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Performance Evaluation of Weighted Feedback Based UPQC under Various Power Quality Issues

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ABSTRACT

Power efficiency is one of the big issues in the energy sector today. It becomes much more critical with the advent of sophisticated and complex systems, whose output is highly dependent on the efficiency of the power supply. Electronic systems are extremely vulnerable to disturbances, so industrial loads are less tolerant to power quality issues like voltage dips, voltage sags, voltage flickers, harmonics, and load unbalance, among others. For custom power applications, a variety of highly modular controllers that take advantage of newly available power electronics components are currently on the market. This paper introduces the concept of a unified power quality conditioner based on the VSC theorem, which is used to increase power quality. Capacitor banks, a series-active filter, and a shunt active filter make up the model. Negative-sequence current and harmonics are primarily compensated by series-active and shunt-active filters, while capacitor banks are used to compensate the reactive power of power frequency. This paper also includes using a weighted feedback algorithm to manage the PCC parameters as well as the UPQC performance. The proposed architecture has been put through its paces with a variety of distributed systems and fault scenarios. The entire framework was designed and analyzed with the help of MATLAB simulink and code.

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NOMENCLATURE

Symbols	Meaning	Symbols	Meaning
β	Angle of voltage	V_i	Series voltage
I_s	Specified load power factor	V_0	Output voltage
P_a	Active power	V_s	Voltage sag
R_a	Reactive power	W_n	Randomized weight
V_A	Apparent voltage	W_{new}	new weight
V_{inj}	Injected voltage	W_{old}	old weight

1. INTRODUCTION

A power quality issue is a phenomenon that occurs in end-use equipment loss due to nonstandard voltage, current, or frequency. As power electronics-based devices used to improve the power efficiency in distribution networks, modeling and simulation of conventional power conditioner is an important concern [1, 2]. UPQC plays an important role in ensuring the device's proper function. In addition to artificial intelligence-based control schemes, traditional control schemes are commonly used. In addition, some sophisticated mathematical techniques in general, and the wavelet transform in particular, are used to improve power [3] efficiency. There are many research papers based on the applications of fuzzy logic, expert systems, neural networks, and genetic algorithms available in power efficiency. The ANN (Artificial Neural Network)-

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based controller is intended for current managing of the shunt-active power filter and was qualified offline by means of data from the proportional-integral regulator. A fully digital controller based on the TMS320F2812 DSP platform is also proposed, which can be used for both comparison generation and control. In another effort, the use of fuzzy logic (FL) [4] inside a micro grid energy infrastructure based on the most recent power conditioning tools systems, such as the Unified Power Quality Conditioner, was proposed (UPQC). Similarly, to coordinate the action of the UPQC's sequence and shunt VSIs, a linear quadratic regulator (LQR) regulation technique [5] entrenched with the ANN is worn. In an additional improvement, a wavelet transform-based control algorithm for UPQC is proposed to repress harmonics in the current and voltage sags. Following that, some authors stress the use of UPQC [6] with a fuzzy logic controller (FLC) and an artificial neural network (ANN) controller on top of the traditional proportional-integral (PI) controller to improve power efficiency. The fortitude of voltage references for series-active power filters was also carried out using a sturdy three-phase optical phase locked loop (PLL) method and a fuzzy regulator. Khadkikar [7] also used the particle swarm optimization (PSO) approach to find the answer to the objective function extracted for minimizing UPQC's actual power injection and constraints. Through using PSO-based data for various voltage sag settings, adaptive neuro fuzzy inference systems were used to get the proposed technique for minimal real power injection with UPQC online. Gravitational search algorithm is used here for power optimization in stability and power quality improvement which depends on the law of gravity and motion. Anwar et al. [8] proposed a technique for current load enhancement using gravitational search algorithm. In this study, gravitational search algorithm focused on optimizing the power quality. However, it exhibits heavy computational overhead for large volume of parameters. Bat algorithm-based power quality improvement is also emerged for investigating power quality issues. Bat algorithm is one of the optimization algorithms proposed by Xin et al. [9]; which was brought from the idea of pulse rate and frequency changes of bats when they were searching for prey. Alam and Arya [10] proposed a steady state linear filter based on bat algorithm for improving power quality in distributed network. Even though bat-based techniques have some advantages in terms of speed, accuracy and execution. However, low exploration is one of main drawback of this algorithm that leads to premature convergence. Ant colony-based optimization is also used previous to sort out the power quality issues which is based on the idea of cooperation and adaptation. Tiwari and Dubey [11] proposed an active power filter based on ant colony algorithm. The work adapted this algorithm to compensate harmonics. However, theoretical analysis of this algorithm if found to be difficult. Although convergence is guaranteed, time taken to achieve the convergence is unpredictable. Many research has been emerged for the power quality issues [10, 12-14], most of the paper focused only on basic functionality features. They cannot cop up with the power quality improvements efficiently. The key goal of this proposed scheme is to increase power efficiency by using a weighted feedback technique to compensate for voltage sag and eliminate harmonics in the distribution network.

The below is how the article is structured: The suggested method is introduced in section I, and the centralized power efficiency conditioner is explained in section II. The topic of the weighted feedback algorithm is covered in section III. The execution of the simulation and discussion of the effects are covered in section IV. The results taken from the proposed work are discussed in section V.

2. UNIFIED POWER QUALITY CONDITIONER

The UPQC is a custom power unit that is used in electrical power delivery systems to increase the power efficiency by eliminating various fault conditions such as power fluctuations, various voltage disturbances and many more. Basically, UPQC has 2 insulator-based converters, one converter is placed in series while the other converter is in common DC bus. Present harmonics may be cancelled, reactive power compensated, voltage harmonics eliminated, voltage control improved, voltage and current imbalances corrected, voltage sag or swell corrected, and voltage interruptions avoided using UPQC. Shunt and sequence compensators are also used in UPQC. Present disturbances are cancelled using a shunt compensator, while voltage disturbances are cancelled using a sequence compensator. The shunt compensator could be attached to the series compensator on either side. The aim of a shunt compensator is to attain strictly balanced sinusoidal source currents in phase by way of the supply voltages at the specified magnitude and frequency. Series compensation, on the other side, injects voltage to keep the terminal [1-3] voltage at the defined amount and frequency. Shunt and series compensation is done with voltage source inverters. Both voltage source inverters are powered by a single DC connection capacitor, as can be seen. Using injection transformers, one of the voltage source inverters is connected in parallel to the AC grid, while the other is connected in sequence. The shunt compensation circuit [4] is made up of a parallel connected inverter and its control circuit. The series compensation circuit, on the other hand, is formed by connecting the inverter in series with the appropriate control circuit. The DC capacitor voltage must be at least 150 percent of the maximum line-line supply voltage for the UPQC to work properly. The shunt compensation [5-7] circuit is made up of a parallel-connected inverter and its control circuit. The series compensation circuit, on the other side, is formed by connecting an inverter in series with a suitable control circuit. The DC capacitor voltage must be at least 150 percent of the maximum line-line supply voltage in order for the UPQC to work properly. The block diagra, of UPQC to PCC is shown in Figure 1.

The expression for the injected voltage of UPQC can be given as follows [8, 10, 11]:

$$\mathrm{V}_{\mathrm{inj}}^2 = \mathrm{V}_0^2 \mathrm{s}^2 + 2\mathrm{V}_0^2(1-\mathrm{s})(1-\cos\beta) \tag{1}$$

where V_{inj} is the injected voltage by UPQC, $V_0$is the output voltage, β is the angle of voltage.
The expression for the apparent power of UPQC can be given as follows:

$$\mathrm{V_A} - \mathrm{UPQC} = \mathrm{V_0 I_0}\big(\mathrm{Q_1}(\theta, \mathrm{s}, \beta) + \mathrm{Q_2}(\theta, \beta)\big) + \mathrm{I_0^2 Q_2^2}(\theta, \beta)\mathrm{Z} \tag{2}$$

The source voltage of UPQC is used as a reference and is calculated as follows:

$$V_{in}\angle\theta = \mathrm{V_p}\angle\beta + \mathrm{V_{ph}}\angle\delta \tag{3}$$

It is important to note that for a power factor of considered load and voltage sag necessity, the amount and phase angles of Vp must be re-soluted in order to remain the load voltage at its rated assessment. For Vp, there are an endless number of possibilities.
The expression for load current can be given as follows:

$$I_{in}\angle\theta + \mathrm{I_c}\angle\delta = \mathrm{I_{ph}}\angle\delta - \theta \tag{4}$$

The angle Ø denotes the load current's (Iph) lagging angle with reference to Vph. Assuming that only the active portion of the load current is supplied by the power supply with δ = 0. The reactive load current portion is ideally the current $\mathrm{I_C}$. The suffix "ph" stands for load variables, while "in" stands for supply variables. Suffixes 1 and 2 signify two points in order for UPQC to take place, on the opposite side of the power source.

$$V_{in} = V_{ph1} = V_{in1} = V_0 \tag{5}$$

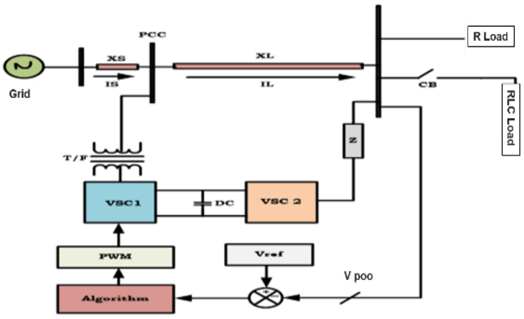

Figure 1. Block Diagram of Unified Power Quality Conditioner connected to PCC

The SLCVC current is supplied by $\mathrm{I_{C1}}$ in that case, with position of +90; the power factor is presumed to be lagging in progress of the supply voltage. The amount of supply voltage has decreased to $\mathrm{V_{in2}}$ in stage 2, requiring the UPQC to work to restore $\mathrm{V_{ph2}}$ to its new scale ($|\mathrm{V_{ph1}}| = |\mathrm{V_{ph2}}|$). This is accomplished by introducing the series voltage $\mathrm{V_{inj}}$, and the load voltage is obtained by choosing between 0 and 90, along with the required magnitude of $\mathrm{V_{inj}}$.

$$I_{in}cos\beta = I_{ph2}cos\theta \tag{6}$$

The load reactive control is injected if the both of the active filters are still active. Surprisingly, for a specified load power factor, this sagging voltage causes the angle to equal, and thus $\mathrm{I_{S2}} = \mathrm{I_{L2}}$ can be deduced.

$$I_{s2} = I_{L2} = I_0 \tag{7}$$

The load's active power demand is constant and equal to the source's active power demand:

$$V_s I_s = V_L I_L cos\emptyset \tag{8}$$

In the condition of voltage sag, where $|\mathrm{V_{S2}}|<|\mathrm{V_{S1}}|$ and s is the voltage sag per unit, then

$$V_{s2} = (1-s)V_{s1} = (1-s)V_0 \tag{9}$$

In a voltage sag, $\mathrm{V_{S1}I_{S1}} = \mathrm{V_{L2}I_{L2}}$ and $\mathrm{V_{S1}I_{S1}} = \mathrm{V_{L2}I_{L2}}$ are used to sustain a steady active power.

$$I_{s2} = \frac{V_0 I_L cos\emptyset}{V_0(1-s)} \tag{10}$$

$$I_{s2} = \frac{I_L cos\emptyset}{(1-s)} \tag{11}$$

$$V_{L2} sin \propto = V_{inj} sin\gamma \tag{12}$$

$$V_{L2} cos \propto = V_{s2} + V_{inj} cos\gamma \tag{13}$$

Combining the above equations, it can be attained that,

$$\mathrm{V}_{\mathrm{inj}}^2 = \mathrm{V}_0^2 \mathrm{s}^2 + 2\mathrm{V}_0^2(1-\mathrm{s})(1-\cos\alpha) \tag{14}$$

The expression for apparent power can be given as follows:

$$V_{inj} I_{s2} = V_0 I_0 cos\emptyset \frac{\sqrt{s^2+2(1-s)(1-cos\alpha)}}{(1-s)} \tag{15}$$

$$I_{c2} cos\alpha = I_{L2} + V_{inj}\sin(\emptyset - \alpha) \tag{16}$$

There by the model for apparent power can be given as follows:

$$I_{c2}V_{L2} + I_{c2}^2 Z = I_{L2}\left(V_0 \frac{\sin(\emptyset-\propto)}{cos\propto} + I_{L2}\frac{\sin(\emptyset-\propto)^2}{cos\propto} Z\right) \tag{17}$$

The expression for the total apparent power can be given as follows:

$$\mathrm{V_A} - \mathrm{UPQC} = \mathrm{V_0 I_0}\big(\mathrm{Q_1}(\theta, \mathrm{s}, \beta) + \mathrm{Q_2}(\theta, \beta)\big) + \mathrm{I_0^2 Q_2^2}(\theta, \beta)\mathrm{Z} \tag{18}$$

$$Q_1(\theta, s, \beta) = \cos\theta \frac{\sqrt{s^2+2(1-s)(1-cos\beta)}}{(1-s)} \tag{19}$$

$$Q_2(\theta, \beta) = \frac{\sin(\emptyset-\beta)}{\cos\beta} \tag{20}$$

When Ø=α, I_{S2} = I_{L2} and I_{C2} = 0, the minimum VA is obtained. The optimal injected voltage under these conditions is given by:

$$V_{inj} = V_0\sqrt{s^2 + 2(1 - s)(1 - cos\emptyset)} \tag{21}$$

Also the expression for advance angle for voltage can be given as follows:

$$sin\gamma = \frac{\sqrt{1-cos^2\alpha}}{\sqrt{s^2+2(1-s)(1-cos\emptyset)}} \tag{22}$$

3. WEIGHTED FEEDBACK ALGORITHM

When a system's outputs are redirected back as inputs as part of a cause-and-effect chain that forms a circuit or loop, this is referred to as feedback. The device is said to feedback on itself in this case. The feedback weighted link is a type of network in which nodes' connections form a directed graph in a temporal order. This enables it to behave in a temporally complex manner. These are feed forward networks that can process variable length sequences of inputs by using their internal state (memory). The term "feedback weighted relation" is loosely applied to two broad groups of networks with a common general structure, one with finite impulse and the other with infinite impulse. The action in both types of networks is temporal hierarchical. An infinite impulse-based feedback network is a guided cyclic graph that cannot be unrolled and restored with a purely feed forward system, while a finite impulse feedback system is a directed acyclic diagram that can be unrolled and replaced with a strictly feed forward system. The output of each point is calculated by some non-linear function of the sum of its inputs, and the "signal" at each relation is a real number. Edges are the term for the contacts. In most cases, the weight of inputs and edges changes as learning progresses. The signal intensity at a link is increased or decreased depending on the weight [10, 12-14]. Systems are trained by analyzing instances, each of which includes a known "input" and "effect," creating probability-weighted relations among the two, and storing them within the net's information structure. The discrepancy among the network's processed yield and a target yield is normally used to train a device [15-20]. This is the mistake. The system then updates its weighted correlations using this error value and a learning law. For each adjustment, the system can generate output that is more and more close to the target output. The instruction will be terminated based on such conditions after a reasonable amount of these changes [9, 21-26] have been made. Models do not always converge to a single solution, for a variety of reasons [27, 28]. For example, depending on the cost function and the model, local minima may occur. Second, when starting far from any local minimum, the optimization process cannot guarantee convergence [29-32]. Third, certain approaches become inefficient when dealing with vast amounts of data or criteria [33]. The following are the steps that have been followed in weighted feedback algorithm.

- Randomize weight (w_n) for estimation of x_i, y_j, and z_k, where n is the amount of NBCC in the sample with a lot of space.
- Ra's optimal goal must be defined.
- Predictive models should be entered.
- If the predicted output for the cutting combination x_i, y_j, and $z_k \geq R_a$, then new weight becomes $W_{new} = (R_a W_{old})/\text{xiyjzk}$
- If not then $W_{new} = W_{old}$
- Go to step 3 and end the training.

The proposed weighted feedback algorithm as shown in Figure 2 is used to manage the PCC parameters as well as UPQC output. The performance of the proposed algorithm is compared with other state-of-the-art algorithms such as gravitational search algorithm (GSA), the BAT algorithm, and the ANT colony algorithm. From the comparative analysis, we observed that the proposed weighted feedback algorithm performs well than the other algorithms.

4. RESULTS AND DISCUSSION

The proposed power system was simulated with UPQC and tested with different test cases such as load switching, fault incidence, and control with four algorithms: weighted feedback algorithm, gravitational search algorithm, ant colony optimization algorithm, and BAT algorithm.

4. 1. With Fault Condition in the Power System

At t=0.1s to t=0.65s, the LLL fault was introduced into the system, and different UPQC algorithms were tested.

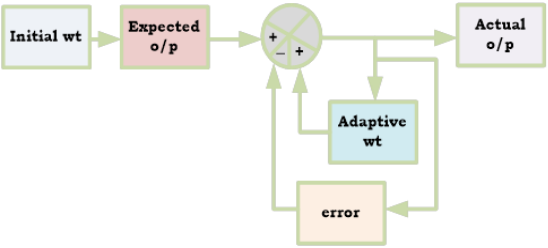

Figure 2. Block Diagram of weighted feedback algorithm

4. 2. Weighted Feedback Algorithm

The UPQC was implemented using the weighted feedback algorithm, and the waveform below depicts PCC parameters such as voltage, current, active strength, reactive power, and power factor under faulted conditions with UPQC. The PCC parameters of the power system under faulted condition with UPQC and WFA is shown in Figure 3.

The voltage has remained almost unchanged, the current has increased to 1.5 times the rated value, the active power has increased to 1.5 times the rated value, and the reactive power has decreased to almost zero.

4. 3. Gravitational Search Algorithm

For the unified power quality conditioner, the Gravitational Search Algorithm was used, and the waveform below displays the PCC parameters under faulted conditions with UPQC. The PCC parameters of the power system under faulted condition with UPQC and GSA is shown in Figure 4.

The voltage has remained nearly constant, although the current has increased to 1.566 times the rated value, the active power has increased to 1.6 times the rated value, and the reactive power has decreased to nearly zero.

Table 1 shows the perfromance of various algortihms based UPQC under faulted condition in terms of various parameters like voltage, current, active power, reactive power and power factor at the point of common coupling.

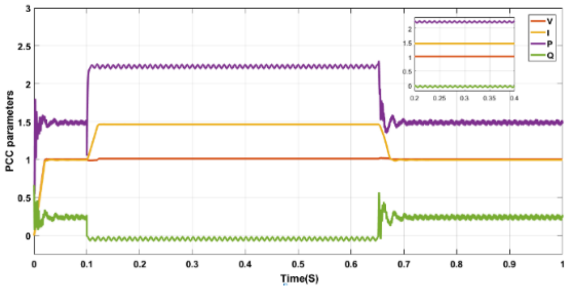

Figure 3. PCC Parameters of power system under faulted condition with UPQC and WFA

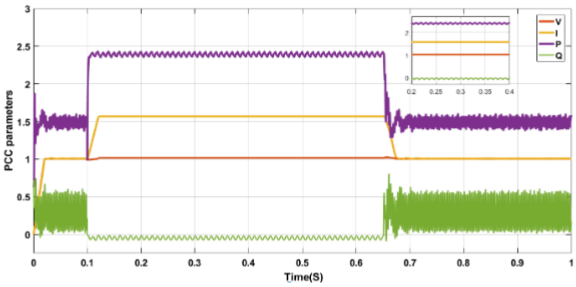

Figure 4. PCC Parameters of power system under faulted condition with UPQC and GSA

TABLE 1. PCC Parameters with fault, DVR, GSA, BAT, ANT algorithms

Parameters	Without facts devices	Weighted feedback	GSA	BAT	ANT
Voltage	0.256pu	1.00pu	0.99pu	0.98pu	0.98pu
Current	25.9pu	1.466pu	1.566pu	1.664pu	1.706pu
Active power	10pu	2.25pu	2.43pu	2.6pu	2.66pu
Reactive power	0pu	0pu	0pu	0pu	0pu
Power factor	0.99pu	1.00pu	0.999pu	0.99pu	0.99pu

4. 4. With Wind Based Synchronous Generator

At t=0.1s to t=0.65s, the wind turbine-based synchronous generator was attached to the grid, and various algorithms for UPQC were tested.

4. 5. Weighted Feedback Algorithm

The weighted feedback algorithm was used to apply the UPQC, and the waveform in Figure 5 shows PCC parameters including voltage, current, active intensity, reactive capacity, and power factor under sudden turbine switching conditions with UPQC.

The voltage has remained almost constant, although the current has increased to 1.1 times the rated value, active power has increased to 1.6 times the rated value, and reactive power has increased to nearly 0.4. It shows smaller ripples during the transition condition but with lesser magnitude.

4. 6. Gravitational Search Algorithm

For the UPQC, the gravitational search algorithm was used, and the waveform in Figure 6 below displays the PCC parameters for a wind turbine-based synchronous generator connected to the UPQC.

The voltage has remained almost constant, although the current has increased to 1.15 times the rated value, active power has increased to 1.7 times the rated value, and reactive power has increased to nearly 0.5. It shows higher ripples during the transition condition when compared to weighted feedback algorithm.

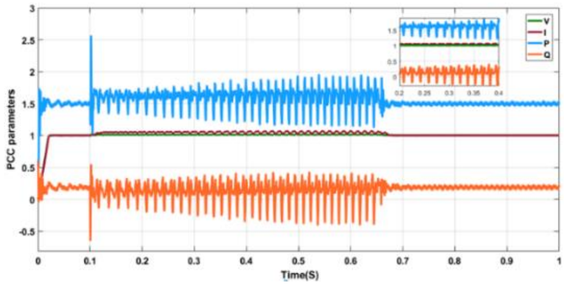

Figure 5. PCC Parameters of power system under sudden switching condition with UPQC and WFA

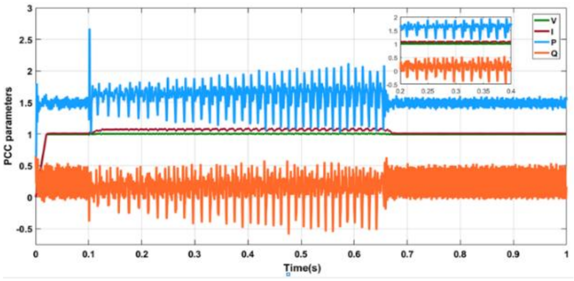

Figure 6. PCC Parameters of power system under sudden switching condition with UPQC and GSA

The efficiency of various algorithms-based UPQC in terms of voltage, current, active power, reactive power, and power factor when the turbine is unexpectedly turned on is seen in the Table 2 where weighted feedback algorithms outperforms other algorithms.

4. 7. With Wind Based Induction Generator

At t=0.1s to t=0.65s, a wind turbine-based induction generator was attached to the grid, and various algorithms for UPQC were tested.

4. 8. Weighted Feedback Algorithm

The waveform in Figure 7 shows PCC parameters such as voltage, current, active rpm, reactive capacity, and power factor with UPQC using the weighted feedback algorithm under sudden turbine switching conditions.

The voltage has remained virtually constant although the current has increased to 1.25 times the rated value, active power has increased to 1.2 times the rated value, and reactive power has increased to approximately 0.2. It shows smaller ripples of lesser magnitude during the transition state.

TABLE 2. PCC Parameters with synchronous generator, DVR, GSA, BAT, ANT algorithms

Parameter	Without Facts	Weighted feedback	GSA	BAT	ANT
Voltage	0.98pu	1.02pu	1.01pu	1.009pu	1.003pu
Current	1.249pu	1.05pu	1.09pu	1.11pu	1.2pu
Active power	1.81pu	1.8pu	1.9pu	2.01pu	2.35pu
Reactive power	0.4pu	0.35pu	0.51pu	0.57pu	0.41pu
Power factor	0.98pu	0.99pu	0.98pu	0.975pu	0.971pu

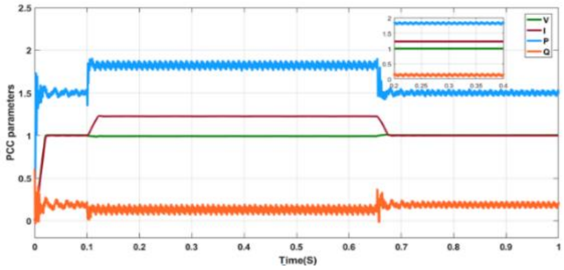

Figure 7. PCC Parameters of power system under sudden switching condition with UPQC and WFA

4. 9. Gravitational Search Algorithm

The Weighted Feedback Algorithm was used for the UPQC, and the waveform in Figure 8 shows the PCC parameters with the UPQC connected to a wind turbine-based induction generator. The voltage has remained almost constant although the current has increased to 1.37 times the rated value, active power has increased to 1.7 times the rated value, and reactive power has increased to 0.42. It has more ripples during the transition process than the weighted feedback algorithm.

Table 3 summarized the performance of different algorithms-based UPQC in terms of voltage, current, active power, reactive power, and power factor when the turbine is turned on suddenly. From the analysis, it is observed that the weighted feedback outperforms other algorithms.

4. 10. With RLC (Resistive, Inductive, and Capacitive) load

The RLC load has been connected to the system at t=0.1s to t=0.65s and various algorithms have been tested for UPQC.

4. 11. Weighted Feedback Algorithm

For the UPQC, the Weighted Feedback Algorithm was used, and the waveform below displays the PCC parameters with the RL load connected to the UPQC. The PCC parameters of the power system under faulted condition with UPQC and WFA is shown in Figure 9.

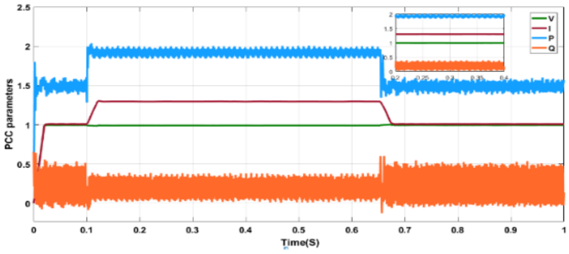

Figure 8. PCC Parameters of power system under sudden switching condition with UPQC and GSA

TABLE 3. PCC Parameters with induction generator, DVR, GSA, BAT, ANT algorithms

Parameter	Without Facts	Weighted feedback	GSA	BAT	ANT
Voltage	0.935pu	0.992pu	0.989pu	0.987pu	0.965pu
Current	2pu	1.225pu	1.297pu	1.315pu	1.362pu
Active Power	2.4pu	1.88pu	2.01pu	2.025pu	2.1pu
Reactive Power	1.5pu	0.2pu	0.36pu	0.39pu	0.18pu
Power factor	0.5pu	0.996pu	0.994pu	0.993pu	0.996pu

While the current has increased to 1.01 times the rated value, active power has increased to 1.05 times the rated value, and reactive power has increased to approximately 0.2, the voltage has remained relatively unchanged.

4. 12. Gravitational Search Algorithm The gravitational search Algorithm has been used for the UPQC and below waveform in Figure 10 shows the PCC parameters with connection of RLC load with UPQC.

While the current has increased to 1.01 times the rated value, active power has increased to 1.1 times the rated value, and reactive power has increased to 0.47, the voltage has remained nearly unchanged. During the transformation phase, it has more ripples than the weighted feedback algorithm.

From Table 4, we came to know that the weighted feedback algorithm is comparatively better than the other algorithms in terms of voltage, current, active power, reactive power, and power factor.

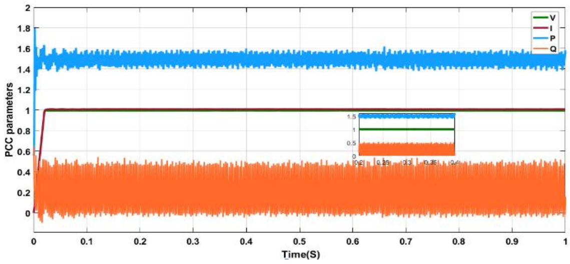

Figure 9. PCC Parameters of power system under sudden switching condition with UPQC and WFA

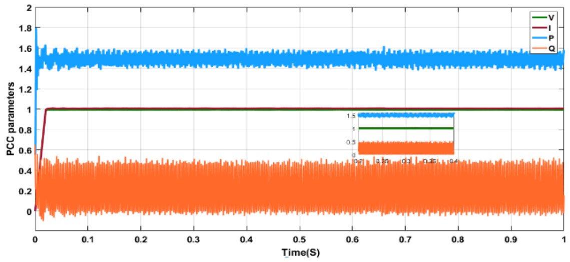

Figure 10. PCC Parameters of power system under sudden switching condition with UPQC and GSA

TABLE 4. PCC Parameters with RLC load, DVR, GSA, BAT, ANT algorithms

Parameter	Without Facts	Weighted feedback	GSA	BAT	ANT
Voltage	0.998pu	1pu	0.996pu	0.996pu	0.995pu
Current	1.018pu	1pu	1.01pu	1.015pu	1.025pu
Active power	1.526pu	1.54pu	1.58pu	1.61pu	1.85pu
Reactive power	0.0001pu	0.22pu	0.5pu	0.51pu	0.36pu
Power factor	0.999pu	0.99pu	0.98pu	0.979pu	0.97pu

5. CONCLUSION

In this article, the idea of a unified power quality conditioner based on the VSC theorem is explored and designed. The PCC parameters as well as the UPQC output are managed using a weighted feedback algorithm in this article. In addition to UPQC, three other algorithms, namely the gravitational search algorithm, the BAT algorithm, and the ANT colony algorithm, were investigated. In addition, a comparison of all four algorithms for UPQC has been made in terms of voltage, current, active power, reactive power, and power factor, with the weighted feedback algorithm outperforming the others under different test conditions. The proposed system is implemented in MATLAB Simulink and the performance of the whole system is evaluated under various operating procedures. The model is further tested for PCC parameters against various conditions. By observing the waveforms, the proposed model proves that the weighted feedback based UPSC is efficient for power quality improvement. As part of the future work, we plan to investigate the performance of the proposed model by combining several algorithms in addition to the abovementioned algorithms.

6. REFERENCES

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Persian Abstract

چکیده

بهره وری انرژی یکی از مسائل مهم در بخش انرژی امروزه است. با ظهور سیستم های پیچیده، که خروجی آنها به شدت به کارایی منبع تغذیه بستگی دارد، بسیار حیاتی تر می شود. سیستم های الکترونیکی به شدت در برابر اختلالات آسیب پذیر هستند، بنابراین بارهای صنعتی نسبت به مسائل کیفیت توان مانند افت ولتاژ، کاهش ولتاژ، سوسو زدن ولتاژ، هارمونیک ها و عدم تعادل بار و غیره تحمل کمتری دارند. برای کاربردهای برق سفارشی، انواع مختلفی از کنترلرهای بسیار ماژولار که از قطعات الکترونیکی قدرت جدید در دسترس بهره می برند، در حال حاضر در بازار هستند. این مقاله مفهوم یک تهویه کننده کیفیت توان یکپارچه را بر اساس قضیه VSC معرفی می کند که برای افزایش کیفیت توان استفاده می شود. بانک های خازن، فیلتر سری فعال و فیلتر فعال شنت مدل را تشکیل می دهند. جریان و هارمونیک های دنباله منفی در درجه اول توسط فیلترهای فعال سری و شنت فعال جبران می شوند، در حالی که از بانک های خازن برای جبران توان راکتیو فرکانس توان استفاده می شود. این مقاله همچنین شامل استفاده از یک الگوریتم بازخورد وزنی برای مدیریت پارامترهای PCC و همچنین عملکرد UPQC است. معماری پیشنهادی با انواع سیستم های توزیع شده و سناریوهای خطا در مراحل خود قرار گرفته است. کل فریم ورک با کمک شبیه‌لینک و کد MATLAB طراحی و تحلیل شد.