# APPLICATION OF DYNAMIC VOLTAGE RESTORER IN MICROTURBINE GENERATION SYSTEM FOR VOLTAGE SAG

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**Abstract:**Now a days controlset-up has been undergoing several disturbances in electric power generation, transmission, and distribution. While altering the sudden electric load and higher power transfer in anextensive interconnected linkage leads to serious, security deficiency in power coordinationaction. The Distributedgeneration (DG) has drained aninordinateconsideration in distribution system due to drop in communicationloss, loadallocation property and enlightening the power quality. Amongst the different basis of DG, themicro turbines generation scheme has a best of improving stability of the system, dependability and power superiority.It may cause powerfluctuation effect problems of power quality. To see if it's possible to combine photovoltaics and a high-speed micro turbine. This broadsidedetermines how a micro turbine-based Dynamic Voltage Restorer (DVR) can accomplish power quality problems such as voltage sags and harmonic falsification while still supplying electricity to consumers. During discontinuous loads, the micro turbine and renewable-based DVR will recuperate voltage sags.The hardware (Renewable with DVR) and simulations (Micro turbine with DVR) were performed in Kit demonstration and MATLAB/Simulink to demonstrate the DVR-based proposed strategy's effectiveness in smoothing the distorted voltage due to harmonics

**Keywords:**Micro turbine, permanent magnet synchronous machine, power interfacing circuits, dynamic voltage restorer, photovoltaic system.

## I.INTRODUCTION

Using a micro turbine and renewable operator to maintain a dynamic voltage restorer power efficiency (DVR). A gas turbine with a DC-DC converter with low and high power, series addition transformer, and

semiconductor adjustments are part of the micro turbine and renewable operator integrated DVR organisation. The microturbine scheme generated power used in the extensive range of applications such as base powerload, peaksavingpower, combinedpower and heat etc[Behrooz vahidi et al 2009].The MTG arrangement is a new and dissolute growing equipment and attractive a commercial and expected to developed a govern source of DG in the forthcoming power supply system[Berube G.R and Hajagos.L.M 1998].Tiny, low-power gas turbines with outputs ranging from 25 to 300 kilowatts are known as micro-turbines. [R.R. Patel and D.N. Gaonkar] 2006].To address issues such as voltage sags [Ezoji.H and Sheikholeslami.A 2009] and their extreme impact on sensitive loads, custom power devices, such as dynamic voltage restorers (DVRs), are used in power distribution networks.This problem is effectively minimised by using a micro turbine dependent and Renewable operator power quality improved voltage sag dynamic restorer to inoculate anappropriatedegree of voltage with a suitable level angle.

## II.MICROTURBINE

Micro turbines are designed to last longer and need less maintenance[10][19]. Figure 1 depicts the microturbine model's matlab/Simulink execution, including all of its control organizations. Temperature control, fuel control, turbine dynamics, and speed governor and acceleration system blocks are all included in the model.A speed controller is the droop ruler with a straight proportional output proportional to the speed error. A PID controller's lead lag transfer feature is commonly used to model speed control.The temperature mechanism is a popular process of gas restriction production at a rescheduled time dismissal temperature, self-governing of temperature or fuel characteristics differences.In general, a micro turbine is made up of a single shaft turbine for its management structure, a high-speed PMSM generator, and a interfacing of power electronics circuit as a power converter[17][18].

Micro turbines are divided into two categories.The compressor and turbine are connected to the electrical alternator by the same shaft in this high-speed single-shaft part. Turbine speeds usually vary from 50,000 to 1,20,000 revolutions per minute. A split-shaft micro turbine is a type of micro turbinethat combines a

3600 rpm turbines of energy with a traditional generator through a gearbox [12].

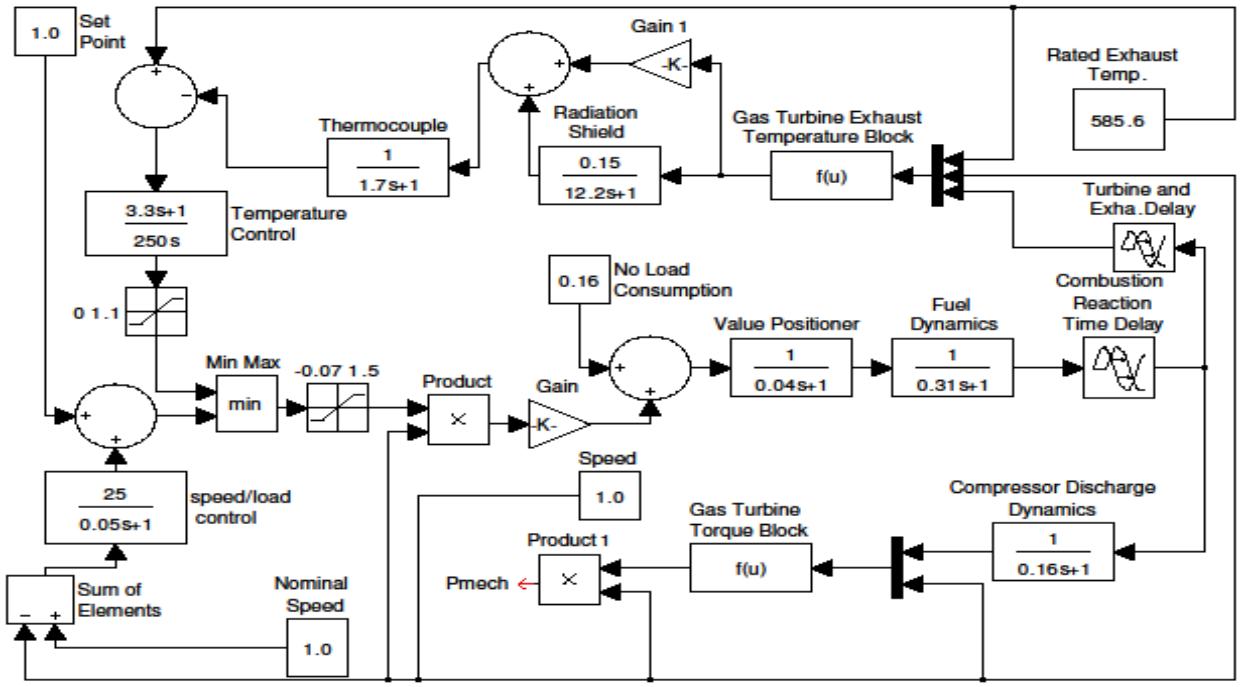


Figure1.Simulation diagram of Micro turbine

The micro turbine developed distributed generation arrangements are the most significant solicitations of permanent magnet synchronous machines.

## III.RESTORER OF DYNAMIC VOLTAGE

A restorer of dynamic voltage is a new solid-state device that injects voltage into a system through a series link to normalize the load voltage. The DVR comes with a control and safety system, as well as an injection/booster transformer, harmonic filter, voltage source converter, PV (dc charging circuit), and an injection/booster transformer.Figure 2 depicts a simulation diagram for a micro turbine with DVR.

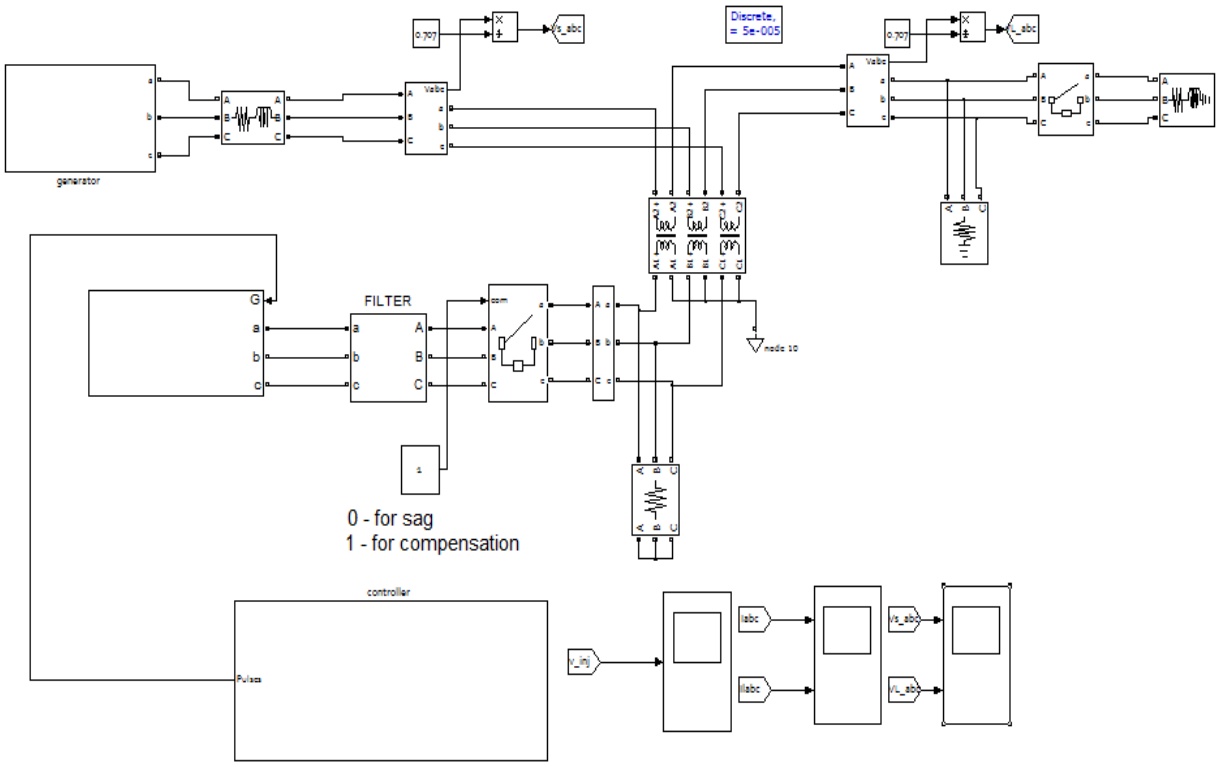


Figure 2: Restorer of Dynamic Voltage Simulation Diagram.

The injection/booster transformer is a customized transformer that associates the DVR to the network through HV-windings and transformers, combining the infusion rewarding voltage provided by voltage source converters with the entering supply voltage. The addition transformer, also known as a booster transformer, isolates loads in aggregation [16].

A harmonic filter's primary purpose is to retain the harmonic voltage continual given by voltage source converters at a comfortable level [9]. Its uses storage and switching devices to produce a sinusoidal voltage of any frequency, magnitude, or phase angle.A dc link's function in storage devices is to supply the VSC with the energy it needs to generate inserted voltages. [8].

Renewable operators with dynamic voltage restorers and grid-connected photovoltaic systems both showed uncontrollable characteristics. The co-ordination is calculated as a negative load in the grid. To alleviate these issues, a storage organization that allows for energy management must be integrated.In a

standalone device, the micro turbine adjusts the distinction between solar energy and loads, eliminating the need for energy storage coordination. The grid will classify this device as a small power plant, not only as a source of harmful energy, in a grid-connected organism with well-managed electricity.All PV power variations are practically rewarded by the MTG. However, in the case of delicate loads, it is important to minimise quick power fluctuations. The app can be used to carry out all of the DVR's protective functions[11].

The DVR's primary role is to use a booster transformer to insertwith dynamism regulated voltage produced by a converter with forced commutation in series with the bus voltage.This ensures that any voltage variations caused by ac feeder transiting instabilities are balanced by a voltage of equal magnitude supplied by the converter and inserted on the basis of medium voltage at the boost transformer's termination. There are two ways to use a DVR. The converter shorts the low voltage winding of the booster transformer in standby mode (VDVR=0)[10]. The DVR injects a reimbursementfinished the booster transformer voltage in the boost method (VDVR>0) when a supply voltage disturbance is detected[14][15].

A predictable DVR power rating, various load circumstances, and altered forms of voltage sag are all factors that influence whether or not voltage sag would be compensated. When it comes to phase angle jump, some loads are more penetrating than others. A series transformer attaches a DVR to the coordination and can deliver up to 50% of the step-to-ground interface voltage. [13].

## IV.Results and discussion

Simulation results from MATLAB/SimulinkDVR to compensate for load voltage with hysteresis voltage regulation confirm the anticipated process. Figure 2 shows a simulink example used to validate the presentation of the DVR using unipolar and psychotic switching methods to manipulate the DVR. In this case, as shown in fig.3, there is a 30% three-phase voltage drop with a +30 phase jump in supply voltage phase –a that starts at 0.5 s and lasts until 1 s. The DVR is applied [7] with test cooperation and tested

without and with DVR.A voltage source that can be programmed is recycled to provide a distorted voltage with 3rd harmonic material first, and then 5th harmonic supplement in the supply voltage. Figure 4 shows the effect of voltage sag correction for HB1=0.005 using hysteresis voltage control with bipolar switching.The serial injected voltage components are shown in Figure 5. As shown by the outcomes, the DVR is capable of harvesting the appropriate voltage constituents for various phases and assisting in the conservation of a balanced and continuous load voltage at the nominal value. The simulation results demonstrated that the suggested DVR is capable of qualifying voltage sag in a grid organisation.The proposed DVR-based system strategy was effective in compensating for voltage distortion in the load and in maintaining a more stable and less harmonic content and a smooth voltage profile.A voltage supply can be injected by the DVR, and the required voltage constituent can be injected to maintain the load voltage normal and steady at the optimum range.

Fig.3. Hardware Implementation of Renewable operator power quality improved voltage sag.

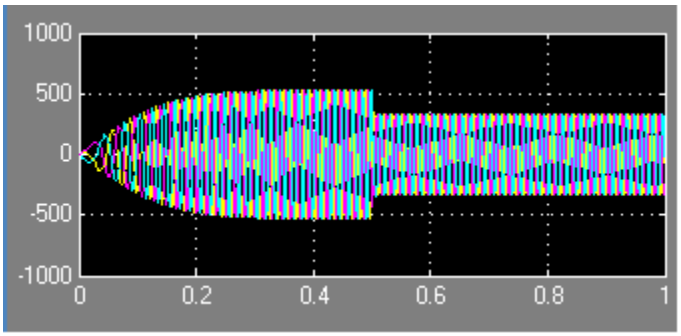

Figure 4 shows the output voltage with a sag (without DVR)

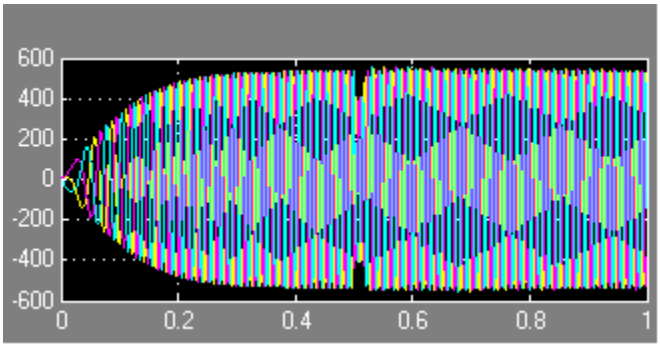


Figure 5: The DVR's Output Voltage

## V.CONCLUSION

DVR is suggested as the most important scheme for improving power efficiency, and it has proven to be a valuable and effective scheme. The assembly and demonstration of the regulator a system and power coordination together with a responsive load is provided by the hardware (Renewable with DVR) and simulations (Micro turbine with DVR) platform of MATLAB/Simulink of DVR with a power path.Fast acting hardware (renewable with DVR) and dynamic voltage restorer, a micro turbine are included in the proposed effort (DVR). The DVR is capable of moderating the voltage dropsin the network caused by atypical load conditions.This voltage sag results in a decreased voltage as well as a due to the irregular load, the waveform of falsification has changed. Bothof these issues are simulated for 0.5 to 1 second.It is possible to remove it by inserting a suitable magnitude of voltage with a suitable phase angle while consuming the developed micro turbine and voltage sag dynamic restorer.

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