# ADAPTIVE OBSERVER-BASED FAULT ESTIMATION FOR DFIG BASED WIND TURBINE SYSTEM

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***ABSTRACT:-*** *This project report studies the problem of fault estimation using adaptive fault diagnosis observer method for a DFIG based wind turbine system. This adaptive fault estimation algorithm is proposed to enhance the rapidity and accuracy performance of fault estimation. Then particular, an electrical fault scenario, the DFTG winding short circuit fault, is considered due to its high occurrence rates. Based on the fault estimation information, a fault compensator is designed based on fault information provided by the fault diagnosis scheme to guarantee the stability of the system, and it incorporates with a traditional controller to provide an online fault compensation of winding short circuit faults. Finally, the implementation of the proposed approach and the results obtained from its application to the DFTG based wind turbine system are presented to illustrate the efficiency of the proposed methodology.*

## 1. INTRODUCTION

All around, active power filters have been controlled utilizing pre tuned controllers, such as PI-type or versatile, for the current and furthermore for the dc-voltage loops. PI controllers must be sorted out based on the proportionate straight model, while farsighted controllers utilize the nonlinear model, which is nearer to genuine working conditions. A correct model gotten utilizing keen controllers enhances the execution of the active power filter, particularly amidst transient working conditions, since it can rapidly look for after the current-reference signal while keeping up an anticipated dc-voltage.

Up to this point, executions of prudent control in power converters have been utilized on an exceptionally essential level in induction engine drives. By prudence of engine drive applications, insightful control tends to an astoundingly typical control scheme that handles multivariable characteristics, reexamines the treatment of dead-time compensations, and stipends pulse-width modulator substitution. However, these sorts of employments present weights identified with developments and weakness delivered utilizing dim load parameters. One favored standpoint of the proposed algorithm is that it fits well in active power filter applications, since the power converter output parameters are outstanding. These output parameters are gotten from the converter output ripple filter and the power system indistinguishable impedance. The converter output ripple filter is a touch of the active power filter structure and the power system impedance is gained from comprehended standard methods. On account of obscure system impedance parameters, an estimation method can be utilized to deduce a correct R–L equivalent impedance model of the system.

This project report shows the mathematical model of the 4L-VSI and the standards of operation of the proposed farsighted control scheme, including the course of action methodology. The total outline of the chosen current reference generator actualized in the active power filter is in like way exhibited. At last, the proposed active power filter and the plentifulness of the related control scheme compensation are exhibited through proliferation and supported with experimental results got in a 2 kVA research center model.

## 2. DOUBLE FED INDUCTION GENERATOR (DFIG)

DVG is an abridgment for the Induction, Induction Generator, a period precepts conventional intended cylinder. It rests on an introduction alternator with multi-stage traumatize rotor and a multi-stage sliding loop set with scrapes to strike rotor curving. It is potential to dodge the multi-phase sliding loop assembly (see Electric Brushless Double Feeding Machines), but licensed are problems with skill, cost, and size. A beat substitute is the dual damage rotor smooth feeding machine.

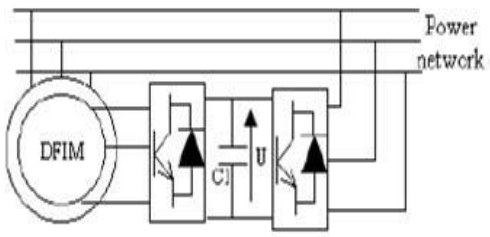


**Fig.1 Double-fed Induction generator**

### 2.1 Principle of a Double Fed Induction Generator Connected To A Wind Turbine:

The direction of DVG is that the rotor curl characterizes to the grid with slip rings and a potential starting point generator from nearest that administers both the rotor and the grid tides. Thus the rotor repeat can change generously from the chain redundancy (50 or 60 Hz). Utilizing the generator to oversee the rotor tides, it is potential to revise the dynamic and working strength bolstering grid of the expert openly of the alternator turn enliven. The oversee statute utilized is one to deal with the waterway double hub correspondence or guide neckline command. The DTK has been changed into a

right cohesion than modern bearing direct essentially when high tides of the dynamo are required.

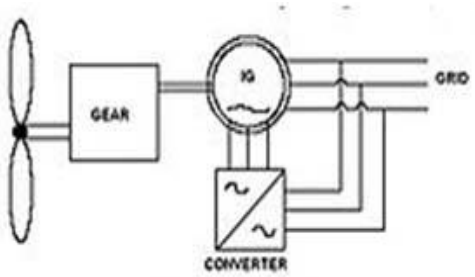


**Fig.2. Principle of DFIG Connected to A WIND TURBINE**

Blended rotors are frequently entrapped 2 to multiple times exchange of turns of the authoritative part. This measure that the rotor heats will outperform and the streams separately cut. Thus in a symbolic ± 30% operational fly float close-by the synchronized enliven, the weighted side of the generator is along these lines diminished float pare cost of the turbine. The shortcoming is that the trek unanticipated the remote performing enliven vary is incomprehensible by the organization of greater examination of rotor potential. Besides, the temporary force by prudence of web disruptions (three-phase and two-phase potential plunges, essentially) will likewise be intensified. I advise with the end goal to dodge the high rotor power - and the high streams generated by the specific heats - from ruining the Magpies and the diodes of the generator, a security lap (christened the juicer) is utilized.

The thick visit part will turn the rotor curl over little scale uncompromising nature when additional streams or heats are distinguished. In ask for extreme capable also the regard when achievable you should utilize an alive grouch. Active Mixer The contracted rotor perhaps separated in an efficient procedure so the rotor side change perhaps in just subsequently 20-60 ms from the episode of the grid eruption. It is so accessible to bring forth a sharp course to the grid at the time whatever remains of the potential drop and so on helps the structure increment from the blunder.

Twofold nourishing inauguration machinery is a heavenly attendant rotor feed encouraging machinery and has numerous points of interest over historic welcome motor upcoming strength applications. To start with, the rotor visit is likewise subservient the power radios chamber, and the inductor oversees both development and transports the relative law. This has intendant sequela for the strength of the solid association and enables the structure to pay the association throughout preposterous power eruptions (low power ride about, leveret).

Second, transcendent the rotor heats and surges empower the inauguration strategy to hover synchronized with the grid time the boost of wind barrel fluctuates. Wind-further wind chamber utilizes a free wind source more wholly than fixed wind diesel, solely in the meantime as little wind encompassing. Thirdly, the expense of the generator is low when as to elective yo-yo fly answers for the reason that just a little scale chunk of the stereotyped strength, commonly 25-30%, is fed to the association about the preacher, et al. is fed to the association honestly from the occupant. The effectiveness of DVG is stunning for a similar reason.

## 3. MATLAB/SIMULATION

MATLAB is a high-execution dialect for technical registering. It incorporates calculation, representation, and programming in a simple to-utilize condition where issues and arrangements are communicated in recognizable mathematical documentation. Commonplace uses incorporate

1. Math and calculation
2. Algorithm advancement
3. Data procurement
4. Modeling, recreation, and prototyping
5. Data examination, exploration, and representation
6. Scientific and designing graphics

MATLAB is an interactive system whose essential information component is a cluster that does not require dimensioning. This permits taking care of numerous technical figuring issues, particularly those with matrix and vector plans, in a small amount of the time it would take to compose a program in a scalar non-interactive dialect such as C or FORTRAN. The MATLAB system comprises of six principle parts:

## 4. REPRODUCTION RESULTS

In this subsection, as an initial step, we expect to examine the behavior of the fault currents (Ifd and Ifq), which has diverse marks for three distinctive fault positions (phase 'a', 'b', or 'c'). Those examination results are urgent to be utilized later for the fault position finding. For that reason, a short circuit fault is brought into stator phase 'a', 'b' and 'c', individually, and for each case the reproductions results are exhibited in Figure.

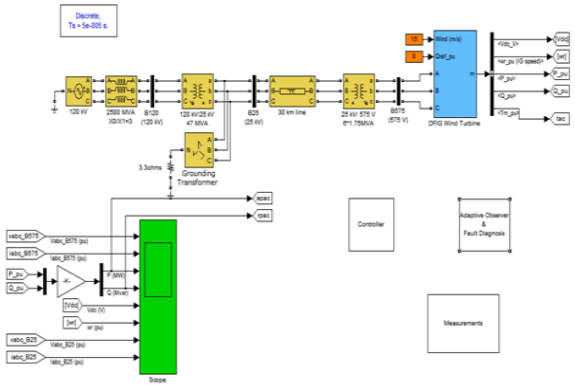

**Fig 3 Simulation Model DFIG Circuit**

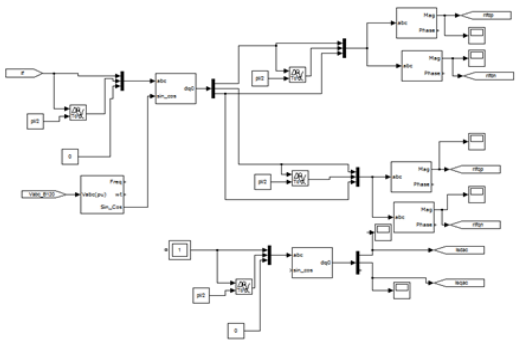

Fig. 4 DFIG Control Scheme

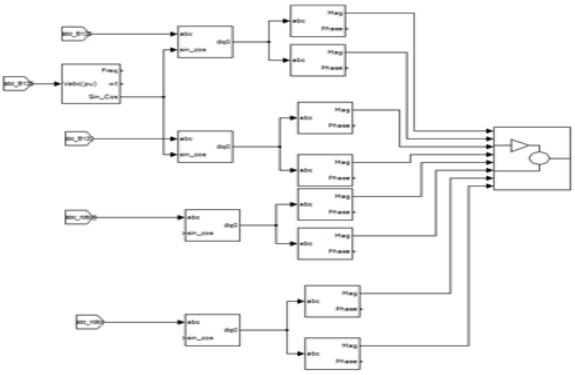

Fig 5 Adaptive Observer

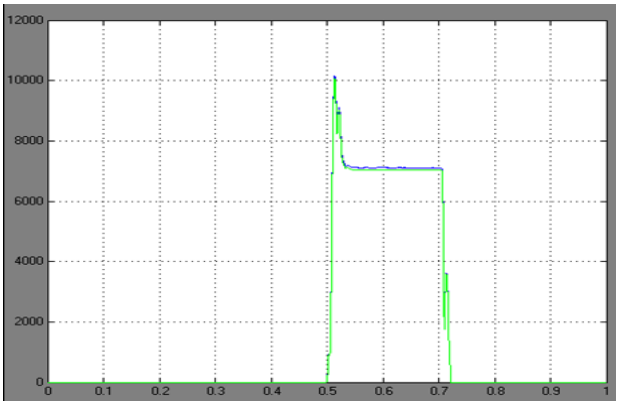


Fig. 6 Simulation Results OUTPUT Voltage

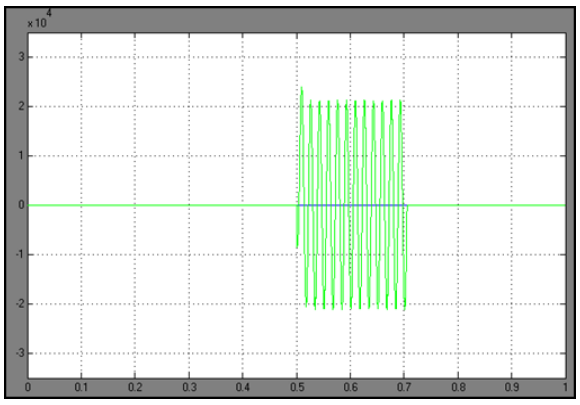


Fig. 7 Simulation Results Ripple Voltage

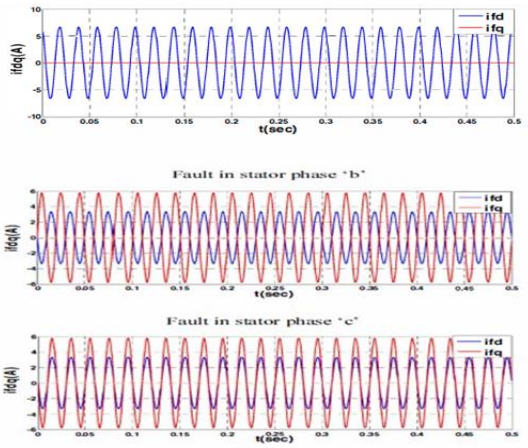


Fig 8 Fault Current $I_{fdq}$ in time domain

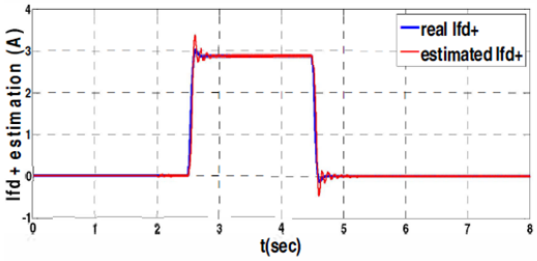


Fig. 9 $I_{fdq}$ estimation using conventional adaptive observer

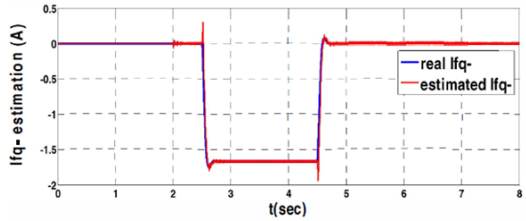


Fig. 10: $I_{fdq}$ - estimation using conventional adaptive observer

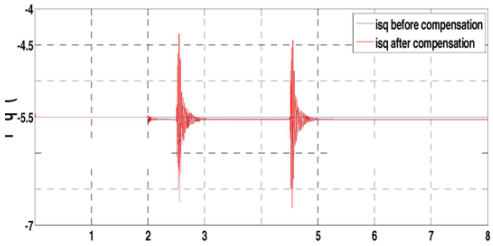


Fig. 11: Stator currents compensation

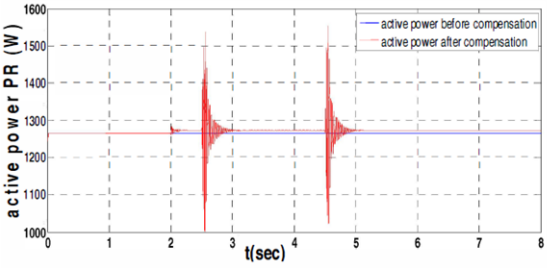


Fig. 12: Active power compensation

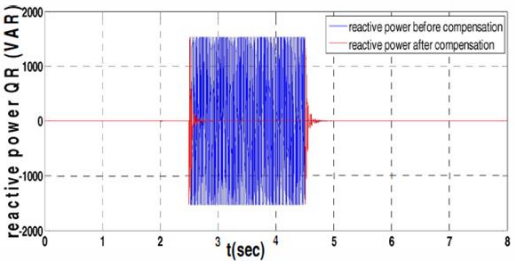


**Fig. 13: Reactive power compensation**

## 5. CONCLUSION

In this paper report, a versatile eyewitness technique for a model-based fault finding was created with the end goal to enhance the dependability of DFIG stator windings short circuit fault within wind turbine systems. Then, an active fault tolerant scheme was synthesized based the fault data given by the fault conclusion scheme. For this reason, a fault compensator was planned, and then used to remedy the current estimations and reference signals. This fault compensator was approved on a shut loop controlled DFIG wind turbine system, and the re-enactment results showed that it can highly lessen the motions in the electromagnetic torque, output power and other output electrical amounts stirred by winding short circuit faults.

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