Power Quality Control of Voltage and Load Sharing In DC Distribution Systems with Three Phase AC Machines

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Abstract— **In this report involves the excellent regulating methods of voltage droop characteristics based on load sharing concept for multiple DC sources. The input is given to the two dc sources are 800V, 800V and by using direct current to direct current converters. The voltage values are stepped down to 364V by using PID controller the voltage is constant at the load side. The two converters of the bus voltages are shared by the ratio of -1/100 and -1/150. By using inverter DC voltages are converted into AC voltages that inverter voltage is given to the asynchronous motor and a Permanent Magnet Synchronous motor.**

This thesis involves the regulating methods of voltage droop qualities as a possible source of load sharing control problem for two direct current converters and also observes the direct current bus converter powers and extend to design and simulation. The direct current bus voltage is fed to the 3-phase asynchronous motor as well as permanent magnet synchronous motor. An Induction motor as well as, permanent magnet synchronous motor characteristics, are also shown in Matlab Simulink.

Index Terms—**Buck converter, Induction motor, Load sharing, Micro grid topology, and PMSM.**

I.INTRODUCTION

A micro-grid is illustrated to be ensuring technology to obtain effective as well as successful energy in an electrical program for the allocated formation such as alternative power options like as breeze, photovoltaic etc. A-direct current lines are having a number of attached places running in parallel,/ and provides the ability to the direct current coach as well as loads. Renewable energy sources are attached by means of a direct current bus by means of direct current to direct current ripper like as a Buck converter[1]. Here in this document using a direct current to direct current ripper for the goal of reducing the voltage. The decreasing voltage is given to the direct current bus and the voltage is shared by the two rippers at the load side. Sagging is taking place so that the voltage is not continuous at load side, we notice sagging features of bus voltage and power converters to address this problem a PID controller is connected to the load side and observe the sagging features of the bus voltages and power converters. A Direct current to direct current rippers will be given as a technique to make multiple volt resources from a specific direct current supply voltage to supply the different divisions in the solution. This strategy is useful for to generating several voltage sources from an individual electrical battery power supply will decrease the product place Considerably [3] .

In direct current to direct current converters we are using as a buck converter. The Buck converter is used to decrease the input voltage from higher voltage values to a lower voltage value. The input and output power values are same. In buck converter circuit the PID controller is used to improve the performance and measurement by choosing suitable changing frequency[5]. The circuit usually consists of an inductor to store the energy and modify to managing the power flow. Sagging occurs when the linear operating range of a compensator with given the highest possible capacitive and inductive rating. The Regulation drop means that the terminal voltage is allowed to be less than the no-load voltage at full load capacitive compensation and it's permitted to be greater than the nominal voltage at full load inductive compensation [6]. PID remotes are discovered in a broad variety of programmers for commercial functions. PID looks for Proportional- Integral- Derivative control. These three remotes are mixed in ihren a way that it generates a command indication. As a feedback controller, PID provides the results are at the preferred value due to the overall versatility and stability of the remotes.

In this paper, the direct current bus voltage is transformed into alternating current bus voltage by using an inverter, which converts fixed direct current voltage to variable alternating current voltage. This adjustable AC voltage is explored to run the induction motor and PMSM. This document represents the acting and simulation of voltage drooping characteristics for with and without PID controller and which are connected at the load side and also simulated the motor characteristics.

An asynchronous motor is a variety of asynchronous AC motor and the principle of an induction motor is based on electromagnetic induction. An induction motor the type of rotor is based on the rotor design. Basically induction motor is a self- starting device because the energy is provided to the armature instantly from a direct current supply. In some cases, an asynchronous motor is also called as a rotating transformer. Induction motors are frequently used in domestic and industrial applications.

PMSM (Permanent Permanent magnetic Synchronous Motor) is much utilized in commercial programs, equipment for the home and software system due to the best quality, great twisting and great management performance.

In order to get an excellent twisting management performance, many techniques are examined. Among the various management techniques, SVPWM (Space Vector Beat Size Modulation) with PI current operator is commonly used for twisting management over PMSM due to a great management performance. A PMSM uses permanent heat included in metal blades to create a continuing magnetic area. The stator provides windings linked with an ac supply to generate a Rotating Magnetic Field (RMF)

A permanent magnetic synchronous engine (PMSM) is an engine that uses long-lasting heat to generate the air difference permanent magnetic area instead of using electromagnets. These engines have significant benefits, gaining the awareness of scientists and a market using in many programs. Two options of permanent magnetic synchronous engine pushes are usually considered based upon on the back-EMF waveform: sinusoidal kind and trapezoidal kind. Then different management techniques (and management hardware) are applied. In this paper, a manager for the sinusoidal PMS engine is described.

II.ACTUAL CONCEPT

The actual concept of a 48V direct currents bus voltage having two direct current to direct current converters working in similar is regarded. The output of direct current to direct current converter voltages can be monitored by handling the work pattern of PWM converters, so these, to be included drop features in a direct current to direct current converter; an obvious decrease in duty cycle is created with improvements in power. Slopes of decreasing characteristics of converter1 & converter2 are fixed to be -1/50 & -1/100 respectively to reaches the load sharing is ratio is 1:2. Further the recommendations to the continuous voltage handling system as 48V. The control system and converters are simulated in Matlab/ Simulink. Hence the reactions of the management of the programme to the load variations are analyzed. PID controller benefits are updated to improve the result of the system.

A.Buck converter design

Basically buck ripper is made up of a Mosfet, an inductor, diode, and a capacitor to separate out the output values. The buck ripper is always operating with the arranged by the regularity method. The converter is created to improve the dimension and efficiency by selecting the suitable changing regularities. An inductor value is measured so these are operating with always an ongoing method. Also for the little heap is present as well as to reduce the present swell content in the outcome.

Following equations are used to find the values of an inductor and a capacitor.

$L\,mean = ((Vin(min) - V\,out) * D\,max)/(\Delta IL * f)$

$C\,mean = 1/(8 * f *$ $V\,out/\ \ IL - R\,c)$

Where,

$V\,in(min)$=minimum input voltage

V out=output voltage

IL=inductor ripple current

D max=maximum duty cycle

$R\,c$=Equivalent series resistance of capacitor

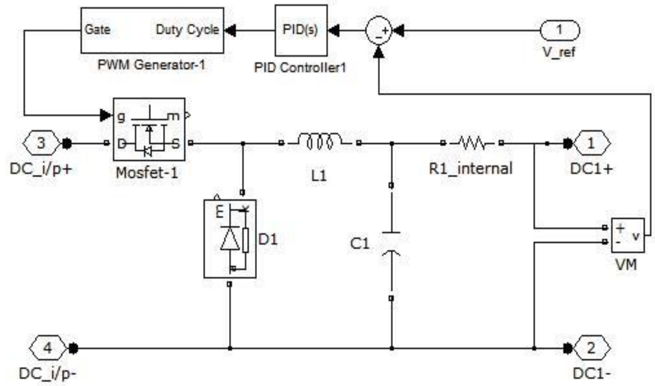


Fig. a: Block diagram for direct current to direct current converter

III.RESULTS

A .Load sharing and voltage drooping for without PID controller

The two converters are talks about the load sharing between the ratios of 1:2. The dc bus explains the short-term fluctuations in power from converter due to the unexpected changes in the load. Therefore the load sharing ratio is same even after the load is changed. In this situation, the dc bus volts are not continuous so that voltage values are decreasing as the voltage value is absent. The outcomes in the dc bus volts are displaying a drop of 0.5V from 48V to 47.5V.

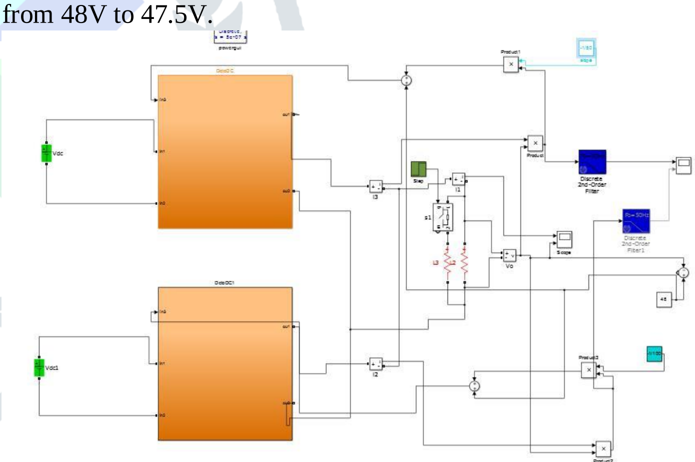
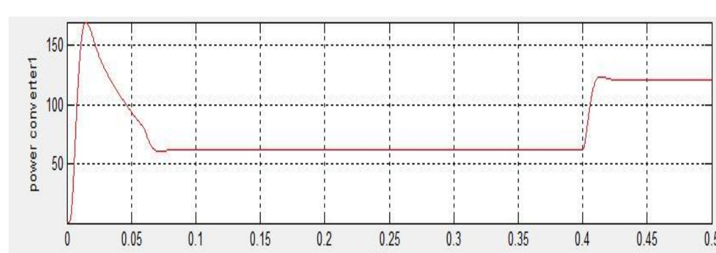


Fig1. Simulink diagram for without PID controller



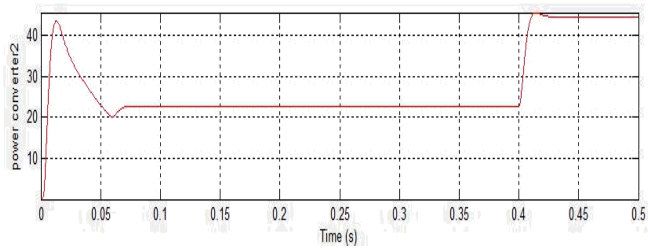


Fig2. Converter power for without PID or load sharing between the converters without PID

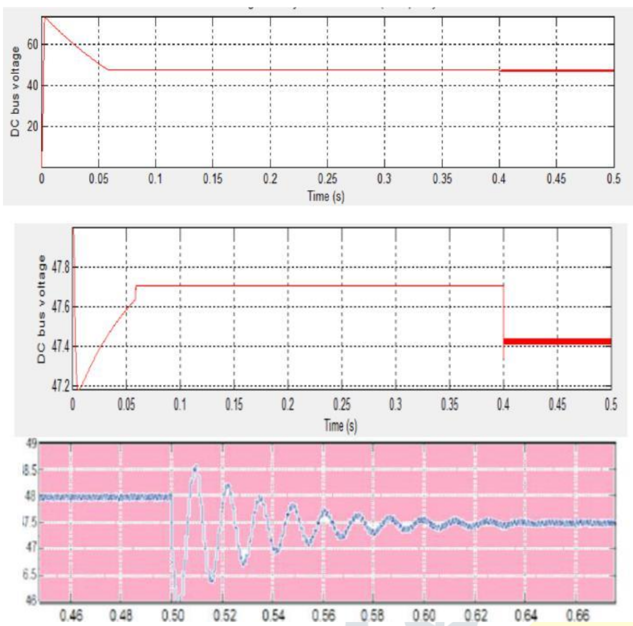


Fig3. Dc bus voltages for without PID

B .Load sharing and voltage drooping for with PID controllers

In this situation, the decreasing voltage is managed by using a PID controller at the load side. The PID controller is utilized to reduce the drooping and maintaining at the constant volts are at 48V on dc coach even the load changes but the load sharing ratio is always the same.

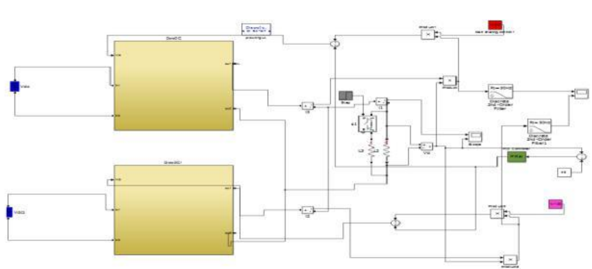
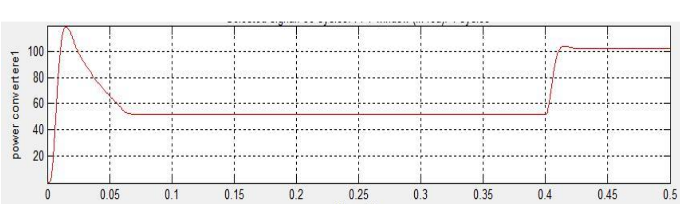


Fig4. Simulink diagram for with PID controller



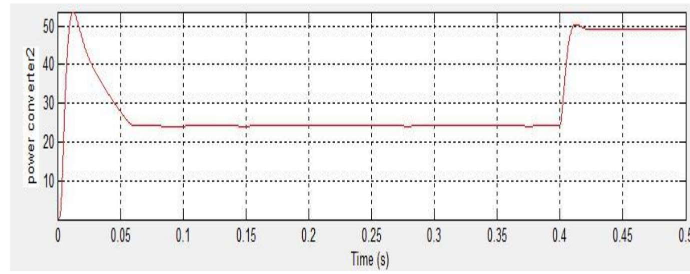


Fig5. Converter power for with PID or load sharing between the converters with PID

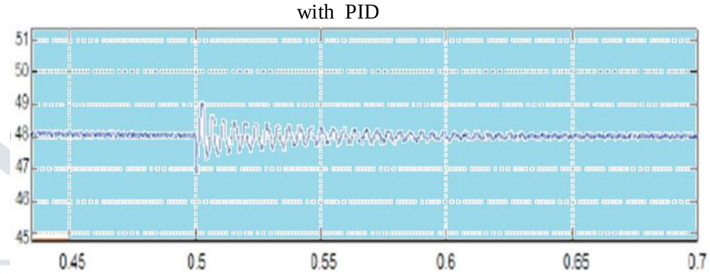


Fig6. Dc bus voltages for with PID

IV.PROPOSED STRATEGY

In this paper, a 364V direct currents bus voltage is obtaining of two direct current to direct current converters operating in simultaneous as well as considered by modeling a PWM converter the output voltage is managed. Therefore to be including sag features in direct current to direct current converter an obvious reduction in the responsibility pattern is arranged with the increase in power. The inclines of the converter 1& converter 2 are fixed to be -1/100 & -1/150 respectively to reaches the load giving the ratio of 1:2 and further the constant voltage regulation method is set to be 364V. Therefore the direct current bus voltage is converted ac voltage and that ac voltage is given to the induction motor and PMSM and motor characteristics and drooping characteristics are also observed.

V.RESULTS

A. Load sharing and drooping for without PID controller and with an induction motor

The ratio of load sharing between the two converters is 1:2 and the drooping has occurred in the voltage. The results in the drooping voltage show decreasing of 184V from 364V to 180V and also the motor characteristics are observed.

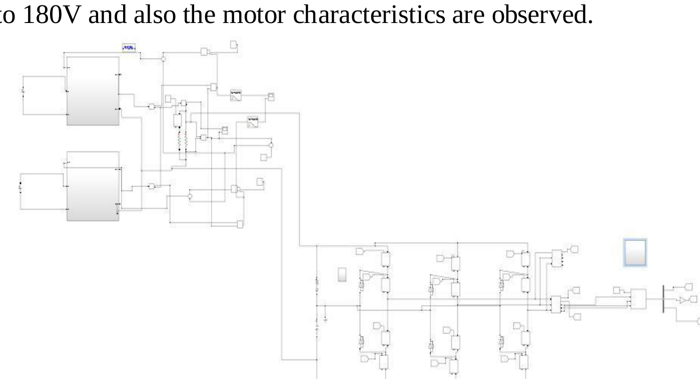
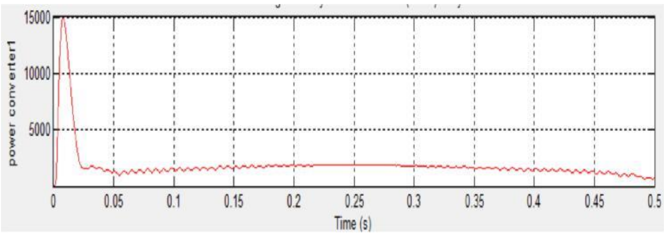


Fig7. Simulink diagram for voltage drooping characteristics for without PID



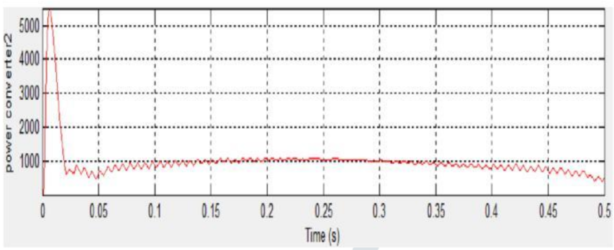


Fig8. Converter powers for without PID

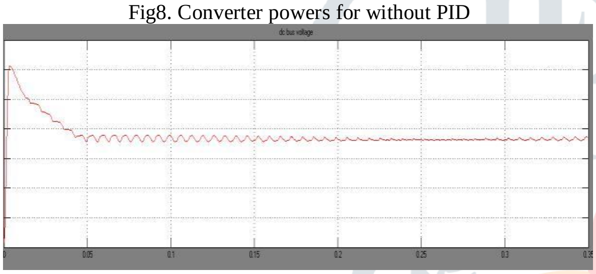
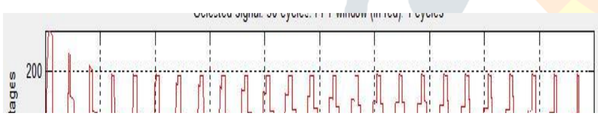
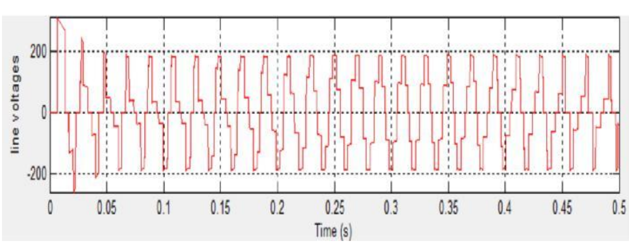


Fig9. Dc bus voltage for without PID





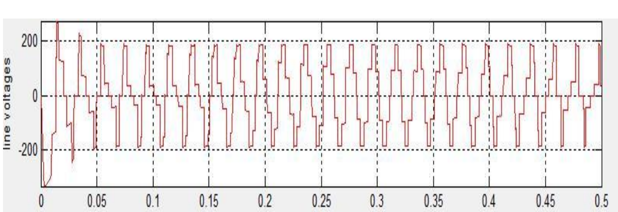
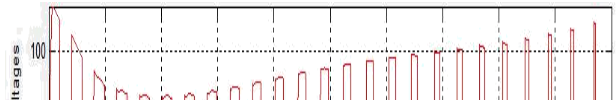


Fig10. Three-phase line voltages without PID



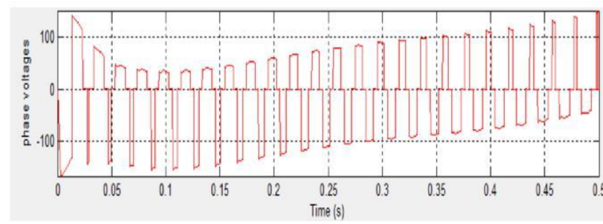


Fig11. Three-phase phase voltages without PID

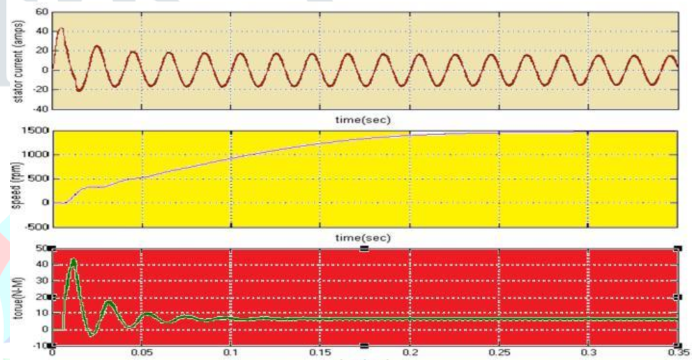


Fig12. Induction motor characteristics for without PID

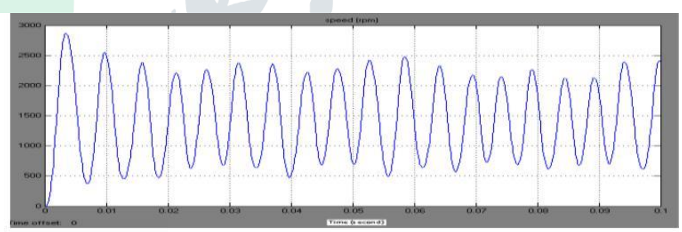


Fig13. PMSM characteristics for without PID

A. Load sharing and drooping for with PID controller and with an induction motor

In this case, the volts are managed by a PID controller. This controller is used to decreasing the voltage and managing a equal voltage at 364V. Load sharing ratio is the same.

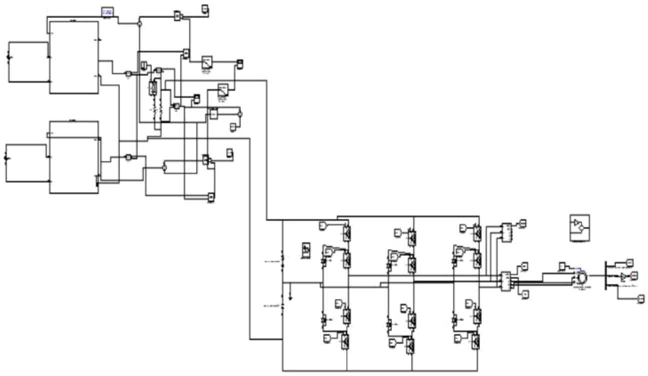


Fig14. Simulink diagram for voltage drooping characteristics for with PID

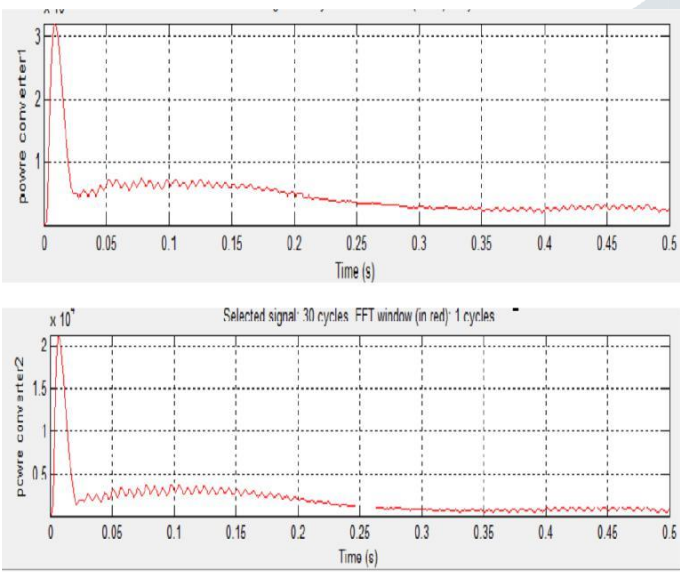


Fig15. Converter powers for with PID

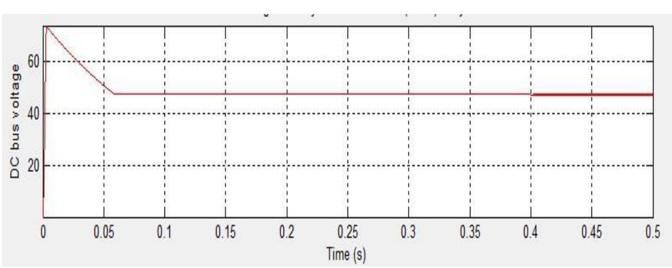
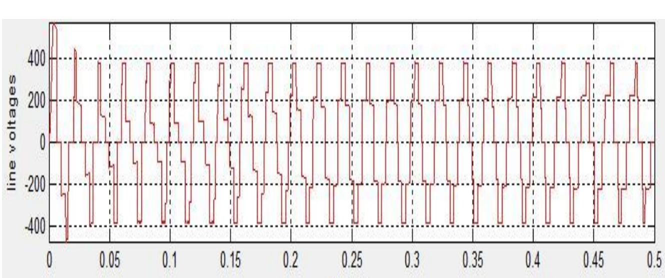


Fig16. Dc bus voltage for with PID



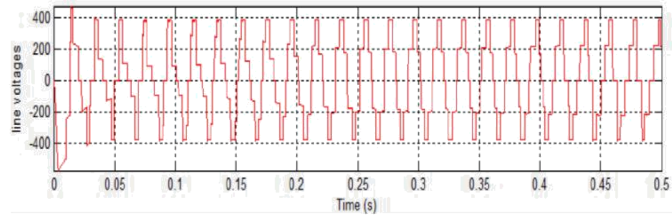


Fig17. Three-phase line voltages with PID

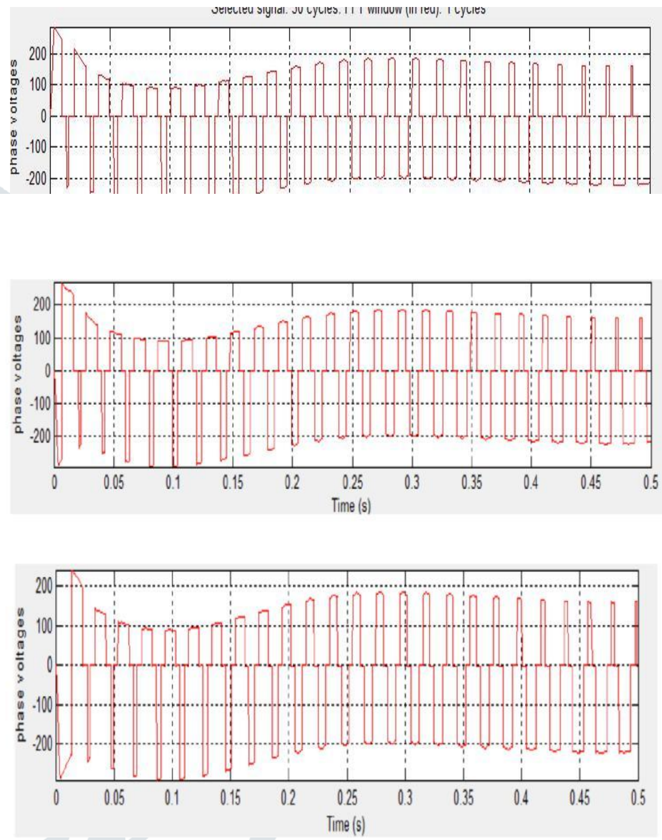


Fig18. Three-phase phase voltages with PID

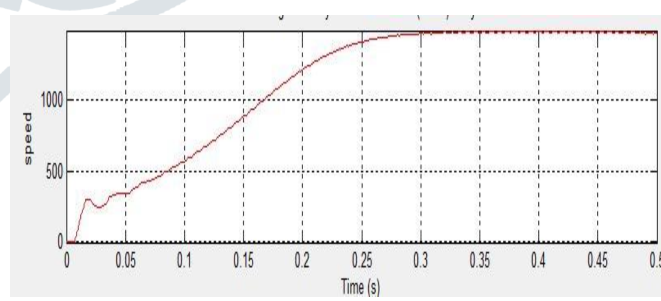


Fig19. Speed characteristics for an induction motor with PID

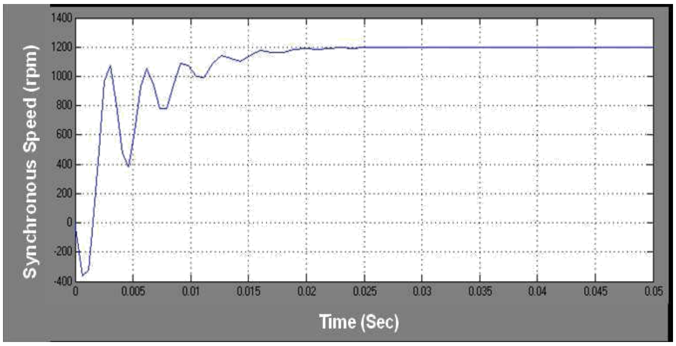


Fig20. PMSM characteristics for with PID

VI. Conclusion

This document presents a power quality control of voltage and Load Sharing in DC Distribution Systems with Three Phase Ac Machines. By handling the voltage axis identifying of sag features, continuous direct current coach volts will be recollected under any running situations. A temporary reaction of control system can be enhanced by adjusting benefits of PID compensator or by replacing it with a superior modern control process.

VII. Future Scope

This system is designed to maintain a power quality improve the power-sharing issues. This will be increased to the other types of motors for various alternative energy sources and also extended to a fuzzy logic controller.

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