Smart and Automatic Industrial Drive with Cleaning, Lubrication and Advance Hydrocarbon Cooling System

Kalyani Pise[1] Shruti Dange[2] Mayur Fande[3] Mr. Kirti M. Dhenge[4]
[4]Professor
[1,2,3,4]Department of Electrical Engineering
[1,2,3,4]KDK College of Engineering, Nagpur, India

Abstract— As some industrial motor and generators has continuous longterm operation may be in years hence, like any piece of industrial equipment it needs maintenance, scheduled periodic visual inspections for optimal machine performance. The project aims for design of motor with on board system which will be capable of self-lubrication and cleaning itself while in running condition automatically, also as cooling plays major role in durability, rating and efficiency of drive hence to remove heating spots problem the device will be equipped with latest hydrocarbon cooling system as well as provision for liquid coolant based forced cooling system. Also, device is to be equipped with automatic lubrication system for lubrication of most stressed parts of an industrial drive which are subject to regular wear & tear which may lead to failure of device. Complete system is autonomous & runs its operation as per set standards as well as demand-based requirement for efficient run of drive using microcontroller & sensors.

Keywords: Cleaning, Cooling and lubrication

I. INTRODUCTION

Accumulation of dirt can lessen the life & efficiency by making the motor operate hotter than it would due to creation of heat spots and carbon dust may lead to flashovers. Keeping both the outside and inside of motor relatively clean does have its benefits. The main stress parts of any industrial drive are the bearings and bushing which should be maintained and lubricated time to time to avoid wear and tear of bearing due to rise in temp because of friction which may lead to mechanical failure of machine. As we are making drives compact and of high power density the colling demand has not decreased hence optimal and proper cooling must be provide to reduce chance of heat spots in winding during abnormal loading and conditions. The proposed project deals with design & modification of industrial drive which will have automatic self-lubrication both on periodic basis as well as load on bearings and temperature of bearings.

High pressure air jet spray-based cleaning and coating system itself placed on stator core covering both rotor and stator winding for cleaning and coating while under operation. Advanced copper-based Hydrocarbon cooling chamber with option of liquid coolant-based cooling system for optimal cooling and removal of heat spots. The system will be autonomously controlled by with microcontroller designed by ATMEL AT-MEGA 328p.

II. BLOCK DIAGRAM

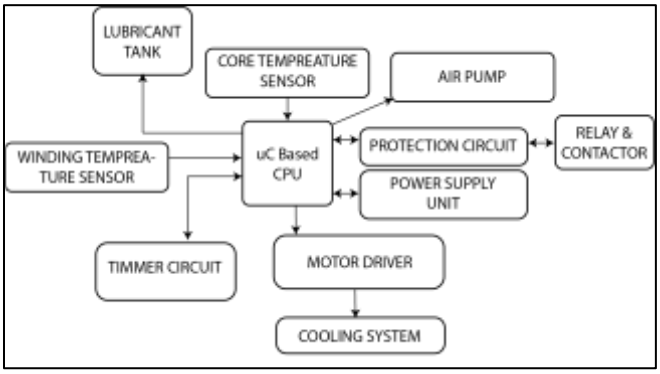

Fig. 1: Block Diagram

The heart of the diagram which is supply unit is placed under the block of protection unit. The work of the power supply unit is to supply various voltage level to various devices which we had used in our project. Next is protection circuit which is controlling relays and contactor. It has two types of sensor which is to monitor the current going inside the machine. If the current exceeds the particular point it will send feedback to the microcontroller which will give command of tripping. Protection circuit actuate relays and contactor to close the circuit. Two types of sensors are placed namely core temperature sensor and winding temperature sensor which senses the temperature and give feedback to microcontroller. Lubricant tank provides the lubrication to inject on to the bearings. Cooling system is nothing but the fan. In our project we are using two fans induced draft fan and forced draft fan to increase cooling efficiency.

III. DESIGN

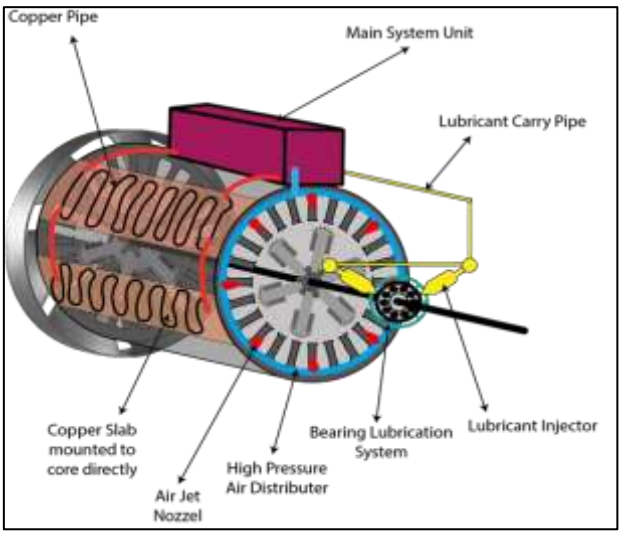

Fig. 2: Design of Experiment

The project deals with designing an industrial drive which will have automatic self-lubrication and cleaning system with better hydrocarbon cooling system. The designed motor gives easy axis in case of manual work to be done on motor as well as it has self-maintenance system run by microcontroller & sensor based automatic system. The 3Phase Salient Pole Synchronous motor (3KVA - 10KVA) will be equipped with advanced copper-based Hydrocarbon cooling chamber with option of liquid coolant-based cooling system for optimal cooling. It also has high pressure air jet spray-based cleaning and coating system itself placed on stator core covering both rotor and stator winding for cleaning and coating while under operation. It also provides smart graphite based lubricant lubrication system for bearings and bushes which are controlled automatically by microcontroller and lubricates time to time as per load conditions and time of run. The system is completely program under Arduino IDE with microcontroller designed by ATMEL AT-MEGA 328p.

IV. ADVANTAGES

- System will be capable of self-lubrication and cleaning itself in running condition.
- No need to stop the machine for maintenance.
- Cooling will be more efficient.
- Due to cooling, there is less chance of generating of heat spots.
- Complete system is autonomous.
- Improved efficiency of machine.
- Less maintenance cost.

V. CONCLUSION

Complete failure of cooling system comes under high priority and require immediate repair. Its prior detection plays an important role in increasing availability and efficiency of the motor. The automatic lubrication system has been used to protect from wear and tear. The designed motor gives easy axis in case of manual work to be done on motor as well as it has self-maintenance system run by microcontroller & sensor based automatic system.

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