



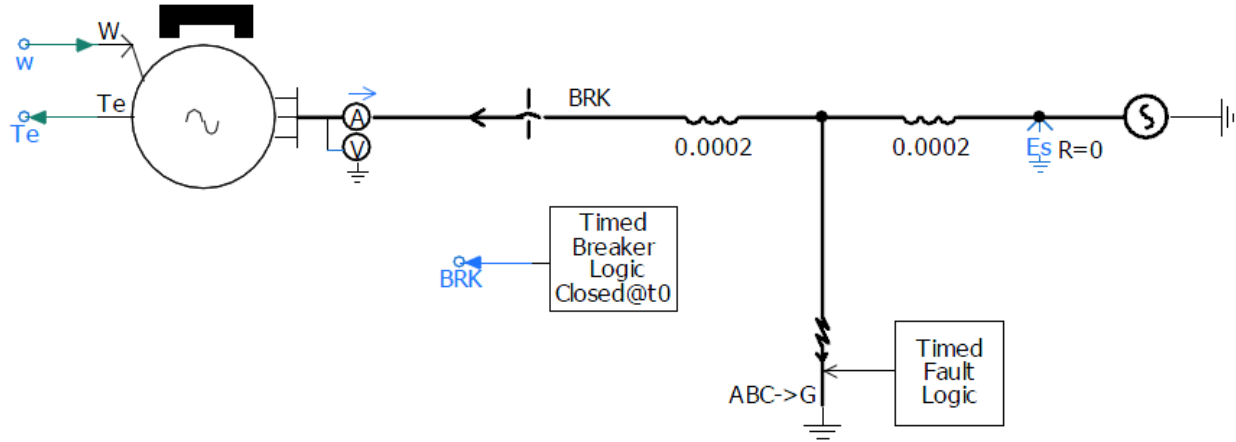
PSCAD Example Permanent Magnet Machine

September 28, 2018
Revision 1

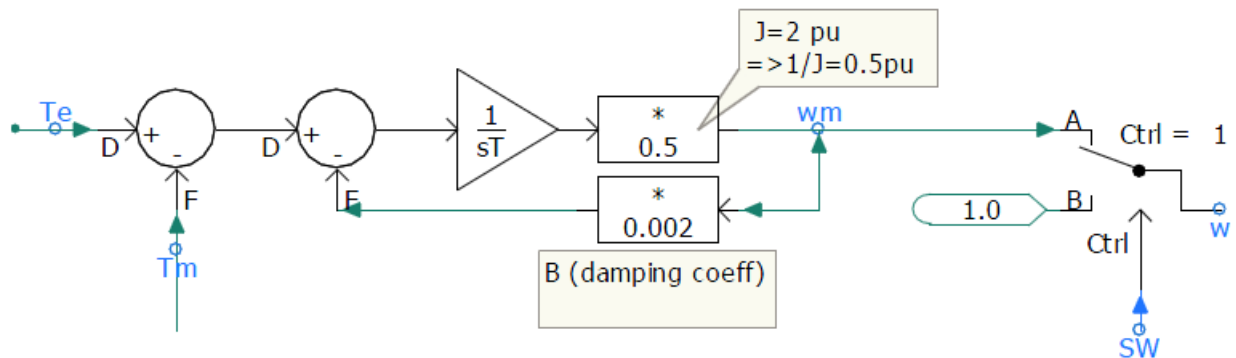


Permanent magnet machine

This example shows the dynamics of Permanent Magnet (PM) machine during different transient conditions. The setup of the Permanent Magnet machine is shown as follows.

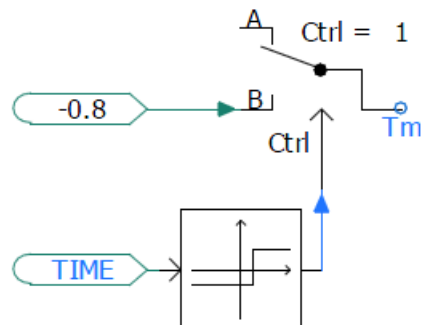


During the start up the machine the speed is kept constant at 1 pu till 1sec. Mechanical dynamics are initialized at 1sec this time. The following block models the rotational dynamics of the rotor. The inputs are electrical torque (T_e) and mechanical torque (T_m).

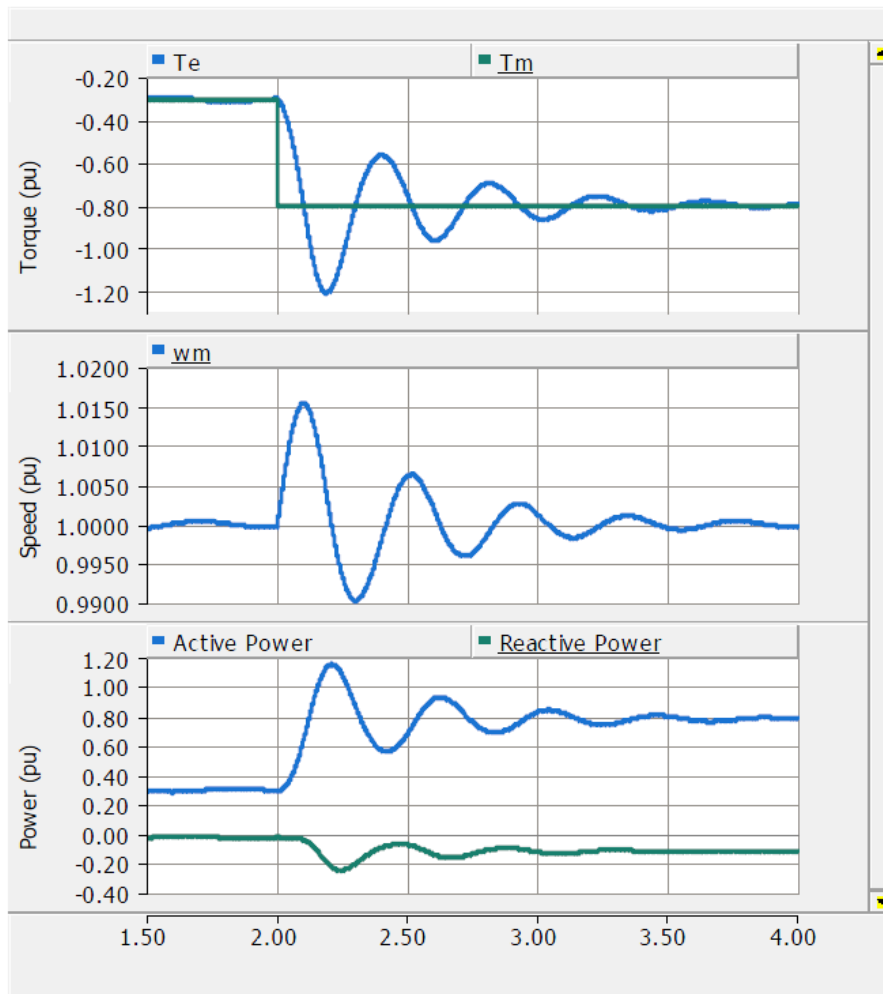


The machine open circuit voltage is about 78 V (1pu) peak for mag.

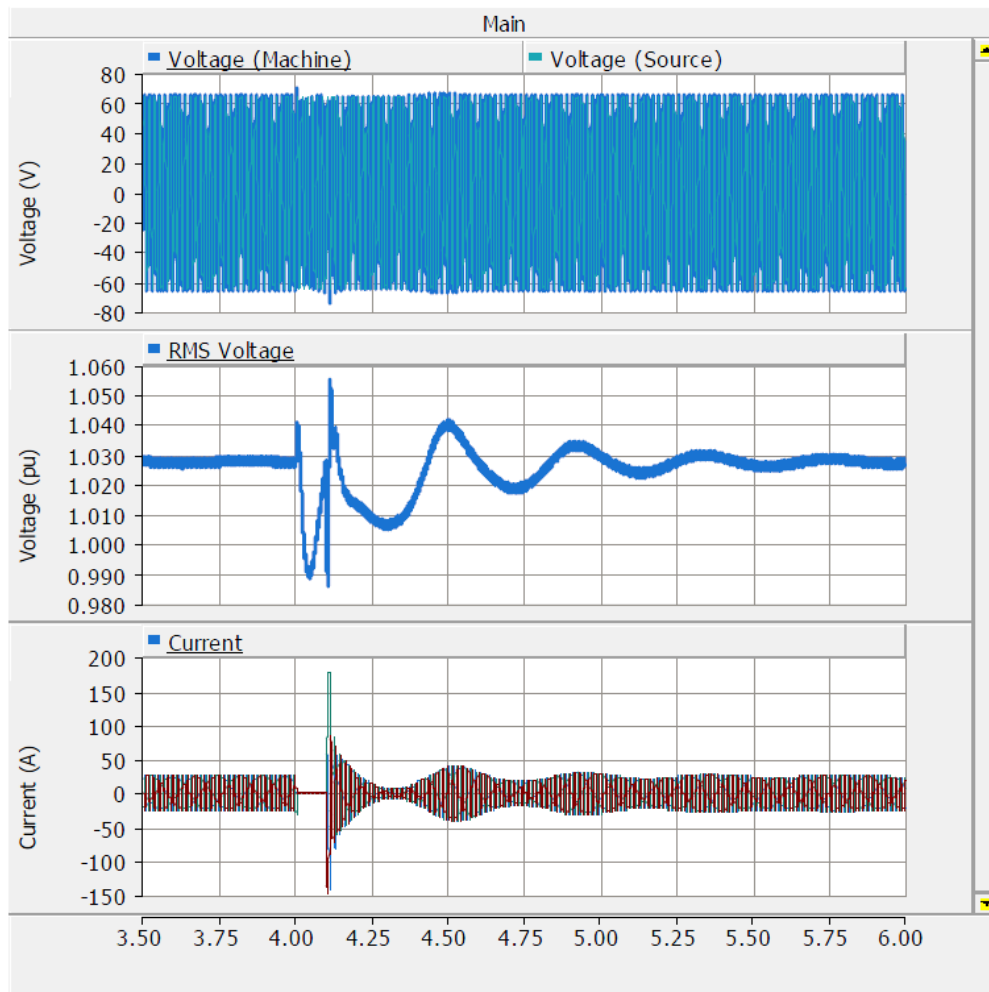
First a step change is applied to the mechanical torque (T_m) as follows:



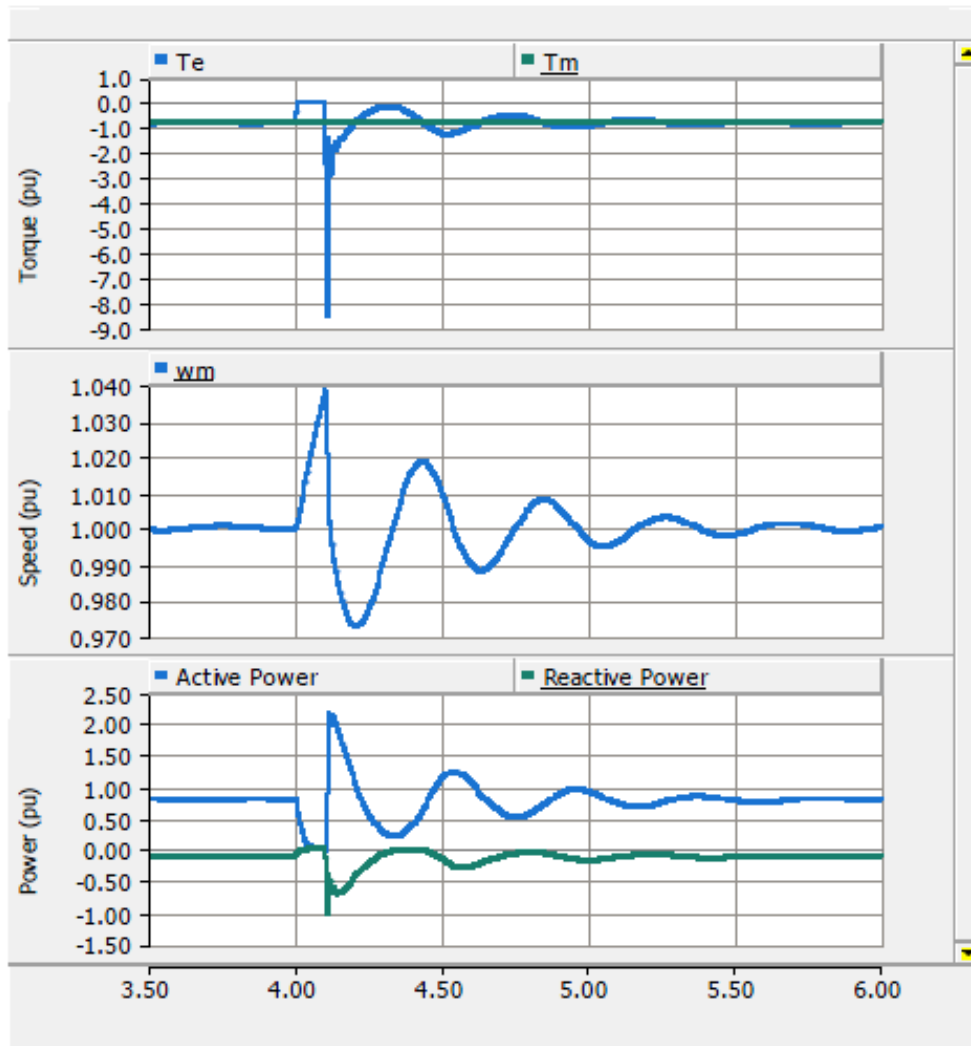
The mechanical torque changes from -0.32 pu to -0.8pu at 2sec. The electric torque and the power variations are shown as follows. The speed settles down at 1 pu after undergoing transients.



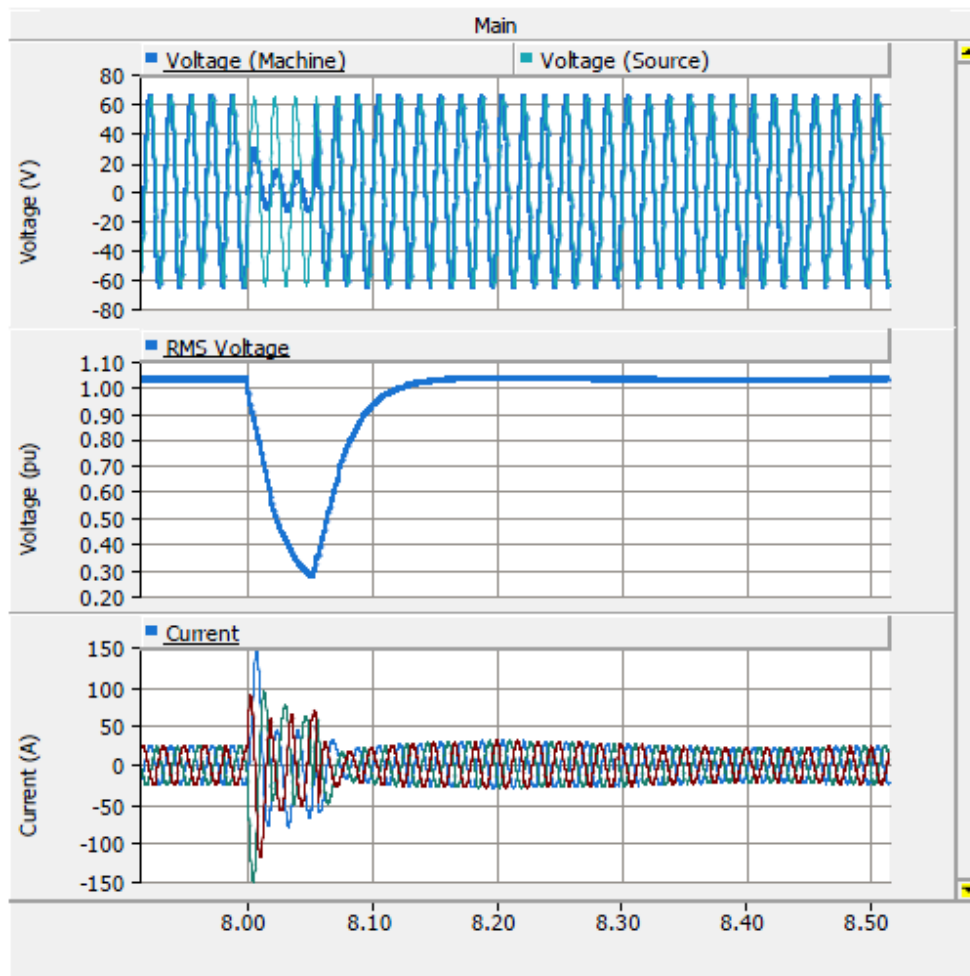
Second the breaker opens at 4 sec and closes at 4.1 sec. The rms voltage at the terminal of the PM machine drops 0.9pu but recovers back to 1pu after some dynamics.



The following figure shows the transients in T_e , speed (ω_m) and active and reactive powers. The magnitude of the speed transient depends on the inertia.



Third a fault occurs at 8sec for 0.05 sec duration and voltage drop to 0.3 pu. The current rises incredibly however the PM machine and the power system resort to pre fault values once the fault is cleared.



PSCAD

Refer to PSCAD case: pm_machine.pscx



DOCUMENT TRACKING

Rev.	Description	Date
0	Initial	01/Jun/2013
1	Rebranding to MHI Rebranding guidelines	28/Sep/2018

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