

Fuzzy Controller for Customer Driven Grid

Suryateja V¹, Sushma N², Shivakumar Rathod³, Shailesh Kumar Yadav⁴

**Under the Guidance of
K RAMYA, MTech., (PhD)
Assistant Professor, Department of EEE
Sri SaiRam College of Engineering, Bangalore**

ABSTRACT

This research analysis proposes the effective digital manipulate and safety of power electronics interfaced structures to compensate the reactive electricity in Transmission machine and allotted technology gadget for better energy aspect and improved average gadget efficiency in a purchaser-pushed grid (CDG). The designed system is interfaced among the voltage supply converter and the utility grid. The Interfaced strength electronic device must be synchronized with the software grid to ensure 1) Stabilization in grid 2) To inject or to soak up the excessive first-class reactive strength to or from the utility grid as a way to hold cohesion power factor three) high typical gadget performance. To gain the above constraints the fuzzy based virtual manage pulse width modulation approach is hired to reap fast dynamic response and higher way of making use of the DC link voltage. In the proposed paintings the hysteresis modern-day manipulates of PWM – VSC, Fuzzy based SVPWM Controller is carried out. The linguistic description is used to design the modern repayment scheme that allows you to enhance the overall performance of grid related voltage source converter device. Modeling, Simulation and experimental outcomes are completed in MATLAB/SIMULINK to confirm the overall performance of the controller.

Keywords: Fuzzy Controller, PWM – VSC, SVPWM Controller, Utility grid, Current Compensation, Customer driven grid.

INTRODUCTION

The demand for electrical strength is growing exponentially due to increase in population and global industrialization. To reduce down the energy disaster hybrid grid is a possible option because of its environmental friendliness, low cost and smooth availability. To beautify the operation of

the grid it has to integrated and synchronized with the primary software grid[1]. In most of the instances the modern controlled PWM in voltage source converter is utilized to healthy the characteristics of distribution era system.

The Voltage source Converters operating on particular fuzzy managed direct vector control approach carry out impartial manage of active/reactive power at each ends. This skill of VSC makes it appropriate for linking to vulnerable AC networks without making use of any nearby voltage resources. For energy reversal, the DC voltage polarity remains the equal for VSC based totally transmission machine and the strength transfer relies upon best on the route of the DC contemporary.

To inject or to absorb the high first-class reactive strength to or from the utility grid the switching pulse to the converter circuit is controlled by way of current controlled PWM technique. the fuzzy based totally SVPWM method is designed as an impartial manipulate shape.

SVPWM switching technique has many execs as it can be operated at very high consistent switching frequency, optimum switching sample, well described harmonic spectrum and incredible DC link bus usage. SVPWM Controller in a grid connected voltage source converter is comprised with lattice harmonics, non-linearity in the shape and deficiency of innate over present day fortification.

In huge-spectrum the PI Controller is used to layout the modern manage scheme in SVPWM primarily based Voltage supply converter which leads to poor overall performance as the controller is hard to design linear mathematical version below parameter variations, Non linearity and load variations [2]. The fuzzy based totally SVPWM Controller is intended based on linguistic depiction which does now not contain any mathematical archetypal of the structure. The fuzzy set concept

may be used to archetypal convinced herbal uncertainties of the plant and manipulate variables. However this method is failed inside the valuable method of power transfiguration sandwiched between supply and cargo in a huge variety of electric power conversion programs [3][4]. The evaluation of an Z-supply Voltage source converter controlled by way of Fuzzy primarily based contemporary Controller is delivered to overcome the trouble related to SVPWM PI Controller and Fuzzy Controller in grid related inverter or converter.

Fuzzy Logic Control for Current Error Compensation

To conquer the negative components of SVPWM linear controller, Fuzzy logic SVPWM Controller is implemented in grid linked VSC. As proven in fig.1 the contemporary and current mistakes are the 2 inputs to fuzzy good judgment controller. the fuzzy cutting-edge repayment controller analyze the analog present day enter in phrases of logical values whose range of universe of discourse is +1 and -1 for enter and output variables. The contemporary normalized enter and the world output is designated with triangular club function. IF – THAN rule is favored to frame a Rule based totally gadget. Fig.3 suggests the manipulate surface for the modern-day reimbursement in grid shape. The row in every grid corresponds to the rule of thumb famed for cutting-edge normalized enter and quarter output in a rule based totally gadget.

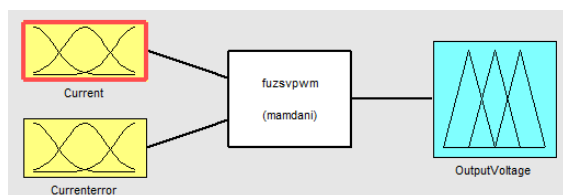


Fig.1. Fuzzy Logic Controller

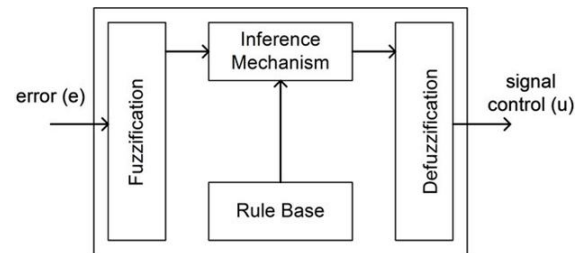


Fig.2 Bloc k Diagram of Fuzzy Logic Controller

Table.1. Converter Switching sequence

Sector	Switching Sequence of VSC
1.	$V_0 - V_1 - V_2 - V_7 - V_2 - V_1 - V_0$
2.	$V_0 - V_2 - V_2 - V_7 - V_2 - V_3 - V_0$
3.	$V_0 - V_3 - V_4 - V_7 - V_4 - V_3 - V_0$
4.	$V_0 - V_5 - V_4 - V_7 - V_4 - V_5 - V_0$
5.	$V_0 - V_5 - V_6 - V_7 - V_6 - V_5 - V_0$
6.	$V_0 - V_1 - V_6 - V_7 - V_6 - V_1 - V_0$

Table.2. Rule Base for Fuzzy Logic Controller

Err/Err. Comp.	NB	NM	NS	Z	PS	PM	PB
NB	NB	NB	NB	NB	NM	NS	Z
NM	NB	NB	NB	NM	NS	Z	PS
NS	NB	NB	NM	NS	Z	PS	PM
Z	NB	NM	NS	Z	PS	PM	PB
PS	NM	NS	Z	PS	PM	PB	PB
PB	NS	Z	PS	PM	PB	PB	PB
PM	Z	PS	PM	PB	PB	PB	PB

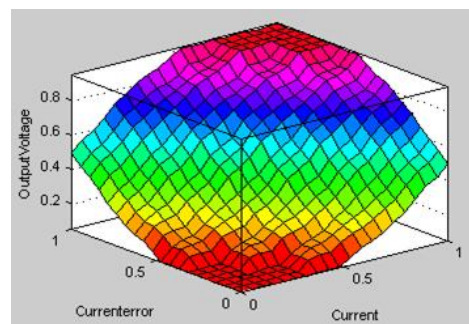


Fig.3. Control Surface for Current Compensation

Conclusion

The Fuzzy based Controller designed in this paper for customer driven grid presents splendid output performance, optimized performance and high

Copyright © 2019Authors

reliability. The Dynamic reaction of the system is found to be maximum under transient circumstance. The DC bus utilization is extended by 15% alongside less harmonic distortion when in comparison to the traditional PWM method. This increases the whole strength first-class of the gadget. With the usage of SVPWM switching the peak switch modern at the time of switching is reduced and therefore losses in the switch is decreased. Therefore disturbance on the converter controls is much less and for this reason the perceptible noise also can be prejudiced and therefore it can be minimized.

REFERENCES

- [1]. Yadav, A.; Srivastava, L. “ Optimal placement of distributed generation: An overview and key issues” International Conference on Power, Signals, Controls and Computation (EPSCICON), 8 – 10 January 2014
- [2]. Judewicz, M.G.; Fischer, J.R.; Herran, M.A.; Gonzalez, S.A.; Carrica, D.O. “A Robust Model Predictive Control For Grid-Connected Voltage-Source Inverters” IEEE Latin America Transactions, Vol. 11, No. 1, Feb. 2013
- [3]. Satyaranjan Jena, B.ChittiBabu, Amiya Kumar Naik, D. Neeraja, “ Fuzzy Logic Based SVPWM Current Controller for inverter interfaced distributed generation system” 2011 International Conference on
- [4]. Yam P. Siwakoti, F. Z. Peng, F. Blaabjerg, P. C. Loh, G. E. Town and S. Yang “ Impedance Source Network for Electric Power Conversion — Part II: Review of Control and Modulation Techniques” IEEE Trans. on Power Electron., vol. 30, no. 4, pp. 1887–1905, Apr. 2015.
- [5]. Pavan Kumar, A.V.; Parimi, A.M.; Rao, K.U. “Implementation of MPPT control using fuzzy logic in solar-wind hybrid power system “Signal Processing, Informatics, Communication and Energy Systems (SPICES), 2015 IEEE International Conference on Pages: 1 - 5, DOI: 10.1109/SPICES.2015.7091364