Therefore, we understand from the various literature reviews, to keep the active and efficient power in the transmission system used by the FACTS controller and there are two basic and fast control methods in the power system generator used to maintain the active power balance (acceptable voltage profile) controlled by. AVR and real power balance (acceptable frequency values) are AGCs in a fixed, flexible or temporary environment.

3. Design and Modeling of Controller

3.1 Automatic Voltage Regulator

Voltage stability is the ability of an acceptable energy storage system to remain unchanged on all buses in the system under normal operating conditions and after a breakdown, increased load requirement, or a change in system condition causes a continuous decrease in power outage. The main sources of reactive energy in synchronizing machines are generators, capacitors, and reactors. When the current field generator is raised, the electromotive power generated will increase. Then, the operating power of the generator is increased to a new level. Therefore, the terminal voltage of the system rises to the required value. AVR control system is a generator that controls the terminal energy of the synchronization machine and controls the active energy of the system at normal values [G. Singh et al, 2011]. The AVR system consists of four main components, namely:
Amplifier model: Amplify the error signal and feed it to the exciter.

$$\frac{V_R(s)}{Ve(s)} = \frac{Ka}{1 + sTa}$$

Where Ka is amplifier constant and Ta is time constant
Exciter model: to provide a stationary rotating magnetic field to induce the voltage in the armature coil.

$$\frac{V_F(s)}{V_R(s)} = \frac{Ke}{1 + sTe}$$

Where Te time constant and Ke is exciter gain
Generator field model: convert the mechanical voltage to electrical voltage.

$$\frac{Vt(s)}{V_F(s)} = \frac{Kg}{1 + sTg}$$

Where Kg generator gain and Tg is time constant
Sensor model: compared the output voltage with a dc setpoint signal to generate the error signal through a bridge rectifier.

$$\frac{Vs(s)}{Vt(s)} = \frac{Kr}{1 + sTr}$$

Where Kr is the rectifier gain constant and Tr rectifier time constant.
Controller: To improve the dynamic response and to achieve zero steady-state error.
The block diagram of a synchronous generator with automatic voltage regulator is:

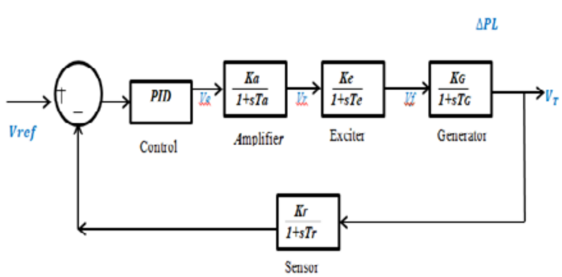
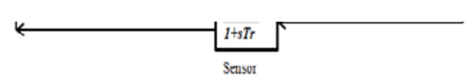


Fig.1: Block diagram of AVR

3.2 Automatic Generation Control

The main purpose of the operation and control of the energy sy  ith acceptable quality, for all consumers in the system. The system will not be b alanced where there is a balance between the demand for energy and the energy produced. Excessive deviation of the frequency can damage tools, reduce load performance, cause transmission lines to overload and disrupt system protection systems, and ultimately lead to instability of the power system [V. Nath et al 2016]. The main objectives of the AGC are to eliminate frequency variation, effective power, short-term power supply and to distribute productive production [C. Reddy et al, 2017]. A simple diagram of the AGC block of a one-stop power system:

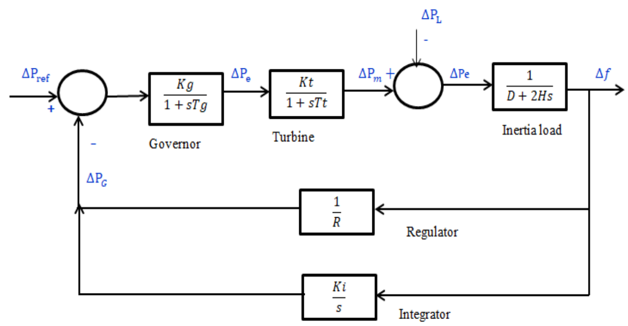


Fig. 2: Block diagram of AGC

3.3 Performance improvement controllers

A controller is an existing unit in a control system that produces control signals to reduce the deviation of the required value from the required value to approximately zero or the lowest possible value. Various controls such as the old (correct, flexible) and solid (smart) controls are proposed to improve the flexible performance of the system and to improve the AGC and AVR research parameters.

Classical optimization methods are useful in finding a high-performance solution for continuous and fragmented tasks. These methods have analytics / numbers and enter into statistical measurements. However, their discovery is difficult. Also, the results of this method are site specific. Example: Proportional integral (PI), Proportional integral derivative (PID), Linear quadratic regulator (LQR), etc. Artificial intelligence is modern, robust and multidirectional controls provide faster and more accurate results than the old system. It offers great flexibility to control system flexibility and has a good ability to resist interruptions. Extract difficulty is resolved but the results were still clear with the site. For example: abstract thinking control, genetic algorithm, particle enhancement, simulated simulation, and neural network artificial.

3.3.1 Classical Control method

PID: a continuous controller that controls the dynamic variables commonly used in industrial control systems to control temperature, flow, pressure, speed, and other process variables. PD controller improves temporary performance and PI control improves control system performance. A block diagram of the PID controller is shown below:

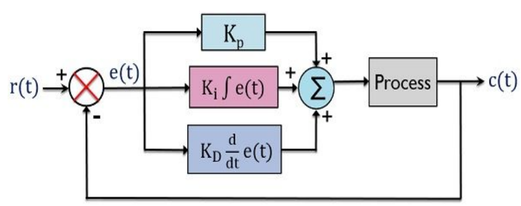


Fig. 3: Equivalent circuit of PID

LQR: is a complete control and response control related to the performance of a flexible system at minimal cost (Gregory et al, 1986).

3.3.2 Modern Control Method

Evolutionary Algorithms: heuristic-based methods of solving problems that cannot be easily solved during polynomial time, such as genetic algorithms and the control of abstract thinking [Devin et al, 2018]. Evolution algorithms are based on the theory of evolution.
Genetic algorithm: an evolutionary algorithm based on Darwin's theory of the choice of the most powerful.
Fuzzy Logic Control: is used when systems are not very linear and control based on an abstract concept of a mathematical system that analyzes analog input values according to logical variables that take continuous values between 0 and 1.
Artificial Intelligence: AI is a computer or neural network component that combines its response to data in much the same way as a human reaction to information (Korikov et al, 2018), as a neural network, particle enhancement. , et al.
Particle Swarm Optimization: is a strong stochastic optimization program based on the mobility and intelligence of the masses created by James Kennedy in 1995.
Artificial Neural Network: based on the large integration capacity of the sensory system to solve visual problems in the presence of a large amount of sensory data using its same processing power.
SA: based on mechanical process of cooling of molten metals using an anneal.

4. Multi-Area Interconnected System

Electrical systems have flexible and sophisticated features and include different control components and many components are linear. These components are connected by tie lines and require frequent control and flow of power [S. Pujan et al 2013]. The main objectives of the multi-site power system are: to reduce the deviation of the power system frequency, to exchange power between fixed distances, and to control the flow of the power of the tie line at a fixed rate [Ali et al, 2016]. [Vijay et al, 2011] introduced the AGC for the four-phase thermal power system and demand side control to reduce the total demand for electrical systems during peak demands to maintain system safety. [K. Parmar et al., 2011] used the LFC dual power system with a DC connector in line with the AC tie line. The LFC and AVR loops proposed in this paper contribute to the efficient operation of the power system by maintaining the frequency and terminal voltage of the corresponding generator at the specified limits. The interconnected system of multiple areas is represented by a ring and a length [V. Nath et al, 2015]. A simplified presentation of the three components of the integrated power system is sown below:

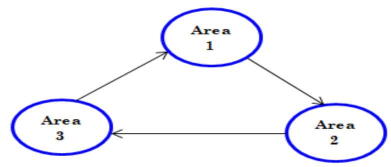


Fig. 4: Representation of Three areas interconnected system

Tie line power flow from area 1 to area 2 can be written as:

$$P_{tie,12} = \frac{E_1 E_2}{X} sin(\delta_1 - \delta_2)$$

Tie line power flow from area 1 to area 3 can be written as:

$$P_{tie,13} = \frac{E_1 E_3}{X} sin(\delta_1 - \delta_3)$$

Tie line power flow from area 3 to area 2 can be written as:

$$P_{tie,32} = \frac{E_3 E_2}{X} sin(\delta_3 - \delta_2)$$

Where δ is a power angle.

Linearizing about an initial operating point we have

$$\Delta P_{tie,ij} = T_{ij}\,\Delta\delta_{ij} = T_{ij}\,(\delta_i - \delta_j)$$

Where $T_{ij} = \frac{|E_i||E_j|}{P_{ri}X}\cos\big((\delta_i - \delta_j)\big) =$ Synchronizing coefficient

$$\Delta P_{tie,ij} = 2\pi T_{ij}\left(\Delta f_i - \Delta f_j\right)$$

5. Literature Review

Over the past two decades, several research studies on the development of an exciting synchronous generator have been successfully implemented to improve the relaxing features of the energy system over a wide range of workplaces and to improve the flexibility of power systems. [Kundur et al, 1994; Noroozi et.al., 2008; Shahgholian et al, 2010].

Controlling the loading frequency using the old PID controller is used and it is emphasized that the controller performance is better than others. However, if the power system structure has indirect flexibility and components, the operating system is variable and standard controls that require a system model should not be used [R. Narayan et al 2013]. In [S. Moghanlou et al 2006], a robust separation control system is used to control the loading frequency in four-phase power systems to achieve robust stability and better performance.

[Chandrasekhar et al, 2015] presented work on the integrated model of AGC and AVR. PI and PID and Fuzzy control are used on both local systems. Uncomplicated control provides better performance than PI and PID. The ambiguous controller fixes the AGC location control error and AVR Excitation. Therefore, the PID controller is a fixed parameter controller and the power system fluctuates and its configuration changes as its expansion occurs. Therefore, the modified PID parameters of the paramedics cannot provide their best answers. This allows the use of 'human language' to describe problems and their incomprehensible solutions. These are stronger and cheaper than conventional PID controls. [Karna et al, 2019] This paper discussed the control of loading frequency in a dual-connected power system using a PID controller and different enhancement methods. Strong control, Particle swarm upgrades have been shown to be the best development and show good performance over a short period of time with short shooting time and adjusting system frequency. However, the primary backlash does not control the voltage deviation of the system and does not consider cost calculations.

[Reddy et al, 2017] introduced the Automatic Generation Control System Automatically using Functional Disruption Rejection Control to Maintain the frequency of the word within the allowable limits of the thermal power system. The authors conclude that their control system is much better than the previous standard control. However, the authors did not control the terminal voltage and the operating power of the system.

[Sambariya et al, 2016] work on controlling the loading frequency using the incomprehensible Multitask-based Control System. In this work, an obscure concept-based controller is considered the problem of controlling the frequency of the load. But it did not remove the error and the paper did not mention voltage, operating power and tie-line power response from simulation. [Nath et al, 2015] discussed the AGC and AVR analysis of the One Area and the Dual Power System which uses Intelligent Controls Control research and control of frequency and electrical power to a tolerable limit. But the authors did not discuss and did not show the effect of the response of the dual power system.[Sambariya et al, 2015] defined Proper Automatic Generation Control With Automatic Voltage Regulator Using Particle Swarm Optimization of a single local power system. The result shows a statistical error and the correction time for variable responses (frequency and voltage) are detected and detected most effectively using a blurring controller and PID controls based on optimal particle control are considered. However, this paper did not consider the energy system of many areas.

[Narayan et al, 2013] operates an intricate mindset designed to control the frequency of automatic loading of four-component connected power systems. These studies aim to maintain the frequency and power of binding lines at the desired value. The boundary of this paper did not keep system voltage and did not reflect the entire system block diagram. [Dabur et al, 2012] has worked on the Matlab Design and Imitation of AGC and AVR for Multi Area Thermal Power System and Demand Side Management to maintain frequency and power exchange with neighboring systems. The drawback of this paper is that DSM is costly and complex.

Based on that, this review aims to provide explanations of the methods used by previous researchers to obtain the final combination of design and control parameters to control the frequency and power of the system. In addition, the proposed paper will be a study on the design and control of the AGC and AVR for a multidisciplinary power system using a fluid-powered FLC controller to obtain better operating system features. The results show that the proposed controller has better overshoot, stop time, up time and removes the error values of the solid state for a shorter period of time using dynamic, bidirectional, or modern controls (FLC) rather than standard controls (PID) in the solid state, And temporary conditions. System simulation is done using Matlab / Simulink software.

6. Conclusion

In this paper, a detailed review of the AGC design and control and AVR systems for multiple multipurpose systems are introduced to control and maintain the frequency, power, and electrical power of the system. Accordingly, we provide guidance on choosing the appropriate control method based on measuring actual power between generations and demand, balancing effective power between production and load, maintaining the objectives of the combined power flow in FACTS, LFC, AGC, and AVR control frequency, effective power, voltage, and operating power. This paper also introduces comparative features of different types of power system controls and from that AGC is to control and control frequency and power and AVR is to control end-to-end power and operating system of the constant state, stop time and over-shooting) of the system.

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BIOGRAPHIE

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