Improve performance for Voltage Control of Variable Speed Induction Generator by use PI Controller

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Abstract:- Research work presents clear control structure for complete induction generator (IG) wont to work underneath variable velocities. Fuzzy logic control (FLC) has been created to mechanically fluctuate obligation cycle of PWM gadget such to keep up DC link voltage steady. Predetermined receptive force for variable speed IG is prepared by implies that of PWM gadget and capacitor bank to make up voltage of IG while not need for battery and to scale back rating of PWM gadget with need for under three sensors. This arranged subject has been utilized with effectiveness for variable pace wind or hydro energy change frameworks. Estimations of IG system at various speeds and burdens are given and demonstrate that this arranged system is fit for fine DC voltages regulation. Arranged system has been reproduced exploitation of Matlab/Simulink programming system and checked hypothetical examination.

Keywords: DC Power Applications, Induction Generator (IG), Pulse Width Modulation (PWM) Converter, Voltage Regulation.

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1. INTRODUCTION

Energy is that essential and most all inclusive live of wide range of work by people and nature. Everything that happens inside of world is that statement of stream of energy in by and large its structures energy is vital info in all parts of nation's economy. Standard wellsprings of energy are continuously exhausted. Subsequently, non standard energy sources have developed as potential supply of energy in India and world on loose. Among arranged nontraditional energy sources, wind energy is raising in light of fact that potential significant supply of energy for development. Wind turbine generators (WTGs) are frequently partitioned into 2 fundamental classes: (i) Mounted Velocity and (ii) Variable Pace/Speed. Settled rate generator includes low power of wind era transformation and no capacity tom offer receptive force support. All through past couple of years, variable pace turbines with self excited induction generator (SEIG) predominant wind energy conversion system (WECS). There are numerous purposes behind exploitation of variable rate SEIG based for most part twist turbines; among those are (i) possibilities to scale back burdens of mechanical structure, (ii) acoustic clam our decrease and (iii) likelihood to control dynamic and receptive force. Settled rate generator highlights low strength of wind era transformation and no capacity to deliver receptive force support.

It conjointly forces mechanical weight on turbine and needs propelled pitch control to keep up constant rotor\ speed. All through past couple of years, variable rate wind turbines with self excited induction generator (SEIG) predominant

wind energy conversion system (WECS). There are numerous purposes behind exploitation of variable velocity SEIG based basically twist turbines; among those are (i) conceivable outcomes to scale back stresses of mechanical structure, (ii) acoustic noise reduction and (iii) opportunity to oversee dynamic (active) and responsive (reactive) force.

Induction generator (IG), with its lower support requests and streamlined controls, is by all accounts legit answer for such applications [1]. For its straightforwardness, heartiness and minimal size per created, IG is favored for little hydro and wind force plants. It's decent monetary appeal. Remaining solitary, its most power doesn't go considerable measure of on far side 15kW [2]–[4]. Along these lines, we need to expect regarding range of force gives from minimal (couple of watts) to gigantic (near to 100kW or more). Be that as it may, first disadvantages of IGS are responsive force utilization and poor voltage regulation underneath variable load or pace, however occasion of static force converters has facilitated control of output voltage of IG [5]–[9]. Actuation machine based generally finish power era subject with diode span rectifier and PWM gadget that uses rotor field introduction has been wanted to manage output voltage of diode bridge rectifier [7].

Real downsides of this strategy are that there are not kidding voltage and current harmonics issues; as consequence of output voltage is rectified by implies that of diode bridge rectifier to charge electric battery furthermore rotor field introduction is given to deal with output voltage while not sifting created current sounds. Besides, polarization bend of IG has not been encased inside of arranged system for up

precision in conspiring rotor flux position. This can be right now real certainty that stable grid voltages aren't advertised.

In view of moment reactive power hypothesis, business of electrical condenser bank and inverter in meantime, with none mechanical rate locator inside of induction machine rotor has been arranged [8]. Amid this paper, angles are examined connected with voltage regulation, with fuzzy logic control courses, for voltage supply PWM gadget associated with self energized induction generator in wind, mini/micro hydro energy application. Fuzzy logic based basically voltage controller has been gotten ready for voltage supply PWM gadget to oversee DC link voltage. Fuzzy logic controller is planned to change obligation cycle of PWM gadget mechanically such to keep up load voltage consistent.
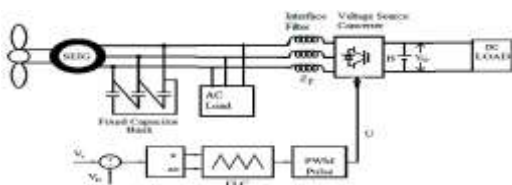

Figure 1.1:- Induction Generator Voltage Control with PWM

Schematic outline of arranged induction generator is demonstrated in fig.1. This arranged IG comprises on standard three phase self excited induction. Generator, wind turbine, mounted capacitor bank, voltage supply PWM gadget, fuzzy logic controller (FLC), AC and DC loads. Self excited induction generator (SEIG) is driven by PM (prime mover). Stator rotation of induction machine is joined with AC burden, to capacitor bank and to voltage supply gadget with DC load. DC burden could likewise be used in applications like cogeneration, battery charging, warming or relationship of those decisions. AC burdens are frequently utilized in option applications, such as pumping water to stores in watering system frameworks. Arranged control method depends on fuzzy logic controller that is advantageous to deal with DC link voltage underneath variable load and velocity condition.

Fuzzy logic controller is proposed to change obligation cycle of PWM gadget mechanically such to keep up load voltage consistent. Capacitor bank and voltage supply gadget offer receptive current needed to energize induction generator. Capacitor bank is utilized to give responsive power and starting stand alone induction generator while not need for electric battery and to scale backs rating of PWM gadget. Output of induction generator is three phases AC supply that is recover into DC exploitation of voltage source converter (VSC) and give to DC load. Voltage over capacitor DC link voltage (Vo) is measured exploitation of

voltage sensor and contrasted and reference voltage (Vr) and error (e) is produced. At point when deferral, change in error (δe) is created. Error and modify in error is given as information to fuzzy logic controller. FLC creates entryway flag that is given to voltage supply gadget for satisfactory IGBT switches. FLC manages output voltage by producing door signal with worthy obligation cycle such voltage over DC burden is looked after steady. This demonstrates self acting component of arranged system.

three phase voltage source convertor exploitation of IGBT force modules. Outputs of induction generator are recovered into DC exploitation of voltage source converter (VSC) and give to DC load. Since gadget DC voltage differs with variety inside of give voltage, to get steady voltage at output terminal, shut circle system fuzzy controller is joined to consequently change obligation cycle of voltage supply gadget to get consistent DC voltage. Obligation cycle (d) is delineated on grounds that proportion of on time to entire time. Entire time is sufficient include of time and off time.

2. PROBLEM STATEMNT

Threshold harmonic distortion are generating by use fuzzy or Dead Beat controller. Energy is that essential and most all inclusive live of wide range of work by people and nature. Everything that happens inside of world is that statement of stream of energy in by and large its structures energy is vital info in all parts of nation's economy. Standard wellsprings of energy are continuously exhausted. Subsequently, non standard energy sources have developed as potential supply of energy in India and world on loose. Among arranged nontraditional energy sources, wind energy is raising in light of fact that potential significant supply of energy for development. Wind turbine generators (WTGs) are frequently partitioned into 2 fundamental classes: (i) Mounted Velocity and (ii) Variable Pace/Speed. Settled rate generator includes low power of wind era transformation and no capacity tom offer receptive force support. All through past couple of years, variable pace turbines with self excited induction generator (SEIG) predominant wind energy conversion system (WECS). There are numerous purposes behind exploitation of variable rate SEIG based for most part twist turbines; among those are (i) possibilities to scale back burdens of mechanical structure, (ii) acoustic clam our decrease and (iii) likelihood to control dynamic and receptive force. Settled rate generator highlights low strength of wind era transformation and no capacity to deliver receptive force support.

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3. PROPOSED METHODOLOGY

We are proposing the PI controlleror improve the performance of the threshold harmonic distortion. The value of the propositional gain is 1 and integration gain is 1.
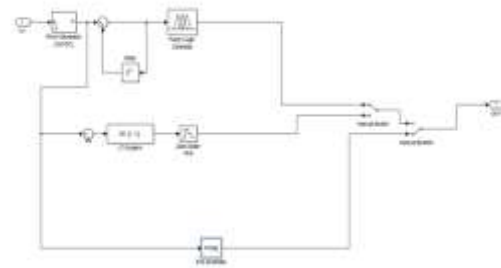

Figure 1.2 :- Maltab Design by PI controller

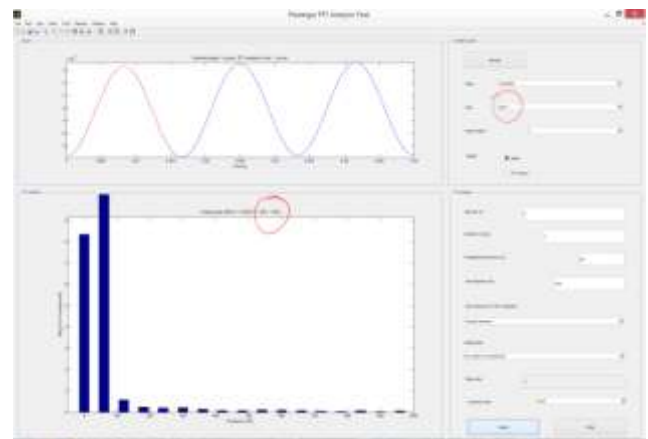### 4. RESULTS

4.1 USING DEAD BEAT CONVERTER

Figure 4.1 THD For Using Dead Beat Converter
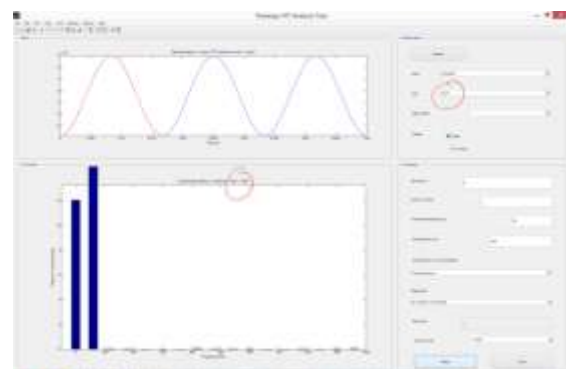

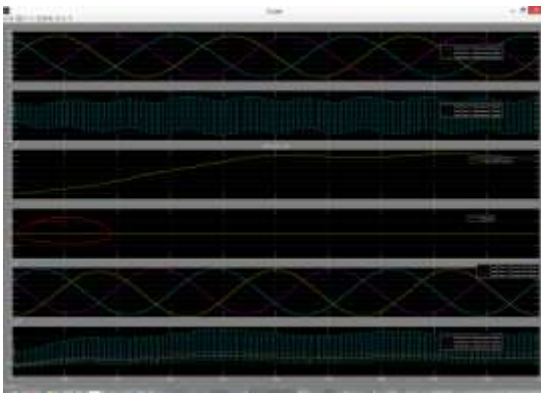Figure 4.2 :- THD Using Fuzzy Logic

Figure 4.3 :- THD Using PI controller

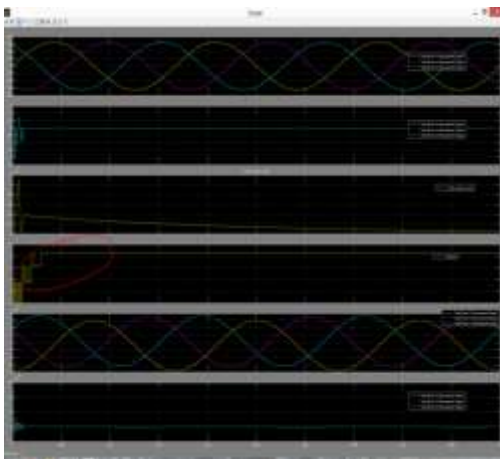Figure 4.4:- Scope results of Dead Beat controller

Figure 4.5:- Scope results of FLC

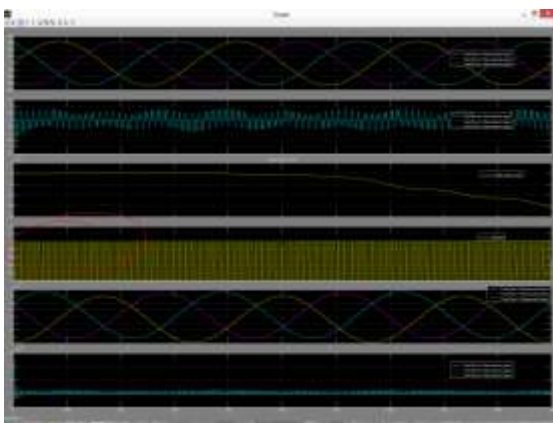Figure 4.6:- Scope results of PI controller

a	THD
Dead Beat controller	1.26%
Fuzzy Logic controller	1.01%
PI Controller	1.00%

TABLE 4.1:- THD controller

5. CONCLUSION

Fuzzy logic controller has been made arrangements for complete IG working with variable velocity and action DC

loads with voltage regulation. Fuzzy logic based basically voltage controller has been anticipated voltage supply PWM gadget to oversee DC link voltage. In order to understand load voltage consistent specific voltage is contrasted and reference most voltage and slip is ascertained, thus reference sign to PWM generator is changed. Numerous impacts of capacitor count on IG system, similar to movement receptive power and starting complete IG while not need for electric battery are incontestable. Henceforth, high system obligation and low system qualities are accomplished. Inside of arranged system administration of SEIG exploitation of fuzzy logic controller is recreated in Matlab/Simulink furthermore reproduction results are contrasted and bum current controller. From correlation, it had been found that SEIG with fuzzy logic controller earned ton of force issue furthermore aggregate consonant mutilations were learned to be less contrasted and miscreant current control. Outcomes demonstrate that fuzzy logic controller based generally SEIG has higher execution that has enhanced consonant profile and system execution and conjointly higher AC & DC voltage regulation are frequently accomplish.

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