EMERJENCY DC INJENCTION BREAKING

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***Abstract*: The emergency dc injection breaking presents a practical design for the implement model will be shown and performances will be station of an improved non-regenerative emergency braking system. The realization of an industrial compared for different motors. The testing session has shown that the model was able to handle up to 5A output and withstand up to 30Vpower line. The proposed eme1rgency braking method can brake most induction machines under 4 seconds. Design considerations, advantage and drawback are then discussed.**

***Keywords*: Dynamic braking, Induction motors**

1. INTRODUCTION

The term braking comes from the term brake. the brake is an equipment to reduce the speed of any moving or rotating equipment, like vehicles, locomotives. The process of applying brakes can be termed as braking.

DC injection breaking is a method of slowing ac electric motor. A dc voltage is injected into the winding of ac motor after the ac voltage is disconnected providing breaking for the rotor Three-phase induction motor drives are extensively used in different sectors of drives industry, but it is a challenge to stop them in short period of time especially for high inertia loads. To control an electric machine by electric drives, its braking system is very important because it helps to decrease the speed of the motor according to will and necessity.

Electronic D.C. braking provides reliable and fast load deacceleration and stopping, requiring no maintenance and conserves energy as well with reduced maintenance costs. Many such applications where D.C injection braking can be deployed are roller-table drives, grinding machines, centrifuges, circular saws, planers, roller and ball mills and so on to reduces stopping time.

DC injection braking is a method of slowing AC electric motors .The modern AC drive consists of an input rectifier converting AC voltage to DC voltage stored in DC capacitors. The inverter converts the DC voltage back to AC voltage feeding the AC motor at the desired frequency. The process power needed flows through the rectifier, DC bus and inverter to the motor. The amount of energy stored in DC capacitors is very small compared with the power needed, i.e., the rectifier has to constantly deliver the power needed by the motor plus the losses in drive system. A DC voltage is injected into the winding of the AC motor after the AC voltage is disconnected, providing braking force to the rotor. Because of their high robustness, highreliability, low cost, high efficiency and good self-starting capability, induction machines prove in being the first choice for many industrial applications such as plastic processing machinery, circular saw machinery etc. Although there widely and extensively increasing in the three-phase motor market, some accidents occur at the interface between the rotating machines and the power supply system. Therefore, an emergency braking remains the most important parameter to control in order to save the machinery parts or operating personal. There are mainly two techniques of braking system for induction motor: the first is friction braking and the second is electrical braking like the dynamic, the reverse voltage (or plugging) and the regenerative ones. Essentially, braking is one mechanism to create a retarding torque by the removal of stored kinetic energy from a mechanical part of the system. This is used to improve the DC injection braking mechanism through a designed system separately connected and completely independent from the actual drive motor. Further, the main contributions especially the use of a recent semi-conductor's technology. It is a successful attempt to design a most suitable DC injection braking system by making balance between the effective response to energy requirement in a reliable control circuit and the low price braking time. This method determines the variation of optimal values of applied voltage and frequency to have a certain braking time of three phase induction motor at a certain load torque with minimum braking energy losses.

II BLOCK DIAGRAM

The step-down transformer converts the high voltage(HV) and low current from the primary side to the low voltage (LV) and high current value on the secondary side. This transformer is given 230volt is step down to 15volt type of this transformer has a wide application in electronic devices and electrical systems.

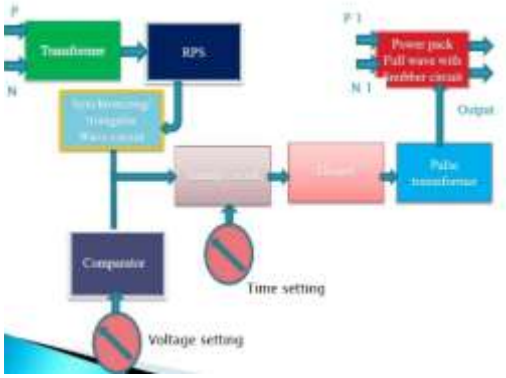

Fig Block diagram of DC injection braking

A regulated power supply is an embedded circuit it converts unregulated AC into a constant DC. With the help of a rectifier it converts AC supply to DC. Its function is to supply a stable voltage (or less often current), to a circuit or device that must be operated within certain powersupply limits. The output from the regulated power supply may be alternating or unidirectional but is nearly always DC (Direct Current).

Timer that operate an electric switch controlled by the timing mechanism. The switch may be connected to an electric circuit operating from mains power, including a relay or contactor or low voltage. We used timing circuit to produce effects such as holding an output on for a set period of time, making an output flash on/off continuously, or delaying an output from coming on for a short time period even though an input had been activated. Driver is an electrical circuit or other electronic component used to control another circuit or component, such as a high-power transistor, liquid crystal display (LCD), and numerous others. They are usually used to regulate current flowing through a circuit or to control other factors such as other components, some devices in the circuit.

The pulse transformer is basically a transformer which couples a source of pulses of electrical energy to the load with its shape and other properties maintained. A powerpack or powerpack is a part of a modular powertrain that contains some type of engine and may also contain a transmission and various supporting components.

Powerpacks are used with certain types of industrial equipment designs, including vehicle designs such as forklifts and cherry picker lifts but also stationary equipment such as paint sprayers. Virtually all modern military tanks use them.

The Snubbers circuits are energyabsorbing circuits used to suppress the voltage spikes caused by the circuit'sinductance when a switch, electrical or mechanical, opens. The most common snubbercircuit is a capacitor and resistor connected in series across the switch (transistor).

The comparator is used to sense when an arbitrary varying input signal reaches reference level or a defined threshold level. The comparator can be designed by using various component like diodes, transistors, op-amps. The comparators find in many electronic applications that may be used to drive logic circuit.

III HARDWARE MODEL

The emergency dc injection breaking operational principal consists of circulating a direct current into the stator windings. Consequently, the dynamic DC injection is considered as 'high-slip' braking technique and its sole purpose is to bring a rotating rotor to a standstill.

Fig: Hardware model of DC injection braking

Theoretically in dynamic braking, the stator of the induction machine has no supply at the time of braking. For that reason, a source of DC is needed. The source is usually a simple rectifier which can be fed either by an adjustable speed drive, line or, like in our case, a separate source for braking purpose. At this level, the direct current injection into the stator induces a static magnetic field. From the motor's air gap point of view and as the motor is disconnected, the static magnetic field opposes the rotating magnetic field stored by the rotor. From Lorentz law, we know that the interaction of the two fields creates a braking torque that resists the motion of the rotor by slowing it down and generates a voltage across the rotor conductors which is explained by Lentz law.
Actually, the amount of braking torque is dependent on the amount of current injected into the motor, the slip as well as the motor class. The higher the DC level, the faster braking will be. But, in order to allow the induced motor's voltage to drop at a safe level, our module accurately and independently control the DC injection in terms of current (braking force or torque) and time (braking duration).
Once the machine has come to rest, the controller disconnects the DC supply from the motor; the motor then remains in a passive state until it is deliberately re-started. IN an event of a potential accident, safety is assured by the DC injection braking, instantly cutting the AC supply to the motor and simultaneously injecting a predetermined amount of DC to bring the induction machine rapidly to rest within 10 seconds.
Energy flow during DC injection braking process converts the kinetic energy of the rotating masses into rotor's bars as heat dissipation and that after disconnecting the main supply, contrary to the 'low slip' braking mode (the regenerative braking) where the kinetic energy is converted to electrical energy at the stator terminals.

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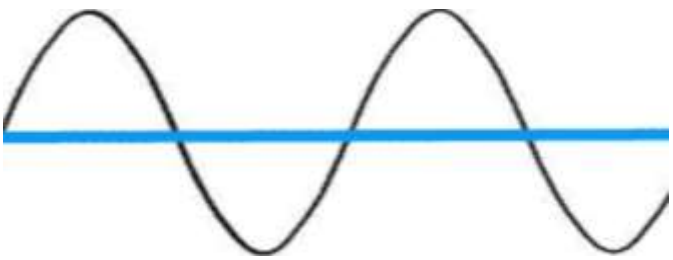
IV RESULT

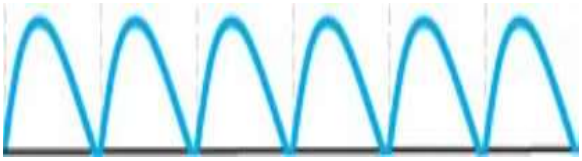
DC Injection Braking is a braking system used with 3-phase motors. The outputs of a DC current that gets applied to two of the windings of the motor, which causes the motor to quickly brake. injection braking really is only effective at low speeds. DC Injection can also be DC used to preheat the motor. Keep the DC current applied across a winding, acts like a short circuit, so current must be limited, and a time limit needs to be set.

Transformer Input Waveform

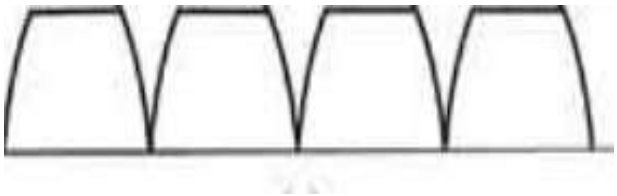


Control Circuit Waveform

Driver and Pulse Transformer Waveform



Snubber Circuit Waveform



V.CONCLUSION

The DC injection braking system for 3 phases induction machines. we explained the theoretical functions of the braking and we detailed the effect of injected current on the energy flow in the machine during braking. Then DC injection braking unit like: the temperature, the recirculating current, the low voltage DC bus and the isolation to improve the efficiency of the proposed design. Results showed and justified the use of replacing a conventional DC voltage source by a DC current source.

The efficiency and improvement of this technic were mainly found in the control and in the limitation of inrush current widely found in common units. As expected, the mechanical losses help in braking.

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