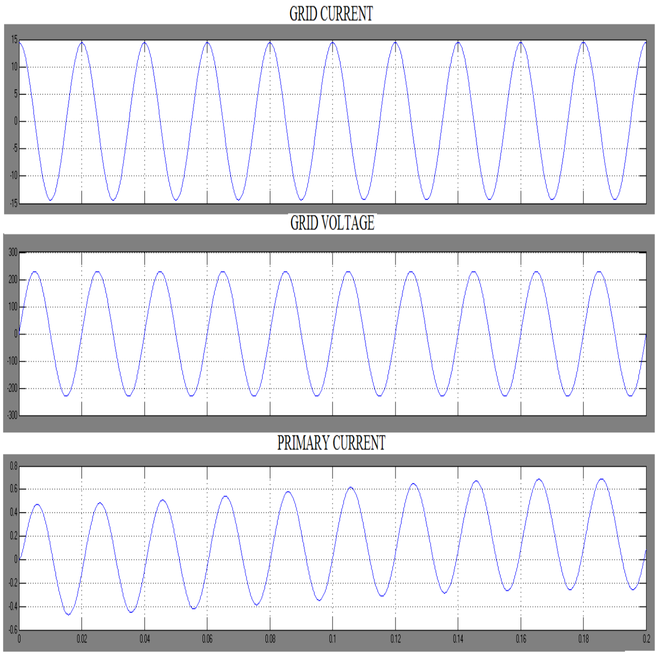

Figure 12: output waveforms of Grid connected single-phase PV inverter with PR controller

From the output waveforms Shown in Fig.12. It is observed that the grid current, grid voltage & primary current are in sinusoidal form. Total harmonic distortion in Grid current of single-phase PV inverter with PR controller. It is observed that the THD in Grid current is 2.90%.

6.5 Simulink results of Grid connected single-phase PV inverter with PRI controller

The Output waveforms of Grid connected single-phase PV inverter with PRI controller is shown in fig.13.

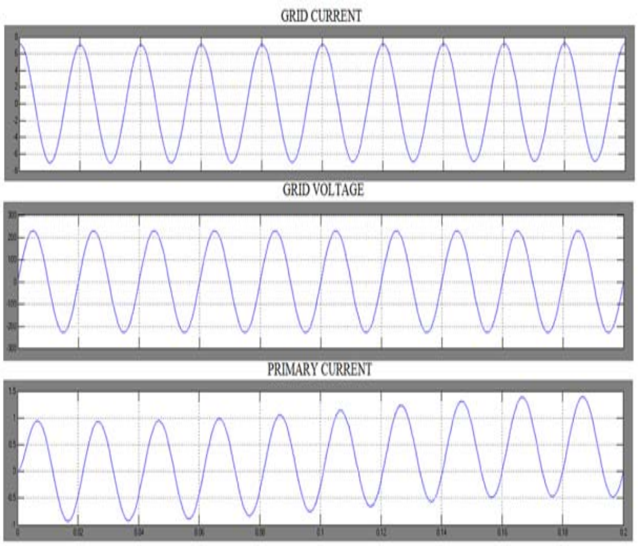

Figure 13: Output waveforms of Grid connected single-phase PV inverter with PRI controller.

From the output waveforms Shown in Fig.13. It is observed that the grid current, grid voltage & primary current are in sinusoidal form. Total harmonic distortion in Primary current of single-phase PV inverter with PRI controller. It is observed that the THD in Grid current is 1.85%.

Table 1: THD Analysis

	Total Harmonic Distortion (THD) (%)		
	Grid current	Grid voltage	Primary current
Before compensation	9.13	0	9.14
PR controller	0.16	0	2.91
PRI controller	0.03	0	1.85

The proposed single-phase PV inverter is simulated using MATLAB/SIMULINK. The corresponding results are showed before compensation, during PR& PRI controllers. Then the THD analyses for the proposed single-phase PV inverter with compensation and without compensation are compared.

7. Conclusion

Modification to the inverter current control for a grid connected single-phase photovoltaic inverter has been proposed in this paper, for ensuring high quality of the current injected into the grid. For the power circuit topology considered, the dominant causes for lower order harmonic injection are identified as the distorted transformer magnetizing current and the dead time of the inverter. It is also shown that the presence of dc offset in control loop results in even harmonics in the injected current for this topology due to the dc biasing of the transformer. A novel solution is proposed to attenuate all the dominant lower order harmonics in the system. The proposed method uses an LMS adaptive filter to estimate a particular harmonic in the grid current that needs to be attenuated. The estimated current is converted into an equivalent voltage reference using a proportional controller and added to the inverter voltage reference. The design of the gain of a proportional controller to have an adequate harmonic compensation has been explained. To avoid dc biasing of the transformer, a novel PRI controller has been proposed and its design has been presented. The interaction between the PRI controller and the adaptive compensation scheme has been studied. It is shown that there is minimal interaction between the fundamental current controller and the methods responsible for dc offset compensation and adaptive harmonic compensation. The PRI controller and the adaptive compensation scheme together improve the quality of the current injected into the grid.

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