# "CONTROLLABLE POWER FACTOR AND IMPROVED EFFICIENCY OF SINGLE PHASE INDUCTION MOTOR DRIVE"

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***Abstract***

***Single-phase power plants are widely used in household appliances and industrial control. Multi-speed processing and reusable motion are provided by the speed control of these motors. This paper presents the variable frequency motor drive system implemented by the inverter of the PWM power supply to improve the efficiency of single-phase power generation (SIM). This system introduces Linear Loss Control (ALMC) for SIM drives. The ALMC provides a new pattern of stator voltage change to achieve minimum motor power under any operating conditions. The operation of the ALMC results in smooth and fast minimal losses. This paper presents the theoretical control method and the simulation results the results of the proposed method.***

## 1. INTRODUCTION

Induction machines are simple, rugged and require less maintenance. Therefore, power generation machines are preferred in most industrial applications such as lathes, drills, elevators, cranes, conveyors, etc. Three-phase power plants are now widely used in almost every industry. Such motor speed control can be achieved by controlling the sharp voltage of the motor by electronic means. The AC voltage regulator, as a power converter, is also used as a soft starter for excitation motors. Three-phase power plants in squirrel cages are used for fans, blowers and pumps in industry. Three-phase variable-voltage variable frequency (VVVF) drives are used to control the speed of these motors, but the controlled technology used in VVVF drives is complex and expensive. Other disadvantages of the VVVF drive are the bending angle delay, low input power factor at low speeds and high switching. To overcome the above disadvantages, a simple system for controlling the speed of a single phase excitation motor is to generate a variable AC voltage directly from the line, with some changes from season to season. This can be achieved by using the blackout angle control (EAC) technology to control the blackout angle using a forced communication switch on the switch when using the track in parallel with the support station. The proposed AC transformer uses only two controlled switches with two diode bridge controllers. Reducing controlled switches is required to reduce switching simplicity, cost, reliability and losses; problems that increase the effectiveness of the behavior.

## 2. METHODOLOGY

Figure 1 shows a circuit diagram of the required circuit. It consists of a central power supply controlled by a Si.e IGBT power supply connected to a single stator powered by a 4 diode bridge rectifier. A similar capacitor connected to the winding stator provides a freewheeling path. An important element is used to interrupt the current of the IGBT semiconductor and turn it on and off with a similar capacitor to turn on the electrical current while the IGBT semiconductor is turned off. Although the system requires a controlled electric motor that can be an IGBT POWER MOSFET, GTO, depending on the power supply. This technique uses pulse control to generate PWM pulses from the IGBT control panel. These PWM amplifiers come from the side clock zone, which has two Op-Amp converters, the LF356 converter, and an IC 555 counter. The 12 V power supply provides round control and a side clock cable. A POT is required to change the input voltage. And similar circuit control12 V wind current provides the first Op amplifier and converts it into a square,It received a dual key from a 2KHz IC 555. Both amplification pulses are connected to the three components as the input and output of a second pulse, which compares the sample and converts it into PWM pulses required to perform the IGBT. Figure 2 shows a diagram of a power meter with a single active motor connected to control the power supply. With EAC technology, continuous IGBT is often used to connect and disconnect loads and power supplies, i.e. to handle charged energy.

Control Circuit Diagram

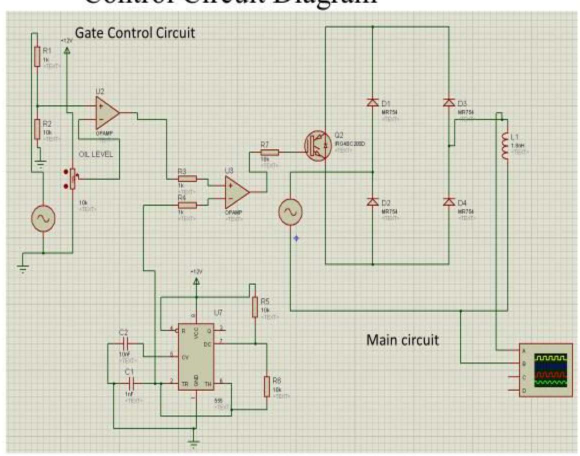


*Fig 1 Power circuit diagram of proposed single phase I.M. with extinction angle control*

## 3. OPERATION

***Active Operating Mode***

The IGBT switch is turned on at t = 0 and off at t = -β to supply power to the load in active mode. For inductive loads, the load current of the load current must be available for the period between t = -β and $a\omega t =$ . When the IGBT is turned on, current flows from the single-phase voltage to the stop station through the switch and diode bridge as shown in the figure.

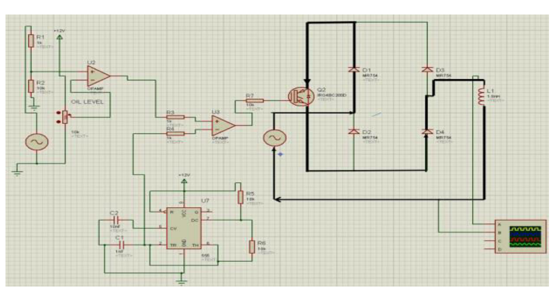

*Fig 2. Active operating model*

***FREEWHEELING OPERATING MODE***

The switch will be turned off during the freewheeling operation mode and the freewheeling operation mode will be started. The capacitors are paralleled through the motor which operates in this way. The motor will not stop because the source supply is turned off and the energy stored in the motor will be used continuously. So the motor does not want to die. It will continue to run. Figure 3. shows the operating mode for free wheeling.

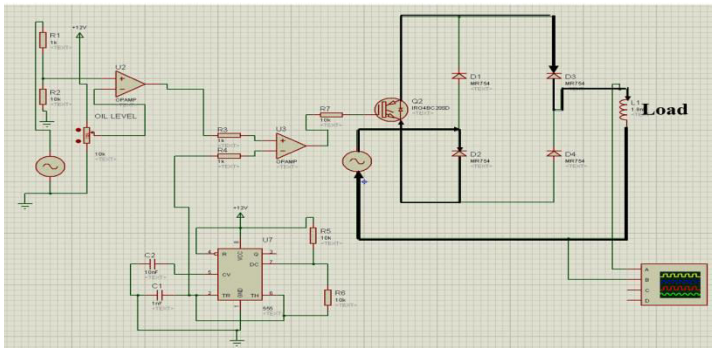


**Fig 3.Freewheeling operating mode**

## 4. RESULT

***Hardware model:***

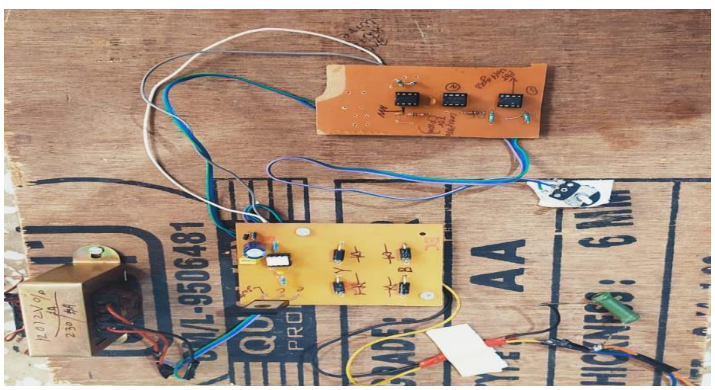

***Fig1 Hardware model of proposed drive***

***Result waveform***

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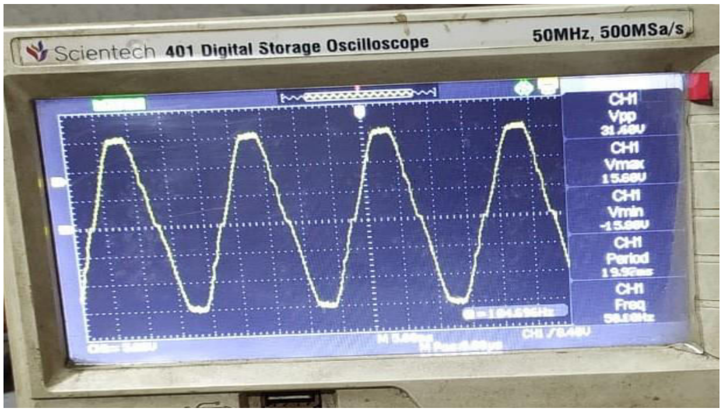


According to the design characteristics of the sine wave character, this drive must output before the disturbance, before the switch-off period, and the current is used only for one period, which means that a large current flows ON time and no current OFF time The power factor is directly depends on the current value, ie [Cosϕ = W / VI]. If there is no current value, the power factor will be one and the switch will be on for a shorter time while the power factor is less than one. If we calculate the value of the average concentration factor of the ON and OFF time, it inevitably decreases towards a unit or a leading power factor.

This drive can't interpret visible changes for single phase load because it consume less current for any type of domestic load ,so for that value power factor changes did not calculated experimentally. Therefore there is not any practical calculations but it is proved by theoretical calculation. But in future it will be extended for three phase system drive of three phase load like irrigation pump, wheat flour machine, etc.

# 5. Conclusion

Based on the experimental results, it can be seen that the proposed drive is suitable for regulating the speed of the excitation engine for fan and fan loads. It was also found that the drive only consumes power when the switch is on, not off time, which means less power consumption for the drive and therefore works with high efficiency compared to vvvf drives. The input coefficient of the proposed drive remains high over the required speed range compared to the vvvf drive. A decrease in source current can be seen at the same motor speed and thus the same production capacity. The THD input current appears to be lower than the VVVF drive. The input current waveform contains fewer peaks than the vvvf drive.

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