Energy Saving for Blower Motor and Hydraulic Plastic Injection Application

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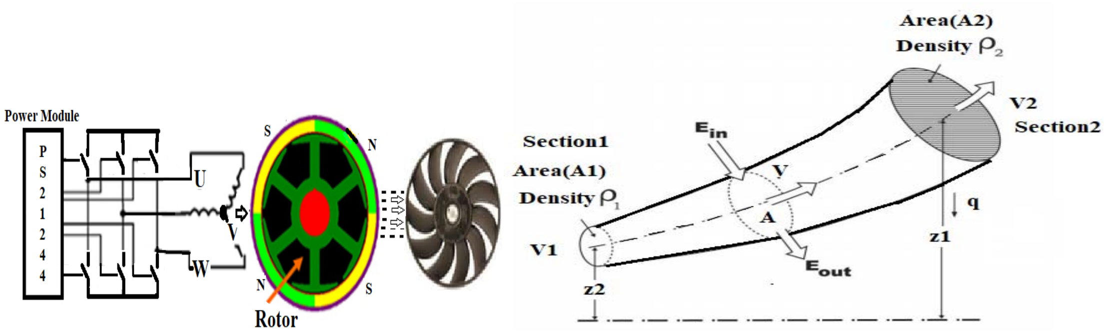
***Abstract*— The paper is proposed solution is developed for the divided two separated two-part sections. In the first section of a paper discusses the ac blower motor, the ac power blower can be variable speed drives control with electrical power inverter supply. Three phase motor type PMSM (AC blower motor) with transformed from a non-linear to linear control using by inverter is rated 100W/200V, 3Ph, 50-60Hz. The first part a paper proposed applied the main power drives module Intelligent Power Modules (PS21244), which is dual-In-Line Intelligent Power Module is DC rated 15 Amperes/600 Volts for electrical main power-driven circuit with three phase inverter ac blower motor. The controller system take model with field-oriented control (FOC), with SVPWM (Pulse Width Modulation), the PMSM includes independent speed & torque control loops regulation there by overcoming the limitation of volts per hertz-controlled method. The experimental of system can control variable speed drives wind speed output. The main power module (PS21244) is small-size and low-cost for based as a controller drive. In the second section of a paper discusses the hydraulic plastic injection heat. For the injection-molding machine (IMM) is equipment that produces all kinds of plastic products. The working principle and the distribution of energy consumption of IMMs are then analyzed in detail. The second of a paper proposed of design power devices phase controllers an electrical soft starter with a star (Y - connection) and delta (Δ - connection) starter method for starting of a 3-phase induction motor starting by power drives SCRs (silicon-controlled rectifiers) for an electrical-hydraulic plastic injection molding machines, hydraulic machines (Induction Motor is a rated 45kW). The power device phase controlled automatically, that is during off load condition and then the system active controlled for energy saving period system about 50 percentage.**

Keywords: AC Power Blower, PMSM Fan Motor, HVAC, Intelligent Power Modules (PS21244), DSP TMS320F2833, VFD, Plastic injection-molding machine, Hydraulic machines, Energy conservation technology, Energy-saving technology, phase controllers.

I. INTRODUCTION

THIS document, the introduction typically describes ac blower motor, in recent years, the importance of cooling technology has become even greater due to an increase in heat emitted by equipment in line with a transition to high functionality and high speed. When the heat of a device is cooled, the heat is transferred in one of the below three ways. There has been an increase in axial flow fans with high static pressure due to the benefits of high-speed drive-in accordance with higher motor performance, and a transition to counter rotation. This has led to increased usage of axial flow fans on equipment with large ventilation resistance due to high mounting density as reference [1], it is can be variable speed drives on drive power airflow. Heating, ventilation, and air conditioning (HVAC) system is designed to achieve the environ-mental requirements of the comfort of occupants and a process. HVAC systems are more used in different types of buildings such as industrial, commercial, residential and institutional buildings as in Fig.1. The HVAC system is to satisfy the thermal comfort of occupants by adjusting and changing the outdoor air conditions to the desired conditions of occupied buildings [2] and [3]. Energy savings at lightly loaded conditions. Energy savings by voltage control is achieved by reducing the applied voltage if the load torque requirement can be met with less than rated flux. This way, core loss and stator copper losses can be reduced. The PS21244 is DIP and mini-DIP IPMs are intelligent power modules that integrate power devices, drivers, and protection circuitry in an ultra-compact dual-in-line transfer-mold package for use in driving small three phase motors. The PS21244 using of 4th generation IGBTs, DIP packaging, and application specific HVICs allow the designer to reduce inverter size and overall design time, as reference [4]. MATLAB Simulink for DSP controller is highly valuable as model design, simulation, code generation, debugging and running can be accomplished for control algorithm.



(a) Diagram of main power of VSD control to PMSM motor blower and, (b) The cross-sectional area of the duct is measured, the flow can be calculated as follows: Flow, (m^3 /s) = Area (m^2)*Velocity (m/s)

Fig. 1. (a) Diagram of main power and (b) steady flow blower air flow, the airflow and static pressure is between those of an axial flow fan and blower, and discharges in a full radius direction.

The introduction typically describes the hydraulic plastic injection heat blower motor. Today's injection moulding machines are more energy-efficient than 30 years ago. Using old machines doesn't save you money. It will cost you even more energy to use the injection moulding machine in 10 years than the initial purchase price. This cost gap will be widened when energy prices are higher. For this reason, energy evaluation must be part of the energy savings for every injection moulding machine. Considering the whole life cost of a machine is difficult but it is the only way to control future energy expenditure. It will help ensure that an attractive low-cost machine does not become an energy hog that raises production costs throughout its entire lifetime. Injection-moulding machines (IMM) constitute the most crucial plastic processing machinery. They can produce a variety of plastic products and various equipment parts, so it is widely used in national defence, electronics, automotive, transportation, packaging, agriculture, education, health, and all areas in daily life [5]. Hydraulic machines have traditionally used a fixed speed three phase induction motor continually running a fixed volume pump but this arrangement has largely been superseded by new designs that aim to adapt oil volumes to demand. Fixed speed motor/variable volume pump machines use an adjustable swash plate on the pump to adjust the delivery of high-pressure oil. The induction motor volume pump machines use a soft start current for Hydraulic machines to add further flexibility. The three-phase induction Motor/fixed volume pump combinations take flexibility and energy saving even further. The traditional method of starting an AC induction motor "across the line" results in full voltage, current, and torque being applied immediately when hydraulic machines is stopped. Process load can also be explored through examination of a machine's power draw. In the Fig 2, and Fig.3 are showed an expanded view of the 47 sec per cycle using graphs such as this, energy use can be optimized by adjustment of process settings such as barrel temperatures and profile, injection speed, back pressure, clamp force, hold pressure, hold time, cooling time and screw back speed while preserving process consistency, production rate and production quality, as reference in [6].

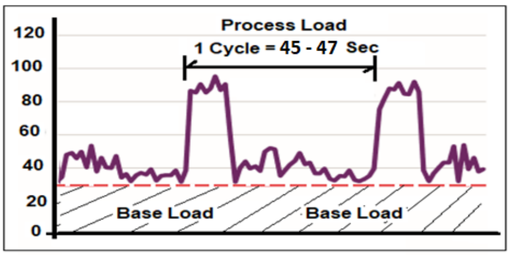


Fig. 2. This expanded view of injection machine (Hydraulic Induction motor machines) power draw shows detailed cycle stages

(a) Plastic injection-moulding (b) Hydraulic machines

Fig. 3. Example his expanded view of injection-moulding machine (IMM) and Hydraulic machines (three phase induction motor)

Energy savings world-leading energy savings with a 40% reduction of electrical power consumption in comparison with conventional hydraulic injection moulding machines is attained by combined capacity control that can use efficient motor rotational speed for each moulding process corresponding to the required oil flow and pressure. Hydraulic injection moulding machines are cheaper than electric injection moulding machines, but have the issues of higher power consumption and lower injection accuracy because of the open loop control, as reference in [7] and [8]. In this paper, the energy conservation technology of an injection-moulding machine (IMM) is presented and the distribution of energy consumption analysed. The aim of this paper is to provide a comprehensive perspective on the energy conservation technology of IMMs for researchers.

II. MATERLS AND METHODS

Due to its usefulness in traction, more-electric aircraft applications and wind power generation systems. However, the complexity of the required control algorithms and signal processing techniques notably increases in relation with conventional three-phase drives, [9] and [10]. The Air system for kitchen ventilation and factory applications an air system consists of hood(s), duct work, and fan(s). The relationship between the air flow rate (CFM) and the pressure of an air system is expressed as an increasing exponential function. Use the Fan Laws along a system curve. If you know one CFM (cubic feet per minute, ft^3/min) (CFM) and static pressure (SP) and speed of blower (RPM) and Horsepower (HP) are point of a system you could use equation (1) - (11) to determine the static pressure for other flow rates. They apply to a fixed air system. Once any element of the system changes, duct size, hood length, riser size, etc. reference as in [10].

$$\frac{CFM_1}{CFM_2} = \frac{N_1}{N_2} \quad (1)$$

$$\frac{SP_1}{SP_2} = \frac{CFM^2{}_1}{CFM^2{}_2} = \frac{N^2{}_1}{N^2{}_2} \quad (2)$$

$$\frac{HP_1}{HP_2} = \frac{CFM^3{}_1}{CFM^3{}_2} = \frac{N^3{}_1}{N^3{}_2} \quad (3)$$

$$q_{V2} = q_{V1}\left(\frac{N_2}{N_1}\right)\cdot\left(\frac{d_2}{d_1}\right)^3 \quad (4)$$

$$\rho_2 = \rho_1\left(\frac{B_2}{B_1}\right)\cdot\left(\frac{T_1}{T_2}\right) \quad (5)$$

$$\rho_1 F = \rho_s F + \rho_d F \quad (6)$$

$$Eff(\%\eta)\, fan = \frac{(q_V).(\rho_1 F)}{10\rho_R} \quad (7)$$

$$\rho_S F = \rho_t F - \rho_d F \quad (8)$$

$$\rho_d = 0.5\rho V^2 \quad (9)$$

$$PWL_2 = PWL_1 + 70\log_{10}\left(\frac{d_2}{d_1}\right) + 55\log_{10}\left(\frac{N_2}{N_1}\right) + 20\log_{10}\left(\frac{\rho_2}{\rho_1}\right) \quad (10)$$

$$P_{R2}(kW) = P_{R1}\left(\frac{N_2}{N_1}\right)^3\cdot\left(\frac{d_2}{d_1}\right)^5\cdot\left(\frac{\rho_2}{\rho_1}\right) \quad (11)$$

$$P_{input}(W) = \frac{P_{tot}.q_v}{\eta_{tot}};\ \eta_{tot} = \eta_{vsd}.\eta_{motor}.\eta_{tranfer}.\eta_{fan} \quad (12)$$

The motor HP and fan RPM can then be matched on the fan performance curve to approximate airflow. Nomenclature for symbols used in this page: q_v = volume flow of air (gross amount of air circulated), m^3/sec, n = rotational speed of fan, d = diameter of fan, p = pressure developed by the fan ρ = density of air, kg/m^3, PR = power absorbed by the fan (kW), B = barometric pressure (mill bars) T = absolute temperature, K (K = °C + 273), standard of velocity pressure about (1.2kg/m^3) in Fig 4 power consumption of fan system, the purposes of fan system are to overcome resistance across system and provide required airflow. Electric power demand of the fan system depends on the total pressure rise, the airflow rate and the total efficiency of the fan system. This electric power can be seemed efficiency losses in direct-driven centrifugal fan this electric power can be calculated by equation (12) reference in [11], where P(input) is. Electric power supplied to fan motor, P(tot) is total pressure rise across the fan, and total efficiency (%), etc. Moreover, there are other positive effects, such as: reduction of mechanical stress by controlling the torque and currents of the process and maintenance costs etc. Fig.5, The bock diagram for proposed of a paper that applied Power Module.

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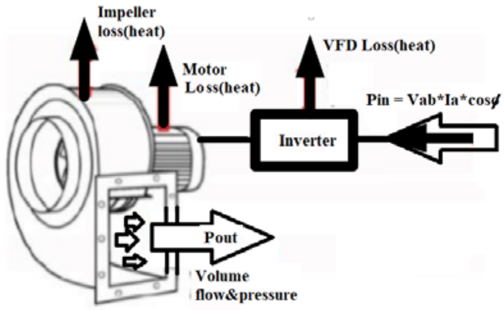


Fig. 4. Breakdown of efficiency losses in direct-driven centrifugal fan

Efficiency of fan system shows the fraction of supplied electric power that is transformed as a useful air pressure rise across the fan. It is based on the efficiencies of the single components as fan, motor, variable speed drive and etc. where Pout is useful power output from the fan, W, Pin is power input to the fan, W.

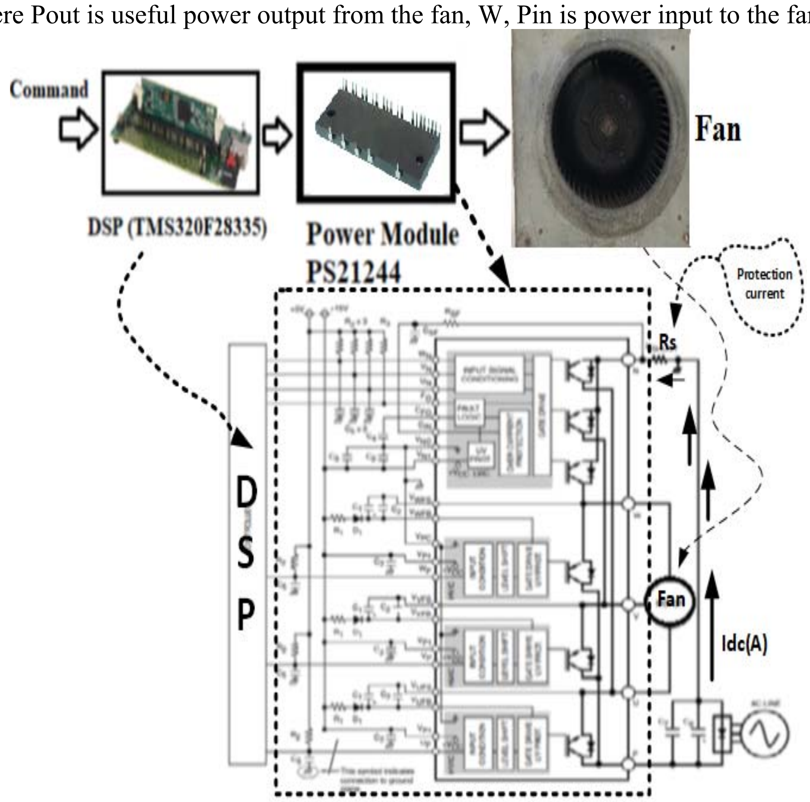


Fig.5 The bock diagram for proposed of a paper that applied Power Module PS21244 (Mitsubishi Electric corporation mini DIPIPM with BSD series Application Note) https://www.galco.com/techdoc/prx/ps21244-e_dat.pdf, based speed control for three phase blower motor with a command using by DSP (TMS320F28335).

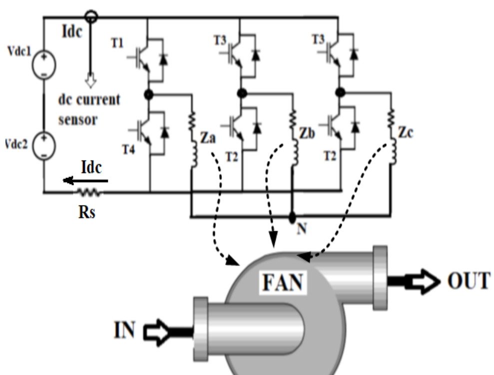


Fig. 6. Two-level inverter (SPWM INV) with DSP (TMS320F28335) speed drives using power module PS21244 drivers current to power IGBT.

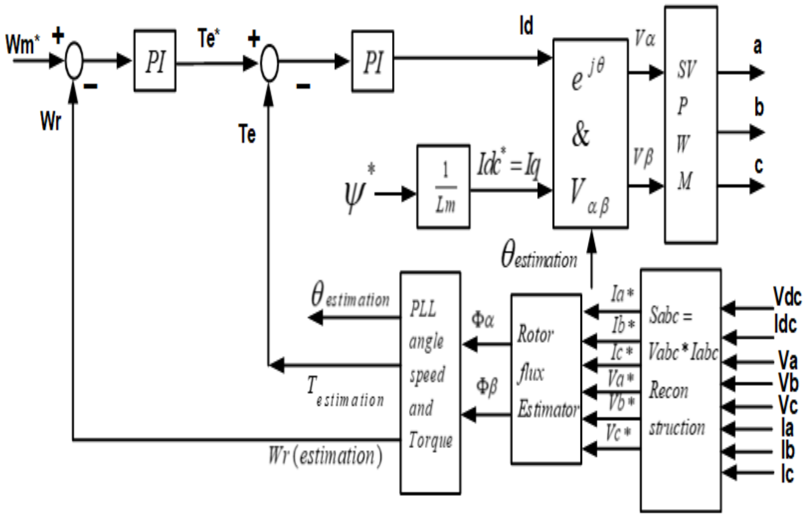
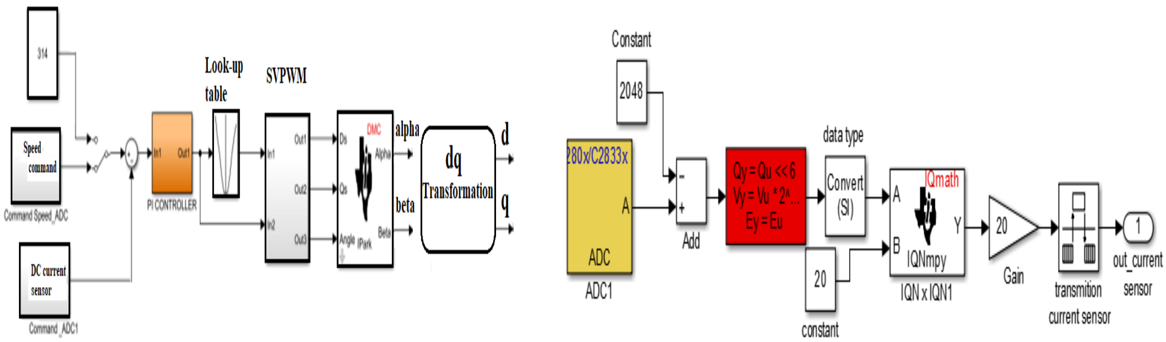


Fig. 7. Block diagram of the controller with field-oriented control (FOC), the PMSM includes independent speed & torque control loops and hence current regulation there by overcoming the limitation of volts per hertz-controlled method.

As shown in Fig.6, this topology uses a four IGBT (main device power electronic) of power module PS21244. Eight space vectors (SVPWM) are used for implementing as application DSP Implementation. As indicated in [12]-[14], the stator flux, torque and speed can be derived from the stator voltages and currents expressed in d-q reference frame. The phase currents and voltages are related to the dc link current and voltage by inverter switching states. A voltage source inverter PMSM drive as in Fig 7. where Vdc is the dc link voltage, Idc is the instantaneous dc link current and the three-phase current (ia, ib, ic) are the instantaneous three-phase winding currents. The torque performance of the PMSM fan motor can be enhanced at low to high frequency range by altering the V/f control law such that the internal power dissipation in the fan motor is held constant. High performance control strategies can be used for adjustable speed fan motor drives in combination with high performance converter topologies. Also, low-cost high-performance converter topologies have been proposed. The DSP (TMS320F28335) board is appropriate for the SVPWM control platform and in Fig.8 (a) and Fig.8(b), shows detail of the model current sensor mode regulation, because of its ability to link the MATLAB/Simulink PWM model to the real-time hardware. In the controller, Code Composer Studio (CCS) of MATLAB/Simulink should be operated properly [15].



(a) The model program SVPWM (b) Model programming, the bock diagram of interface

Fig. 8. (a) The model program SVPWM with MATLAB/SIMULINK Model for based speed command Controller with DSP TMS320 F28335 board and (b) Model programming, the bock diagram of interface input command about speed level and dc current sensor mode with MATLAB/SIMULINK with DSP TMS320 F28335.

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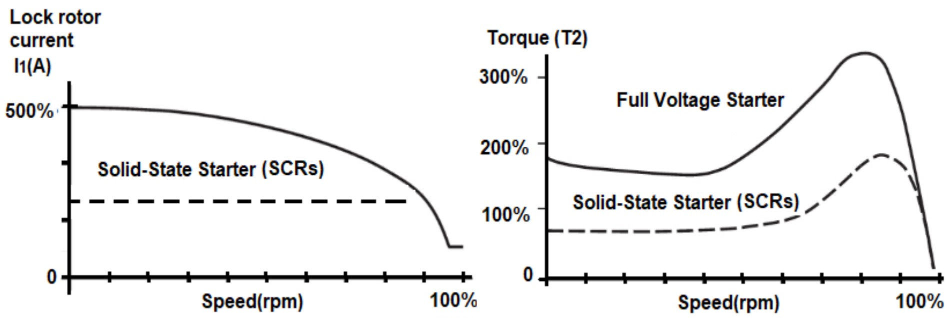
For the injection-moulding machine (IMM), some studies have focused on certain drive controls of the electrical and hydraulic circuits [16] – [20], and some papers have presented control strategies for saving energy [21]–[25].However, the energy-saving technology in IMMs has not been fully reviewed in detail. With the development of control technology, power electronics technology, and variable frequent drive technology, they will provide new ideas and further promote the development of energy saving in IMMs. AC induction motor of electric-hydraulic plastic injection moulding machines that is the simplest starting method. The high inrush current (often 5 to 7 times the motor's rated current) and peak starting torque can damage the hydraulic machines, driven equipment. Across the line starting also causes high peak power demand, which can trigger peak demand fees form the utility company. A soft starter can eliminate these problems by gradually increasing voltage to induction motor (hydraulic machines) terminals during start-up, providing a controlled ramp-up to full speed. This lowers inrush current and controls starting torque, reducing mechanical shocks to the hydraulic machines system. A soft starter relies on three pairs of SCRs (silicon-controlled rectifiers) one pair for each phase of power that are applied gradually for portion of each voltage phase, limiting the voltage provided to the hydraulic motor of IMM (injection-moulding machine). In turn, current is reduced proportionally to the reduction in voltage. Torque, however, is proportional to the square of the voltage, so even a small reduction in torque. For example: a 50 percent reduction in voltage yields a 50 percent reduction in current and a 75 percent reduction in torque, as reference in [26] and as illustrated in Fig 9.



(a) speed vs current (b) speed vs torque

Fig. 9. This characteristic curves of the current and torque of the three-phase ac induction motor for electric-hydraulic plastic injection molding machines control by power device phase controllers with solid-state starter (SCRs).

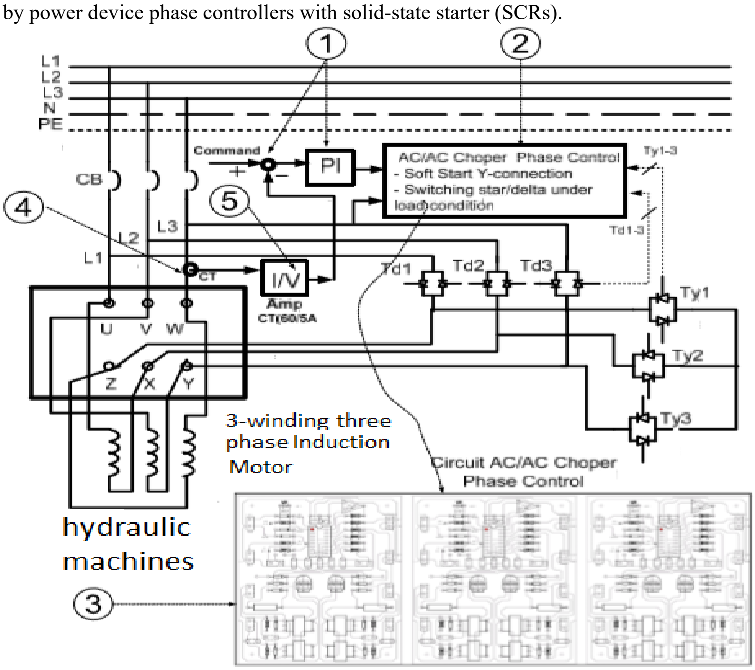


Fig 10. The proposed of design power devices phase controllers an electrical soft starter with a star (Y - connection) and delta (Δ - connection) starter method for starting of a 3-phase induction motor starting by power drives SCRs (silicon-controlled rectifiers) for an electrical-hydraulic plastic injection moulding machines, hydraulic machines (Induction Motor is a rated 45kW).

As shows in Fig.10 and Fig.11., the controller circuit design system using is designed application with analogy circuit for saving cost, the parts is the number1, that the PI-controller diagram, parts diagrams is the number2, the analogy circuit control an AC/AC chopper is a phase controller with soft start of three phase induction motor (electric-hydraulic plastic injection moulding machines), the parts diagrams is the number3, that the PCB-layout service printed circuit board, and the number 4-5 that is AC current sensor (CT) for printed circuit board mounting used for general measurement and the amplified that is dual-supply precision full-wave rectifier can turn alternating AC current signals to single polarity signals using by op amps (741). The paper proposed of design power devices phase controllers an electrical soft starter hydraulic motor control by using TCA 785integrated circuit (IC), typical applications include converter circuits, AC controllers and three-phase current controllers. The synchronization signal is obtained via a high-ohmic resistance from the line voltage. A zero-voltage detector evaluates the zero passages and transfers them to the synchronization register. This synchronization register controls a ramp generator, the capacitor of which is charged by a constant current. The possibility to trigger two ant paralleled thyristors (SCRs) with one IC TCA 785. The trigger pulse can be shifted continuously within a phase angle between 0˚ and 180˚ by means of command. The during the positive line half-

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wave, the gate of the second thyristor is triggered by a trigger pulse isolated transformer at pin 15 of TCA785. During the negative line half-wave, the trigger pulse of pin 14 of TCA785 is fed to the relevant thyristor via a trigger pulse isolated transformer.

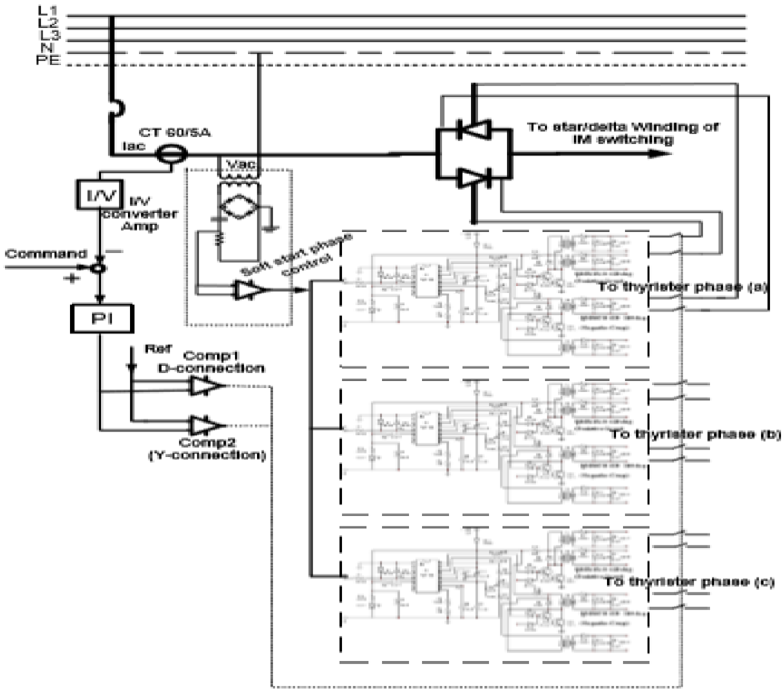


Fig 11. The detail of design circuit diagrams of three phase fully controlled an electrical soft starter hydraulic motor control by using TCA 785integrated circuit (IC), ac power controller circuit for high-power thyristor and shows that is the signals with triggering angle controlled to SCRs (silicon-controlled rectifiers) for an electrical-hydraulic plastic injection moulding machines, hydraulic machines (Induction Motor).

III. RESULTS

The simulated and experimental wave form of the field-oriented control (FOC). The PMSM control algorithm structure is described in Fig. 12, the main control loops are the velocity consist of dc voltage and dc current and the ac voltage and ac current control loops that vary the PMSM motor winding voltages to drive with Intelligent Power Modules (PS21244). In modern high-performance control of SVPWM inverter fed of the PMSM. The FOC can operate smoothly over the wide speed range, can produce full torque at zero speed, and is capable of quick acceleration and deceleration.

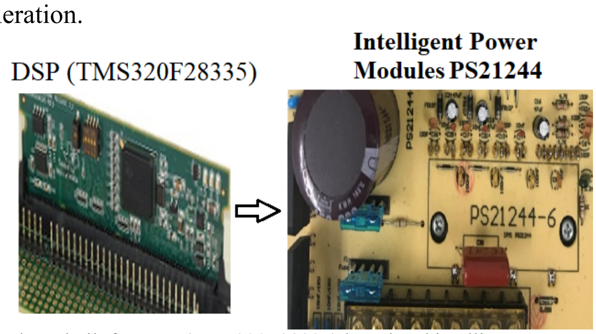


Fig. 12. The hardware prototype has been built for DSP (TMS320F28335) board and intelligent power Modules PS21244 board.

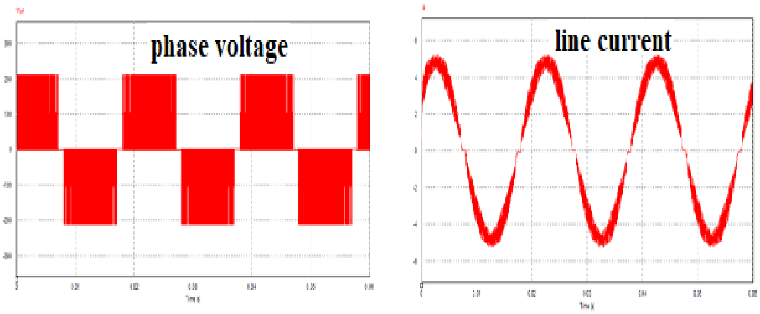


Fig. 13. The simulated result of phase voltage output and line current of model design the field-oriented control (FOC) for PMSM.

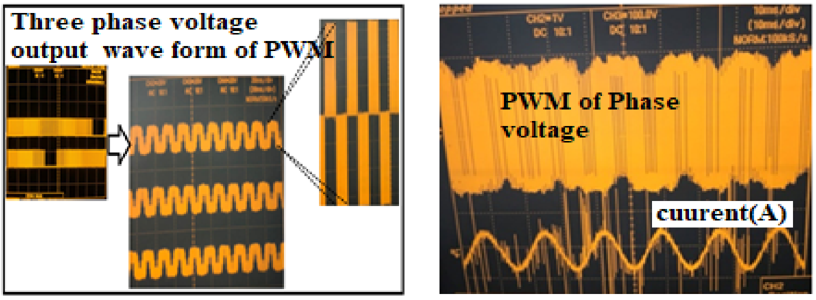


Fig. 14. The experimental result of three phase voltage output and line current of model design the field-oriented control (FOC) for PMSM.

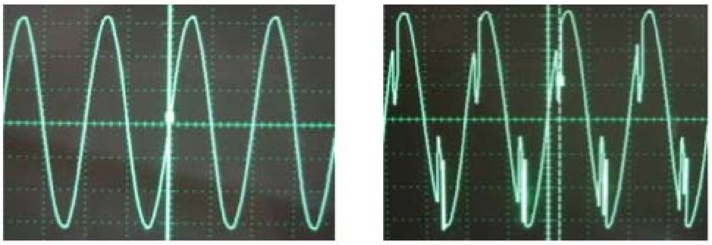
TABLE I
PERFORMANCE OF DATA ACQUISITION SYSTEM FOR MONITORING INDICATES THE RANGE OF INPUT VOLTAGE (0-50V) WITH INVERTER CONTROL TO PMSM RATED 100W/200V, 3PH, 50-60HZ.

VL-N(V)	10.3	15.3	20.6	25.4	30.6	35.3	40.4	45.1	50.5
VL-L(V)	17.8	26.5	35.6	43.9	52.9	61.1	69.9	78.1	87.5
Ia (A)	0.1	0.14	0.18	0.21	0.23	0.25	0.26	0.27	0.28
Ib (A)	0.1	0.14	0.18	0.21	0.23	0.25	0.26	0.27	0.28
IC (A)	0.1	0.14	0.18	0.21	0.23	0.25	0.26	0.27	0.28
Pa (W)	2.55	5.52	9.18	13.5	17.6	22.0	27.2	31.3	36.0
Pb (W)	2.55	5.52	9.18	13.5	17.6	22.0	27.2	31.3	36.0
Pc (A)	2.55	5.52	9.18	13.5	17.6	22.0	27.2	31.3	36.0
PFa	0.85	0.86	0.87	0.88	0.87	0.86	0.86	0.86	0.85
PFb	0.82	0.86	0.83	0.86	0.83	0.84	0.86	0.86	0.85
PFc	0.82	0.86	0.83	0.86	0.83	0.84	0.86	0.86	0.85
Air flow In (m/s)	1.2	1.5	1.8	2.4	3.1	3.2	3.5	3.7	4.4
Air flow Out (m/s)	2.4	3.3	4.4	5.5	7	2.7	8.5	8.7	10.2

TABLE II
PERFORMANCE OF DATA ACQUISITION SYSTEM FOR MONITORING INDICATES THE RANGE OF INPUT VOLTAGE (60-230V) WITH INVERTER CONTROL TO PMSM RATED 100W/200V, 3PH, 50-60HZ.

VL-N(V)	60.1	80.9	100	120	151	203	230
VL-L(V)	104	140	173	207	262	352	398
Ia (A)	0.28	0.3	0.32	0.36	0.47	1.06	1.37
Ib (A)	0.28	0.3	0.32	0.36	0.47	1.06	1.37
IC (A)	0.28	0.3	0.32	0.36	0.47	1.06	1.37
Pa (W)	43.3	57.9	64.5	77.0	120	272	478
Pb (W)	43.3	57.9	64.5	77.0	120	272	478
Pc (A)	43.3	57.9	64.5	77.0	120	272	478
PFa	0.84	0.80	0.75	0.71	0.68	0.65	0.64
PFb	0.84	0.79	0.67	0.60	0.68	0.65	0.64
PFc	0.84	0.79	0.67	0.60	0.68	0.65	0.64
Air flow In (m/s)	4.8	5	5.1	5.3	5.5	5.6	5.7
Air flow Out (m/s)	10.8	11.9	12.6	13.5	13.6	14.2	14.5

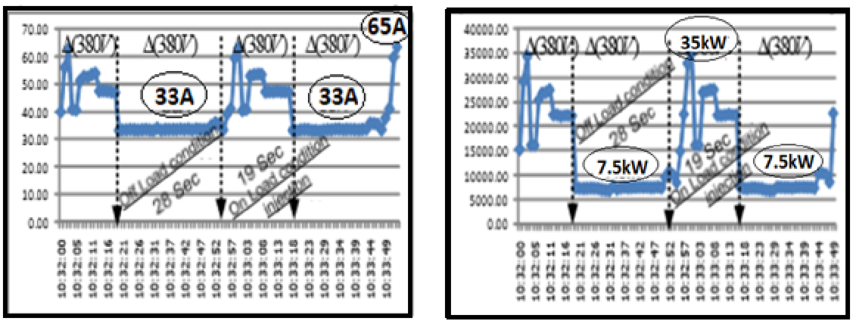
Illustrate example can be seem in Fig.13, for simulated with phase voltage, phase current, and Fig.14, for experimental result of the model design the field-oriented control (FOC) for PMSM, in the waveform with PWM three phase voltage waveform and line current input to PMSM. The inverter control on board DSP and intelligent power Modules PS21244. For the table (I) and table (II) shows data acquisition electrical energy consumption consists of ac voltage(V) ac current(A) apparent power (VA) reactive power (Var) active power (W) and power factor (PF) and air flow input (m/s) and air flow output (m/s) on variable frequency speed drive inverter control (VFD) control to fan (blower) on variable air flow. Injection-moulding machine (IMM), soft Starters can be reducing the mechanical stress significantly, but create voltage stress to the motor. The operator needs to find the balance between the two by fine tuning the starting process. The soft starter provides graduated voltage waveform level in to the three-phase induction motor to provide smooth staring, as shown in Fig.15 that is as illustrate on voltage waveform with power conversion by using Power SCRs into hydraulic machines of three phase induction motor.



(a) Voltage wave form 100% (b) Voltage wave form70%

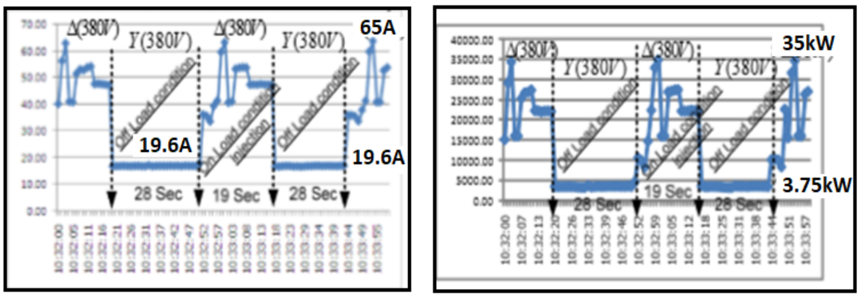
Fig. 15. The result is that of the voltage wave form of a power conversion by using Power SCRs into injection-moulding machine (IMM), the reduce energy power consumption that is the controller by change voltage waveform 70% may not be sinusoidal because reduce

In this a paper A star delta starter is the most commonly used method for starting of a 3-phase induction motor. In star (Y - connection) and delta (Δ - connection) starting an induction motor is connected in through a star connection throughout the starting period. Then once the motor hydraulic machines reach the required speed, the motor is connected in through a delta connection. The results of this expanded view of injection machine (hydraulic Induction motor machines), these devices monitor and record different electrical parameters that can include volts, amps, watts, volt-amps (VA), volt-amps reactive (VAR), kilowatts (kW), kilowatt hours (kWh), in the paper as to show in Fig. 16, the data of current(A) and data of active power (kW), we had to marked an observation and analysis based on the data gathered in the experiment. The IMM is the operation with delta connection (Δ -connection) and as illustrate to shows the data experimental results that requires the most energy of the input current and active power for hydraulic electric motor, a duration measures an amount of time using time-based values, is during period 1, off load condition about time 28 sec and the period 2, on load condition about time 19 sec. The minimum data current and active power minimum value about 33A/7.5kW, as illustrate in Fig, this is duration time with it off-load injection heat of the hydraulic machine cycle. As shown in Fig.16 and Fig.17 and Fig.18, that is result performed the experiment for energy saving with duration period, that an automatic phase change is designed disconnect delta connection (Δ - connection) load from its power source to star (Y - connection) system with three phases fully controlled that is the signals with triggering angle controlled to SCRs (silicon-controlled rectifiers).



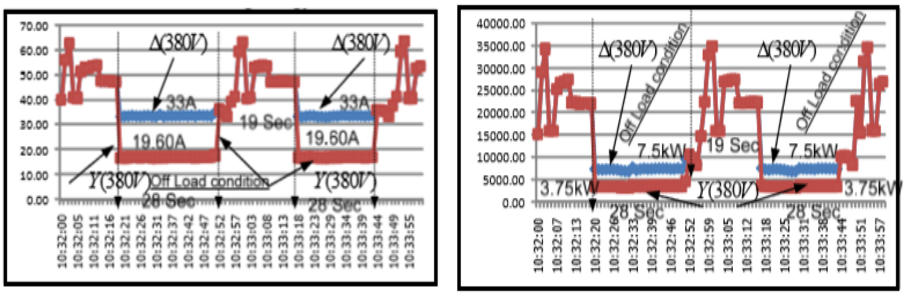
(a) Current consumption (b) Power consumption

Fig. 16. The result of the experiment that of the current (A) when delta (Δ -connection) is during period 1, off load condition 28 sec that is the minimum value current and active power about 33A / 7.5kW and the period 2, on load condition using time 19 sec that is the maximum value current and active power about 65A /35kW.



(a) Current consumption (b) Power consumption

Fig. 17. The purpose of the result performed the experiment for energy saving with duration period, that of the current (A) when change delta (Δ -connection) to star (Y - connection) system with power device phase controlled, that is during period 1, off load condition 28 sec that is the minimum value current and active power about 19.6A / 3.75kW.



(a) Current consumption (b) Power consumption

Fig. 18. The power device phase controlled automatically, that is during period 1, off load condition 28 sec, the comparison data measurement current consumption before (Δ - connection about 33A) and after data consumption of star (Y - connection about 19.6A) system, and data measurement active power consumption before (Δ - connection about 7.5kW) and after data consumption of star (Y - connection about 3.75kW) and then the system active controlled for energy saving period system about 50 percentage.

IV. CONCLUSIONS

The conclusion is the first part of the research a paper and this will present energy saving of the ac blower motor, the technological process performances by the fan temperature precise control. The PMSM at controlled speed also increases the life of the equipment. So, the installation of variable frequency drive (VFD) in the fan (Blower) would be energy efficient and can result in reduction of several units of electrical energy consumption in a factory. In this a paper proposed using power drives as Intelligent Power Modules PS21244 can be control main power for variable speed PMSM with math model of the field-oriented control (FOC) The controller system uses a MATLAB/SIMULINK Model for based speed controller with DSP board. The second part of the conclusion of the research a paper and this will present energy saving of the hydraulic plastic injection heat with applying by power device phase controlled automatically, systemic approach to reducing energy consumption on every place possible, from the geometry of the moulded part, over the basic equipment for injection moulding, to additional equipment, it is possible to achieve multiple energy savings. The system active controlled for energy saving period system about 50 percentage with power device phase controlled to SCRs (silicon-controlled rectifiers), that is during period 1, off load condition 28 sec. In addition, the methods and characteristics of the energy conservation technology in hydraulic control circuits and electrical control circuits are developed. Besides the positive economic impact, it should be noted no less important positive impact on the environment in the form of reduced production of greenhouse gases that are directly related to the energy consumption.

The final part of the research is paper and this will present the model design system shows good results under all conditions employed during simulation. The prototype system is built and tested in laboratory. This paper is providing guideline to further analyses and improve power drives conversion in the field of power electronics and electrical power system

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