Computer Simulation Of Electric Motor Drive Systems Including The Power Electronic Network

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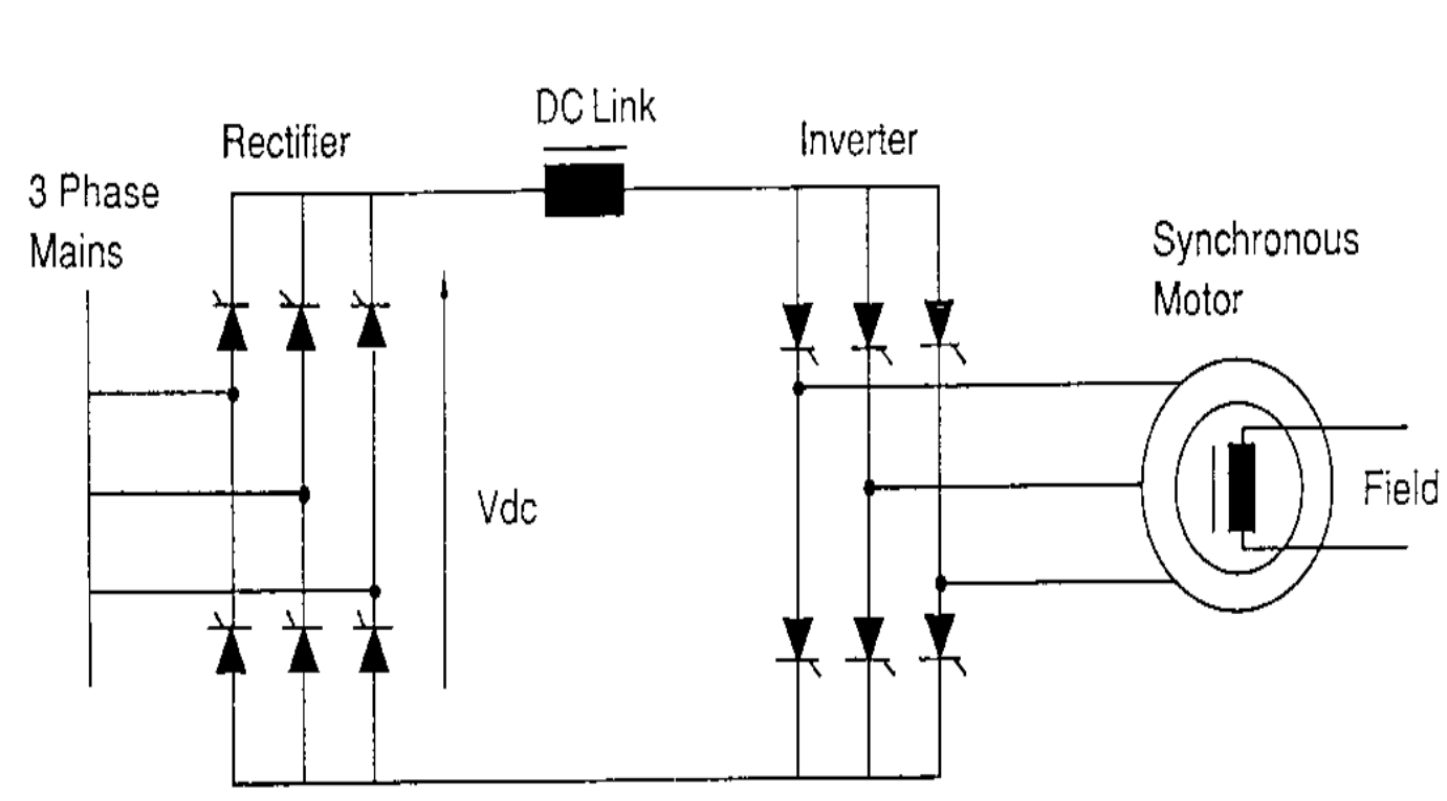
ABSTRACT :-

This paper presents a general technique for the computer simulation of electric motor drive systems including the power electronic network. The network elements are represented by dynamic models which accurately reflect the switching behavior of power electronic converters. The control system of the drive is included in the simulation model, so that the transient and steady-state performance of the entire system can be analyzed. The technique is demonstrated by its application to a three-phase synchronous motor drive with a Load commutated inverter. The simulation results show good agreement with experimental data. The technique is flexible and can be used to simulate a wide variety of electric motor drive systems.

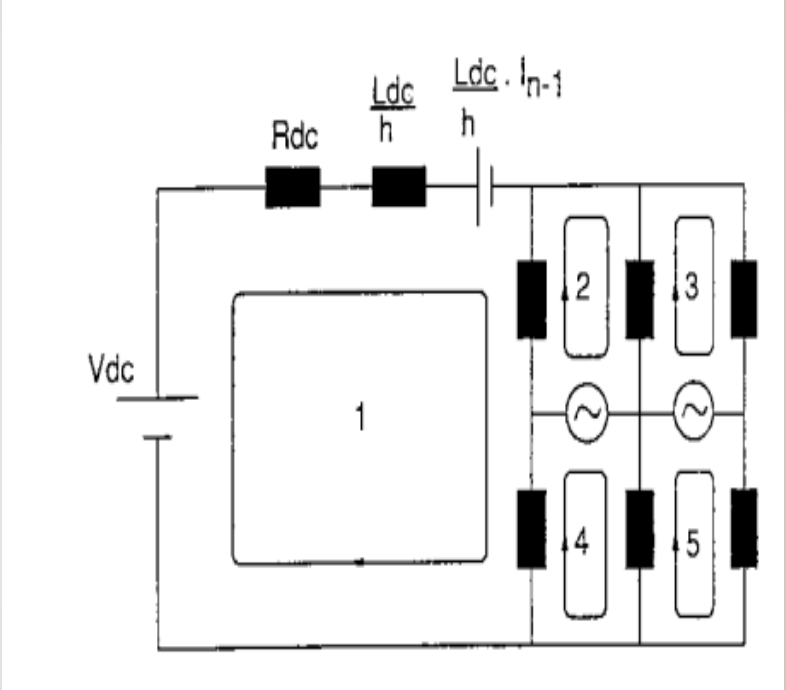
OBJECTIVES :-

- simulation technique for electric motor drive systems that can be utilized for performance analysis, optimization, and design improvements.
- Develop a general technique for accurate computer simulation of electric motor drive systems.
- Promote the advancement of electric motor drive system simulation.
- Demonstrate the technique's effectiveness through a specific application.

System Block Diagram :-

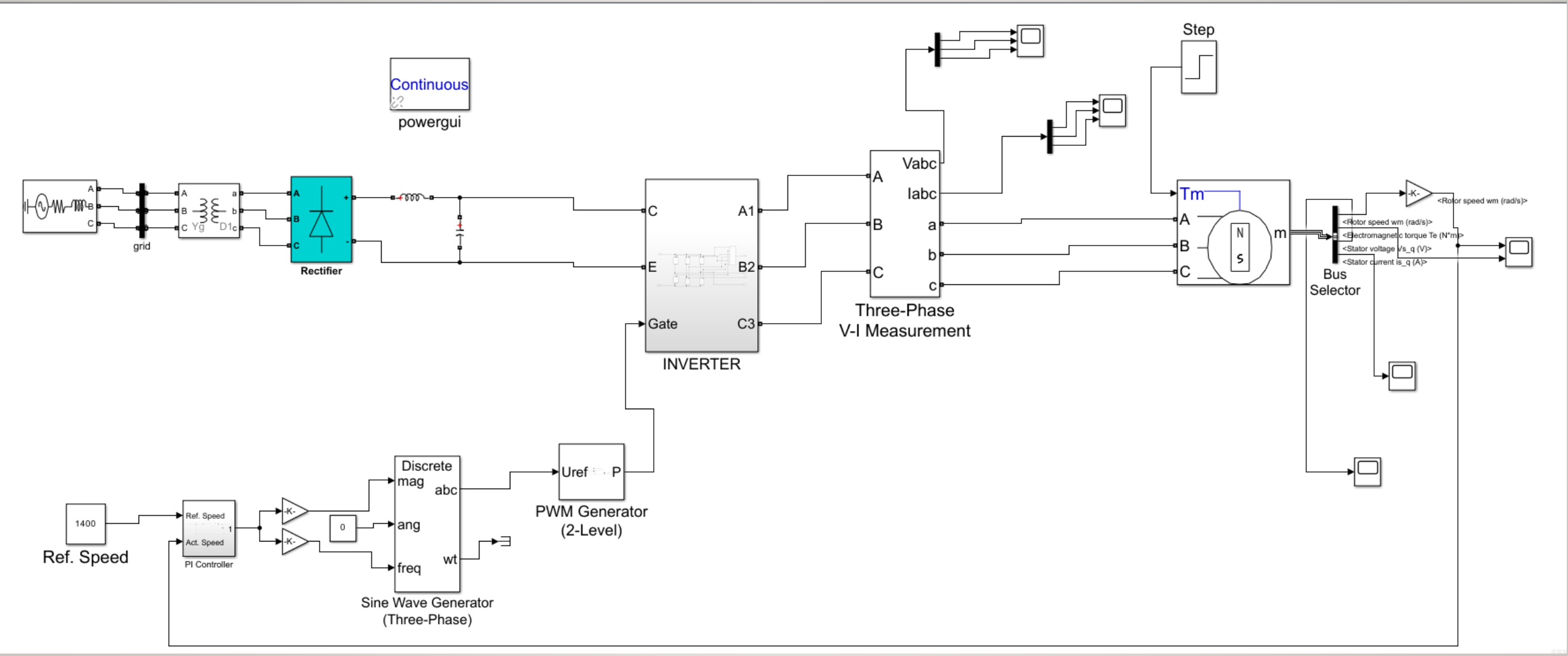


LCI Fed Synchronous Motor Drive System

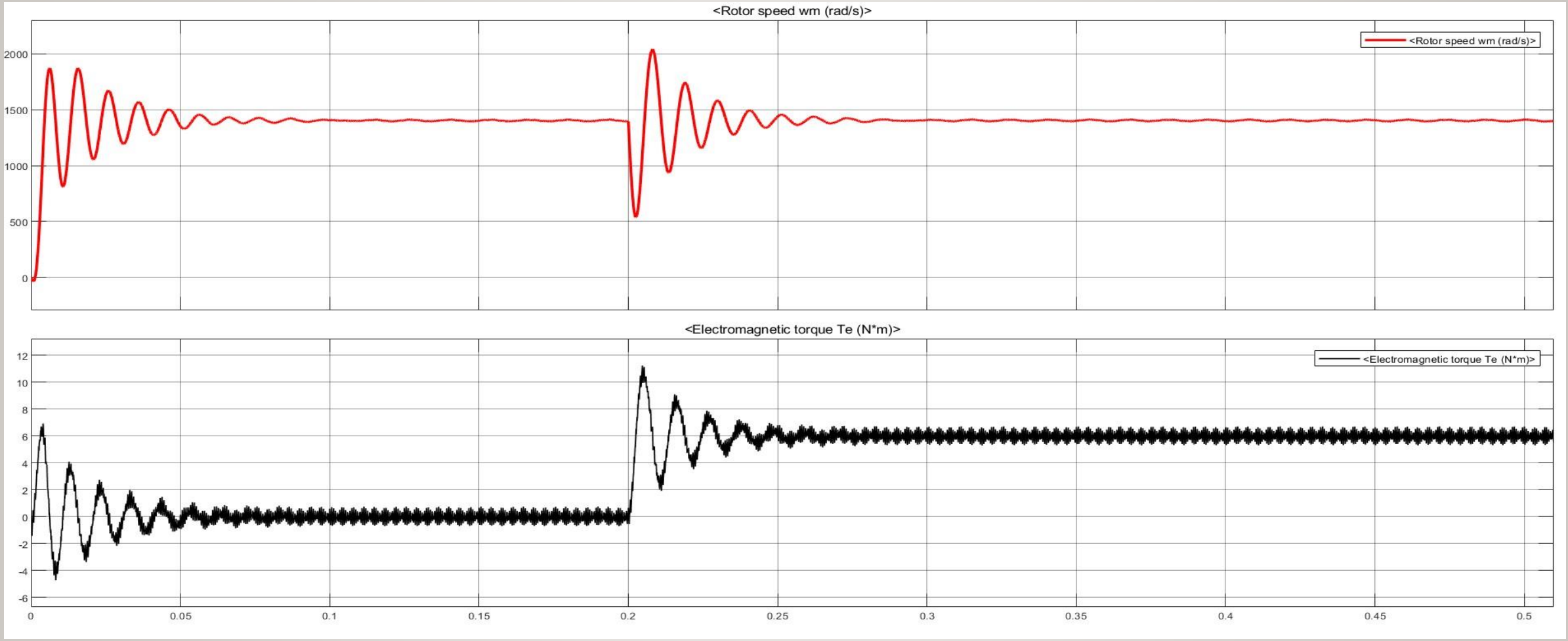


Power electronics network configuration

Simulation Setup :-



RESULTS :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<Rotor speed wm (rad/s)>
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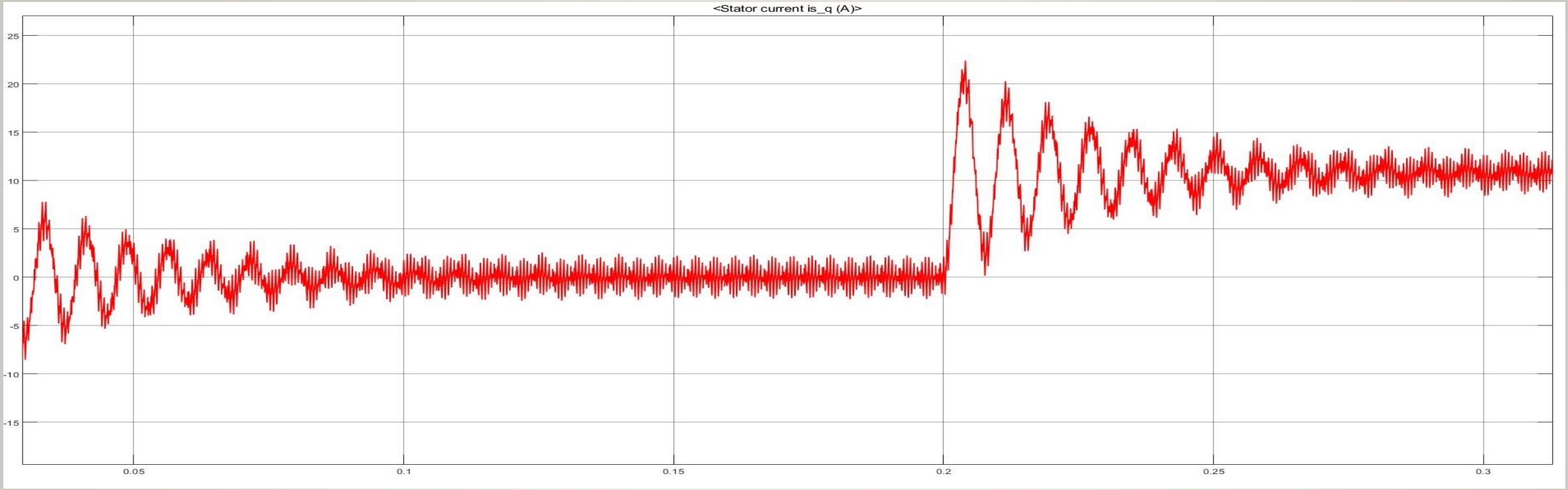
1500
1000
500
0
<Electromagnetic torque Te (N*m)>
<Electromagnetic torque Te (N*m)>
12
10
8
6
4
2
0
-2
-4
-6
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5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25
20
15
10
5
0
-5
-10
-15
0.05
0.1
0.15
0.2
0.25
0.3

CONCLUSIONS :

- This paper has described a generalized machine/power electronic interface technique applicable to situations where the standard assumptions concerning stator voltage or current are not sufficient. A load-commutated inverter synchronous motor drive system in the steady state is used as an illustrative example. The predicted waveforms of voltage and current for a sample operating point are compared with their experimental equivalents (measured on a 3-kVA prototype drive system), and an excellent level of agreement is achieved. Work is proceeding on the extension of these techniques to the transient speed case.