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THERMAL POWER PLANT MANAGEMENT USING CHAOTIC SWARM INTELLIGENCE

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Abstract— **We introduce in this paper an algorithm called chaotic swarm intelligence algorithm which solve Economic dispatch problem of the thermal power plant at some extent this algorithm is more better than other techniques and the convergence of Chaotic PSO is faster as compared to standard PSO. We discuss the generator unit constraint, objective function, power balance constraint and prohibited operating and discuss the advantages of the technique apply on these constraint.**

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Keywords- Chaotic Swarm Intelligence ,PSO,Economic Dispatch

I. INTRODUCTION

Today economic dispatch problem is a very critical issue in power industry. The main objective of economic dispatch is, “the optimal output of a number of electricity generation facilities, to meet the system load, at the lowest possible cost, focus to transmission and operational limitations”. The best Economic load dispatch must be meet with the generator perimeter, slope level, load demand, forbidden operational region[1,2].the economic load dispatch problem many predictable method are used to solve the problem , these method are Differential Evolution technique [3] ,Firefly Algorithm technique[4,40-43],Using Evolutionary Computation [5,45-49],Root finding techniques[6],Bat Algorithm[7],Lambda iteration method[8],New probab-ilistic method[9],HYBRID GA-PS-SQP METHOD[11,39], Lambda Iteration and Back Propagation Neural Network Methods[12,50-55] All of these methods is solve the economic dispatch problem there are many other method which is solve the economic dispatch difficulties in power engineering, Basically the economic load dispatch is very challenging issue as we know that the incorporation of valve point loading effect, and through multiple local optimal points the economic dispatch problem is non-linear, not convex [13], many gasoline possibilities with diversified similarity and dissimilarity constraints [14].Conservative techniques possess modest mathematical model and high search speed but they are pointless to find a solution of such problem since in the cost function they possess the difficulties of Multiple local lowest points, Some Technique need for that feature is considering to be important, as we know that the great profit loss over time and limitations in the figure of fuel-cost curves hence calculations are not obligatory as they could be lead to below an optimal level [15].Other methods which are used to find a solution of the problem of economic dispatch which is based on simulated intelligence have been planned to solve the Economic dispatch problem these are heuristic optimization techniques [16], genetic algorithm, simulate annealing[17,56] ,neural network, Ant colony optimization[18,60-62],and particle swarm optimization[19,20].In the above introduction we discuss the problem of economic dispatch in the current power network some of technique and method are involve to solve these problem and increase the power demand, now I am going to tell you some of the earlier problem rise in power industry and its improvement with different methods, problem statement, which is solve the economic dispatch problem.

II. PROBLEM STATEMENT

As we know that an electrical system has some power station. Every station contain numerous generating units. On any time, in different power station the entire load demand in the system to be meet with the generating units. To decide the power yield of every power station, and in a power station the power yield of every generating unit is by economic dispatch mechanism, as a result the economic dispatch mechanism will reduce the total price of fuel required to cater for the load system. Problem is to meet the load demand with generator output demand at the minimum cost. if the load demand does not meet with generator output so different problem rises in power plant ,varying generator constraint instantaneously ,fuel cost high ,no reliable power and security .so all these problem is solve by various method.

III. OBJECTIVE OF THE ECONOMIC DISPATCH

To solve any real time problem our main task is to first-rate the correct Scheme. In the process of the Power network the succeeding purpose can be measured:

- The whole production cost is to be minimize e.g. is fuel, maintenance of the generator and startup cost which is the input for the utility.
- Minimize the emission of different gases that emit from the thermal power station and the last is to:

- Maximize the consistency and safety of the system.

So in above scenario our main aim is to minimize the cost.

1. EARLIER PROBLEM RISES IN POWER INDUSTRY AND IMPROVEMENT

In plant operation the most important purposes is pre-settle which is a single of the many relations used to describe the information economic hourly constructing of all current system properties .the ratings of a pre-schedule run give required input to real-time economic dispatch and/or hydro-thermal procedure ,pre- dispatch may also be used as an maintenance in system preparation where valuation of abnormalities for arrangement delay lead is completed on the basis of the real optimal running styles [37,59]. In the period of 1985-1995 there is a big growth and change is occurred. There is new a policies and computer programs has been settled for the unit commitment and for the economic management development on optimal base [38].so that definition the issue of economic dispatch difficulty is the correct responsibility of a number of units output of a total units in a set which is to support the require demand load on "optimum" method.

2. TECHNIQUE USED TO SOLVE THE PROBLEM OF ECONOMIC DISPATCH

Year before there is various technique is used which is solve the problem of economic dispatch for thermal power plant. Latterly some of useful and fast growth method is used to solve this problem these are availability of computational competency and mathematical techniques [21] due to this many of complicated issues is magnificently resolved.

PSO provide a better result, to solve the discrete and continuous problem of optimization by using Particle swarm optimization which is a stochastic method of optimization [22].Recently the economic problem is clarified by PSO .the PSO is originally grow in 1995 by James Kennedy and Russell Eberhart is Inspired from a swarming of bird and in a discipline order of fish [23],logically the particle swarm optimization is resemble with genetic algorithm[56] so that these two are population based exploration techniques (GA).to solve the problems of mixed integer optimization and non-linear problem which are distinctively a complicated engineering system so GA have capability to solve such problem. But the computational cost of the genetic algorithm is very expensive which a drawback, [24] is. In the field of swarm intelligence particle swarm optimization is a progression optimization tool which is found on swarm called population [25], in PSO every bird which is called particle move towards the best position i.e. each particle creates decision have own experience together with its neighbor knowledge. The basic PSO is easily catch into a local minimum. Computational efficiency, comparative strong to control parameters, simple concept ,easy execution are the main advantage of PSO .by comparing the efficiency of computational with heuristic optimization method and mathematical process ,in that case Particle swarm optimization is useful for discontinuous optimization problem and non-linear problem [26].however the PSO have several benefit.to generating an efficient solution very fast than other techniques it be able to apply of large dimension optimization [27].for that reason with the growth of computer system technology further interest and awareness is being rise in the swarm intelligence application which solve the problem of economic dispatch.

So for the 3 disparate unit of thermal power plant, chaotic swarm intelligence is showing to be helpful for the problem of economic dispatch.

IV. FORMULA OF THE EDP WITH CONSTRAINT OF THE THERMAL POWER SYSTEM

The operating fuel cost is the main cause in thermal power system [96].the main purpose of economic dispatch is reduced the total cost of fuel with in the generator constraint, from a number of thermal generator units we need to take the optimum output for a number of thermal generator units, result is to touch the load of a system [28].For economic load dispatch we consider many factors these are

- Units operating constraints/cost
- Generator and reserve restrictions
- Plant startup and shut down restriction
- Objective function
- Valve point effect
- Security constraint

All of these constraint are discussed in detail.

A) GENERATING UNIT INPUT-OUTPUT CURVE

As we know that huge amount of money are utilize for the construction of power station which containing numerous generating unit and billions of amount are consumed on a maintenance of units during operation also called maintenance cost ,payment for the staff .interest charge, operational cost and depreciation charge. The important part of running cost which can be control is Fuel cost. Hence, for further discussion we take only the fuel cost.

By varying the input fuel the output power to become changed. We can measured the fuel (input) in Btu. /hr and Ton/hr. Rs/ton are the cost of fuel, during the operation of generating unit 'i'give power MW so the input can be specified as Rs / hour. As shown in figure 1 displays a generating unit input -output curve .every generator have a limitation of power producing so that it can be operate in that these are maximum power Pi max and minimum power Pi min

As we know that there is various generating units in power plant .If all the generator component input and output characteristic are equal then all the units will be equal loaded while in the reverse case mainly the input output characteristic of generating units are different so that the individual unit have Power P is different and have particular input cost

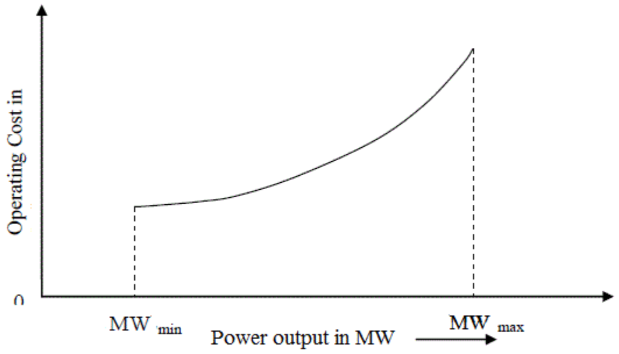


FIGURE 1: INPUT OUTPUT CURVE

B) OBJECTIVE FUNCTION

To meet the load demand of the thermal power plant in a specified period of time so the total cost of fuel of the different unit of generator is to be reduce by the use of objective function of the ED. The objective function of the economic dispatch which contain numerous constraint of inequality and equality is given below:

$$F_T = \sum_{i=0}^{n} F_i(P_i) \qquad (1)$$

$$F_T = F_1(P_1) + F_2(P_2) + \cdots + F_n(P_n)$$

Here in the above equation the P_T show the position vector and it has been show as

$$P_T = P_1 + P_2 \cdots \qquad \cdots + P_n$$

$$F_i(P_i) = a_i P_i^2 + b_i P_i + c_i \qquad (2)$$

Now sum of the fuel cost of the n^{th} generator is equal to the total fuel cost F_T

$$F_1(P_1) = a_1 P_1^2 + b_1 P_1 + c_1$$

$$F_2(P_2) = a_2 P_2^2 + b_2 P_2 + c_2$$

$$\vdots$$

$$\vdots$$

$$F_T = \sum_{i=0}^{n} F_i(P_i)$$

In the above equation the total fuel cost is represented with. F_T The coefficient of the fuel cost for i generator are a, b and c. Pi is the output power of the generator units the n number of generator unit is represented with i. Show the amount of generator units committed to operating system the operating fuel cost is represented with . Quadratic and naturally, cubic cost functions more accurately models the real answer of conventional thermal generators where fuel is oil, coal and gas.

C) EQUALITY AND INEQUALITY CONSTRAINT

For any optimization problem the optimal solution of is required to define within feasible region. This possible range can be represented by equality or inequality constraints. In economic load dispatch problems following are the constraints that should satisfy.

1.POWER BALANCE CONSTRAINT ON THE THERMAL GENERATING UNITS

$$\sum_{i=0}^{n} P_i = P_L + P_D \qquad i = 1, \ldots\ldots, n.$$

The transmission network loss of a unit power output is represented with P_L and the total power demand is represented with P_D . In the above equation the total power of ith generator is equal to the power demand and transmission line losses.

To minimize the operating cost of the generator by determining the generator schedule which is a main objective of the economic dispatch. To focus on the limitation that

Total generation = Total Load (that transfer to consumer) + Losses (line losses, generator losses)

2.GENERATOR LIMITS CONSTRAINT OF THERMAL GENERATOR UNITS

$$P_{i,min} \le P_i \le P_{i,max}$$

In the above inequality equation the minimum incoming power demand is $P_{i,min}$ on the generator unit ith . P_i min show and the maximum incoming power demand is $P_{i,max}$ on the generator unit ith , in real time system the incoming Load demand is between within that limit. However we focus on the thermal generator units to show the behavior of incoming load demand with the generator units.

Some of the restrictions of the economic dispatch are discuss in detail these are Risk-based economic dispatch in which Security regions, Prohibited Operating Zone , With Valve point effects and Multiple fuel Options for which a power system to be secure [29].

3. OPTIMUM POWER FLOW OR SAFETY CONSTRAINED OF ECONOMIC DISPATCH

Transmission constraints habitually limit ability to use lower cost power. The main goal of an optimal power flow (OPF) [57] is to define as by considering the limitation of transmission so that to operate a system instantaneously in optimum way. Generally minimizing operating cost = optimal (power), however with in the transmission constraint continue the power flow [29].

4. BENEFIT OF VALVE POINT

The function of fuel cost is expressively better if generation units with various valve steam Turbines are considered as we know that in steam turbine multiple valves are present for generating units [30]. To maintain the real power balance by accommodating the opening and closing of these valves. However in the cost function they add the ripples. Which create the objective function highly non-linear [30]. With the quadratic cost function the sinusoidal functions are added and its equation are given below :

$$F_i(P_i) = a_iP_i^2 + b_iP_i + c_i + abs\left(\sin\left(\left(P_{i,min} - P_i\right) \times f_i\right) \times e_i\right)$$

By considering valve point loading effect f_i and e_i are the coefficients of generator unit i

5. MULTIPLE FUEL OPTION

As we known that in thermal generating unit There are different type of fuels can be used, therefore we can represented an objective function of fuel cost with piecewise quadratic function so that the effect arise by changes of fuel type is to be considered [30].

$$
\begin{array}{ll}
F_i\,(P_i) = a_i P_i^2 + b_i P_i + c_i & if \quad P_{i,min} \le P_i \le P_{i,1} \\
a_{i2} P_i^2 + b_{i2} P_i + c_{i2} & if \quad P_{i1} \le P_i \le P_{i2} \\
\vdots & \\
\vdots & \\
a_{in} P_i^2 + b_{in} P_i + c_{in} & if \quad P_{imax} \ge P_i \ge P_{in-1}
\end{array}
$$

For the n^{th} power level $a_{in}\ b_{in}$ and c_{in} are the cost constants values of generator i [30].

6. FORBIDDEN OPERATIONAL REGION

Due to the physical constraint of machine component for example vibration in shaft bearing, steam valve and so on the generators may have settled range where operation is restricted. Generate a non-continuities in cost curve by the analysis of forbidden operational region and then converts the constraints which is given below:

$$
P_i = \left.\begin{array}{l}
P_{i,min} \le P_i \le P_{i1}^L \\
P_{i,K-1}^{\ U} \le P_i \le P_{i,k}^L \\
P_{i,zi}^{\ U} \le P_i \le P_{i,max}
\end{array}\right\} \quad \cdots \cdots \cdots \cdots \cdots \cdots (a)
$$

In equation (a) the lower and upper limit are $P_{i,K}^{\ U}$ and $P_{i,K}^{\ L}$ of k which show a Forbidden Operational Region of unit i and for the prohibited operating zone k is the index, z_i show the amount of Forbidden Operational Region .

V. PRINCIPLE OF CHAOTIC SWARM INTELLIGENCE

Particle swarm optimization which is a stochastic method of optimization. Recently the economic problem is clarified by PSO .the PSO is originally grow in 1995 [58] by James Kennedy and Russell Eberhart is Inspired from a swarming of bird and in a discipline order of fish .In a particle swarm optimization each individual particle exchanges preceding knowledge between themselves and this understanding increase the efficiency of the group to attain his position [10]. Such as genetic algorithms PSO is an evolutionary motivated solving issues [31,32]. Repetition of cycle up to a specific number a collection of variables possess values which is familiar near to that follower whose value is touching to the aim at any particular instant PSO may look complex but actually it is a very easy process [23]. The problem of nonlinear optimization is effectively solved by this process [20].PSO parallel of the manners of bird swarms. Assume the subsequent condition: in a specific area a bunch of birds are randomly move to find the food. In this area a piece of food is being investigated. These bird did not identify the food where it is present. Thus what is the optimum procedure is to find the food in this area? The bird which is near to the piece of food the actual one is to follow it .

In an N-dimensional solution space PSO technique is near to the problem whose definition can be denoted with point. To perform motion in the solution space hence a number of particles are randomly set .on every single repetition, this technique detect the strength of their own and their adjacent and they follow and moving towards the successful neighbors. PSO remarkably a very effective and simple method and use to solve a very complex problem domain [31].

In a multi-dimensional space every particle try to find the best point by keeping the knowledge of its neighbor , preceding knowledge and its own current velocity due to this it achieve an optimal point in a less time .in a multi-dimensional space each particle have a location and is characterized with position vector X_i each particle have a speed in a search space and is denoted by velocity vectors V_i .In i, j $dimensional$ each particle has its own best position which is $P_{i,j,Local}$ and the best location of swarm is kept in $P_{i,j,Global}$ for the position of particle i and k iteration the well-run velocity and previous velocity are determined in below equation .

$$V_i^{k+1} = \omega.V_i^k + c_1.rn_1.(Pbest_i^k - X_i^k) + c_2.rn_2.(Gbest_i^k - X_i^k)$$

In the above equation the X_i^k position of particle i in kth iteration. V_i^k

Show the velocity of particle i in k iteration, ω show the inertia weight factor c_1, c_2 are the acceleration coefficients and, rn_1, rn_2 are the random numbers between 1 and 0

In the iterations process The optimum competency of every single particle is stored in a memory which is called the *Pbest,* In the iteration process the optimal value of *Pbest* is to determine the Gbest called global best .in the above equation the velocity of every sing particle is being update by using the idea of *Gbest* and *Pbest* [15].Now the particle has a new position. Which is given below

$$X_i^{k+1} = X_i^k + V_i^{k+1}$$

X_i^{k+1} = On iteration k+1 show the existing position of particle

V_i^{k+1} = On iteration k+1 show the velocity of Particle

X_i^k = On iteration k show the position of Particle

c_1 And c_2 are the acceleration coefficient which pull every single element toward the position of Gbest and Pbest. In the above velocity equation the inertia weight factor is recommend To increase the convergence, so the inertia weight factor ω is important factor in velocity equation, A balance between local and global manipulation is to pick up a best inertia weight as result with a minimum number of iteration we find the best optimal result [14].to obtaining the optimal results and convergence in the middle of 0.9 and 0.4 so this range is best for varying the function value [15].However the convergence process is to be increase by the following equation is utilized [33].

$$\omega^k = \omega_{max} \frac{\omega_{max} - \omega_{min}}{iter_{max}} \times k$$

As we know that Inertia weight factor is represented with k, the Maximum number of iteration is represented with $iter_{max}$ the number of iteration of existing value is denoted with k the weighting factor minimum value is denoted with ω_{min} and maximum value is denoted with ω_{max}.

3. PSO ALGORITHM AND FLOW CHART

In this technique, the values which is give the information to others is only Lbest (Gbest) values. The progression simply looks for the optimum solution .PSO is unidirectional data sharing tool. In PSO the convergence process is very fast and it converge to the best solution is very quickly while Matched with Genetic algorithm, [34].

As we know that before observing for goals by updating the generation particle swarm optimization is set a collection of arbitrary particles (called birds).during the iteration process every single particle is justifying by two best value .first one is optimum result this one has achieved up to now.it is called a pbest(lbest). Any particle in the population Particle swarm optimizer traced another optimum value in the population which is the best value and achieved up to now this value is called gbest(global best).

In the following equation (a) and (b) decision of the two best value, update the location and velocity of the particle are included

$$V_i^{t+1} = \omega.V_i^t + c1.rn_1.(Pbest_i^t - X_i^t) + c2.rn_2.(Gbest_i^t - X_i^t) \quad \text{-- -- -- (a)}$$

$$X_i^{t+1} = X_i^t + V_i^{t+1} \quad \text{-- (b)}$$

The outcome of current particle is represented with X_i^t, the Velocity of particle is represented with V_i^{t+1}, c1, c2 are acceleration coefficient or learning factor. Generally . $c1 = c2 = 2$ The random number is represented with rn_1 and it is between (0, 1)

1) CHAOTIC SWARM INTELLIGENCE

PSO is a strong technique which is used to solve the problem of a non-linear optimization problem. A moment ago, to consider the generator limitation also the objective constraint which is called fuel cost function i.e. for the nth units to decrease the generator cost.so the problem of economic dispatch is solved by PSO method which is magnificently active technique .execution of conventional Particle swarm optimization is expressively based on its parameters in the local optima the complication is being trapped, so that the PSO frequently sustain the problem in search space. Although in engineering field an efficient method can be applied on nonlinear optimization problem this method is known as chaos. The chaotic is a very useful technique in practical application so that in the problem of curiosity they keep the population diversity, in PSO this is the main advantage of chaotic swarm intelligence. The parameters acceleration coefficient, inertia weight and random number are important features which is effecting the convergence of standard PSO.

Here we introduce a new technique in this paper which is chaotic swarm intelligence and “a random process evolving with time” to improve the performance of global convergence in particle swarm optimization. Chaotic mean irregular, randomness, in PSO to speed up the distraction from the local minima by using the chaotic method, a short time ago the optimization techniques using chaotic method achieve a very much consideration in the literature. The chaotic method is

Formulate as chaotic version of standard PSO. For a better result we create more scatteredness to get better solution because the convergence of Chaotic PSO is faster as compared to standard PSO and most important is the computational difficulty of the suggested scheme is better as compared to standard PSO, the chaotic convergence as compare to PSO is 97% while the PSO is 82%.

2) FOR THE PSO PROCEDURE PSEUDO CODE ARE AS FOLLOW

whereas every single particle
initializing the particle
Stop
perform
For every single particle
calculate the suitable value

whether the suitable value is greater than the best suitable value called Pbest in record
save the existing value as a new Pbest
finish

Of the entire particles Select the particle have optimum suitable value as the Gbest
For each particle
according to the equation (a)which is discuss above compute the velocity of particle
according to the equation (b) Update the position of particle
Stop
Whereas lowest error conditions or maximum cycle repeat is not achieved

3) PSEUDO CODE OF CHAOTIC SWARM INTELLIGENCE ARE AS FOLLOW

Create
Arbitrarily initialize particle swarm

Arbitrarily generate Cr (0)

Whereas (the ceasing of condition is not meet or repetition of numeral cycle)

Calculate the suitable value of particle swarm
For n = 1 to number of particles
Find pbest
Find gbest
For number of dimensions of particle d is equal to 1

Renovate the Chaotic Cr value

Update the position of particles
Next d
Next n

Renovate the value for inertia weight

Afterward production till cease the condition

End:

On every single iteration the velocity of particle is to be finalized as a Vmax (maximum velocity) on this dimension, the velocity of particle would go beyond to the Vmax is due to the sum of acceleration, so that the user specified the parameter. Then on that dimension the velocity *Vmax* is limited. [30, 1].

4) STEP WISE PROCEDURE OF FLOW CHART

In particle swarm optimization method the following steps in procedure are represented as flow chart follows:

(1). before starting the program, in the problem space, on h dimension set the population arrangement of particles with velocity and arbitrary location [35].

(2).Now for every single element, in h variable the required optimal fitness function is to be calculate it

(3).In h dimensional solution space match the fitness valuation of particle with the *Pbest* particle if its value is more acceptable than Pbest , at that point the Pbest value will be equal to Gbest also the position of Pbest will be equal to the present place

(4).tally the value of fitness (present) with the whole (group of particles) of the prior best, In the index of an array change the fitness value(present value) of the current particle and Gbest value ,if the present values is more acceptable than the Gbest

(5). in the above equations (a) and (b) varying the position of particle and also to varying its velocity, and C1 and C2 are The acceleration coefficient that is pull every single particle toward the position of Gbest and Pbest [36].

5) FLOW CHART

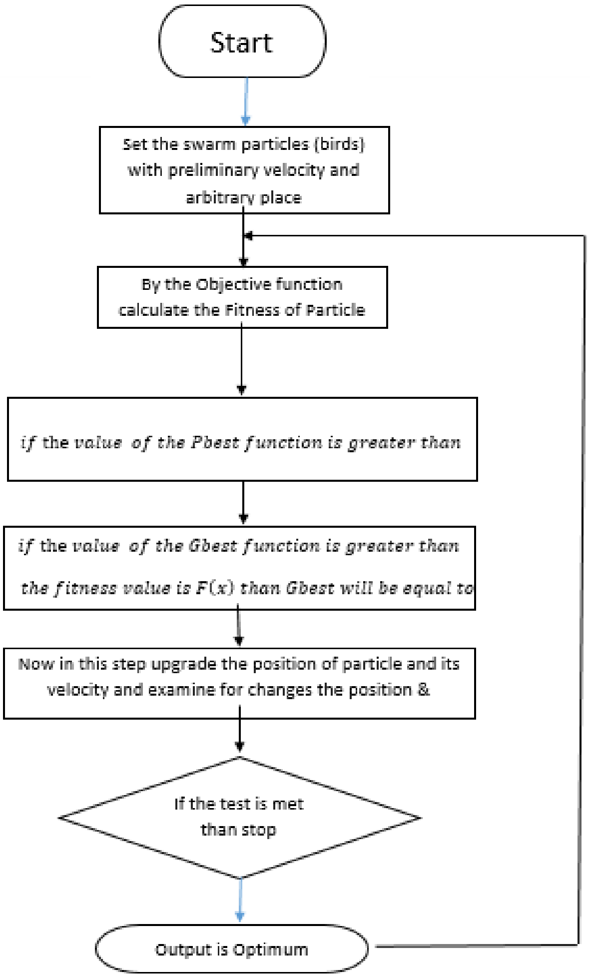
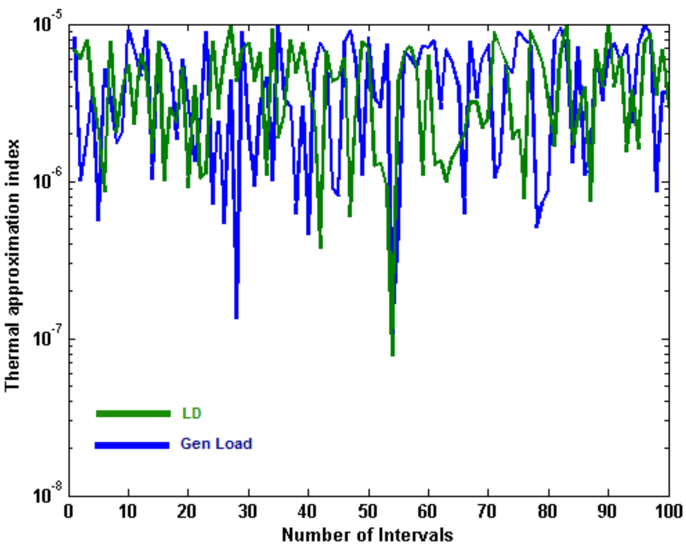


FIGURE 5-1: FLOW CHART OF PSO

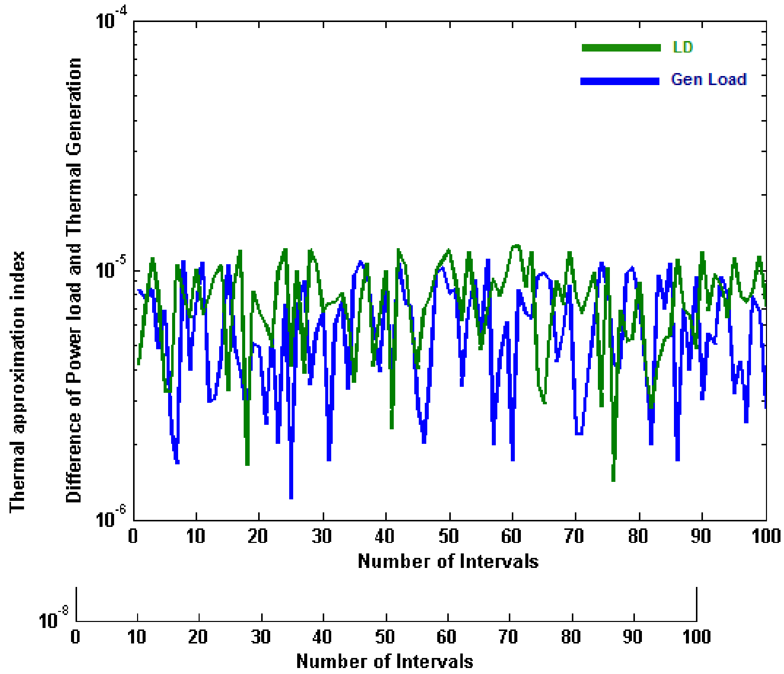
VI. Simulation Result

As we know that to solve the economic dispatch problem by considering the transmission losses we use a chaotic swarm intelligence which solve this problem by comparing with PSO the convergence is faster and take less time also the probability of solution is 98 % from the PSO, the problem is implemented in MATLAB and it was running on a core i3, 4GB RAM with 2.5Ghz processor and operating system Win 8 after several number of iteration the following result are



obtained, these result are obtained by considering 3 Units of thermal power plant. Range take from -1000 to +1000 MW

FIGURE 1: FIRST TEST B/W LOAD VARIATION WITH RESPECT TO GENERATOR LOAD



In the figure (1) , we check the variation arise in the thermal units MW in the range of 10-7 to 10-5 with respect to load demand these are the power variation which is execute the simulation for 100 cycle

FIGURE 2: SECOND TEST B/W LOAD VARIATION WITH RESPECT TO GENERATOR LOAD

In the figure (2) the variation of Power in thermal unit is check for the next 100 sec both the graph show that the power demand is varying with time to time it not have a constant value

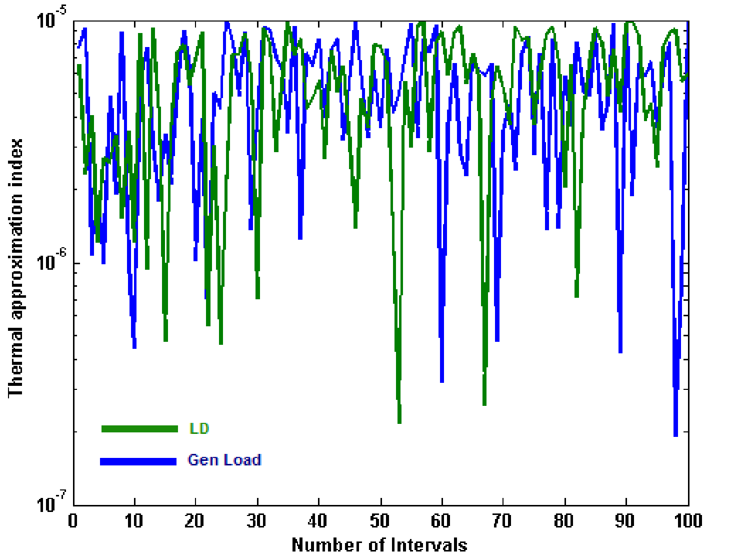


FIGURE 3: THIRD TEST OF LOAD DEMAND VARIATION WITH RESPECT TO GENERATOR PEAK LOAD

In the figure 3 from the complete evaluation we magnify the range of approximation index

FIGURE 4: FOURTH TEST LOAD DEMAND VARIATION WITH RESPECT TO GENERATOR PEAK LOAD

In the figure 4 called fourth test the variation of load of the consumer and generator variation of the thermal power plant will gradually decrease the generator unit and consumer will goes to the steady at some instant

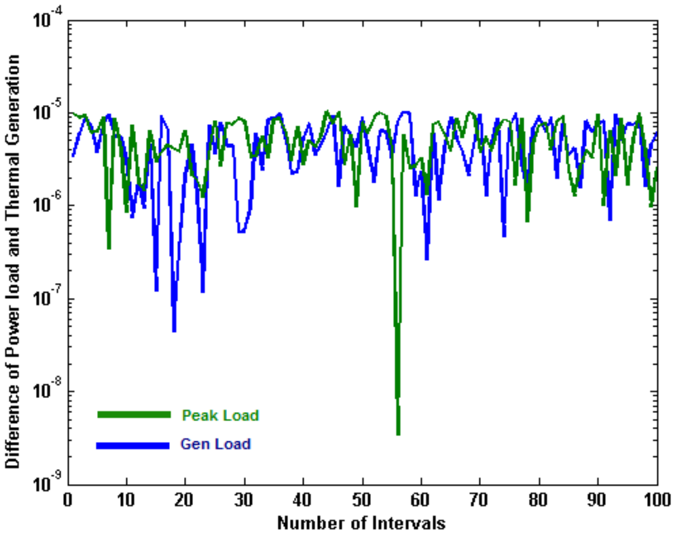


FIGURE 5: FINAL ITERATION TEST OF LOAD DEMAND VARIATION WITH RESPECT TO GENERATOR PEAK LOAD

In the figure (4) and (5). As we know that consumer load very instantaneously increase and varying in this we represent the load variation of incoming demand while compare with thermal generation unit there is so much difference the test is run from 0 to 100 sec in the fig (VI-5) the peak point (green) show the peak demand of consumer which would evaluate in (VI-5) graph

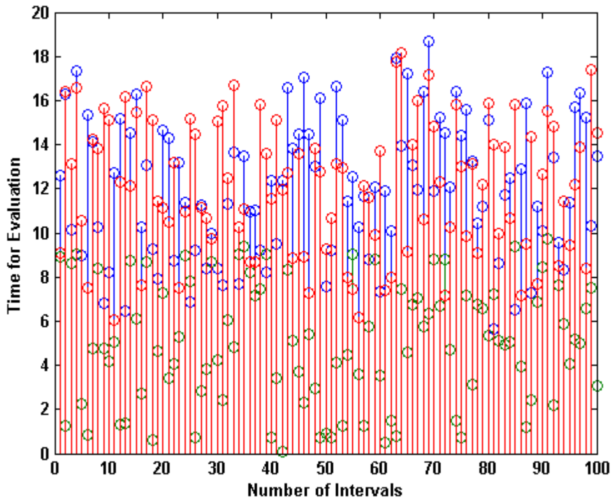


FIGURE 6: 1ST ITERATOIN LARGE VARIATION OF LOAD DEMAND WITH RESPECT TO GENERATOR VARIATION AND THERMAL INDEX LEVEL.

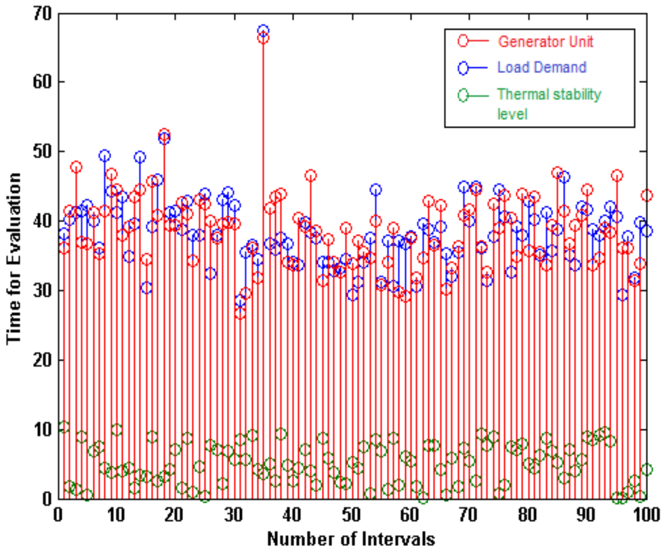


FIGURE 7: 2ND ITERATION LOAD DEMAND VARIATION WITH RESPECT TO GENERATOR PEAK LOAD AND THERMAL INDEX LEVEL.

In the figure (6) and Figure (7) to evaluate the incoming demand with thermal generation units in this graph the incoming demand show in blue and thermal units power rating show in red and the thermal index level shown in green by using chaotic method we check the convergence that how fast it work to evaluate the load demand from 0 to 100 sec the evaluate will check for 20 cycle the load demand will continuously merged with thermal unit and also the thermal index of power plant will gradually coming in steady state position.

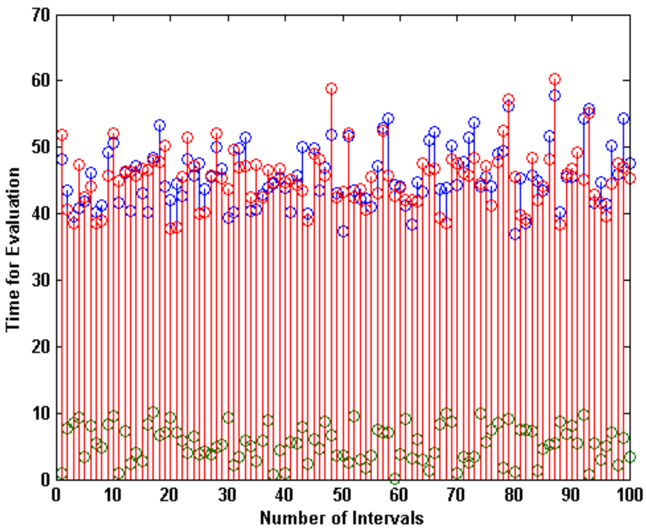


FIGURE 8: 3ND ITERATION LOAD DEMAND VARIATION WITH RESPECT TO GENERATOR AND THERMAL INDEX LEVEL.

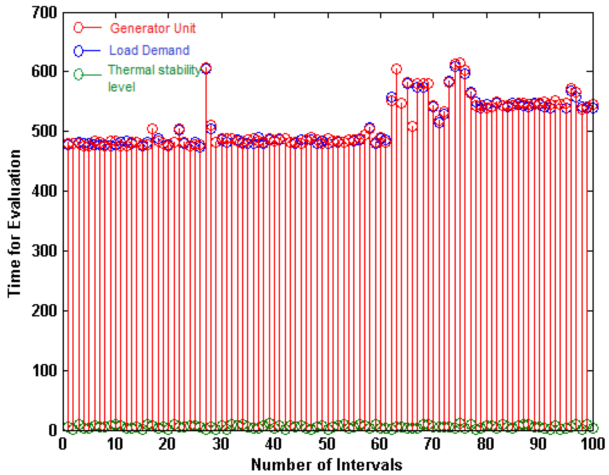


FIGURE 9: FINAL ITERATION ALIGHNMENT OF LOAD DEMAND WITH RESPECT TO GENERATOR LOAD.

In the figure (8) and (9) cycle will increase to 70 in both graph the thermal index ,power demand is closing to the thermal unit rating after the checking the merging point of the PD and thermal unit rating on 587 iteration both are integrated also the thermal index is evaluate in steady state .

VII. CONCLUSION

The algorithm is applied on the thermal power unit which is to solve the economic dispatch problem. The result are shown in the graph which is found satisfactory. The future methodology is quite simple, reliable and efficient and suitable for Real-world applications. While comparing with the Standard/conventional particle swarm optimization the convergence process of the chaotic swarm intelligence is fast also in the above graphs produce results are in high accuracy and in less computational time. The chaotic convergence as compare to PSO is 97% while the PSO is 82%.

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