Performance Analysis based Optimization with the Abet of ANN and Genetic Algorithm

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ABSTRACT
Currently many countries facing the one decisive problem, forces companies to look for appropriate approaches to optimize energy utilization and demand administration in increasing demand of electrical energy and the expenses which it imposes on the organization. Accordingly all the organizations are intended to start the centralized air conditioner method for maximum consumption for buildings like organizations, companies and colleges etc. All the electronic companies are invented to occurrence of both operations at a time in development of science technology. For detecting the environment temperature; as the scientists are formerly installed temperature sensor, this method is called automatic control. Existing techniques are given that the room required (cool and heat) temperature with only obtainable sources on particular environment, hence in our technique we use value engineering technique for the procedure of successful development. To offer increasing profitability all along with getting better product presentation and performing works in shorter durations is our final goal. Several environment sources are used, like natural water, natural gas and sea water for both operations. For generating data set and Genetic algorithm for optimization, I propose to use the Artificial Neural Network. At this point I expect to discover wherever possibility of available source is far above at that time that bulk of source is used for separate plan operation.

Keywords
Value engineering, Artificial Neural Network, Scheme specification, room temperature load, Scheme selection, Genetic Algorithm

1. INTRODUCTION
Value Engineering is a function oriented, systematic application of recognized techniques which identify the function of the product or service, establish a monitory value for that function and provide the necessary function reliability at the lowest overall cost [1]. Value engineering is another named in “Value management” and “Value control”. In general value engineering is applied to any product process procedure system or service in any kind of business or economic activity including health care, governance, construction, industry and in the service sector. Particularly added cost does not improve quality or the ability to perform the necessary functions, then value is decreased. [2].

The value engineering process consists of several phases, including the information phase, function analysis phase, creativity phase, evaluation phase, presentation phase and implementation phase. Creativity depends on the human brain and cannot be computerized easily by conventional Programming [3] [20]. In the stage of the function Evaluation, one of the most significant stages of the VE job plan, either the absolute evaluation by amount of money or the relative evaluation by rating is employed, to evaluate the function of items and to determine the priority of improvement in the value [4].It has become a standard practice for many government agencies and private engineering firms and contractors since its first adoption in the 1950s [5]. It is applied in construction industry from 1960s Value engineering studies on a number of facilities were carried out, and more useful VE proposals (VEPs) were produced and applied. VEPs refer to the highly refined experts' knowledge, including the creative and innovative ideas produced by experts from a wide variety of fields [6].

The value analysis technique was subsequently introduced into construction by the US Navy and the Army Corps of Engineers circa 1963 through the adoption of incentive provisions and sharing clauses in construction contracts [7].Value engineering is to improve the performance outputs and Inputs, by having a conceptual approach to value engineering studies along with project management, project analysis, value analysis, and value management [8].The sustainable development of all the sources, development that fulfills the needs of the present generation without compromising the ability of the future generation to meet their own needs, regardless of setting aims because the continuation of the development is the most important aim[9].

With the growing increase in competition, in the most recent decades, companies sought to create higher value in their products for customers. Japanese companies, like Toyota, succeeded in doing so, with products of higher quality at a lower cost [10]. The VE application was only a decision of the project management. There was not the engagement of the Company Management. Although many of these applications were successful and the Company had good savings in this projects [19]. The application of Value Engineering (VE) in the construction industry has been observed in a number of countries around the world, and is recognized as one of the most effective methodologies for achieving ‘best-value-for-money’. [18].

A responsible allocation of the required resources is therefore essential and the cost efficiency needs to be optimized. The “Value” of a plant can be defined as the reliable performance of “functions” to meet customer needs at the lowest overall “costs”. [21]. It is mainly used for saving time, saving money, build teamwork and satisfy customer. It is help to learn improve your career skills and to get knowledge for comparing the process between organizations to other organizations. Its final result is improving quality along with eliminating unnecessary cost and without damages the essential functions and increasing efficiency.

Rest of this paper is organized as follows: the second section presents literature review based on existing work for reducing the total cost along with improve the quality of output. In the third section presents methodology based on artificial neural network and genetic algorithm for providing the optimized cost due to different area space. In the fourth section presents results and analysed regarding the proposed technique of the optimized solution. We improve the Genetic algorithm by neural network optimization presented in Section 3.

2. LITERATURE REVIEW BASED ON EXISTING WORK

In 2010, Wei Tong Chen *et al*. [11] have discussed the Success of a value engineering workshop (VEW) depends on numerous interrelated factors. Unfortunately, some of these factors were overlooked by VEW teams. The proposed study applied factor analysis and the Analytic Hierarchy Process (AHP) to analyze a questionnaire survey distributed to experienced VE practitioners. A VEW performance assessment model was designed based on the data collected. The proposed model was used to assess two VEWs of a construction project to demonstrate its usefulness in performance assessment. Assessment results were analyzed, and suggestions were provided to improve VEW performance. Performance could be enhanced by using the proposed model for self-diagnosis, process improvement, and team motivation.

Value engineering (VE) programs are implemented to enhance the value received over the life-cycle of constructed assets. It was defined as the process of relating the functions, quality, and costs of the project in the determination of optimum solutions for the project. In 2011, Marzouk [12] has proposed the application of the ELECTRE III model in the context of value engineering. The steps of the ELECTRE III model include; estimation of concordance indices, estimation of discordance indices, estimation of credibility scores, performing distillation procedure, and performing complete ranking. The proposed methodology was intended to support the decision making on alternatives with an increase in the efficiency of the resolution process. A numerical example was presented to demonstrate the use of the proposed methodology.

In 2011, Fazel Zarandi *et al*. [13] have intended to assist the experts during the creativity phase of value engineering through utilizing the past experiences and avoid them in a specific domain from repeating the same experience. To the purpose, a general fuzzy case based reasoning (CBR) system was developed. Our system benefits from a fuzzy clustering model for fuzzy data to facilitate case retrieval and reduce the time complexity. The inherent analogical nature of a case-based reasoning (CBR) model and its integration with fuzzy theory would facilitate access to more precise and systematically classified information during a VE workshop. In order to test the performance of the proposed system, it was applied to suburban highway design data extracted from National Cooperative Highway Research Program (NCHRP).

In 2010,Haiwen Shu *et al.*[14] have described the district cooling and heating (DCH) system can provide both cooling and heating for blocks of buildings in cold climate areas, however, different thermal source schemes of a DCH project always differ in their first cost, operating cost, maintenance cost, regulation performance, control performance, energy-saving and environment protection performance, etc. It then elaborates on how the proposed model was applied in the first seawater source heat pump DCH project in Chinad Dalian Xinghai Bay project. The calculation results shows that even though the scheme of seawater source heat pump system was not economical under commercial electricity price mainly because of its relatively high initial cost, yet it has the highest value coefficient under civil electricity price. The proposed technique also implies that privileges of policy for renewable energy utilization system are necessary to help promote the energy-saving and environment-friendly scheme of seawater source heat pump system.

The increasing demand of electrical energy and the overheads which it imposes on the organization, forces companies to search for suitable approaches to optimize energy consumption and demand management. Application of value engineering techniques was among these approaches. Value engineering was considered a powerful tool for improving profitability. These tools are used for reduction of expenses, increasing profits, quality improvement, increasing market share, performing works in shorter durations, more efficient utilization of sources and etc. In 2011,Habibollah Najafi *et al*.[15] proposed technique, they should review the subject of value engineering and its capabilities for creating effective transformations in industrial organizations, in order to reduce energy costs and the results have been investigated and described during a case study in Mazandaran wood and paper industries, the biggest consumer of energy in north of Iran, for the purpose of presenting the effects of performed tasks in optimization of energy consumption by utilizing value engineering techniques in one case study.

In 2006, Nader Naderpajouh *et al*. [16] have persented a fuzzy decision support system (DSS) to be employed in evaluation phase of VE. The proposed multi alternative decision model may be recommended where alternatives' preferences ratios are different, and scores assigned to each alternative idea are uncertain. It utilized a VE has greater payoffs at the earlier stages of the construction projects, in which most of the criteria are still vague and not precisely defined, exploiting this DSS may result in more tangible model of decision making process and satisfactory outlook of VE studies in construction projects. A ranking methodology in a spreadsheet template was also provided to facilitate the ranking process.

In 2011, LI Lingyan *et al*. [17] have introduced a evaluation index system of value distribution is constructed. The value distribution calculation model was built, which was named Entropy-Fuzzy comprehensive evaluation model by utilize entropy and fuzzy comprehensive evaluation method. Furthermore, according to the market research data, the reasonable value distribution was discussed in order to provide a reference of comparative study on the value distribution of residential engineering for each city. The result implicates that the order of the reasonable value distribution was the construction value, the marketing value, the planning and design value, the investment analysis value, the service value, and the fund value, the land value.

In 2008, F. Jariri *et* al. [22] have proposed a need to incorporate three famous design cost management methods, called: Quality Function Deployment (QFD), Value Engineering (VE) and Target Costing (TC) into a single model had been addressed. Each method performs very well in cost management procedures as design activities. These methods had been incorporated into a mathematical programming model, in order to achieve the maximum benefit of each method. The model, essentially, optimizes customer satisfaction subject to target cost. The tool was a mixed integer zero-one nonlinear programming. The unified model has been proposed to prevent a non-optimal solution when methods interact with each other.

In 2012, M.A. Youssef *et al*. [23] have described a value engineering technique, was applied on a model of primary school. The paper suggested that GAEB should construct a value engineering department included in its organization structure. Finally that draws overall conclusions about the application of value engineering (VE) in the GAEB in Egypt.

Also, to get the optimum set of activities, alternatives for cost saving and maximize the utilization of the available funds for new construction and maintenance works. The value engineering technique application is based on data collected from GAEB.

In 2011, Palanivel Subramaniyam *et al.* [24] have introduced trend emerging in the New Product Development (NPD) was the development of lean and six sigma activities. Material cost and design time had to be optimized in order to make the system effective and deliver the design at the shortest time of market with good quality. This proposed technique deals with the approach associated to optimization of above mentioned problems. It was done with the strategy of Six Sigma and philosophy of Lean by using Topology optimization.

3. METHODOLOGY BASED ON OUR PROPOSED TECHNIQUE

3.1 Optimization for Proposed Technique

3.1.1 Artificial Neural Network

In Artificial Neural Network is made up of many artificial neurons and each of its input has the own weight associated with it. An artificial neuron is a device with many inputs and one output. The neuron has two modes of operation; the training mode and the testing mode. In the training mode, the neuron can be trained to fire (or not), for particular input patterns. In the testing mode, when a taught input pattern is detected at the input, its associated output becomes the current output. The available sources of the India environment mention below, [25], [26]

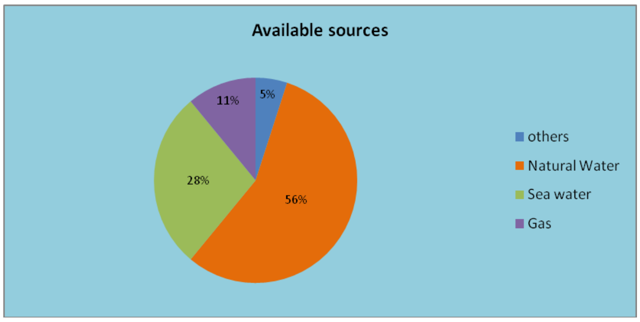

Fig 1. Available sources in India

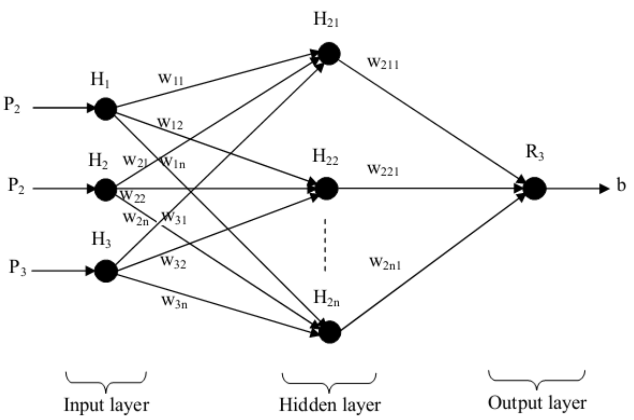

Fig 2 Artificial Neural Network

So here we have utilize many input one output model ANN. The inputs are environmental source, Area size and load (heating and cooling) applied to ANN, the output of the system is load corresponding cost.

3.1.2 Artificial Neural Network_ In simulation Setup

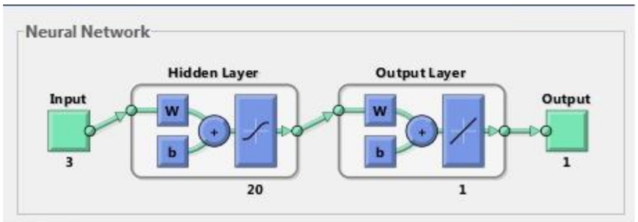

Fig 3. Artificial Neural Network for cooling and heating

In Neural Network, the variable inputs are applied to the hidden layer. Many of the researchers to utilize the many input and many outputs model Neural Network. It is having two nodes they are training node and testing node. During the process happen the hidden layer output is fed to the output layer. This diagram is utilized for general operation for cooling and heating. In this, output is mainly based on the input parameters. This figure shows that basic function of the Neural Network. Cooling condition, initially utilize the algorithm parameters like Data division, Training, Performance and derivative are random, Levenberg-Marquardt, mean squared error and default. Then to set all the parameters like Time, gradient value, Mu and Validation checks, once after this setup process then click on the process performance. It will produce the best validation performance graph.

These are the images taken from the Matlab.

3.1.2.1 Cooling Condition

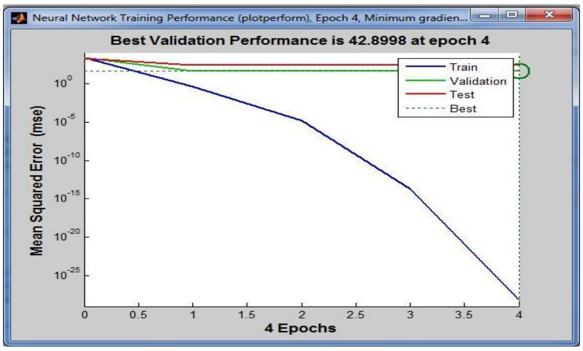

Fig 4. Cooling performance

In this figure shows that the best validation performance of the neural network is exactly closes to the trained validation of the neural network.

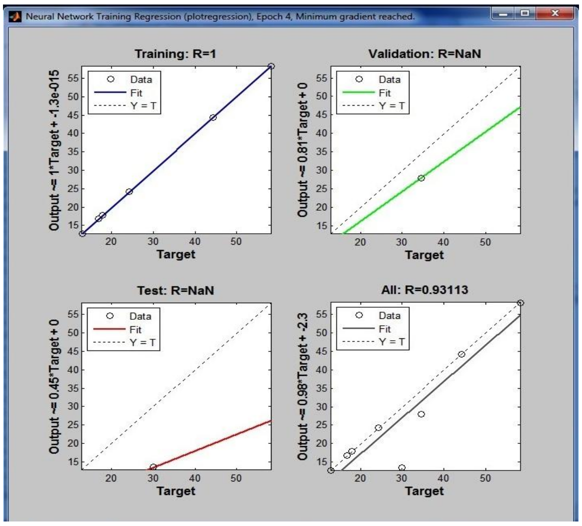

Fig 5. Cooling regression

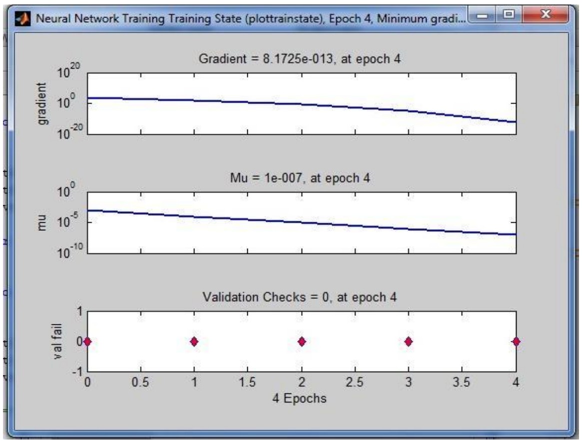

Fig 6. Cooling Training state

This cooling process is done by the ANN, in this operation some initial setup to complete the process. Here some of the settings are Gradient, Mu and validation checks. In normal ANN techniques having some value on this parameter but our testing parameters value are exactly closes to all the parameters.

3.1.2.2 Heating Condition

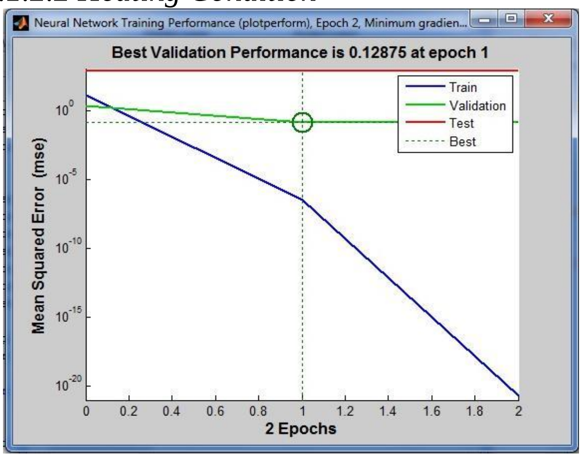

Fig 7. Heating Performance

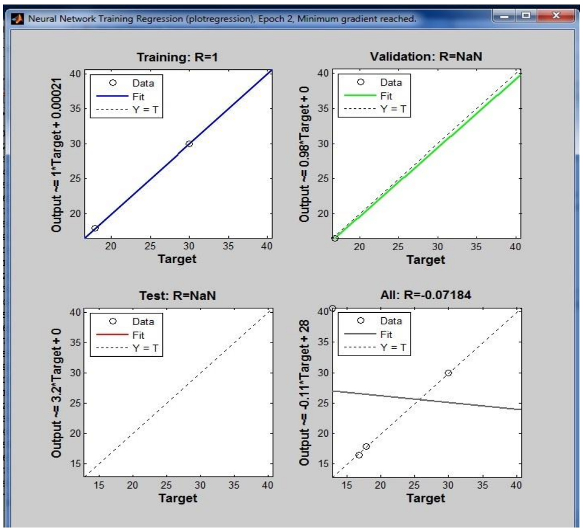

Fig 8. Heating regression

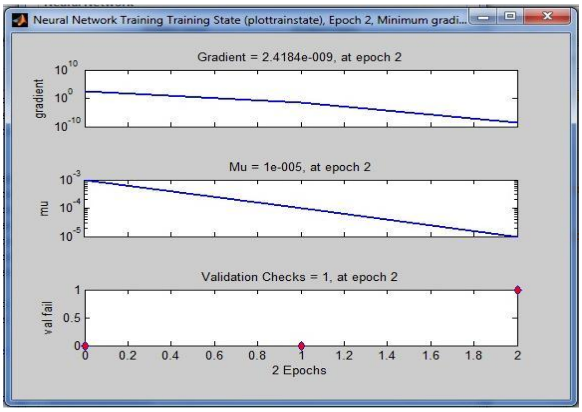

Fig 9. Heating Training state

Heating performance of the ANN having the training setup is exactly closes to the best validation performance of the Heating process. It is shows that our testing solution is approximately equal to the normal operation of the ANN. Heating Training state of the ANN having some initial setup for providing the proposed technique desired output.

Scheme Selection

Here ANN having the ten input parameters and two outputs. It is mainly on the selecting the best utilized scheme.

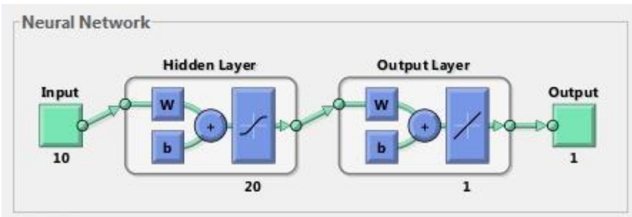

Fig 10. ANN for Scheme Selection

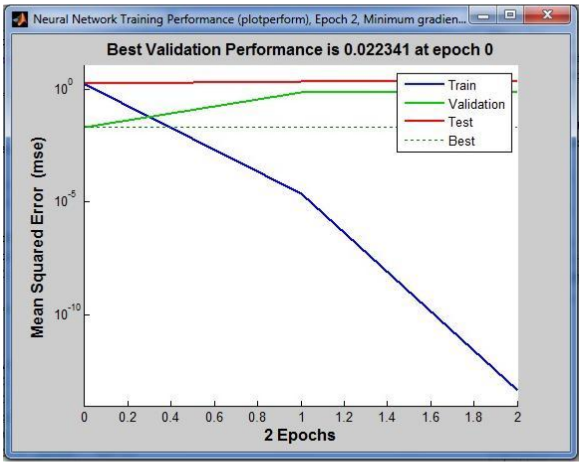

Fig 11. Scheme performance

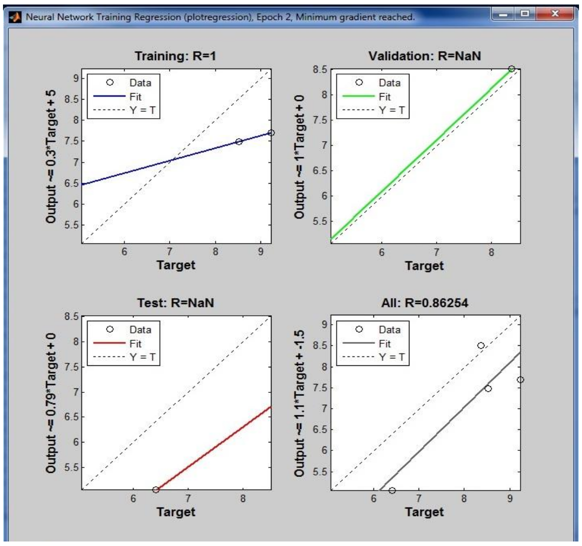

Fig 12. Scheme regression

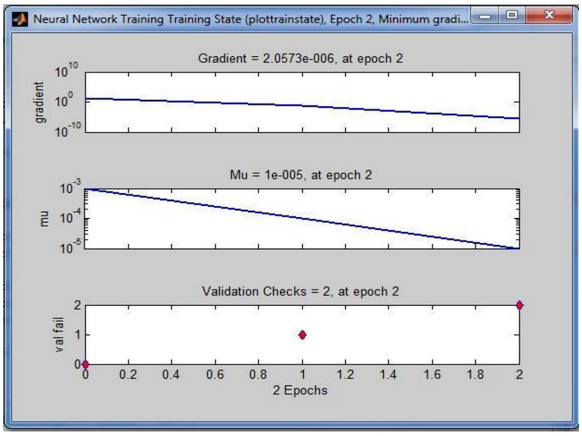

Fig 13. Scheme Training state

In this scheme section also having some initial setup for provides the best validation performance of Scheme selection. Here best validation performance is somewhat variant training performance. This is significant for selecting the scheme. If we achieve on this all the parameter value then only our system to be providing the original output.

3.2 Genetic Algorithm

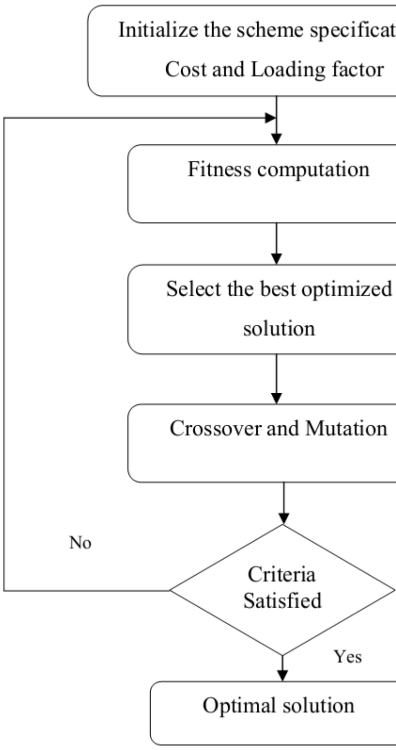

Fig 14. Flowchart for Genetic Algorithm

Generation of Chromosome

In generation of chromosomes is the function of the randomly generated set of chromosomes (set of genes). In our proposed technology we have to utilize the ANN output is fed to the GA. In this outputs are scheme selections, cost and loading factor of the adequate buildings.

Fitness Computation

Fitness computation is best way to finding the optimization solution on the chromosomes. In our proposed technology to applied all the information about Value engineering data. Here the output F_C is based on the initial input of the GA.

$$\sum_{a=0}^{N-1}\alpha_b \frac{1}{1+\exp\sum_{a=0}^{N-1}(1-p_a\beta_b)} = F_C$$

Selection

In all the chromosomes are producing the different fitness value. We have to select the minimum value of the fitness value chromosomes. They are called parent chromosomes. In our proposed technology to use the angle, the fitness value of the different angle is noted. We have to select the only minimum fitness value for fix the robotic arm.

Select the optimized chromosome = $F_C / 2$

F_C --- Count of total cost

Crossover

In reproduction is contains the crossover and mutation operation. The crossover operation is having many methods to produce the offspring. They are one point, two point, uniform, and arithmetic crossover.

Two point Crossover

A crossover operates that randomly selects a crossover point within a chromosome then interchanges the two parent chromosomes between these points to produce two new offspring. When recombined the chromosomes avoids genes at the head and genes at the tail of a chromosome are always split.

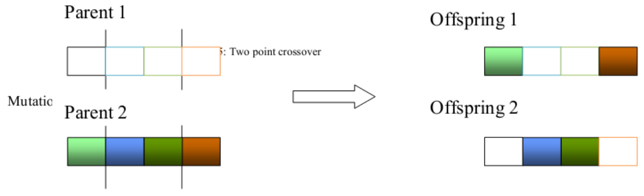

Fig 15. Two point crossover

Mutation

Mutation is the function of the generating new offspring from the single parent and maintained the diversity of the each chromosome. There is a chance to get a gene of a child is changed randomly. This gene performance is better than the old parents. Mutation having two methods they are random and alternate method.

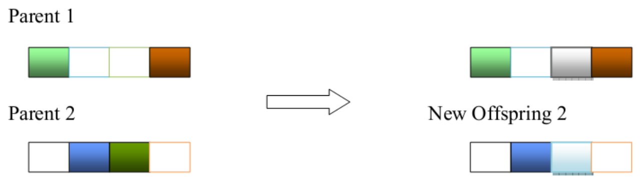

Fig 16. Mutation operation

In this technique we have to utilize the two point crossover method, which is producing the effective output for the mutation operation. Scheme selection and Total cost of the launching plants are under the crossover and mutation operation.

Overall layout

In our proposed technique we have to utilize the Artificial Neural Network and Genetic Algorithms for optimizing the launching plant cost along with improving the performance of the product

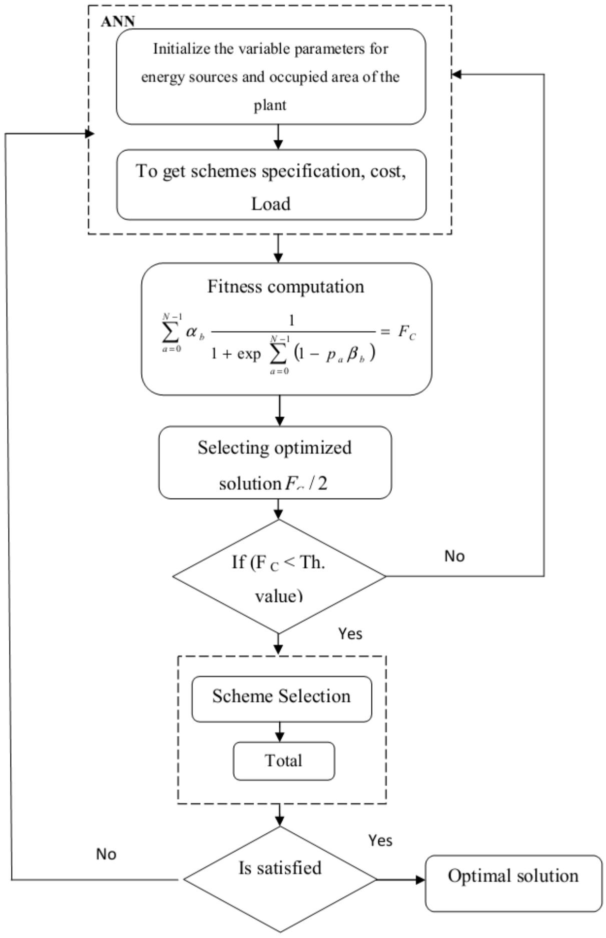

Fig 17. Overall flowchart

Initially, all the sufficient information about the whole buildings has to be collected. After that to be analysed all the needs like what amount of temperature in particular area and how much power load to be set to the used system. The changeable inputs are environment sources and engaged area of the buildings in this ANN. The overall process of the ANN is injected by these inputs. We have to place target value and finding error value before coming to the output side. Afterwards output side we have to collect the schemes specification under the function factor, total cost of the environment sources and sufficient cooling and heating load of the needed area of the buildings. This is concluding output for the Artificial Neural Network. All the output is fed to input of the Genetic Algorithms at that time.

The entire inputs are useful for the fitness computation in Genetic algorithms. For choosing the optimized value the fitness value should be used. The optimize fitness value go to the crossover and mutation. We have to use the two point crossover method, which is producing the successful output for the mutation operation in this method. Scheme selection and Total cost of the traditional plants are beneath the crossover and mutation operation. The weight value of the dissimilar function factor is the main point in scheme selection. The occupied area of equipment plant (F1), system adjustability (F2), effectiveness of system control (F3), safety and protection performance (F4), plant noise level (F5), equipment service life (F6), equipment failure rate (F7), energy-saving property (F8), environment protection performance (F9) and privileges of policy (F10) are the function factors. The score (degree) for every function factors are based on performance of the operation. The relative degree of importance that one function factor is adjacent to another is represented by 1, 3, 5, 7 and 9, which can be interpreted as equally important, slightly important, obviously important, strongly important and absolutely important correspondingly. Therefore 2, 4, 6 and 8 are the medium values of each neighboring pair of higher than odd numbers respectively. Within this case the highest characteristic root of the final judgement matrix (λ_{max}) is 10.571, the consistency index (CI) is 0.0634 and the random index (RI) is 1.49, thus the consistency ratio (CR) is 0.0426 (<0.1). Thus the matrix has adequate consistency. The first cost, system operating cost and system maintenance cost produces the total cost. Due to area of the system and related Loading factor, this cost of the system is varied. But the optimize solution is fulfilled for all environment that is the output of our planned technique.

Objective function for output performance

$$R_b = \sum (P_a . W_{ab}) \tag{1}$$

$$Q_b = F_{th}(R_b + t_b) \tag{2}$$

$$W_{ab} = W_{ab}^{*} + LR . e_b . P_a \tag{3}$$

$$e_b = Q_b . (1 - Q_b) . (d_b - Q_b) \tag{4}$$

$$e_b = Q_b (1 - Q_b) . \sum (e_c . W_{bc}) \tag{5}$$

$$W_{ab} = W_{ab}^{*} + (1 - M) . LR . e_b . P_b + M \left(W_{ab}^{*} - W_{ab}^{**} \right) \tag{6}$$

$$V_a = \frac{F_a}{C_c} \tag{7}$$

$$f_a = \sum_{b=1}^{v} P_b A_{ab} \quad (a = 1,2,...., u) \tag{8}$$

$$F_a = \frac{f_a}{\sum f_a} \tag{9}$$

$$TC = C_i + O \times DF_{sum} + M \times DF_{sum} - R \times DF \tag{10}$$

$$DF_{sum} = \frac{(1 + dr)^T - 1}{dr \times (1 + dr)^T}$$

$$DF = \frac{1}{(1 + dr)^T}$$

$$EUAC = TC \times RF \tag{11}$$

$$RF = \frac{dr \times (1 + dr)^T}{(1 + dr)^T - 1}$$

$$C_a = \frac{EUAC}{\sum EUAC_a} \tag{12}$$

System operating cost

$$\tau_{E.R} = q_C / q_R \tag{13}$$

$$\tau_{E.B} = q_h / q_B \tag{14}$$

$$\varepsilon_R = \frac{q_C}{q_R T_R} \tag{15}$$

$$\varepsilon_B = \frac{q_h}{q_B T_B} \tag{16}$$

$$\varepsilon_R = \tau_{E.R} / T_R \tag{17}$$

$$\varepsilon_B = \tau_{E.B} / T_B \tag{18}$$

$$I_R = \left(\sum I_{R.N} \right) T_R \varepsilon_R = \left(\sum I_{R.N} \right) \tau_{E.R} \tag{19}$$

$$I_P = \left(\sum I_{I.N} \right) T_R \left(\varepsilon_R + \frac{1 - \varepsilon_R}{v_p} \right) \tag{20}$$

$$I_{CT} = \left(\sum I_{CT.N} \right) T_R \left(\varepsilon_R + \frac{1 - \varepsilon_R}{v_{CT}} \right) \tag{21}$$

$$I_B = \left(\sum I_{B.N} \right) T_B \left(\varepsilon_B + \frac{1 - \varepsilon_B}{v} \right) \tag{22}$$

$$G_{fB} = \left(\sum G_{fB.N} \right) T_B \left(\varepsilon_B + \frac{1 - \varepsilon_B}{v} \right) \tag{23}$$

$$G_S = (G_{S.N}) \tau_{E.B} / 1000 \tag{24}$$

$$G_{W.CT} = 0.02 \Re_{CT.N} T_R v_{CT} \left(\varepsilon_R + \frac{1 - \varepsilon_R}{v_{CT}} \right) \tag{25}$$

System maintenance cost

$$C_d = C_i f \tag{26}$$

$$f = (1 - r) / T \tag{27}$$

Where

a , b - each of inputs and layers respectively
P_a - a^{th} input of network
W_{ab} - established weight
R_b - Internal value of the operation
t_b - established threshold value
Q_b - Resulting output
F_{th} - Activation function
LR - Learning Range
e_b - Error
M - Momentum factor
V_a - Value Coefficient
F_a - Function coefficient
C_a - Total cost coefficient
f_a - Accumulated total function score of scheme a
P_b - Weight coefficient
A_{ab} - Score of the function factor b
TC - Total cost
O - Operating cost
DF_{sum} - Sum of discount factor
M - Maintenance cost OPERATION
R - Residual value
DF - Discount factor
dr - Discount rate (assumed to be 8%)
L – System service life (assumed to be 20 years)
$EUAC$ - Equivalent uniform annual cost of scheme a
RF - Capital recovery factor
$\tau_{E.R}$ -equivalent full load hours in summer (h)
$\tau_{E.B}$ -equivalent full load hours in winter (h)
q_C -annual cooling load (kJ/a)
q_R -maximum cooling output of the chillers (kJ/h)
q_h -annual heating load (kJ/a)
q_B -maximum heating output of the boilers (kJ/h)
ε_R -cooling load factor
T_R -annual accumulated cooling hours (h)
ε_B -heating load factor

T_B -annual accumulated heating hours (h)

I_R -annual electricity consumption of chillers/heat pumps (kWh)

$I_{R.N}$ -rated electric power of chillers/heat pumps (kW)

I_P -annual electricity consumption of condensing water pumps (kWh)

$I_{I.N}$ -rated electric power of condensing water pumps (kW)

v_p -number of condensing water pumps

I_{CT} -annual electricity consumption of cooling towers (kWh)

$I_{CT.N}$ -rated electric power of cooling towers (kW)

v_{CT} -numbers of cooling towers

I_B-annual electricity consumption of auxiliary facilities for boilers or LiBr absorption chillers/heat pumps (kWh)

$I_{B.N}$ -rated electric power of auxiliary facilities for boilers or LiBr absorption chillers/heat pumps (kWh)

v - Number of boilers or direct fired LiBr absorption heat pumps.

G_{fB} -annual natural gas consumption of boilers or direct-fired LiBr absorption heat pumps (m^3/h)

$G_{fB.N}$ -rated natural gas flow rate of boiler or direct-fired LiBr absorption heat pumps (m^3/h)

G_S -annual consumption of pressurized steam (t/h)

$G_{S.N}$ -rated flow rate of pressurized steam (t/h)

$G_{W.CT}$ -annual water consumption of cooling towers (m^3/a)

$\Re_{CT.N}$ -rated water flow rate of cooling towers (m^3/h)

C_d -annual depreciation cost

r -residual rate

4. RESULTS AND DISCUSSION

In order to give maximum utilizing of the energy sources, this section explained the experimental results of our proposed technique.

Only focussing on the Building size, available sources and adequate cooling and heating load of the entire building is done in our planned technique. Sufficient parameters are not to be considered for optimization based on the existing technique i.e., only focusing on the sufficient cost based on the complete size of the building. When area of the building is low or high the maximum resources are used to provide in this document. Now Table 1 is represents the experimental results and we can see the maximum using sources.

Optimization cost between the existing and proposed technique in fixed area of the building

Table 1. Optimization cost between the existing and proposed technique in fixed area of the building

Sources	Existing technique [14]					Proposed technique				
	Building area	Cooling load	Heating load	Cooling cost	Heating cost	Building area	Cooling load	Heating load	Cooling cost	Heating cost
0.56	20	105	150	24.26	29.93	20	105	150	24.26	29.93
	120	115	70			120	115	70	24.39	29.86
	96	127	78			96	127	78	24.123	29.658
	90	100	55			90	100	55	23.9986	30.154
0.28	20	105	150	39.3	16.85	20	105	150	39.3	16.85
	120	115	70			120	115	70	39.86	16.458
	96	127	78			96	127	78	39.758	16.584
	90	100	55			90	100	55	39.0256	16.845
0.11	20	105	150	44.24	12.83	20	105	150	44.24	12.83
	120	115	70			120	115	70	44.19	12.99
	96	127	78			96	127	78	44.39	12.69
	90	100	55			90	100	55	44.02	12.7
0.05	20	105	150	58.2	17.85	20	105	150	58.2	17.85
	120	115	70			120	115	70	58.37	17.6
	96	127	78			96	127	78	58.02	17.73
	90	100	55			90	100	55	58.12	17.86

Optimization costs for proposed technique in variable area of the building

Table 2. Optimization costs for proposed technique in variable area of the building

Sources	Proposed technique (if decrease the building area)					Proposed technique (if increase the building area)				
	Building area	Cooling load	Heating load	Cooling cost	Heating cost	Building area	Cooling load	Heating load	Cooling cost	Heating cost
0.56	19	99.75	142.75	23.0856	28.954	21	110.25	157.5	26.003	31
	119	114.002	69.416627	22.986	28.7854	121	115.958329	70.583329	26.987	30.846
	95	125.6770824	77.1875	22.854	28.04587	97	128.322917	78.8125	26.548	31.0254
	89	98.888879	54.388879	22.92465	28.548	91	101.11101	55.611101	26.235	30.46
0.28	19	99.75	142.75	38.789	15.147	21	110.25	157.5	41.057	17.659
	119	114.002	69.416627	38.0254	15.245	121	115.958329	70.583329	41.654	17.2546
	95	125.6770824	77.1875	38.125	14.987	97	128.322917	78.8125	40.99985	17.456
	89	98.888879	54.388879	38.32245	15.02145	91	101.11101	55.611101	40.1255	17.23245
0.11	19	99.75	142.75	43.015	11.457	21	110.25	157.5	44.79	14.659
	119	114.002	69.416627	43.984	11.245	121	115.958329	70.583329	44.70254	14.5864
	95	125.6770824	77.1875	42.754	11.014	97	128.322917	78.8125	44.35456	14.38452
	89	98.888879	54.388879	42.546	10.998	91	101.11101	55.611101	44.2546	14.9875
0.05	19	99.75	142.75	56.898	15.85	21	110.25	157.5	59.895	19.005
	119	114.002	69.416627	56.985	15.546	121	115.958329	70.583329	59.6542	19.2543
	95	125.6770824	77.1875	56.654	15.994	97	128.322917	78.8125	59.7546	19.4547
	89	98.888879	54.388879	56.755	15.156	91	101.11101	55.611101	59.02457	19.7995

Cooling performance

Table 3. shows that cooling performance of a, b, c and d are Natural water, sea water, natural gas and others respectively

Source	Building area	Cooling load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Cooling cost
0.56	19	99.75	9	8	8	10	8	9	8	9	10	10	8.7722	23.0856
			10	7	5	10	5	10	5	7	10	10	5.553	23.14254
			8	6	6	10	6	5	6	6	10	10	4.7005	23.05468
			5	5	10	10	10	8	7	5	10	10	7.4606	23.0145
			6	9	9	10	7	6	9	8	10	10	9.1754	23.213
			7	10	7	10	6	7	10	10	10	10	8.9976	23.0984

(a)

Source	Building area	Cooling load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Cooling cost
0.28	19	99.75	9	8	8	10	8	9	8	9	10	10	8.7722	38.789
			10	7	5	10	5	10	5	7	10	10	5.553	38.7215
			8	6	6	10	6	5	6	6	10	10	4.7005	38.586
			5	5	10	10	10	8	7	5	10	10	7.4606	38.546
			6	9	9	10	7	6	9	8	10	10	9.1754	38.7458
			7	10	7	10	6	7	10	10	10	10	8.9976	38.845

(b)

Source	Building area	Cooling load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Cooling cost
0.11	19	99.75	9	8	8	10	8	9	8	9	10	10	8.7722	43.015
			10	7	5	10	5	10	5	7	10	10	5.553	43.1576
			8	6	6	10	6	5	6	6	10	10	4.7005	43.0214
			5	5	10	10	10	8	7	5	10	10	7.4606	43.0874
			6	9	9	10	7	6	9	8	10	10	9.1754	43.9842
			7	10	7	10	6	7	10	10	10	10	8.9976	43.0146

(c)

Source	Building area	Cooling load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Cooling cost
0.05	19	99.75	9	8	8	10	8	9	8	9	10	10	8.7722	56.898
			10	7	5	10	5	10	5	7	10	10	5.553	56.8452
			8	6	6	10	6	5	6	6	10	10	4.7005	56.80125
			5	5	10	10	10	8	7	5	10	10	7.4606	56.8123
			6	9	9	10	7	6	9	8	10	10	9.1754	56.8245
			7	10	7	10	6	7	10	10	10	10	8.9976	56.8213

(d)

Heating performance

Table 4. shows that Heating performance of a, b, c and d are Natural water, sea water, natural gas and others respectively

Source	Building area	Heating load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Heating cost
0.56	19	142.75	9	8	8	10	8	9	8	9	10	10	8.7722	28.954
			10	7	5	10	5	10	5	7	10	10	5.553	28.9015
			8	6	6	10	6	5	6	6	10	10	4.7005	28.9456
			5	5	10	10	10	8	7	5	10	10	7.4606	28.9565
			6	9	9	10	7	6	9	8	10	10	9.1754	28.9423
			7	10	7	10	6	7	10	10	10	10	8.9976	28.94789

(a)

Source	Building area	Heating load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Heating cost
0.28	19	142.75	9	8	8	10	8	9	8	9	10	10	8.7722	15.147
			10	7	5	10	5	10	5	7	10	10	5.553	15.128
			8	6	6	10	6	5	6	6	10	10	4.7005	15.098
			5	5	10	10	10	8	7	5	10	10	7.4606	15.278
			6	9	9	10	7	6	9	8	10	10	9.1754	15.013
			7	10	7	10	6	7	10	10	10	10	8.9976	15.154

(b)

Source	Building area	Heating load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Heating cost
0.11	19	142.75	9	8	8	10	8	9	8	9	10	10	8.7722	11.457
			10	7	5	10	5	10	5	7	10	10	5.553	11.498
			8	6	6	10	6	5	6	6	10	10	4.7005	11.423
			5	5	10	10	10	8	7	5	10	10	7.4606	11.4354
			6	9	9	10	7	6	9	8	10	10	9.1754	11.442
			7	10	7	10	6	7	10	10	10	10	8.9976	11.4576

(c)

Source	Building area	Heating load	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Scheme selection	Heating cost
0.05	19	142.75	9	8	8	10	8	9	8	9	10	10	8.7722	15.85
			10	7	5	10	5	10	5	7	10	10	5.553	15.8456
			8	6	6	10	6	5	6	6	10	10	4.7005	15.8256
			5	5	10	10	10	8	7	5	10	10	7.4606	15.8425
			6	9	9	10	7	6	9	8	10	10	9.1754	15.8459
			7	10	7	10	6	7	10	10	10	10	8.9976	15.83256

(d)

In above mentioned tabulation shows that finding the optimized scheme to launching the suitable location by utilizing the function parameters and different sources. Here building area and load are variable for both operations like heating and cooling operation. Function parameter having the ratings up to 10 due to the surrounding situation. During the scheme selection, mainly considered the function parameters of each scheme. Scheme selection also changing, it is depends on the source, area and function parameters. Each scheme having the some ranges up to 10. In this model we separate into the four schemes. The below mentioned diagram shows that the how to changing over scheme selection and corresponding cost due to changing function parameters, and load of the separate operation.

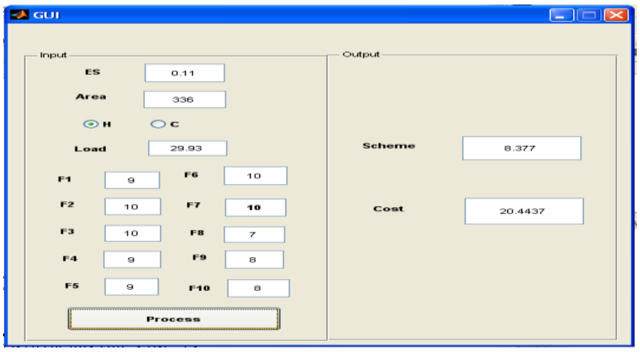

Fig 18. Matlab output

This model of diagram shows that the one part of operation is performed over the above tabulation mentioned. When execution process is happening under the matlab software mentioned on the above diagram. Here we have to put energy source, building area size and desired room temperature whether it is heating and cooling condition. The output of this technique is depending on the function parameters. This is sample model output for our proposed technique.

Desired building size

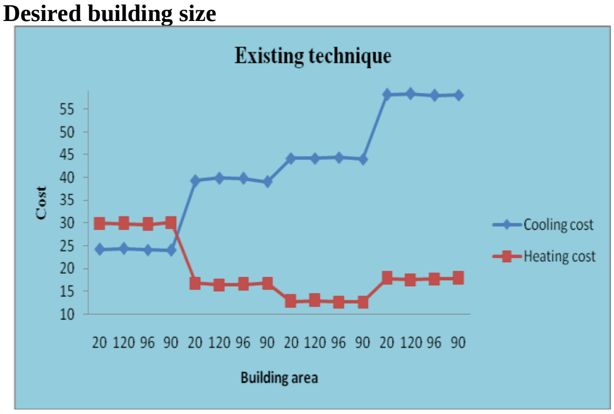

Fig 19. Existing technique

The aforementioned graph show that the existing technique cooling and heating performance of fixed building area size. Blue colour mentioned the cooling cost and Red colour mentioned the heating cost. Cost of this technique is unit of 10^6 yuan.

Variable building area

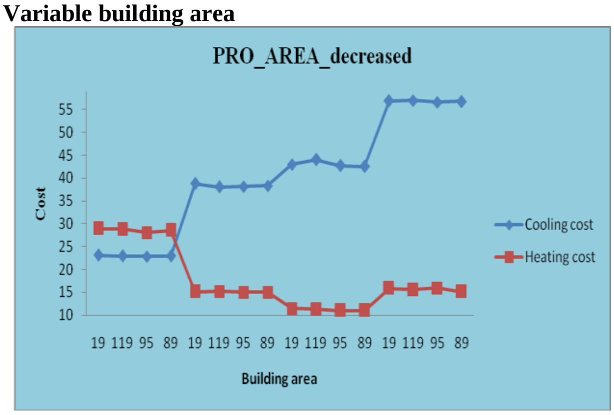

Fig 20. Proposed area decrease

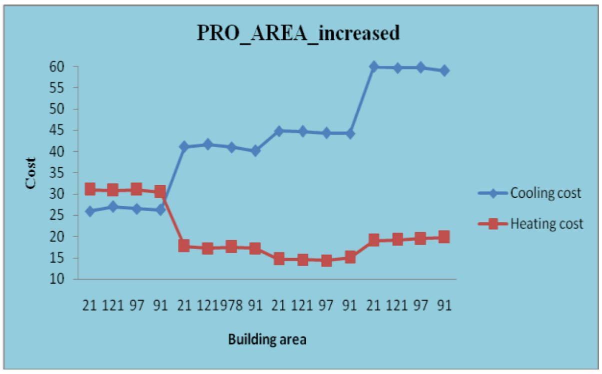

Fig 21. Proposed area increased

This afore mentioned both graphs are area decreased and area increased respectively. Here also the blue colour refers to the cooling cost and red colour refers to the heating cost of different building size. In this cost is varying towards the building size. This zigzag model of this graph mentioned on the some of the building section, normally have the heat environment but cooling cost is increased because normally in India environment is changeable. So cooling cost of this technique is increased but compared with existing technique this cost is close to that amount.

Cost analysis

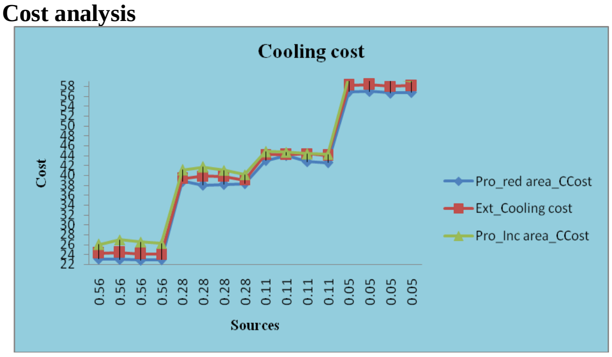

Fig 22. cooling cost

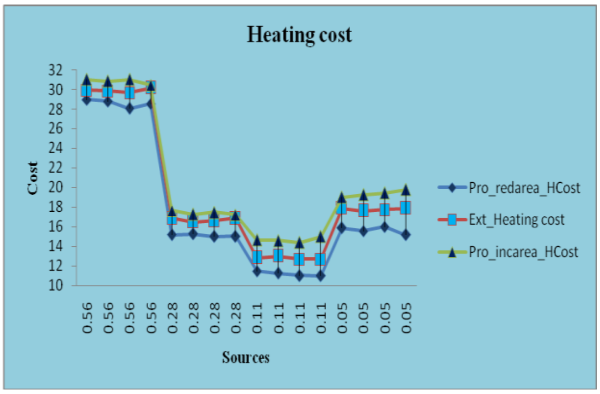

Fig 23. Heating cost

This afore mentioned graph, X axis represents the variable source and Y axis represents the adequate cost, it is comparison between existing and proposed techniques cost.

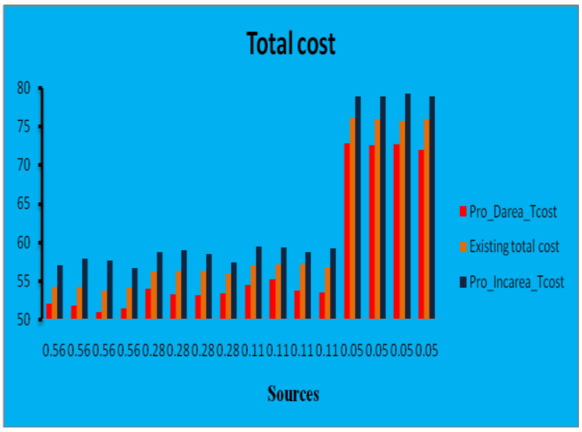

Fig 24. Total cost of existing and proposed technique

This aforementioned graph shows that the total cost of the all the sources utilizing the variable room area. Here the cost is depends on the building area and adequate load of cooling and heating purpose and mainly based on the available sources. In our technique is mainly for reducing the total cost if sources are easily available areas.

5. CONCLUSION

Only the existing sources on particular environment for providing room desired temperature is viewed in earlier techniques normally, i.e., Sea water source heat pump system: In Dalian Xinghai Bay project is launched in the middle-west part of the seaside city of Dalian, China. Different type of source to use the particular system also uses the available sources in our proposed technique. Providing the needed temperature, it is introduced to launch the system all over in India. To produce more abundance at the same time raising the product performance and also using the existing source fully is the technique's decisive aim. We have authority for the entire function factor for selecting the major used scheme to be launched to attain this process. Therefore we proved the presentation of the planned technique is tremendously superior to existing technique.

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