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Interline Unified Power Quality Conditioner with Fuzzy Logic for Critical Load Bus Voltage Regulation

T.Vijay muni

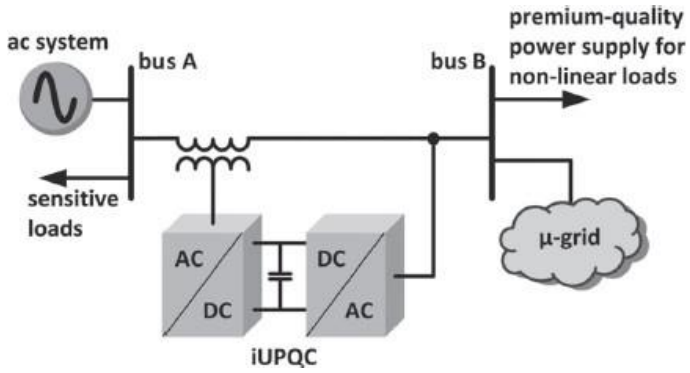
[1]Department of Electrical and Electronics Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur, Andhra Pradesh, India 522502

vijaymuni@kluniversity.in

Abstract

The most recent development in the realm of FACTS equipment and technology is the interline unified power quality conditioner. that improves voltage control at both the grid side and load side bus. When compared to its homologous counterpart, the traditional Unified power quality conditioner, the new FACTS device's effectiveness is evaluated. The research presents a soft computing technique, specifically a fuzzy logic-based controller, for the planned Interline unified power quality conditioner. The proposed control topology's application and usefulness are evaluated, and The proposed control architecture is implemented, tested, and simulated in a MATLAB/SIMULINK environment.

INTERLINE UNIFIED POWER QUALITY CONDITION-ER (IUPQC)



Improved iUPQC controller.

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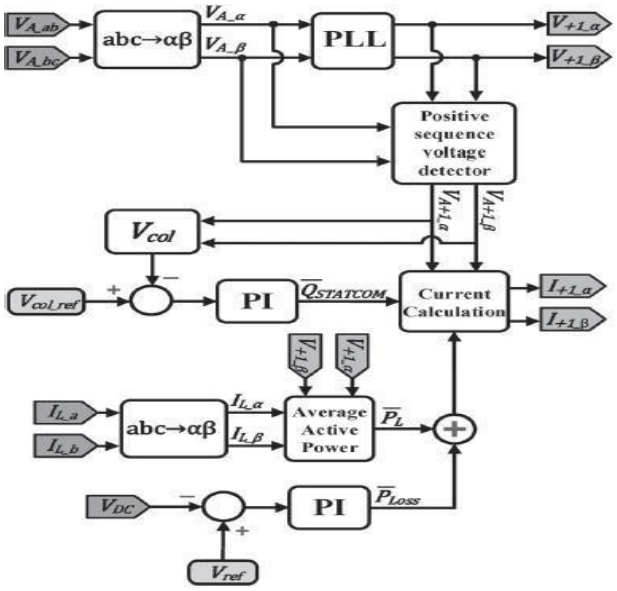

Fuzzy Logic Controller

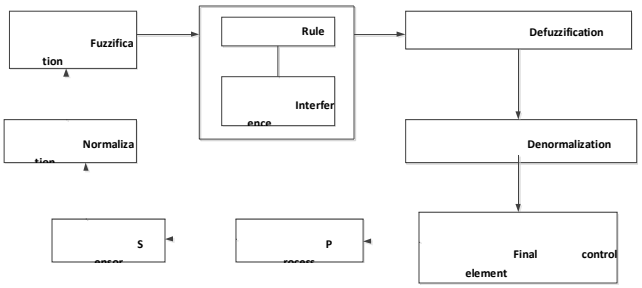

Table iUPQC Parameters

e / Δe	NB	NM	NS	ZE	PS	PM	PB
NB	NB	NB	NB	NB	NM	NS	ZE
NM	NB	NB	NB	NM	NS	ZE	PS
NS	NB	NB	NM	NS	ZE	PS	PM
ZE	NB	NM	NS	ZE	PS	PM	PB
PS	NM	NS	ZE	PS	PM	PB	PB
PM	NS	ZE	PS	PM	PB	PB	PB
PB	ZE	PS	PM	PB	PB	PB	PB

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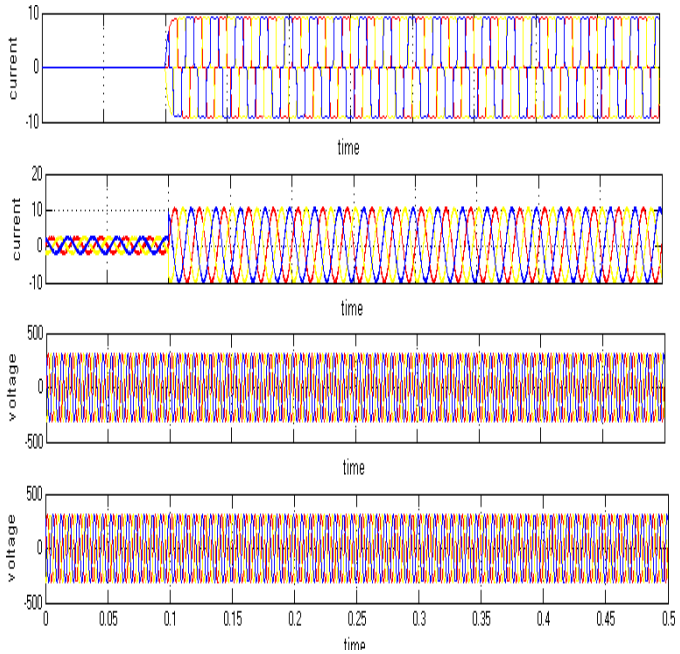
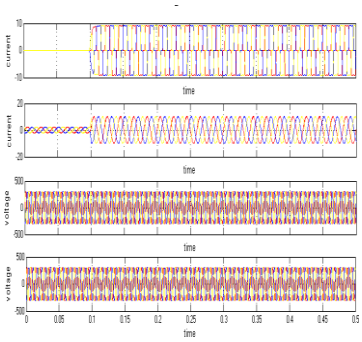


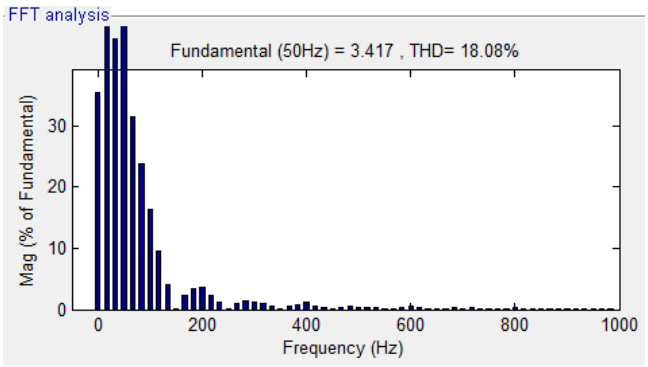
Simulation Results

load current, grid current, load voltage, grid voltage for iUPQC response using PI controller [1].

load current, grid current, load voltage, grid voltage for iUPQC response using fuzzy logic controller [2].



THD WITHOUT USING CONTROLLER



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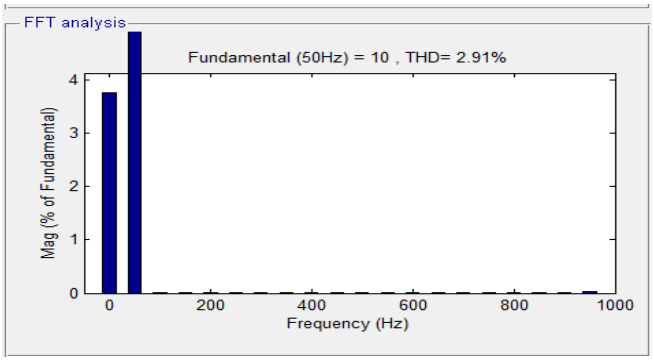
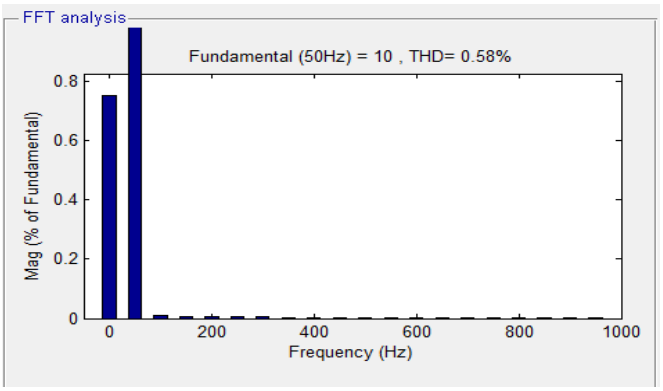


THD using PI controller



THD using fuzzy logic controller

TABLE COMPARISION OF RESULTS

Type of the Controller	THD in %
Without controller	18.08
PI controller	2.91
Fuzzy Logic controller	0.58

CONCLUSION

PI controller and fuzzy logic controllers are successfully used in the simulation of non-linear load using iUPQC. In comparison to the PI controller's THD of (2.91)% and the grid current's THD of (18.08)% without a controller, the fuzzy logic controller performs better with a THD of (0.58)%.For greater performance, a different controller, like a neuro-fuzzy one, could be employed in future analyses.

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