

Comparative Evaluation of Pi and Fuzzy Controllers in IUPQC

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Abstract:- In every walk of our life's usage of the power-electronic based load is increasingly drawing the attention towards the power quality. The Internally Bound Together Power Quality (IUPQC) is intended to upgrade the nature of intensity in the appropriation framework which is the combination of shunt and series connected 2nd order devices. This paper contrasts the performance of IUPQC with PI Controller and Fuzzy Logic controller in enhancing feeder utilization system in power quality. The proposed controller enhances the voltage regulation and their performances are compared in terms of Total Harmonic Distortion (THD) for the grid current. The efficiency of the IUPQC using PI and FUZZY controller has been confirmed using MATLAB/Simulink.

Keywords:- IUPQC, Fuzzy logic, proportional Integral.

I. INTRODUCTION

Power quality refers to analyze and maintain power problems manifested in current, voltage, or deviations in frequency that result in improper operation or failure of equipment. The excess utilization of nonlinear leads to an undesirable effect in an operation on power systems. Consonant substance on voltage and current waveforms assumes a striking job amid these. Essentially, uninvolved channels are utilized to take out line currents sound. Presently, it is presenting reverberation in the force framework. Along these lines, dynamic line conditioners have gotten more mainstream than latent channels. Dynamic force channel remunerates the sounds and responsive force at once. This dynamic force channel can either be associated in arrangement or shunt or mixes of

both. The Shunt dynamic force channels are favored more than the arrangement dynamic force channels as a large portion of the modern applications needs current symphonious remuneration. Numerous kinds of dynamic force channels have been executed to expand the exhibition of the force quality. The characterization depends on the standards is as per the following.

- Speed and ratings of the framework required in the repaid framework.
- Parameters of the system
- Techniques used in evaluating reference value.

Current controlling voltage sources can be outfitted and utilized by a suitable control mechanism to decide the dynamic force channel usefulness. The electrical force framework incorporates a different type of little makers that utilization sustainable power sources, as sun-based boards, wind generators and so forth.

II. SYSTEM DESCRIPTION

Current harmonics in the system are compensated by the use Shunt power filter which injects equal and opposite harmonics compensating into grid. To compensate the current harmonics, this power filter acts like the power parameter used to inject the harmonics and phase is shifted to 180°. It can be applied for any type of load harmonics called as current harmonic sources. By using appropriate method, the shunt active power filter is used as power factor compensation. So, the distribution system considers non-linear load and shunt active power filter as simple resistor. Consonant remuneration of Shunt dynamic force channel is appeared in Fig.

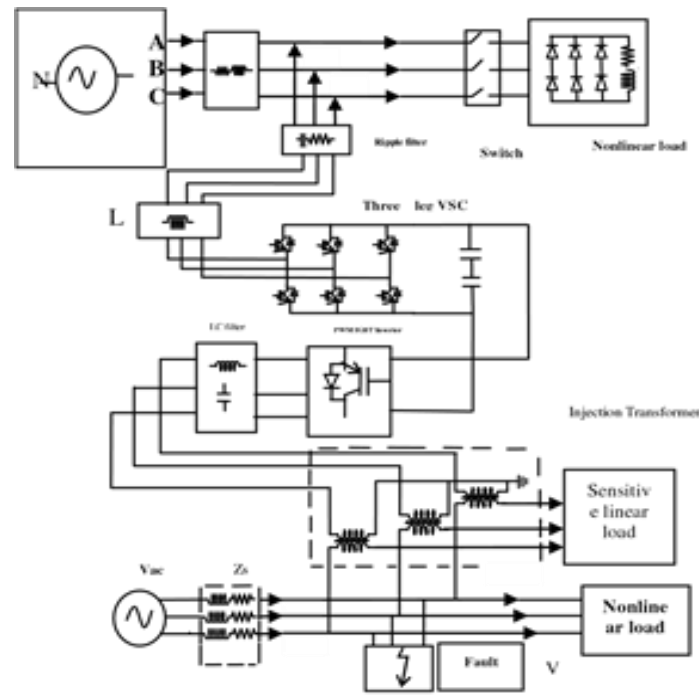


Fig. 1. IUPQC circuit diagram

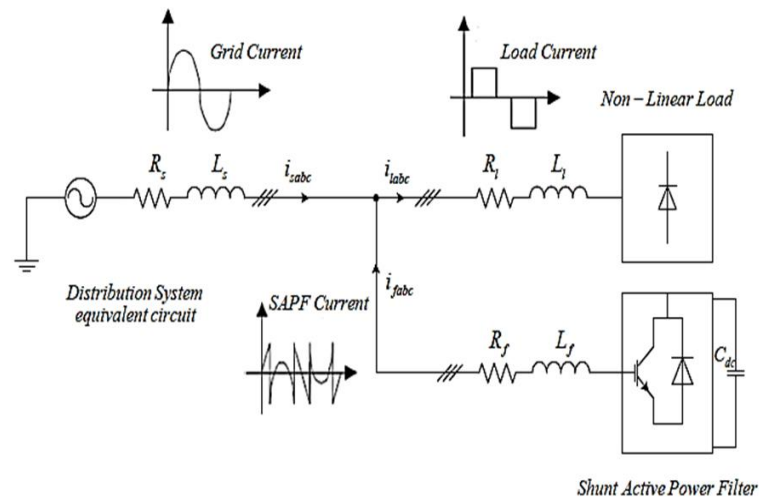


Fig 2:- Harmonic Contents of a Signal.

III. PI CONTROLLER

Controllers are generally classified as the three basic controllers namely Proportional, Integral and Derivative. Among these types or modes, the Proportional-Integrative modes commonly used as control modes and Derivative is used as high controller making the system loop more stable on its own in control systems. The Combinations of these modes can be classified as PI, PD and PID. Among those, PI and PD are very often used as practical analysis in control systems.

PI controller is used to extinguish the obligatory motions and consistent state blunder brings about the presentation of the on-off condition controller. By bringing Integral controller mode into a system effects overall stability of a system and speed response is affected. As a

result, the PI controller has no tendency to increase the speed of operations. From this we can conclude that the PI controller does not have the control to analyze the situation that what will occur with the blunder in the blink of an eye. By presenting subordinate mode, this issue can be ended which can examine what will occur with the mistake in the blink of an eye so the response time of the controller is diminished.

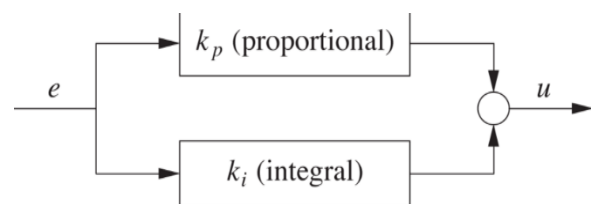


Fig 3

PI controllers assumes a key job in businesses, particularly when the speed of the activity isn't an issue. Controller without Derivative is utilized when:

- There are Large aggravations and commotions during the procedure of activity
- The Fast reaction of the framework isn't required
- There is enormous vehicle delay in the framework.
- Either capacitive or Inductive vitality stockpiling all the while.

Tuning is defined as the method that continuously calculates an error value and performs the corrections based on PID controllers. This principle is simple as it must fulfill the complex criteria within the controller limits. According to loop tuning, some of the classified methods are:

- Manual method,
- Ziegler–Nichols method,
- PID tuning methods.

IV. PROPOSED CONTROLLER

Fuzzy logic controller is a sensible framework, which has a propelled tasks of multi-valve logic. Nonetheless, Fuzzy logic is as comparative as the hypothesis of Fuzzy sets and the hypothesis that identifies with instances of un-indicated limit objects. It is defined as; Fuzzy logic has different operations in both concept and substance in terms of multi logical systems.

Fuzzy logic controllers of first generation can be simply defined by a block diagram.

The Fuzzy logic control called as information-based module which contains the data pretty much all the sources of info and yields of fluffy controller. It contains the set of statements and the corresponding degree of functions which implies the information factors to the fuzzy principle base framework and the yield factors to the controller.

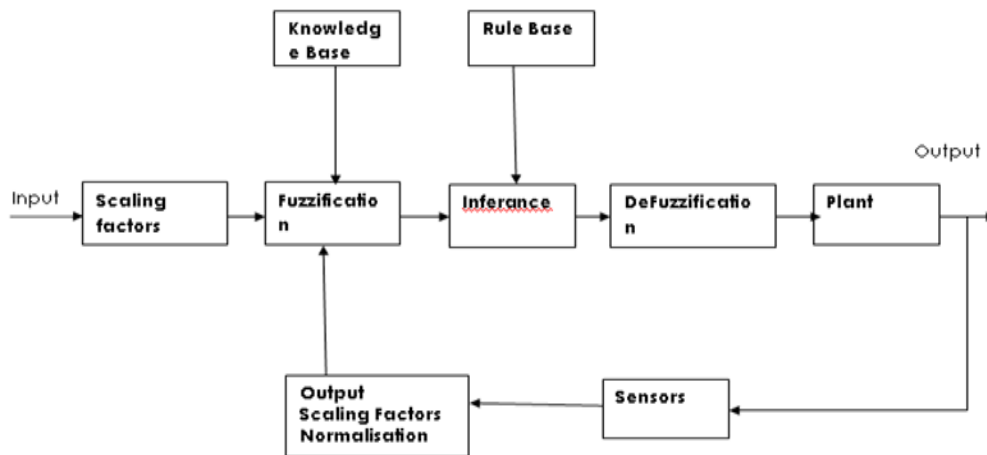


Fig 4:- Simple Fuzzy Control System

➤ Creating a Fuzzy Inference System (FIS):

By use of Editor in the Fuzzy Toolkit, we can assemble the arrangement of rules, characterize the participation capacities, and examine the presentation of a Fuzzy Inference System. Creating a Fuzzy Inference System includes the corresponding variables/ values in information dependent on client characterized rules it allots comparing esteems to the yield vector.

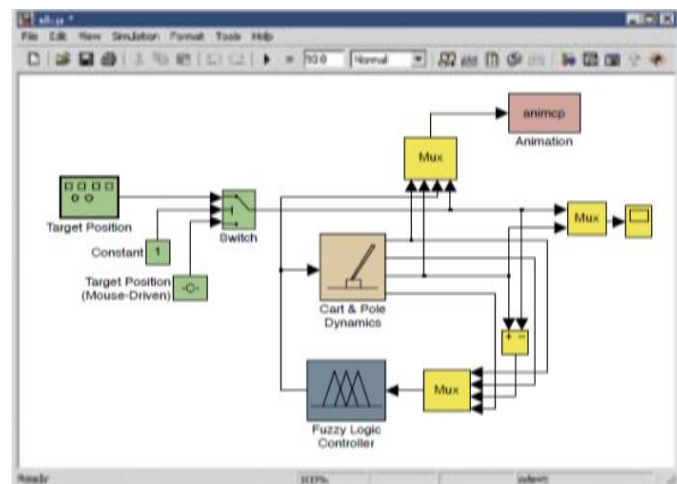


Fig 5:- Fuzzy Interference System

V. CONCLUSION

Efficiency of IUPQC simulated by using the MATLAB Simulation, Instantaneous reactive power theory and abc to dq theory are used for DVR & DSTATCOM individually, Showing the work efficiency of an Interline Unified Power Quality Conditioner using Proportional Integrative i.e. PI controller and FUZZY logic controllers. To analyze the performance of unbalanced, non-linear, and

faults in a inter connected line. It watches the IUPQC valuably shields the touchy burdens from current music. In DSTATCOM and in DVR pi and Fuzzy controllers remunerates current sounds in the delicate burden just as keeps up the reference voltage worth and all the above unsettling influences from the above perceptions. From the above contemplations, we can infer that the IUPQC with Fuzzy logic can give amazing execution to all power quality issues.

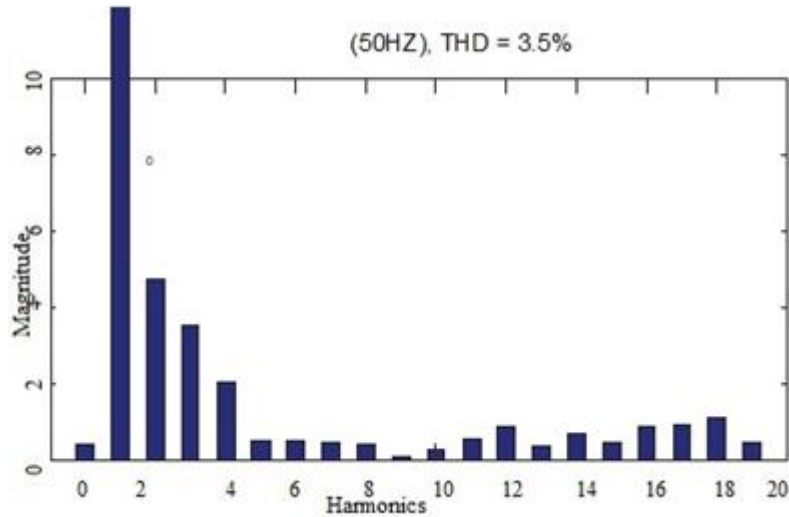


Fig 6:- THD analysis DVR using PI controller

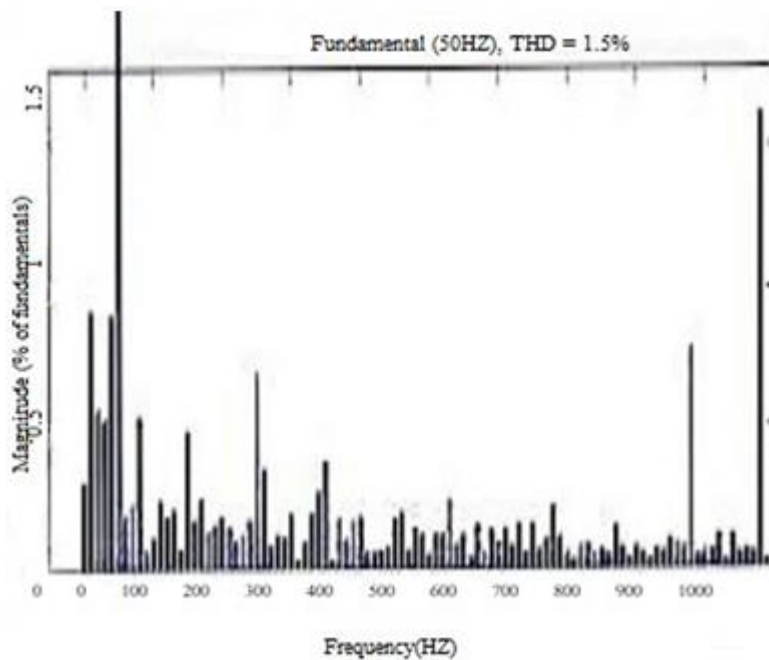


Fig 7:- THD of DVR using FL controller

➤ *Comparative Performance of DVR and Dstatcom*

Total Harmonic Distortion	Without Controllers	with PI	with Fuzzy Logic
DSTATCOM	30.6%	4.2%	2.4%
DVR	14.7%	3.5%	1.5%

Table 1

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