ISSN- 2394-5125 VOL 8, ISSUE 05, 2021

Streamlining of a Multi Source Power Plant for Power

[1]*Mr. B.Raju Assistant Professor, banothu.raju12@gmail.com*
[2]*Mr. Venkateswar Rao Assistant Professor, venkatsnmpkmm@gmail.com*
[3]*Mr. V.Saidulu Assistant Professor pecsaidulu.eee@gmail.com*
Department-EEE
Pallavi Engineering College Hyderabad, Telangana 501505.

Abstract – While meeting demand and deducting on-line active losses, this research proposes a technique for optimizing a multi-source power station's economic and environmental performance while employing an ant colony algorithm in MATLAB version 7.6. A ponderation coefficient of 0.6 yields production costs of $819.996/h, emissions of $0.269 Ton/h, and total expenses of $968.033036 per hour for the IEEE 30 nodes network, with line losses of 6.92 MW and a calculation time of 6.38 seconds for the network. Using a computation time of 9.179 seconds and data for the Algerian 114-node network, we arrived at a production cost per hour of 19668.9445 dollars, emissions per hour of 0.673 tons, and a total cost per hour of 20596.032 dollars. On-line losses per hour were 17.1 MW. In the end, the findings showed that regardless of the network size, ACO produced the best values, while ACOS had the quickest convergence time. We found the technique to be superior to previous Meta – heuristic approaches.
There is now a greater understanding that more power is possible via the simple resonance of spring loadings. Spring resonance's ability to retain energy without significant loss is now well understood. This is a significant departure from current gear transmission system state-of-the-art.

Introduction

Power production from renewable sources (apart from nuclear) is complicated by the need for high shaft-power revolutions per minute and the corresponding torque. Because shaft revolutions per unit time are inversely proportional to torque, low-energy sources aren't a good fit for high-voltage power systems. In hydro dams, the enormous water mass and the potential height permit a massive torque that finally develops adequate speed for power production. Construction of a dam is notorious for its high costs and negative effects on the environment [9,10].

ISSN- 2394-5125 VOL 8, ISSUE 05, 2021

Massive river and ocean resources are available to most nations, including Nigeria [2]. Flow forces are generated by the energy that flows through rivers. For modest flow forces, the study proposes a unique method of increasing the flow forces by various factors utilizing the wheel and axle concept in a novel way. The country's rising energy needs are well-known. Water as a renewable energy source is widely accessible and provides a significant alternative to hydrocarbon energy with its related greenhouse-effect that is currently endangering our world's survival. Water [8,9].

Now that this mechanism has been revealed, it is possible to capture and exploit the hydrokinetic forces of flowing streams and other natural phenomena. According to the study of [1,] significant amounts of energy can be derived from rivers across much of Nigeria, allowing local communities to generate electricity for immediate usage by their residents instead of waiting for grid power that may or may not be available at any given moment. Small effort is needed to run a relatively large load, and wheel and axle systems have long been utilized in industries where this is the case. A new approach is needed to generate electricity from upland rivers, streams and water flow systems, particularly in areas where dam building is uneconomical or ecologically problematic [11,12].

Methodology

There is a theory in this work that a power transmission system may be built that improves torque without reducing angular rotation of the shaft. The result of this method is an engineering technology that creates more electricity than it takes in. Basic theory for the hypothesis is provided by conducting industry and literature studies. As the issue is a practical one requiring laboratory work, developing and testing prototypes, the solution adopted involves doing research and conducting experiments.

Input power must be more than output power, according to research. Until now, this has been the foundation of my knowledge of both engineering and scientific principles and practices. The simplest way to explain the idea that energy or power cannot be generated or destroyed is to use this expression.

Material

Resources and software programs were used to ensure a successful endeavor. Also, a laptop having the following capabilities: Ant colony technique was written on Pentium 4 with 2GB of RAM, dual-core CPU running at 1.73GHz, as well as the latest MATLAB version 7.6.

Methods

Power Distribution Optimisation by use of Optimization

Optimization of power plant is determining the optimum power levels at the lowest possible cost of production and toxic gas emissions, while yet meeting the needs of the customer. This is done while minimizing the multi-objective function, which represents the goals to be attained while taking limits into account. A mono-objective function is one that has just one goal in mind, such as the cost of producing or working on a project.

Expenditure in Production

Formula for defining it is as follows:

$FP_i = a_i + b_i P_i(t) + c_i P_i^2(t)$ (1) where a_i, b_i and c_i are production coefficients cost and P_i, the power delivered by generator i.

Emision Functions Cost

In the following equation, the term is defined as

$Em_i = \alpha_i + \beta_i P_i(t) + \gamma_i P_i^2(t)$ (2) where α_i, β_i and γ_i are coefficients of cost of emission of the generator.

Combining single- and multi-objective functions

Mono-objective functions may be combined into multi-objective functions using two primary methods: the equilibrated sum approach and the penalty factor method.

Method of the Equilibrated Sum

$F_T = \mu FP_i + (1 - \mu)\omega Em_i$ (3) where F_T, μ and ω, μ Designate the global function, the coefficient of ponderation, and the factor of emission costs.

ISSN- 2394-5125 VOL 8, ISSUE 05, 2021

Method of the Penalty Factor

$FT = FP_i + h_i E_{mi}$ (4) with $h_i = FP_i / E_{mi}$ representing the factor of penalty.

Constraints

Both equality and inequality requirements are specified by the formula I n Pi= PD + PL(5), n signifies the number of generators, PD is the active power consumed by the load, and PL denotes the active on-line losses, while $P_{gimin} \leq P_{gi} \leq P_{gimax}$, i = 1, n.

Active Power Distribution Using the Ant Colony Algorithm.

It is at this phase that components are added to partial solutions, which are then merged to create a solution. There is a case study that illustrate the difficulty of dynamically modifying phenomenon tracks in order to represent the ants' experience The OPF problem may be formalized using ACO by modeling it after ants and understanding their basic behavior. A building process used by ants on the graph G = A may be characterized as stochastic (C, L). It's possible that ants may come up with a solution, but it's unlikely. It's possible to connect these components using pheromone tracks that may be kept in an adaptive memory, which is represented by the system's visibility value (It may be a priori knowledge of the issue or come from a different source than ants; it is frequently the cost of the electricity produced by each state power station). Graph connections and component links may be connected in two different ways using pheromone tracks. To keep track of how far they've gone from their starting position and when to stop, they all employ the same kind of internal memory. They move in accordance with the rule of probabilistic decision function of pheromone trails, ant condition, and problem restrictions. It's possible to update a track connected with an individual component or its relevant connection when a new component is added. Track pheromone of components and connections may be updated after the solution is in place. In addition, it has a limited ability to come up with a solution. An objective function, a game of constraints, and a game of solutions are all used to illustrate the OPF problem. The end goal is to identify the global optimum that meets all of the requirements. The problem's many phases may be described as a chain of events. As the ants move through a graph G = (C, L), they create solutions while constructing components of C, which stand for the electricity provided by the linked power plant.

Results and Discussions

As part of the ant colony's algorithm, we used the weighted sum approach to combine two goals (cost of production and cost of emissions) as follows: It's easy to see how this formula comes to be, although it's not always obvious (11). Between zero and one is possible to assess how much of each aim is being optimized by looking at the ponderation coefficient. It's possible to achieve 100% environmental and zero economic optimization by setting D=0, for instance. Zero percent environmental and zero percent economic are two different kinds of optimizations, yet they're both possible in the same system. Power needed for this network test is 550.66 $/Ton x 283.4 MW, which is a factor of the gas's emission cost. The IEEE-30 network nodes have been subjected to the ant colony technique for optimization.

Table 1: The 10 possibilities of q0,q1,q2,q3,q4,q5,q6... of the ACO-OPF

	β= 11 ρ = 0.4 qo = 0.4	**β = 6 ρ = 0.3 qo = 0.7**	**β = 10 ρ = 0.8 qo = 0.6**	**β = 10 ρ = 0.6 qo = 0.3**	**β = 11 ρ = 0.8 qo = 0**
PG1 (MW)	180.699	172.055 4	177.994 6	166.87 5	180.956 1
PG2 (MW)	48.067	51.109	42.130	55.427	43.605
PG5(MW)	19.618	23.398	19.025	20.498	20.353
PG8(MW)	14.589	17.355	21.983	16.656	15.983
PG11 (MW)	17.986	13.615	17.850	15.760	14.999
PG13(MW)	12.240	15.154	13.823	17.264	17.181
Active lost (MW)	09.802	09.202	09.407	09.080	09.680
Production cost ($/h)	803.770	803.41	804.45	804.86	804.150

CONCLUSION

It was decided to employ an optimization approach for a multi-electric power station source in this study in order to get the most accurate estimation of online power losses while also reducing production costs and emissions. At the beginning of our investigation, we looked at networks with 30 nodes and 7 generators, then networks with 57 and 10 generators, and finally the 59 nodes and 114 nodes found in Algeria's IEE-57 network. In order to minimize multi-objective function while taking into account separate constraints of equality and disparity in production and emissions, an ant colony approach was developed in MATLAB. Emissions costs were 819.996 $ per hour; 0.27 tons per hour; 968.330 $ per hour for IEE network 30 nodes, respectively. At an average cost of 19668.944 dollars per hour, 0.673 tons of carbon dioxide equivalent per hour, and 20596.032 dollars per hour for the Algerian network, we arrived at losses of 17.1 megawatts in 9.18 seconds.

REFERENCES

1. **ARSEL, 2012.** Rapport de contrôle technique et commercial auprès de 10 000 abonnés de la société AES- SONEL, 74p.
2. **Alkhalil Firas, 2011.** Supervision économie et impact sur l'environnement d'un système d'énergie électrique associé à une centrale photovoltaïque, thèse de Doctorat, Ecole Nationale Supérieure d'Arts et Métiers.
3. **Berro A., 2001.** Optimisation multi objectif et stratégie d'évolution en environnement dynamique, Thèse de doctorat, université des sciences sociales de Toulouse I, France.
4. **Courtecuisse V., 2008.** Supervision d'une centrale multi source à base d'éoliennes et de stockage d'énergie connectée au réseau électrique, thèse de doctorat, Ecole Nationale Supérieure d'Arts et Métiers, France.
5. **Bouktir T. and Slimani L., 2008.** Economic Power Dispatch of Power System with Pollution Control using Multi-objective Artificial Bee Colony Optimization with FACTS devices, Leonardo Journal of Sciences, 223-234
6. **Deepak Kumar et S. R, 2014**. Design of an advanced electrical power distribution system using seeker optimisation Algorithm, Electrical power and energy systems, Vol.4, pp 196-217
7. **Dorigo M. and Stützle T., 2003.** The ant colony optimization meta-heuristic: Algorithms, applications, and advances, Kluwer Academic Publishers pp 251-285.
8. **Dréo J., 2009.** Adaptation de la méthode de colonie de fourmis pour l'optimisation en variable continues : Application en génie biomédical, thèse de doctorat, université de Toulouse I, France.
9. **Global Village Cameroon, 2012.** Etat des lieux du cadre règlementaire du secteur des énergies renouvelables au Cameroun. Rapport d'analyse.

10. **Koridak A., Rahli M. et Younes M., 2008.** Hybrid Optimization of the Emission and Economic Dispatch by the Genetic Algorithm, Leonardo Journal of Sciences, Vol. 4, 193-203.
11. **Mancer N., 2012.** Contribution à l'optimisation de la puissance réactive en présence de dispositifs de compensation dynamique (FACTS), Mémoire de magister, Département génie électrique, Université Mohamed Khider-Biska, Algérie.
12. **Missoum R., 2008.** Etude d'un dispatching économique des puissances actives par l'algorithme de la colonie de fourmis, thèse de doctorat, département d'électrotechnique, Université Hassiba Ben Bouali Chlef Algérie.