SIMULATION AND DEVELOPMENT OF DSP BASED DIGITAL EXCITATION CONTROL SYSTEM FOR SYNCHRONOUS MOTOR

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Introduction:

Power factor (PF) improvement is an important opportunity to save energy and improve reliability of the electrical system in industrial facilities. The synchronous machine, with the aid of an intelligent excitation controller, can control power factor to reduce the plant reactive loading to the connected system. Final simulation has been done using PSIM software. It is shown that unity power factor and also power factor regulation achieved by proposed control strategy. The proposed control algorithm including the whole system control is implemented on a low cost, fixed-point DSP TMS320F2811. Different modes like power factor control and var operation are also provided.

Block Diagram and Description of the Proposed Topology:

Block diagram of the proposed motor starter is shown in Fig. 1. As shown in block diagram, 3-phase controlled rectifier is used to get the D.C. current, which is given to the field by changing the firing angle of SCR, the excitation current can change.

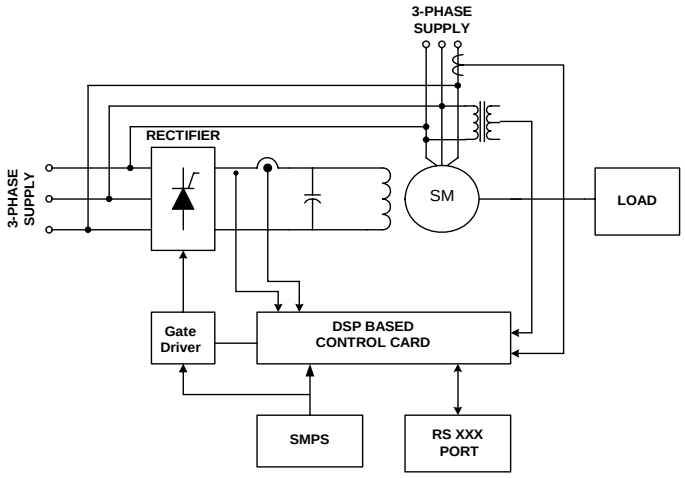

Fig. 1 Block diagram of synchronous motor starter.

Simulation of the Proposed System:

Simulation is carried out in the PSIM software. Open loop and close loop simulations are carried out for the different condition. In this starter power factor variation facility is also available. I.e. as per requirement system will operate in leading or lagging or unity power

factor. Also load is varying then also one set power factor will be maintained. For both these conditions simulation results are shown in Fig. 2.

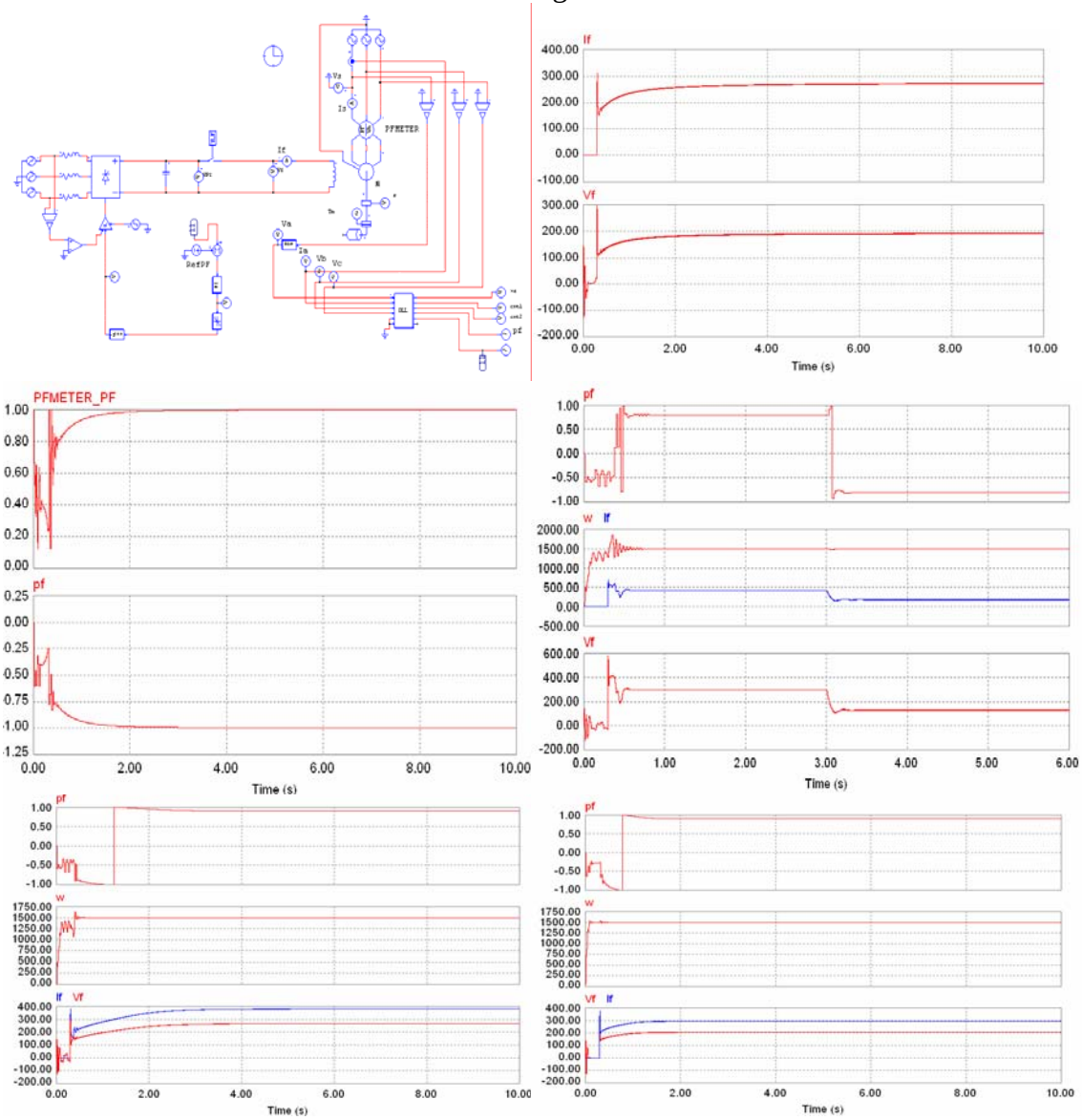

Fig. 2 Close loop simulation and different results under the different conditions

Conclusion:

Finally from the simulation results the power factor of the motor can be change within certain range and motor is operated at unity or leading power factor as per requirement. Close loop simulation of the proposed topology is run successfully. This starter has so many advantageous features compare to those conventional methods of starting the synchronous motor. This starter is also operating in the different modes like PF mode and VAR mode as per the nature of load. For the certain level of the input voltage dip motor will operate but if this condition will remain for extended period of time then power factor protection relay will trip. Also power factor regulation is carried out by means of the excitation (Rectifier output current).