Power Quality Improvement Using UPQC Integrated with Distributed Generation Network

ABSTRACT
The increasing demand of electric power is giving an emphasis on the need for the maximum utilization of renewable energy sources. On the other hand, maintaining power quality to satisfaction of utility is an essential requirement. In this paper, the design aspects of a Unified Power Quality Conditioner integrated with photovoltaic system in a distributed generation is presented. The proposed system consists of series inverter, shunt inverter are connected back to back on the dc side and share a common dc-link capacitor with Distributed Generation through a boost converter. The primary task of UPQC is to minimize grid voltage and load current disturbances along with reactive and harmonic power compensation. In addition to primary tasks of UPQC, other functionalities such as compensation of voltage interruption and active power transfer to the load and grid in both islanding and interconnected mode have been addressed. The simulation model is designed in MATLAB/Simulation environment and the results are in good agreement with the published work.

KEYWORDS:
1. Distributed Generation (DG)
2. Interconnected mode
3. Islanding mode
4. Maximum power point tracking (MPPT)
5. Power Quality (PQ)
6. Unified power quality conditioner (UPQC)
7. Photovoltaic array (PV).

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SOFTWARE: MATLAB/SIMULINK

BLOCK DIAGRAM:

Fig. 1. UPQC with DG connected to the DC link
EXPECTED SIMULATION RESULTS:

Fig. 2  Bus voltage, series compensating voltage, and load voltage

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Fig. 3 Simulation result for upstream fault on feeder: Bus voltage, compensating voltage, load voltage
CONCLUSION

The new configuration is named unified power-quality conditioner with Photo Voltaic System (UPQC-PV). Compared to a conventional UPQC, the proposed topology is capable of fully protecting critical and sensitive loads against distortions, sags/swell, and interruption in both islanding and interconnected modes. The performance of the UPQC-PV is evaluated under various disturbance conditions and it offers the following advantages:

1) To regulate the load voltage against sag/swell and disturbances in the system to protect the nonlinear/sensitive load.
2) To compensate for the reactive and harmonic components of nonlinear load current.
3) To compensate voltage interruption and active power transfer to the load and grid in islanding mode to protect sensitive critical load.
4) Depending upon the ratings, the combined system can reduce the cost up to one fifth of the separate system. Capacity enhancement has been achieved using multi-level or multi-module and central control mode, however, the flexibility of UPQC to increase its capacity in future and to cope up with the increase load demand in medium voltage distribution system.
REFERENCES


