Sensitive Analysis of A Two Area Inter Connected Power System by using Optimization Technique

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Abstract: **The Automatic Generation Control of an inter-connected two area Thermal-Thermal power system subjected to sensitive analysis of proposed system parameters under different load condition. How System responds under different load condition. Moth flame optimization Algorithm is used to Tune the parameters of PI, PID controller (Kp, Kd, KI). By including the non- linearities like GRC, TD and Dead band for getting better results.**

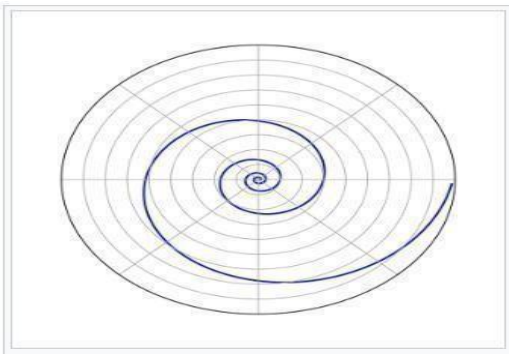
Keywords -AGC, Optimization, MFO

I. INTRODUCTION

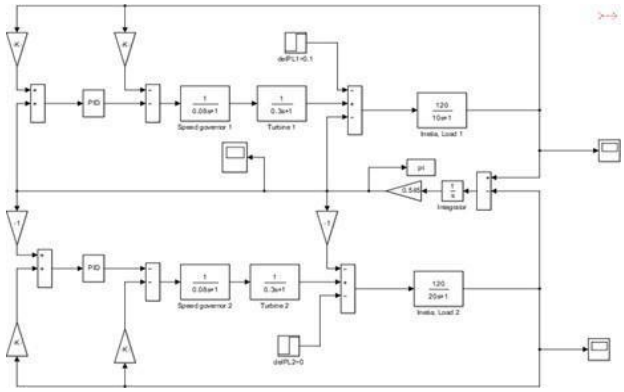
Power system is one of the biggest networks with several interconnected system. The main objective of power system utility is to maintain continuous supply of electrical power with an acceptable quality to all the consumers in the system. The power system will be in equilibrium when there is a balance between power demand and power generated. There are two basic control mechanisms used to achieve Reactive power and Real power balance. The Former is called Automatic voltage regulator (AVR) and Later is called Automatic Generation Control (AGC). In our power system load is always changes with Respect to time. As we know that in synchronous machine if load changes corresponding to that speed Also changes if speed changes then corresponding to that frequency also changes. So, we need to maintain frequency as constant It is impossible to maintain Balance between generation and load without control. So, we need an optimal setting for controllers [1]. Optimization refers to the process of finding the best possible solution for a particular problem. As the complexity of problems increases, over the last few decades, the need for new optimization techniques becomes evident more than before. Then a Genetic algorithm is used to tune the parameters of PID controller like Proportional gain (Kp), Integral gain (Ki) and Derivative gain (Kd). To get an accurate insight of the AGC problem [2]. And the Differential evolution [4] and FireFly [5] algorithms based Automatic generation control for inter connected power system should be developed. The main disadvantage of GA is the requirement of large CPU time and unable to handle functional constraints' function evolution for each string is independent and hence they could be processed in parallel. Later some methodologies are developed for PID Controller [6],[7]. It is Necessary to include the important physical constraints Such as Generation rate constraint (GRC), Time delay (TD) and Dead band. Here a nature inspired Moth Flame Optimization algorithm to tune the Parameters of PID controller like (Kp, Ki, Kd). Basically, optimization refers to the process of finding Possible solution for a particular problem [9]. The main Inspiration of proposed algorithm is the navigating Mechanism of nature called Transverse orientation. They maintain some fixed angle with respect to moon to travel long distances. Once they reach the Moon or any other any lightning source they rotate spirally around the source. For each and every iteration it is going to update the Flame number and Distance. The incorporation of DC link in parallel with AC link as an area interconnection has also exhibited favorable effect on dynamic response of the system [10].

$$S(M_i, F_i)=D_i e^{bt} cos(2\pi t) F_j$$

Di=distance of i-th moth j-th flame
b=constant for defining the logarithmic spiral0



II. BLOCK DIAGRAM



III. RESULTS AND DISCUSSION

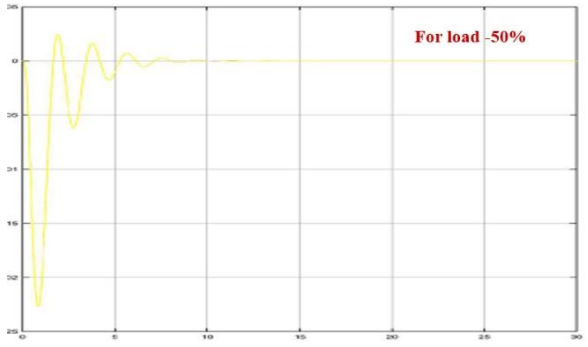
Here the moth flame optimization algorithm is used to Tune the parameters of PID controller. The above system Is simulated using MATLAB 2014 version for changing the parameters of two area interconnected thermal-thermal of +%50 and -%50 how system behaves with respect to Corresponding change. From the Fig1&2 shows compare the performance PI and PID controller the system performance is high in PID controller when compared to PI controller. The PID Controllers parameters like Proportional, integral and Derivative (Kp, Ki, Kd) the gain of the controller is high When respect to PI controller parameter gains. Here MFO can give best results when compared to Another optimizing algorithm. For desired values of PI or PID controller are Obtained by increasing number of iterations.

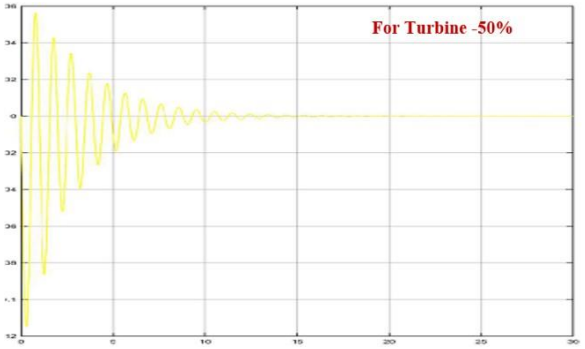
PI controller Gains						
System		Area1		Area2		
Parameters	change	Kp1	Ki1	Kp2	Ki2	MFO optimal value
Tg	+50%	0.013	0.6018	1.5639	0.8853	19.5752
	-50%	4.2086	0.6862	-0.0353	0.7986	6.3734
Tt	+50%	1.2307	2.0646	2.6454	-0.7614	63.1754
	-50%	2.5035	1.6301	0.0674	0.6047	0.79454

Table 2: For PID controller

PID Controller gains								
System		Area1			Area2			
Parameters	change	Kp1	Ki1	Kd1	Kp2	Ki2	Kd2	MFO optimal value
Tg	+50%	5	5	1.7281	4.1814	4.8895	5	0.53305
	-50%	5	4.8975	2.5409	3.75	4.58	4.7380	0.077764
Tt	+50%	3.9162	5	1.2171	3.4202	5	2.0138	0.043315
	-50%	3.7283	5	0.7696	1.0306	0.3632	4.9837	0.0480023

Table 2 : For PI controller





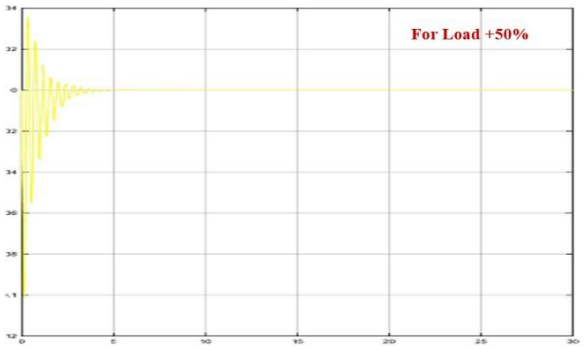


Figure 1: Graphs for PI controller

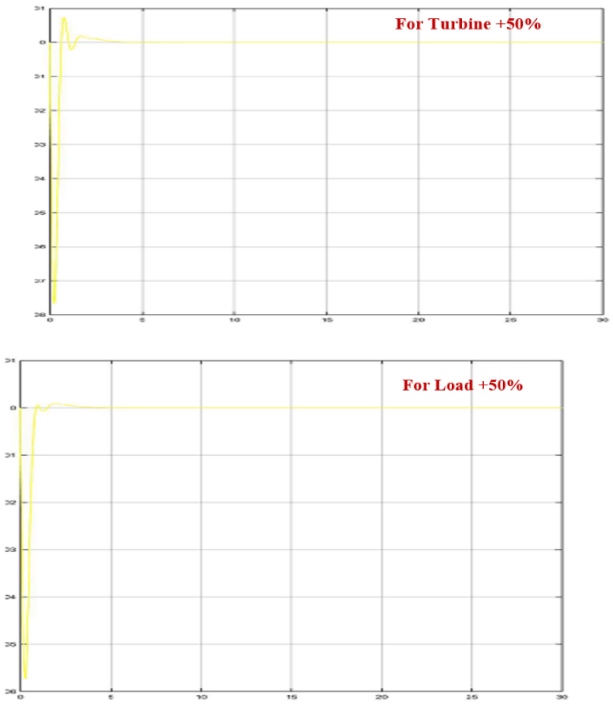


Figure 2 : Graphs for PID controller

IV. CONCLUSION

MFO algorithm is tested to find the capabilities for tuning an optimal controller for a two-area thermal interconnected system with including non-lineraties.it is observed then controller parameters are changed when number of iterations are increased and we get much more better results. Comparing the performance of PI and PID controller, PID controller give the more Accurate value.

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