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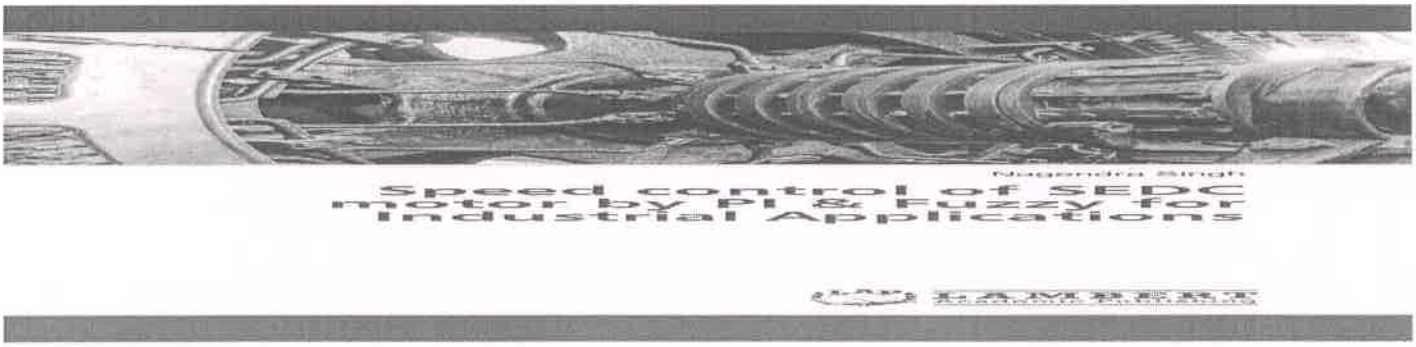

Speed control of SEDC motor by PI & Fuzzy for Industrial Applications

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This book is about the application of separately excited DC motors in industrial applications. SEDC motor is very versatile and it can used for many industrial applications when forward and backward motion is required. Since industrial work required constant and smooth operation so SEDC motor is very feasible for such operation using a suitable controller. PI controller is a classical controller but most industries use it. So this work shows the disadvantages of PI controllers and its results are compared with the fuzzy controllers. The fuzzy controller provides very accurate and smooth control of the SEDC motor. results of the fuzzy controller show that if the load is changing, the output of the motor is still uniform and smooth.

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Optimization techniques used for designing economic electrical power distribution

From the book Meta-heuristic Optimization Techniques

Nagendra Singh and Yogendra Kumar

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Abstract

Design of electrical machinery system is very important because its size is very big and handling is very difficult. Therefore, it is required to design the electrical engineering system, including electrical machines and power system, very compact but its efficiency cannot be reduced. From long ago, optimization techniques are used to develop compact and efficient electrical systems. Optimization techniques can optimize the mathematical model of any linear or nonlinear system in real time and provide minimum or maximum optimum values. So many optimization techniques are used for obtaining the best value of the mathematical model. But due to day-by- day updates in the technology, nobody can say this is the most suitable deign of the electrical system. This chapter proposed the latest optimization technology that is used to distribute the electrical power in an economic and efficient way. Due to high loss of power in transmission line, per unit distributed cost increases. This chapter also discussed the comparative analysis of different optimization techniques with a suitable case study, and about the various challenges that arise when optimizing the data using optimization techniques.

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Abstract

Technologies are predominantly meant to give solutions to critical problems related to the well-being of human life. Whenever, a new technology comes into existence, it affects human life, directly or indirectly. Cellular communication technology is one of the most life-changing technologies to have come into existence and has soon got acknowledged worldwide. After the invention of 4G technology, people have started to move into the digital world. The fourth generation of wireless communications is also used in many industrial, business, and personal applications. Many countries are using this technology in health-care services very effectively. But the fourth generation of wireless communications has a major issue, of lagging of high-speed bandwidth Internet connectivity. The health-care sector is very essential and important for each and every country. But due to the nonavailability of health-care resources and low-speed Internet, many countries are finding it difficult or next to impossible to accomplish the smart hospital dream. Even in rural areas, the different health-care systems are using the conventional system, because of which they are facing lots of problems in the monitoring of the health-care system and it is getting more difficult day by day. The fifth-generation mobile network is a new global wireless standard after 1G, 2G, 3G, and 4G networks. The 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices. As 5G technology provides a very high Internet connection speed and requires less time to receive or send big data, it is largely

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Control Applications in Modern Power Systems pp 431–443

Analysis of Electromagnetic Interference in Solar Photovoltaic Grid System

Ritesh Tirole, Jai Kumar Maherchandani, Nagendra Singh, Raju Kumar Swami & Dimpy Sood

Conference paper | First Online: 27 May 2022

268 Accesses

Part of the Lecture Notes in Electrical Engineering book series (LNEE,volume 870)

Abstract

Electromagnetic interference (EMI) generated in grid-connected solar photovoltaic (SPV) system is addressed in this research paper. The major emphasis has been given on the issues related to generate EMI magnitude due to PV panel capacitance to earth, Common Mode (CM) interference due to switching of

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CHAPTER - 3
OPTIMUM SOLUTION OF ELECTRICAL POWER SYSTEM OBTAINED BY EVOLUTIONARY TECHNIQUES

BY

Nagendra Singh & Yogendra Kumar

Abstract:

Electrical power sector is very large and complicated system. Generation, transmission and distribution of power are the main task of power system with maintaining the stability limits. When power is distributed among the consumers, due to inductive nature of load used by the consumer, large power loss arises in the system. Overall efficiency of the system is nearly about 35 percent. Which shows that the system need to improve its performance using compact and efficient operation of the electrical power system. By using economic load dispatch power can be distributed to the consumers in such a way so that all consumer should be fulfill their load demand without overloading of the generating units. The selection of generating unit at different load duration required on the effective and efficient optimization techniques, which optimize the data of power transmission and generation system very quickly. This optimize data will help to operate the power system in efficient way and provide high efficiency and reduce the losses. So many optimization techniques are available which can optimize the linear as well nonlinear data effectively. In this chapter discussed evolutionary techniques which are currently used for optimization of the power system data and give better results than classical methods. Further discuss the application of various optimization techniques in electrical engineering. And at last included the result oriented data and compare the performance of the optimization techniques.

Keywords: Electrical power system, Evolutionary techniques, optimization, objective functions.

Introduction:

Electricity is very important in our life. We cannot imagine the word without electricity. Requirement of electricity is very high where as generation is limited. Due to high demand of electricity required to optimize the schedule of distribution of electricity, so fulfill the demand of all consumer without overloading [1]. Since the electrical transmission and distribution network is very big and complicated, many factors affect the transmitted power on the network. Even due to these factors high losses arises on the transmission network. Such losses creates high voltage drop on the electrical network. Losses and voltage drop also depends on the types of consumers, and load operated by the consumers. Generally large consumers operated high inductive load and hence increase the reactive power, decrease the power factor and hence increases the line losses and voltage drop [2]. In India thermal power plant is the largest power generating plant. Second largest power generated by hydro power plant. Solar and wind power generation contribution is very less as compare to the load demand. Figure 1 shows the current percentage of power generation by the different power plant [3].

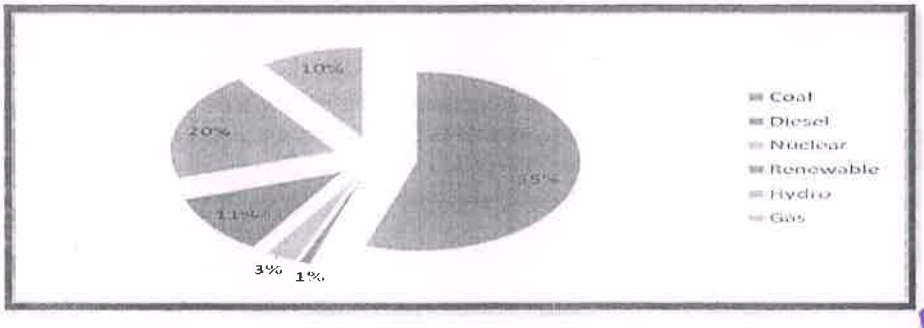

Figure 1: power generated by different power plants

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CHAPTER – 12
USE OF OPTIMUM HYBRID SYSTEM FOR ECONOMIC ELECTRICITY SUPPLY

BY

Nagendra Singh, Mukesh Kumar Kumawat, Shiva Ram Krishna

act:

oal of the proposed thesis is to obtaining optimum size of hybrid generating units has the minimum generation cost. s study simulate different combination of energy resources and its results are compared to each other. Simulation l developed with the solar, wind diesel based hybrid system for fulfillment of load demand of industries by using of IER 2.81 version. Obtaining reliable and cost effective strength solution for the global expansion of mmunication areas gives a completely difficult problem. Grid connection are may be available but in our simulation not considered.

words: Hybrid system, renewable energy generation system, HOMER, Economic supply of Electricity.

1. Background :

emitting increase in power demand, depletion of fossil fuels and environmental concerns forces all stake holders of power system to adopt alternative resources of energy, efficient conservation system and energy conservation niques. The installed capacity of the power plant is mainly depends on thermal power plants which are responsible for ting the pollution in the environment. On the other hand Solar, wind and other non-renewable energy sources are e economical, efficient and having less installation demands but less reliable. To address the issue of reliability, rid system comes into existence which provides power with more reliability and in the age of information technology communication it can be used to fulfill the auxiliary power requirements at remote location. As telecommunication tor is the important sector where auxiliary power is required at its exchange offices, in current thesis solar, wind and sel based hybrid system is considered for which the optimization is done with the help of HOMER software which is veloped by the National Renewable Energy Laboratory, USA. Here telephone exchange office of deistic Bhopal is en as the case system.

1. Introduction :

cations distant form the urban areas need for energy efficient electric generating sources to overcome the problem of ortage of electricity. By this means required to plant some alternating system which is different of conventional system. ybrid generation system is one of the best solutions for generation of electricity in rural region by proper using of nconventional power resource like solar, wind and other available resources [1]. Power utilities in many nations around e world are turning away their concentration toward more energy- efficient and renewable electric power sources. The se of renewable energy sources in remote locations could help reduce the operating cost through the reduction in fuel tilization, also concentrating on enhancing the efficiency of system efficiency, and decreasing the noise and emissions. lybrid energy system is a combination of various types of resources it may be renewable energy resources or usual esources in order to complete the load demand and increase the reliability of the system. Getting reliability and minimum ffective cost of power solution for the worldwide expansion of many sectors such as telecommunication sectors, small cale production offices which are facing lots of problem due to short cutting of electricity [2]. Grids may be available or ome cases remote area not available, their extension can be extremely costly in such type of commercial users. As the nitial costs of conventional system are low where powering provided for these sites by diesel generator but these generators needed lots of maintenance cost as well as consume lots of fuel.

Renewable and alternative energy distributed generation (DG) sources, energy storage, and combined heat and power (CHP) are very promising technologies which can help reduce undesired emissions and fossil fuel dependence, and improve energy efficiency and reliability. While DG technologies are able to operate on their own, higher efficiency can be obtained by incorporating energy storage and CHP (when possible) as a hybrid system [3].Constant speed of flow of wind is required for generation of wind electrical power in such remote locations. Hybrid system with interconnection of solar system, wind electrical system, storage battery for backup and diesel generator system is very reliable because the diesel generating system acts as a cushion to take care of changes in speed of wind and it always try to maintain the

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CHAPTER – 10
SPEED CONTROL STRATEGY OF PMBLDC MOTOR
BY

Mukesh Kumar Kumawat & Nagendra Singh

Abstract:-

Brushless Motor is likewise drawn out as stepper engine yet the term stepper engines, Brushed Direct current (DC) moto are around since the mid-nineteenth century, however brushless engines range unit a sensibly late entry. In this chapte Describing about the Permanent Magnet Brushless Direct current Motor (PMBLDCM) working, application Advantage & disadvantages of the Motor. How it worked, what is controlling circuit of the PMBLDC motor, what is the applicatio available of this motor. Also describe about design circuit & modelling Equation of the PMBLDC Motor.

Keywords- PMBLDC Motor, Controller Circuit, BJT, MOSFET, IGBT, SCR, etc.

1. Introduction:

Permanent Magnet BLDC Motor Conventional Direct current (DC) Motor zone unit to a great degree temperate then thei makings brand them appropriate for custom as servomotors. Be that as it might, their lone disadvantage is that the essential an electronic change and encounters that variety unit topic to attire then need upkeep. In this section examine with the essential structures of PMBLDC Motor drive circuits, crucial working standards and enduring state qualities PMBLDC Motor and utilizations of the PMBLDC Motor will be quantified Constructions then Determination Routes

1.1 PMBLDC MOTOR-

The expansion of late-night brushless locomotives is importantly almost comparable the air conditioner engine, known the static magnet electric engine as Figure 1 valuable outline of a three-stage PMBLDC engine.

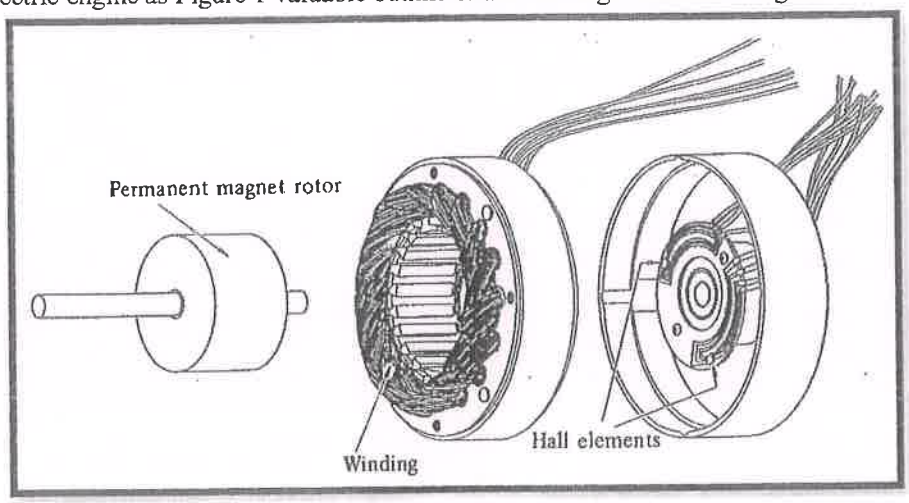

Figure 1 dissembled read of a PMBLDC MOTAR

The stator windings zone unit like those in a poly-stage air conditioning engine, and the rotor comprises of 1 or additio unchanging lodestones. Brushless Through existing (DC) machines are selfsame astounding after air habituat synchronous engines in that the past consolidates a few implies that to see the rotor position (attractive shaft) to Diagr out how to give signs of the semiconductor electronic based switches as appeared in figure 2 the most widely recogni position (post locator) [3] gadget is that the Hall component, however a few engines use optical sensors.

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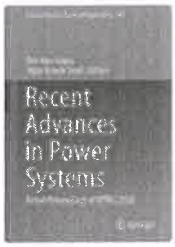

Recent Advances in Power Systems pp 205–215

Renewable Power Generation Using Asynchronous Generator: A Review

Nagendra Singh, Ritesh Tirole, Shekh Kulsum Almas & Dimpy Sood

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Abstract

Wind energy is the form of sun energy. Flow of wind is not uniform all time. For conversion of wind energy into electrical energy synchronous generator were used. Synchronous generator used for the constant speed of power generation. So using synchronous generator for irregular wind energy conversion in electrical energy is not efficient. Due to such

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Optimization of Economic Dispatch Using PSO With Time Varying Acceleration Coefficient

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Abstract— **One of the primary issues in the world of electrical power dispatch that still getting higher because of the most complicated and essential problem in the power system operation is economic dispatch. Economic dispatch is a vast subject in modern power system because of its non linearity constraints. Due to this reason economic dispatch becomes a great challenge for researchers and engineers. The principle target of Economic dispatch is to make the producing electrical power inside points of confinement to meet the necessities of demand request with least cost simultaneously fulfilling the various constraints. In this work we have proposed a new PSO technique for the optimization of economic dispatch with the properties of time varying acceleration coefficients. The suggested technique is tested for various IEEE transmission bus system of economic dispatch; its results are evaluated with prominent technology presents in literature.**

Keywords- *Economic dispatch, cost minimization, optimization, PSO with time varying accelaration and constraints.*

I. INTRODUCTION

Economic dispatch identified the generated output power of the power plant. According to load demand these available powers of the plant generated by different generating units are selected and loaded in a manner so that minimize the overall cost of thermal plant and satisfied the various limitations generally called constraints [1].

Economic dispatch issue is actually the arrangement of an enormous number of load flow issues and picking the best one which is ideal as in it needs least cost of generation of power [2].

Conventional economic load dispatch would be considered as linear model and it is assumed that the total power is generated within limits of maximum and minimum of generated power. The cost curve should be linearly increased with generated power. Many algorithms were proposed by researchers for the solution of such linear model, like lambda optimization [3], linear programming method [4], nonlinear method, gradient method and interior point method [5]. Electric power systems have been designed to ensure an affordable, reliable electricity service to consumers. Economic load dispatch focuses how to making best use of available generating resources to meet customers demand and at lowest possible cost.

In the economic dispatch considered many effects like valve loading effect [6], prohibited operating zones [7] and ramp limits [8] which makes more complicated the calculation of such problem.

So, characteristics of ELD issue must be approximated to meet the necessities of the old dispatch calculations, in any case, such approximations may prompt immense loss of income and time. The old style inclination based systems flopped in tackling these kinds of issues.

Recent techniques are efficient in computation, and have ability to search the better solution of the complex optimization problems like PSO [7], Genetic Algorithm [9], Evolutionary Algorithm [10], Simulated Annealing [11], ANN [12], TabuSearch [13], Ant Colony [14], and Differential Algorithm [15].

In this work consider various test data of IEEE bus system like 10 and 15 generating unit system. All the considered test data tested by the proposed TVACPSO and also same data tested using classical method like Lambda iteration and evolutionary techniques like PSO, CPSO, and WIPSO. The results of TVACPSO are evaluated with Lambda optimization, PSO, WIPSO and CPSO for the validation of the results.

II. FORMULATION OF ELD PROBLEM

Economic load dispatch objective is define as

$$\text{Minimize } F_C = \sum_{i=1}^{T}[c_i + (b_i P_i) + (a_i P_i^2)] \quad (1)$$

Subject to the following constraints

$$P_i = P_D \quad (1a)$$

$$P_i^{min} \le P_i \quad (1b)$$

$$P_i \le P_i^{max} \quad (1c)$$

Where, F_C -total generation cost; c, b, and a- coefficients, T- used generating units, P_i-Sum of generated power. P_D-Instantaneous load demands.

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BUMBLE BEES MATING OPTIMIZATION ALGORITHM FOR ECONOMIC LOAD DISPATCH WITH POLLUTION

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***Abstract*— A new nature inspired algorithm, that simulates the mating behavior of the bumble bees, the Bumble Bees Mating Optimization (BBMO) algorithm, is proposed in this work for optimization of economic load dispatch. Economic dispatch is a method to evaluate the performance of the generating units to fulfill the load demand on minimum fuel cost. The proposed method bumble bees mating optimization (BBMO), work on different three modes namely the queen, the workers and the drones (males). For the evaluation of performance this study consider case study of forty generating unit data. The case study data is tested in various algorithms like Ant colony optimization, particle swarm optimization and genetic algorithm along with BBMO. The performance of all considered algorithm in this work is compared and it is found that minimum operating cost of the forty generating unit system is evaluated by BBMO. Convergence rate of BBMO is also very fast as compared to other considered methods.**

Keywords — *Economic load dispatch, BBMO (Bumble Bees Mating Optimization), Valve point loading effect, constraints.*

I. INTRODUCTION

The main characteristic of the economic load dispatch problem is to share the output power of the running generation sources so as to provide the load demand and satisfying the generator constraints at a minimized fuel cost. Electrical power systems are very large interconnected arrangement. Economy of any country also very much depend on the availability of electricity. For the effective, economical and reliable operation of large interconnected power system, it requires a proper analysis of operation. Optimization of such large system can be easy obtained by using economic load dispatch. Study of economic load dispatch helps us to operate power systems economical and efficient manner, therefore improves supply of energy without any disturbances [5].

The characteristic of classical economic load dispatch (quadratic cost function) problem is linear in nature. Whereas if considered the valve loading effects the characteristic of cost function must be non-smooth [6]. Old optimization techniques like gradient method used to optimize ELD [9].

Since the classical optimization techniques has many drawbacks and unable to give the global solution of the problem. Many new approaches are presented in literature like genetic algorithm[10], ACO[11] PSO [6],[8]for the solution of economic load dispatch problem.

In this work suggest the BBMO algorithm [1-4], for the optimization of linear and nonlinear economic dispatch including the effect of valve loading in the generator. The effectiveness of the proposed algorithm is check for the data of 40 generating units.

II. ELD FORMULATION

A. Fuel Cost Function

Linear ELD fuel cost function is formulated as given in Eqn. (1) and eqn. (2).

$$F_T = \text{Min } f(FC) \tag{1}$$

$$f(FC) = \sum_{i=1}^{N} a_i P_i^2 + b_i P_i + c_i \tag{2}$$

Subject to the following limits

Power Generation Limits

The generated power at plant should be lies in the limits of maximum and minimum,

$$P_i^{min} \le P_i \le P_i^{max} \tag{3}$$

Generated power balance limits

The total power generated at thermal power plant should be equal to the sum of overall load require and loss of the line and it is represented as in eq. (4).

$$\sum_{i=1}^{n} P_i = P_D \tag{4}$$

Where F_T is the total generation cost, f(FC) shows the cost function in terms of power generation, a_i, b_i, & c_i are the cost coefficients, P_i is the power generated by i^{th} generating units, N shows the number of generating units. P_i^{min}&P_i^{max} lower and upper limits of generated. And P_D total system demands.

B. Fuel cost Function with valve point loading effects.

In the thermal power plants generators are provided valve system to control the speed of rotation. Due to presence of these valve ripples are arises at the time of operation. So that

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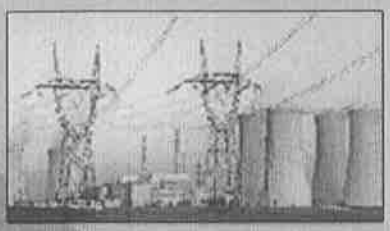
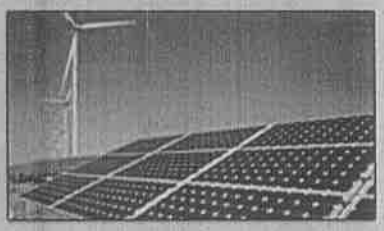
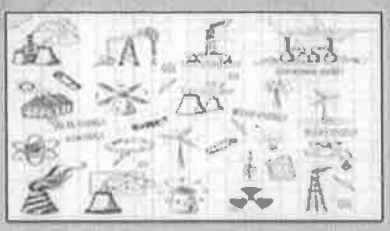

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Effect of Valve Loading on Thethermal Power Economic Load Dispatch Using New Elephant Herding Optimization

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Abstract

Economic load dispatch has used to evaluate minimum cost of power generated at the thermal plants. Economic load dispatch characteristic can be formulated in quadratic cost function, considered as linear function. The quadratic ELD cost function will be nonlinear in nature when involve the effect of valve loading. For optimization of linear as well as nonlinear cost function this work proposed a latest meta-heuristic swarm based technique known as Elephant herding optimization (EHO) and modified EHO (MEHO). The EHO technique is stimulated by the herding behaviour of elephant organization. EHO has the fast convergence rate due to the use of clan updating as well as separator operators. In general elephants live together under the leadership of a matriarch. The male elephants leave the family when they grow enough. So according to behaviour of elephants consider two type of operators namely clan updating operators and separating operators for optimization of the linear and nonlinear problems. In these work results of MEHO is compare with EHO, ACO and PSO. The outcomes show that MEHO can find the higher values on maximum benchmark issues than the ones three metaheuristic algorithms.

Keywords- Economic load dispatch (ELD), Modified Elephant herding optimization (MEHO), ELD with valve loading effects, PSO, Constraints, Optimization.

INTRODUCTION

The goal of the economic load dispatch problem is to share the output power of the running generation sources so as to provide the load demand satisfying the generator constraints at a minimized fuel cost. Accordingly numerous optimization techniques are implemented to solve complex and convex ELD problems. Some of them include the participation factor methods, the gradient methods, the linear methods and Newtonian methods etc. [1]. Electrical power systems are very large interconnected arrangement. It plays very significant role in the economy of any country. For the effective, economical and reliable operation of large interconnected power system, it requires a proper analysis of operation. Optimization of such large system can be easy obtained by using economic load dispatch. Study of economic load dispatch helps us to operate power systems economical and efficient manner, therefore improves supply of energy without any disturbances [2].

The characteristic of classical economic load dispatch (quadratic cost function) problem is linear in nature. Whereas if considered the valve loading effects the characteristic of cost function should be non-smooth [3]. Many classical and modern optimization techniques used to solve such nonlinear problem.

The feature of classical load dispatch problem is linear in nature. Whereas if considered the valve loading outcomes the feature of characteristic of ELD will be nonlinear [3]. Many classical and new optimization strategies used to evaluate solution of such nonlinear objective.

The parametric quadratic programming method was

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