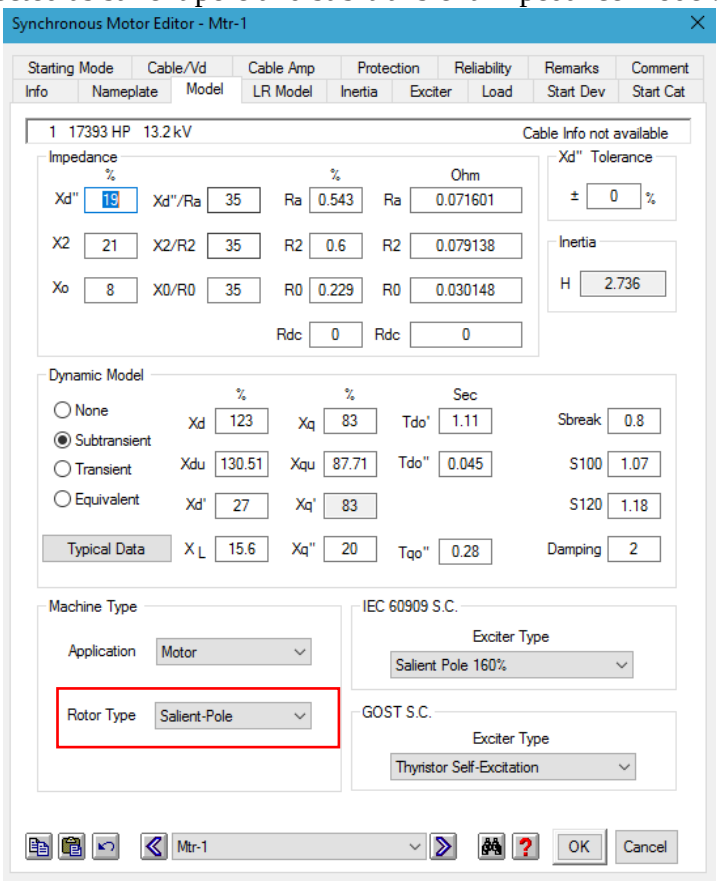
1. Note: synchronous motor name plate data as follows:



2. Rotor type is selected as salient pole and sub-transient impedance model.



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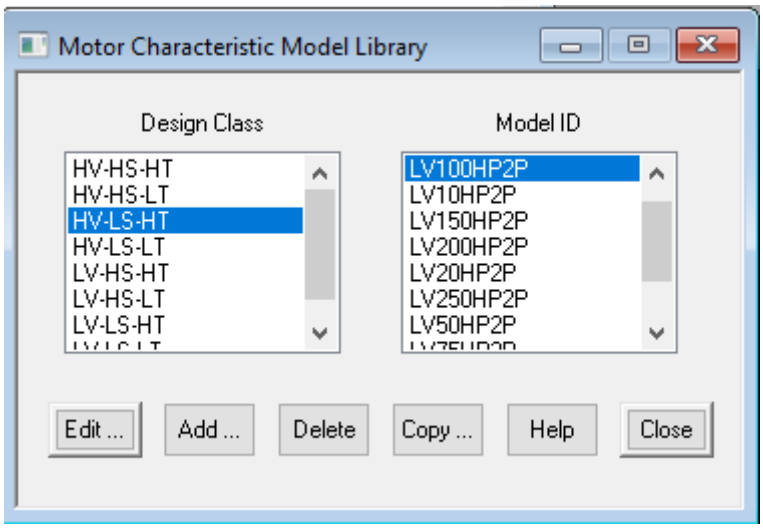
3. Note Motor LR data from standard ETAP library as below:-



4. Observe Motor LR data Torque-Slip Curve.

Motor Characteristic Model Library Editor

Slip [1 - Wm/Ws] in %: 100

Torque Slip Curve — ID : LV100HP2P

	Slip	Torque	I	PF
1	100	104.9	625.7	31.01
2	90	96.31	613.9	31.08
3	80	89.82	600	31.17
4	70	85.44	583.5	31.31
5	60	82.83	563.4	31.5
6	50	81.71	538.5	31.8
7	40	82.79	506.6	32.32
8	30	89.68	464.1	33.35
9	20	111.6	403.6	35.9
10	10	161.4	306.6	45.48
11	9	167.9	293	47.62
12	8	174.7	278.4	50.18
13	7	181.6	262.4	53.26
14	6	188.5	244.8	56.94
15	5	195.3	225.2	61.3
16	4	200.2	202.9	66.41
17	3	191.8	176.8	72.24
18	2	163.5	145	78.7
19	1.5	137.9	125.6	82.11
20	1	102.5	102.1	85.59
21	0.8	85.33	90.9	73.39
22	0.6	66.45	78	58.79
23	0.4	45.87	62.5	44.2
24	0.2	23.67	41.8	29.6
25	0.04	5.08	14.2	18.07

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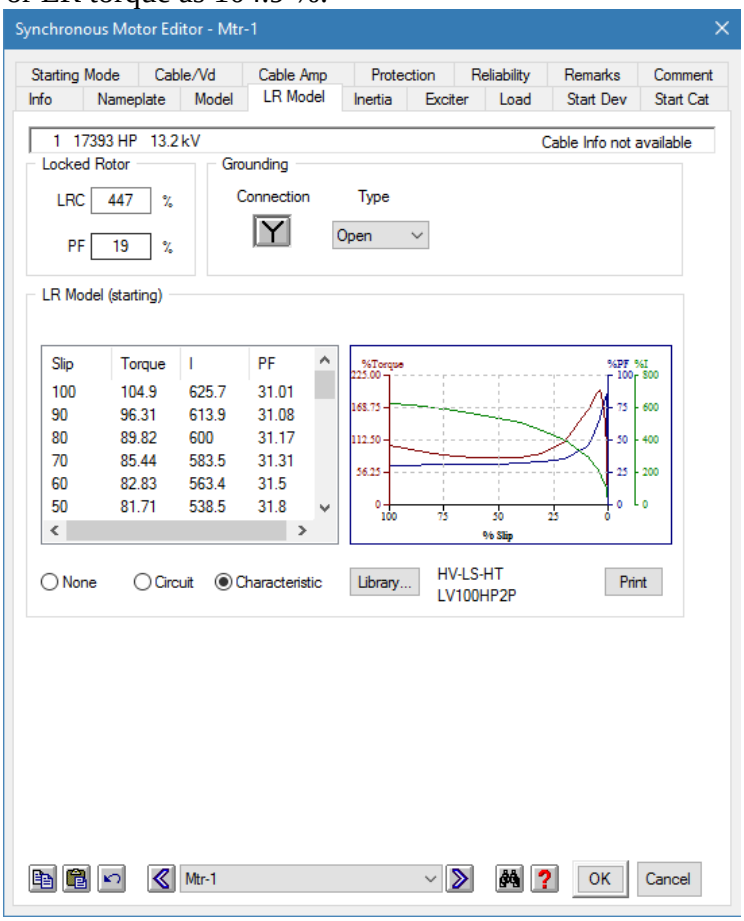
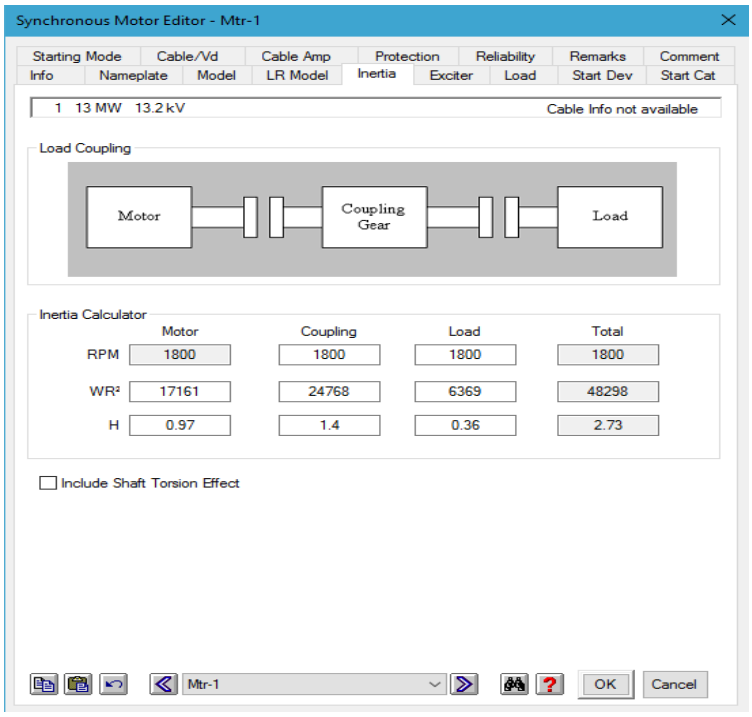
5. Observe synchronous motor data in LR-Model page. Note LRC=447% and starting pf as 19%. With start or LR torque as 104.9 %.



6. Note inertia data as follow:



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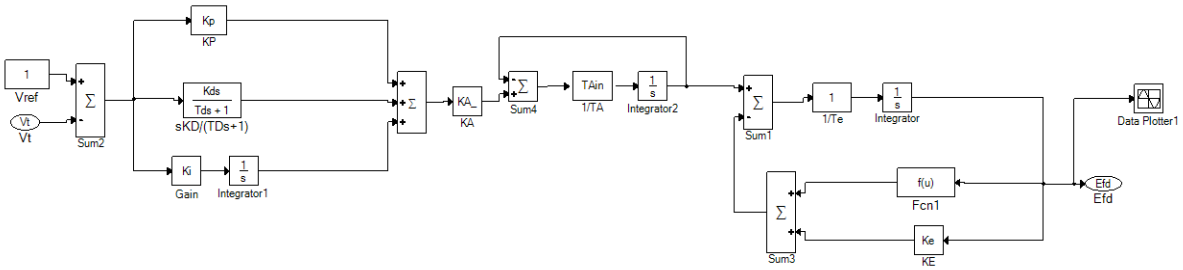
7. Note Exciter selected standard IEEE-AC8B UDM model from UDM folder.



8. Note motor load library data selected from standard polynomial library "CLSD VALVE".

9. Note data on starting Mode page, Note discharge resistance value of 0.2 Ohm and note excitation application at 98 % speed in the starting Mode Page.

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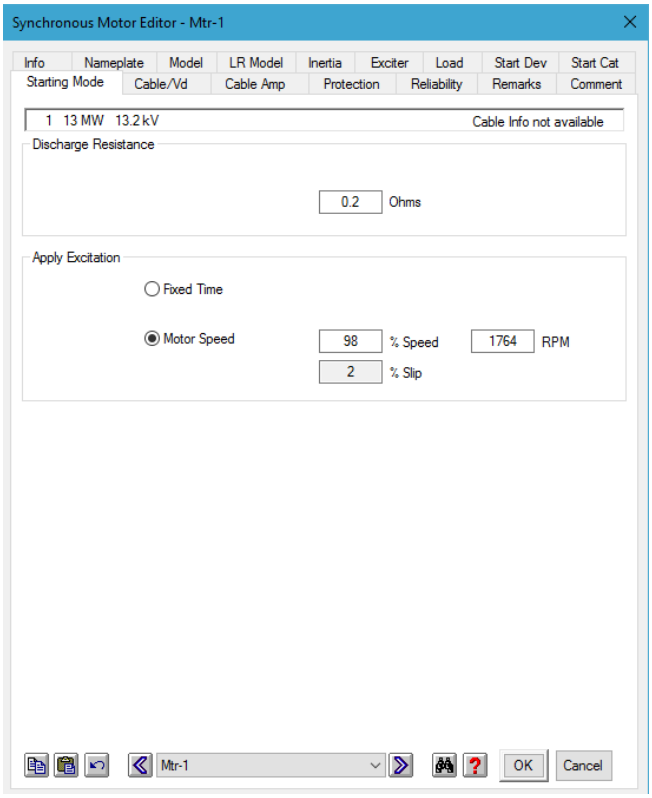
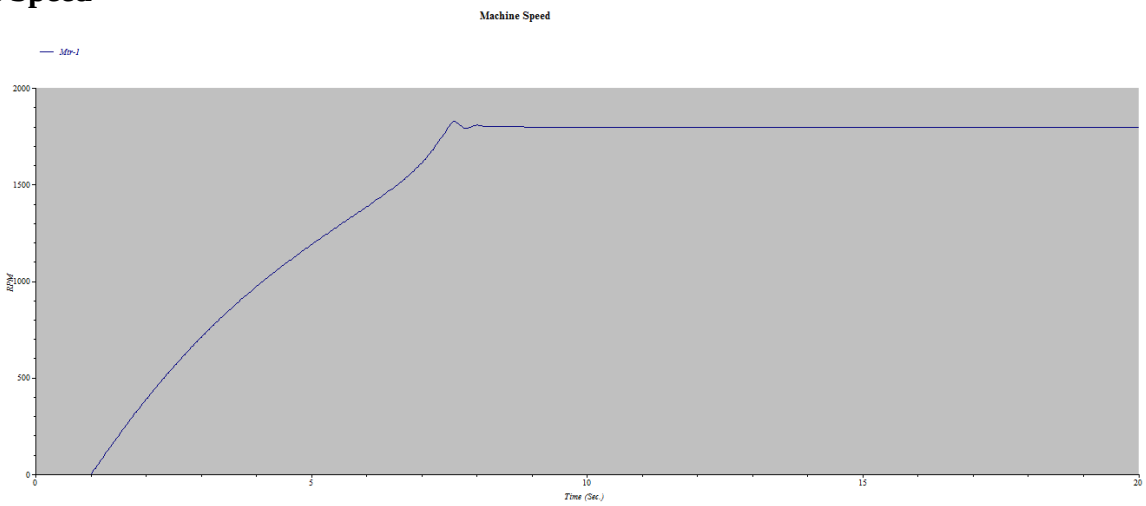


10. Open TS case name "Start_Mtr1". Note motor start at 1 sec in the Events Page with simulation time of 20 sec.
11. Note Plot page of TS file selected to plot 'Mtr-1' in Syn. Motor & 'Bus2' in Buses.
12. Run Transient-stability with output report name as 'Start_MTR1'.
13. Go to the plots, and check the results.

Machine Speed



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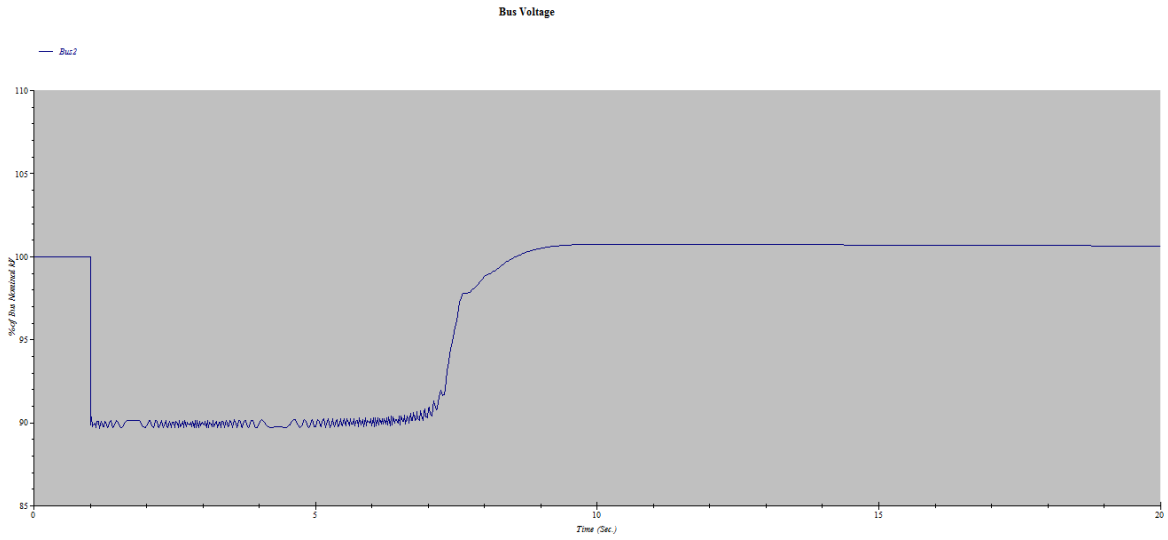
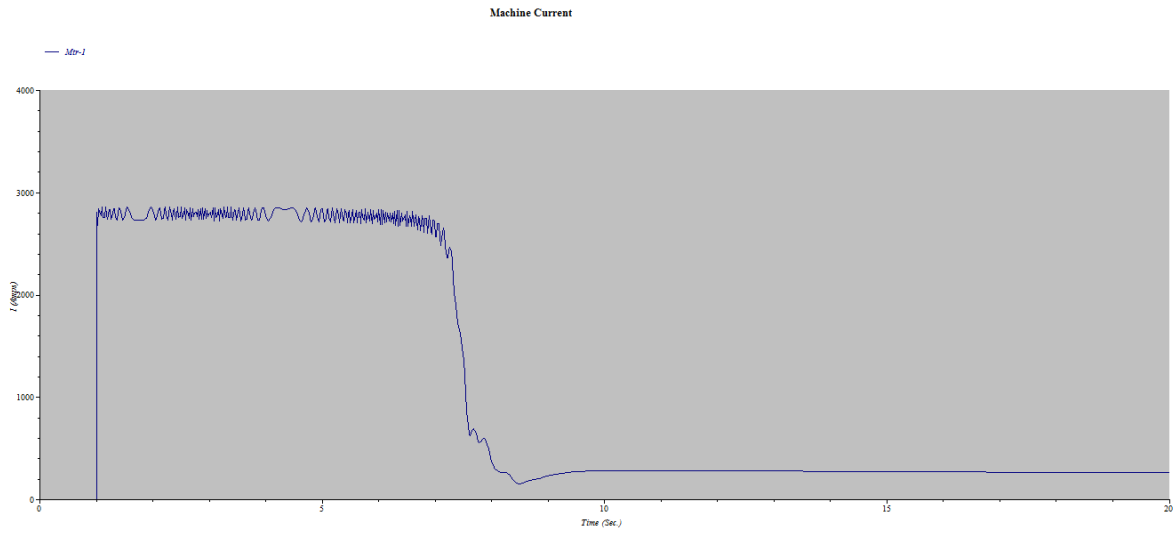
Bus Voltage



Machine Current



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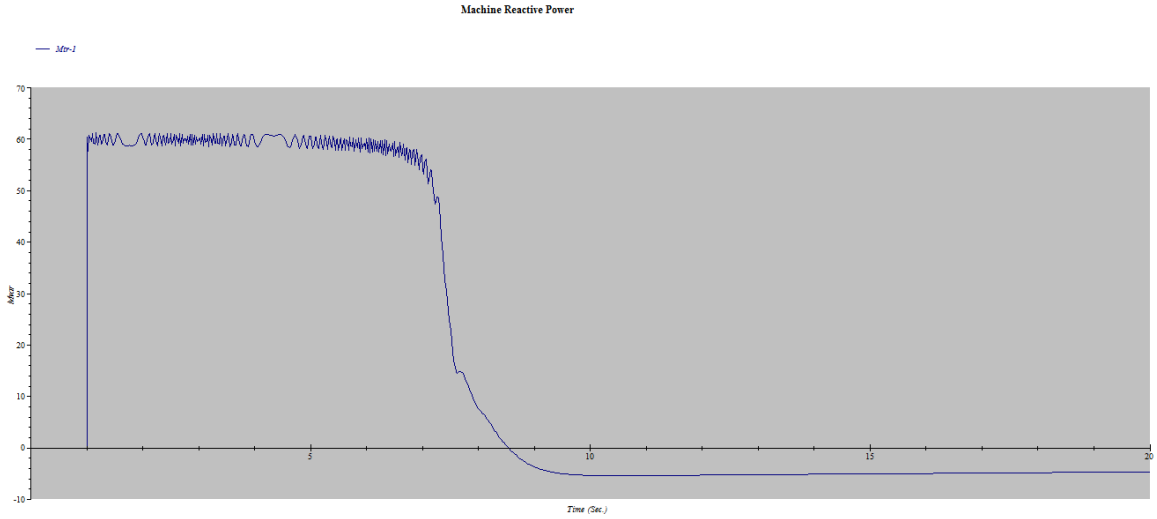
Machine Reactive Power



Note:

During starting period of synchronous motor, transient oscillations are noted in the motor responses. These oscillations due to saliency effect are superimposed on the average voltage and average current response of the motor.