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Review on Precision Control of Induction Motor Drive through Pressure Transducer

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Abstract

Reducing energy cost makes perfect business sense; it saves money, enhances corporate reputation and helps everyone in the fight against climate change. The main objective of this project work is to apply the principles and Technology of motion control on the applications of Pneumafil / H-Plant which is used to control the pressure requirement of any process applications. The closed loop control system is required here to control the motion of induction motor. The basic idea for the proposed work is carried out by using industrial programmable controller, so as to control variable speed AC drive systems for Pneumafil / H-Plant applications.

Keywords: Variable Frequency Drives, Pressure Transducer, VVC +, Matlab, MCT 10

I. Introduction

Variable Frequency Drive or VFD is a power electronics based device which converts a basic fixed frequency, fixed voltage sine wave power (line power) to a variable frequency, variable output voltage used to control speed of induction motor [1]. It regulates the speed of a three phase induction motor by controlling the frequency and voltage of the power supplied to the motor. The speed of induction motor is directly proportional to the supply frequency and no. of poles of motor [4]. Electric drives are used in boats, traction systems, lifts, cranes, electric car, etc. They have flexible control characteristics. They are available in wide range of torque, speed, and power [5]. A pressure transducer, often called a pressure transmitter, is a transducer that converts pressure into an analog electrical signal. . Pressure applied to the pressure transducer produces a deflection of the diaphragm which introduces strain to the guages.

II. Literature Review

The Literature Review is shown in the form of Table 1. There are different authors who have worked on the Control Technique of Drive such as VVC +, V/F and others. From this table, it is shown that our research will represent the work on Precision Control using Pressure Transducer for three phase Induction Motor.

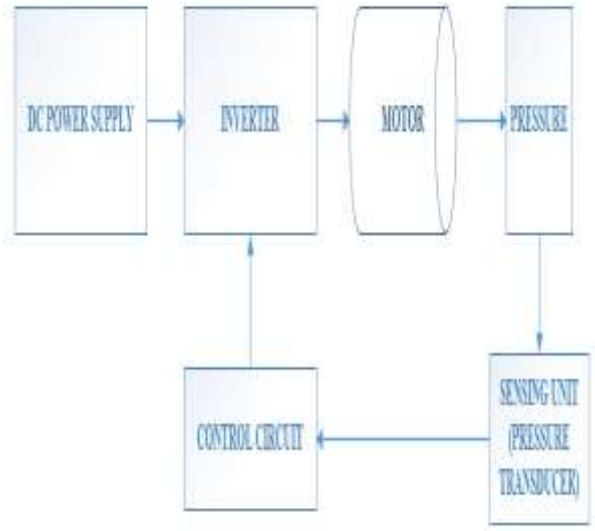

Figure 1 Block Diagram of Proposed Scheme

Figure 1 shows the block diagram for the Proposed Scheme. In this, the DC Voltage Supply is used to feed into Inverter (IGBT) which will provide the variable output of the AC drive. The Load connected here is Suction Motor through which the suction pressure of the system will be maintained as per the requirement. The sensing unit used is Pressure Transducer, which will convert the mechanical pressure into electrical quantities.

III. Problem Identification

There are different problems with the above discussed technique in which the energy saving was very less with the Pressure Control mechanism. The Pressure of the system will give the direct command to the

Variable Frequency Drive from which the controlling of the system with increase or decrease in pressure will take place.

Without Pressure Transmitter, the drive will run at variable speed but creates the issue of automization in the system. And this will creates the issue for energy optimization. The pressure plays a vital role in the Industries. The Pressure of the system will determined by the Pressure Transmitter.

Figure 2 shows the Problem Identification flow chart. In this flow chart, the drive is running at fixed frequency and fixed output voltage. Due to this, the power or energy consumption will be high if pressure of the system is required low. With constant frequency and voltage, the power consumption will also be constant.

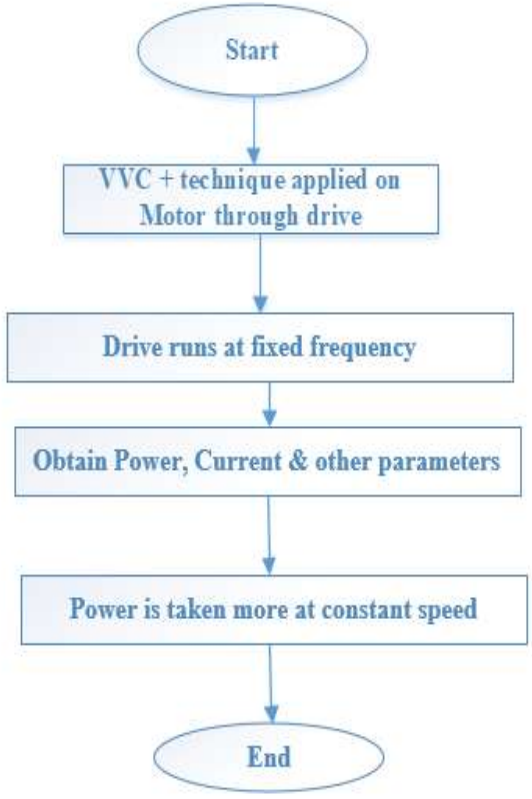

Figure 2 Problem Identification

IV. Proposed Methodology

Figure 3 shows the Proposed Methodology flow chart. In this technique, we have used the Pressure Transducer as sensing unit. VVC plus technique is used here. Sequential Logic Controller is applied in drive where the process starts at time T. And after sometime, the calculation of Reference

Sr. no.	Author name	Technique	Controller	Outcome
01	Mohammed T. et al [1]	Multi motor Drives	Direct Torque Control (DTC) method	Direct torque control (DTC) strategy is studied
02	Jirasuwankul, N. [2]	Induction Motor Drive	Fuzzy Logic	Improving efficient energy
03	Ali Saghafinia et al [3]	Adjustable speed drive	Indirect field oriented control	Simulation model of an adjustable speed drive of IM
04	Chitra A et al [4]	Multilevel Inverter; Induction Motor; V/f control	Closed Loop V/F Controlled	Performance Comparison with Matlab Simulink
05	Rinchen Geongmit Dorjee [5]	Variable Frequency Drive	PLC and SCADA	V/F control of Induction motor using VFD with PLC & Scada
06	Kiran Kumar GR et al [6]	Variable Speed AC Drives	PWM AC drive	Precision Motion Control of AC drive
07	Muawia A. Magzoub et al [7]	induction motor variable speed drive	hybrid fuzzy-fuzzy controller	Efficiency improvement
08	Narongerit et al [8]	Constant volt / hertz technique	Direct Torque Control (DTC) method	Simulation & Modelling of Direct Torque Control IM Drives
09	This Dissertation	Precision Control of 3 phase Induction Motor	AC Variable Frequency Drive	Precision Control using Pressure Transducer for Energy saving

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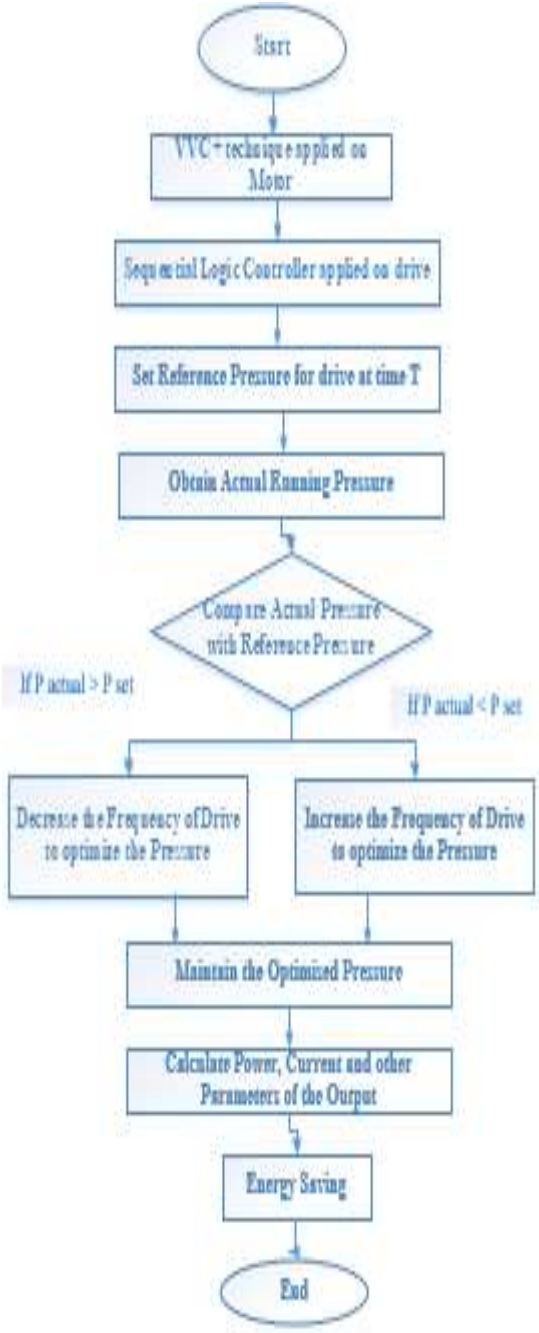
Pressure is obtained and the actual pressure of the system will be obtained. Now, compare the actual pressure with the set pressure and after this the actual pressure and set pressure is compared. In this comparison, if the Actual Pressure is less than that of set Pressure, then the frequency or speed of the suction fan or motor will increased to a limit where it will be somewhat similar to that of the set pressure.

Similarly, if the Actual Pressure is more than that of set Pressure, then the frequency or speed of the suction fan or motor will decreased to a limit where it will be somewhat similar to that of the set pressure. Thus, the same process continues and will maintain the optimum pressure of the system. In this, the machine will run at variable speed or variable voltage with respect to pressure of the system, then it will finally give variable Power or energy consumption.



V. Conclusion

The above technique will provide the better solution for the energy saving purpose especially in textile and chemical industries which works on pressure requirement of the system. The optimized speed will obtained as per the requirement of pressure with no effect on the production and quality of the final product. The quality of the product will be maintained

with the optimized pressure and thus saves the power and maintains the quality and stability of the system.

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