DESIGN OF PARALLEL OPERATION OF SYNCHRONOUS MOTORS FOR PRODUCTION OF FANS

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ABSTRACT

The focus of this project is the design of control system capable of controlling the speed of multiple permanent magnet AC motors with the use of a single frequency converter to increase the overall efficiency of ventilation systems for barns. The project is proposed by DACS who specialises in ventilation systems for chicken and pig farms.

The speed of AC motors is controlled by the frequency of the input voltage. The frequency of the voltage is controlled by a frequency converter of which the base cost is relatively large compared to the price of a larger converter. Due to this, it is desirable to use a single frequency converter to control multiple motors to bring the cost down. This can already be achieved by the use of asynchronous motor utilising a rotor magnetic field generated from an induced current in the rotor. This electric machine, however, has poor efficiency, $\sim 70\%$, compared to synchronous motors with permanent magnet to generate the rotor field, $\sim 90\%$.

To test the control a test rig is set up composed of two complete air outlets including chimney, motor, and fan. Different sceneries (different load, damper position, etc.) will be tested to examine the effects of disturbances applied to the control system. The system will also be examined for the case if one of the motors is blocked by foreign debris. This is done to examine how this will affect the system, and if necessary, logic will be implemented to stop all motor motion to prevent burn out of the electric circuits. The test rig is provided by DACS.

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