INDUCTION MOTOR CONTROL USING SMALL DC LINK CAPACITOR INVERTER FED BY THREE PHASE DIODE RECTIFIER

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Abstract This venture enhances the unwavering quality and power thickness of three stage variable speed drives by controlling presents a little film capacitor inverter based acceptance engine control . A hearty half and half engine controller is created to counteract execution corruption caused by the electrolytic capacitor-less inverter sustained by front-end diode rectifiers. The structure of the controller consolidates a model-based controller (MBC) and a hexagon voltage controlling controller (HVC). The MBC decides the order yield voltage with the convergence of the torque and rotor flux linkage charge. In the HVC mode, the order voltage vector is resolved just by the torque charge and the hexagon-formed inverter voltage limit. Fruitful utilization of the control approach is substantiated by a graphical and diagnostic implies that actually prompt a solitary voltage choice run the show. This paper additionally looks at the operation affectability under engine parameter floats to decide how to decouple its impact utilizing a voltage unsettling influence state- channel plan. This venture enhances the yield voltage and smoothening wave shapes by utilizing fluffy controller than PI controller. The outcomes checked through MATLAB/SIMULINK condition.

Index Terms—Front-end diode rectifiers, hexagon voltage controlling controller (HVC),model-based controller (MBC), little film capacitor inverter, three-stage variable speed drive.

I.INTRODUCTION

In ease three-stage variable speed drive applications, for example, warming ventilating-aerating and cooling (HVAC) frameworks, diode rectifiers are generally utilized as the front-end circuit for non regenerative ac–dc change as a result of their lower cost and higher dependability. In

these sorts of minimal effort air conditioning drive frameworks, aluminum electrolytic capacitors are usually used to adjust the contrast between the quick information and yield control and additionally stifle the voltage spikes caused by spillage inductance and exchanging operations, as appeared in Fig. 1. Then again, the dc-transport capacitor is massive and overwhelming as well as one of the minimum dependable parts on different power electronic topologies. Besides, the parasitic lead inductance can cause voltage spikes, which are a main consideration in the disappointment of energy electronic gadgets. A disappointment review of switch mode control supplies revealed that electrolytic capacitors are in charge of the greater part of the breakdowns of an inverter. In this manner, there is expanding
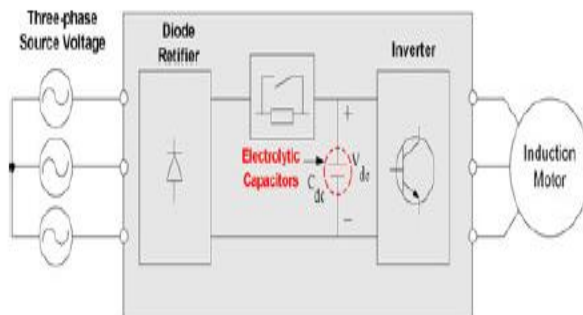

Fig. 1 Three-phase diode rectifier and PWM inverter for IM drive.

Enthusiasm for the checking lifetime of electrolytic capacitors for solid and safe operation. Then again, disconnected checking procedures require extra Measurements and in addition from the earlier information for the reference show, which makes observing procedure entangled and troublesome. A formerly revealed online technique for assessing the capacitance can't be connected to inverters nourished by diode rectifiers. In such manner, a scope of regenerative converters and control techniques have been proposed with a specific end dc transport. The concentration of most examinations has been on the most proficient method to diminish the dctransport capacitor of three-stage beat width adjustment (PWM) rectifiers and single-stage diode rectifiers . All past examinations were outfitted with a customary shut circle current controller to direct the air-hole torque and flux linkage of air conditioning engines. In any case, prompt current control in a little dc-transport capacitor inverter with the diode rectifier

front-end is not direct in light of the fact that the dc-connect voltage and yield energy to the engine diminish intermittently because of the nonattendance of vitality stockpiling. This quick dc voltage lessening drives the engine to be worked as often as possible in the field-debilitating district beneath a based speed. Thusly, the present control system turns out to be more confounded under voltage-restricted conditions in light of the fact that numerous target sub controllers, for example, field-debilitating, hostile to windup control, and over balance conspire, ought to be outlined deliberately in light of the mind boggling tradeoff between the sub control activities and current control elements .

II.Design and Analysis of a Motor Controller

Fig. 2 demonstrates a piece graph of the proposed control technique for an IM utilizing an intricate vector portrayal. Here, v∗ abcs and ve∗ mdqs are the stator voltage summons in the abc-reference outline and the synchronous reference outline, separately, and Vdc means the deliberate dc-connect voltage. When beginning (Mode I),

the scalar Volts/Hz or V/f open-circle control is acquainted with keep away from the absence of perceptibility of the engine back-EMF voltage at low speeds. This element allows the drive framework to fulfill the beginning pace prerequisite of the back-EMF following based position sensor less operation, of which the edge starts in the region of 10% of the evaluated speed. The control specialist is then given over to demonstrate based control (MBC, Mode II) or hexagon voltage controlling (HVC, Mode III), depending on the amount of available dc-link voltage.
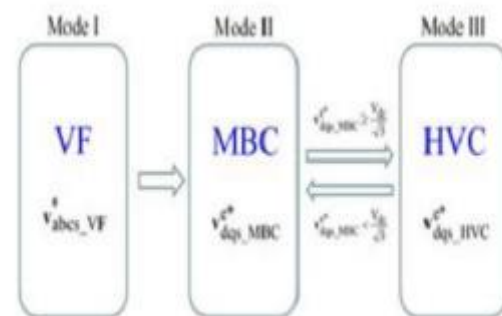

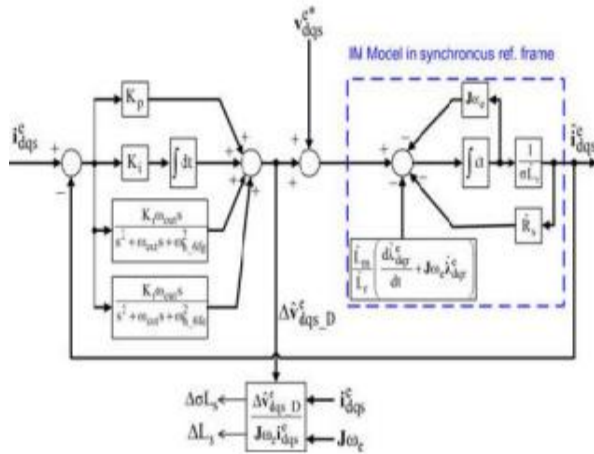Fig.2 Proposed IM control strategy for small capacitor inverters.

Fig. 3. State-filter design for decoupling the parameter dependence.
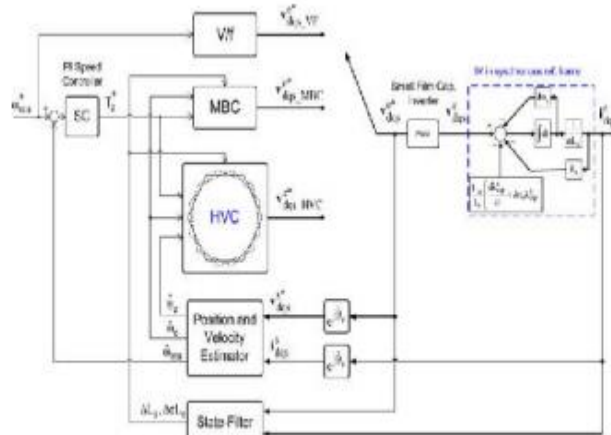

Fig. 4. Overall control block diagram.

III.FUZZY LOGIC CONTROL

FLC determined by the set of linguistic rules. The mathematical modeling is not required in fuzzy controller due to the conversion of numerical variable into linguistic variables. FLC consists of three part: a. Fuzzification, b. Interference engine, c. Defuzzification. The fuzzy controller is characterized as; For each input and output there are seven fuzzy sets. For simplicity a membership functions is Triangular. Fuzzification is using continuous universe of discourse. Implication is using Mamdani's "min" operator. Defuzzification is using the "height" method. FLC block diagram as shown in figure 2.
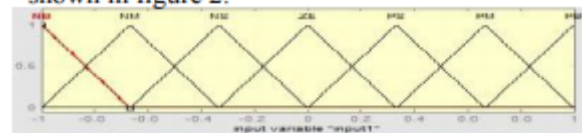

Fig. 5. Fuzzy Logic Controller

a. Fuzzification

Membership function values are assigned to the linguistic variables, using seven fuzzy subsets: NB(Negative Big), NM(Negative Medium), NS (Negative Small), ZE (Zero), PS (Positive Small),PM(Positive Medium) and PB (Positive Big). The partition of fuzzy subsets and the shape of membership function adapt the shape up to appropriate system. Input error E(k) and change in error

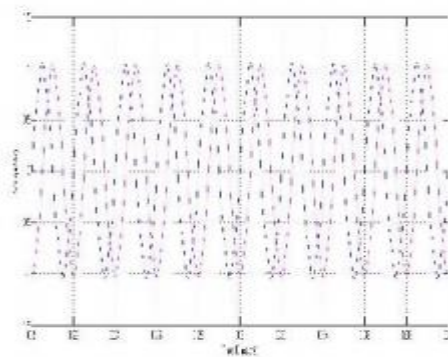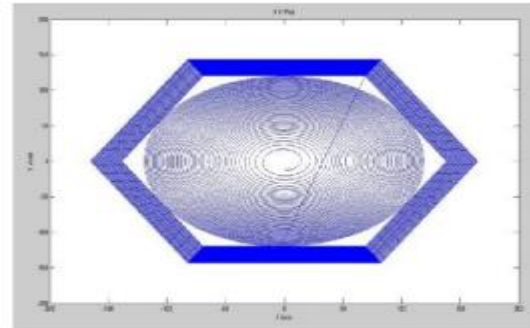CE(k) of values which is normalized by an input scaling factor as shown in table 1.

IV. MATLAB DESIGN AND SIMULINK RESULTS
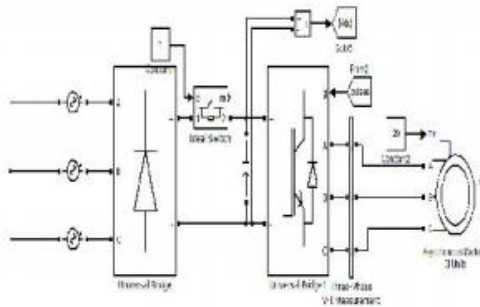
Simulink Block diagram of Fuzzy controller:
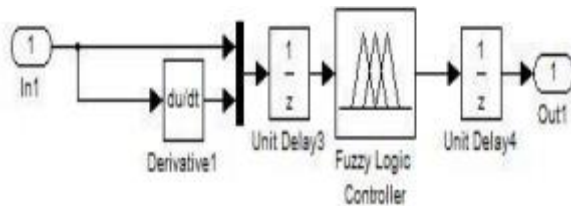
Simulik results based on FUZZY controller:

CONCLUSION

This project addresses the controller design of a position sensor less vector-controlled IM drive system supplied from a small dc-link film capacitor inverter fed by a three-phase diode frontend rectifier. The proposed approach focuses on the controller performance when entering or leaving the infeasible voltage domain. The PI motor-current-regulator-free control structure presents a smooth transition from the MBC under the unconstrained voltage region to

the HVC when the voltage limit is encountered. The analytical solution leads to the dynamic voltage modification at each time step with respect to the available dc-bus voltage. The algorithm can provide adequate results over a number of potential secondary upsets found in the current regulator-based control structure. The operation sensitivity under motor parameter drifts is also examined to decouple its influence using a voltage disturbance state filter. The test results clearly show that the proposed method can improve the inverter reliability without sacrificing the motor control performance. This project improves the output voltage and smoothening wave forms by using fuzzy controller than PI controller .Simulation results verified through MATLAB/SIMULINK environment.

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