IDENTIFY AND PRIORITIZATION OF FACTORS AFFECTING THE ENERGY CONSUMPTION IN CNG STATIONS BY USING DATA ENVELOPMENT ANALYSIS

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ABSTRACT

With regard to the issue of the use of CNG fuel has been carried out to reduce fuel costs, lower pollution and saving natural resources soreduce costs of stations and increase profits per cubic meter of gas is one of the most important factors affecting investment in the industry to attract applicants. Also, given the widespread CNG industry, Installation of energy efficient strategies can be effective in reducing product cost. In this study, using Shannon entropy to weight of criteria "Brand Equipment", "energy efficiency" and "energy consumption" was calculated. Using TOPSIS technique to prioritize key indicators affecting the energy consumption in stations then to ensure the identification of the parameters the analytic hierarchy process (AHP) and expert opinion was used. Finally, the indicators were prioritized by using DEA. Results indicate that there is nineteen main indicators are effective in reducing energy consumption of stations that The indicators' main electric compressor "," Main fan compressor "," Electric water pump "," fan pump oil "and" water heater "has been the most effective also efficient and inefficient use of equipment (as one of the criteria affecting the energy station) were identified in various capacities of station.

KEYWORDS

StationsCNG ،Energy Consumption، Capacity of Stations ،Brand Equipment،TOPSIS ،Shannon Entropy ،AHP ،DEA.

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Introduction

Energy efficiency in machinery and equipment used in CNG stations since it is important . That reduce costs of stations and increase profits per cubic meter of gas is one of the most important factors affecting investment is to attract applicants in the CNG industry.Equipment used in stations istypically included (Dispenser, GasTank, Gas Compressors, Electrical and Mechanical components) andone way to reduce energy consumption in CNG stations is reduce power such as electro coolers, blowers, main electric compressor, dryer heater that have very important role in their Energy consumption status. (Dehghan, 2011) .With attention to law enforcement targeted subsidies and rising energy prices, Private sector investors is not certain to invest in this industry and need information from parameters affecting the energy consumption of CNG stations Therefore, this study using the Shannon model, TOPSIS, AHP and DEA seeks to identify indicators affect the energy consumption of CNG stations by using criteria related to energy consumption And the answer to the question of how to measure these indicators such as manufacturing quality (brand equipment) and energy efficiency affects energy consumption And the results of its helps private sector energy consumption to select the optimal equipment. Since the government policy is closing of energy prices to real price in coming years, and these policies directly affect the private sector industry and so far there is not any scientific research in relation to the impact of the reduction in energy consumption as CNG stations so existence of such vacuum makes researcher to identify parameters affecting energy consumption CNG stations with little help to stimulate and attract private sector investment in this industry.

Review of the literature

ETABI, 2008: A paper titled "Analysis cost - benefit the construction and operation of CNG fueling station for private single purpose in Tehran" has stated, substantial economic savings resulting from the reduction in gasoline consumption gasoline vehicles and the reduction of pollution from fuel combustion in vehicles compared to gasoline and diesel-fueled vehicles, the vehicles and the construction of important gas CNG fuel stations in a situation in which one of the ways to control excessive consumption of gasoline and diesel fuels.

GHANDI, 2011: an article entitled "Evaluation of measures to reduce the power consumption of CNG staions" has stated, the compression process of natural gas in CNG stations to increase the distance traveled by the vehicle and reduce the space needed to store while these compression is requires large power consumption. This is an attempt in this article to studies power consumption with low power equipment and role of power saving status is displayed by the optimal use of the equipment and the methods to reduce power consumption methods, optimal method shall be selected.

MAHOOTCHI, 2008: A paper titled "Economic Analysis of the establishment and operation of CNG fueling station in Tehran for the private sector" has stated, the present study was to evaluate the economic justification of the project. Based on previous studies, the current level of investment required to build a fueling station CNG 14,209,000,000 Rials that the 3.43 billion are awarded to the private sector by government of the device (instead of calamity loans). Monthly income will be 61,320,000 Rials for a fuel station with 4 dispenser and 8 nozzles, where the average every 6 minutes, fueling a vehicle with a capacity of 15 cubic meters.

FARAMARZ, 2011: an article entitled "Evaluation of strategy and solution for the maintenance and operation of CNG stations" has stated, This paper attempts to provide specific strategies and experiences gained during several years due to a CNG system about the services, maintenance and operation CNG industry of safety management in education system, SCADA, efficient the deliver in the stations.

PORPARTOY, 2009: an article entitled "Evaluation of the role of finance construction of CNG" has expressed that due to the widespread production of automobiles in recent years andThe rate of growth in gasoline consumption and a continuation of this trend create a gap in the balance between production and consumption of gasoline in the country .Purpose of the present study was to assess the overall economic and financial indicators in CNG station.

RAZAVI RAD, 2009: A paper entitled "Analysis of operating costs and decrease its CNG stations" has stated. At present, most of CNG stations in the country's form of government and by municipalities and contractors with contracts with the private sector, which is approved by the National Broadcasting Company petroleum products, are governed. The aim of the present study was to cost utilization and identify indicators to measure it.

FARZANEH, 2011: an article entitled "Study of the effect of storage at the filling station CNG" has stated in filling compressed natural gas to the storage system and method of operation of the station efficient use. In the present study, based on the first and second laws of thermodynamics, and the assumptions and theoretical analysis has been used to study the effects of the filling gas you have in station are discussed.

Frick, 2007 an article titled "Optimizing the distribution of compressed natural gas (CNG) fueling stations: Case Studies in Switzerland" has stated, to become a mass market product compressed natural gas (CNG) be a dense network of stations established objective of this paper is to analyze the cost and benefit of station.

Methodology

CNG stationsequipments are influence energy of stations due to in most of them rotary electro engines are used. And with respect to efficiency and significant energy waste in their structure, and also relatively expensive price they have significant influence in persuading private investors in selecting the equipment in accordance with their terms of active suppliers are responsible for the CNG industry. Obviously, power consumption of manpower and civil factors such as power consumption of office buildings located in the stations are compared to the energy consumption o of the equipment used is negligible.

The research method is application, descriptive and survey. In order to identify the input and output variables and indicators for energy consumption in CNG stations interviews through expertise and experts and managers were conducted. Rating importance of criteria is based on Shannon's entropy weighting method specified then to ensure the correct identification of the criteria used hierarchical TOPSIS and AHP model and the results were compared and confirmed indicator to be rank and given the breadth of devices and parameters, output of data envelopment analysis approach to reduce and optimize energy-efficient devices will detect.

Population and statistical sample

Technical and operational experts Deputy Oil Products Distribution Company in Tehran that have technical and administrative experience acceptable to the industry and holds a bachelor's degree is high, has been used .

The data gathering method

Library Studies : To collect data related to the research and theoretical literature related to the topic of library studies and articles such as English and Persian books, theses, technical documentation submitted by suppliers, documentation Iranian Oil Products Distribution Company Website Internet-related research has been used.

Interview : In this study of the views and experiences of managers, technical experts and senior professionals active in the industry CNG, irregular interviews or open with them have been conducted.

Questionnaire : In this study, two types of questionnaires were used as follows :

Number 1 (questionnaire of Shannon entropy); In order to determine the various parameters, survey forms including all indices were provided and used experts from 25 of the Oil Products Distribution Company of Tehran who have domain required and sufficient expertise.

Number 2 (questionnaire of Paired comparisons) : Which contains a table consisting of 5 rows and 5 columns with 25 experts were used 25 of the Oil Products Distribution Company of Tehran. The five-choice questionnaire is (from very low importance to very importance). Analysis of questionnaire determines measures the intensity of adjustment towards the subject of research.

Reliability and validity of interview : In order to validate is interview with experts in their field of research regard to executive and technical experience and without limiting the time of the interview.In order to enhance the reliability use preliminary interviews and using multiple interviewers are used.

Reliability and validity of questionnaire :In the present study to determine questionnaire reliability investigated the domain experts and validity of the questionnaire survey was approved.Cronbach's alpha was used to assess reliability of the questionnaire. For alpha coefficient, calculate the variance of the scores for each question (or a subset of questions) and calculate the variance of all questionnaires' scores.

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} S_i^2}{S^2}\right) \quad (1\text{-}1)$$

α: Cronbach's alpha coefficient

K: Number of questions in the questionnaire

S2: Total variance

S2i: Variance related to the question (i)

In order to measure the reliability of the questionnaire using SPSS software, 0/923 was obtained using a questionnaire which shows the reliability of reliability is required.

Data Analysis : Identify factors and options affecting energy consumption in CNG stations

After interviews with experts (technicians and administrators) and to study the factors affecting energy consumption sources, energy consumption measures and options that affect the CNG stations were extracted as follows:Indicators influencing energy consumption in CNG station as follows: “Station location”, “Rotation speed Electromotor”, “Energy efficiency”, “Quality Parts (Brand Type)”, “Depreciation of equipment”.Options affecting energy consumption in CNG station as follows: “Main fan compressor”,“Oil Heater”,“Air Dryer”,“Air compressor”,“Emergency lighting”,“Main lighting”,“Solenoid valve”,“Electro main engine compressor”,“Electric water pump”,“Blower motor”,“Fan oil pump”,“Fan canopy”,“Board of Dispenser”,“SCADA”,“Water Heater”,“Dryer Heater”,“PLC”,“G & F Equipment”,“UPS”.

Defined parameters affecting energy consumption in CNG station:

Efficiency Equipment : Use equipment with high efficiency compared to the low efficiency has a significant impact in energy consumption. Manufacturers provide usually engines with standard design and a lower cost. This type of engine due to competition has less efficiency.

Quality Parts (Brand Type) : Responsibility for Supply all parts for a station by supplier of on the National Broadcasting Company of petroleum products Since each suppliers cooperating with the different manufacturers so Quality parts was different at the production stage and the setup stage, So that the energy consumption of the equipment installed by a supplier to a location specified capacity compared to similar equipment installed by other suppliers are making a difference. In other words, what is the quality of parts and equipment for more efficient energy consumption is reduced proportionally.

Rotation speed Electromotor : An electric motor converts mechanical energy to electrical energy. Three phase induction motors widely used in CNG industry. Obviously much more electric rotation speed will consume more energy.

Depreciation of equipment : CNG station equipment Depreciate over time due to the amount of activity and will consume more energy than new equipment.

Station location : Station location is also effect on energy consumption. For example, stations due to the geographical called the South; throughout the day has light and need less lighting against the northern stations. Also according to the geographic location of the station, two types of comperessors is used: air cooling and water cooling. Water cooled compressors will consume more energy than air cooling compressors.

Also station that had been downtown rather than station around the city are more active and thus continuously operating equipment and energy consumption is higher.

Evaluation of Weights Indicators affecting the energy consumption CNG stations using Shannon's entropy technique

In order to determine the various parameters survey forms were made including all above indicators and was used 25 of the Experts from National Broadcasting Company in the Tehran area petroleum products. The experts were asked to form their own opinion, and depending on the level of importance of each of these parameters allocate as are very important points (9), important (7), the intermediate (5), minor (3), or very low importance (1).A decision matrix is a multiple attribute decision model contains information that entropy can be used as an evaluation criterion. A decision matrix, consider the following:

T-1 :The scores assigned to the parameters by decision-makers

Number of decision maker	Depreciation of equipment	Station location	Efficiency of Equipment	Motor rotation speed	Quality Parts
1	1	1	9	1	7
2	1	1	9	1	8
3	1	3	9	1	7
4	1	1	9	1	8
24	5	1	8	8	9
25	1	2	6	7	7
Total	81	61	197	79	190

The information content of the matrix firstly $(P_{i,j})$is the following:

$$p_{ij} = \frac{r_{ij}}{\sum_{i=1}^{m} r_{ij}};\ \forall i,j \quad (1\text{-}2)$$

And for Ej the set Pi, j for each characteristic will:

$$E_j = -K \sum_{i=1}^{m} [p_{ij}.\mathrm{Ln}\, p_{ij}];\forall j \quad (1\text{-}3)$$

So that k is a positive constant and equal to : $\frac{1}{\text{Ln (m)}}$(1-4)

Uncertainty or deviation degree (dj) of information created for j index is:

$$d_j = (1 - E_j); \forall j^{\circ} \quad (1\text{-}5)$$

Finally, the weights of the index will:

$$w_j = \frac{d_j}{\sum_{i=1}^{n} d_j}; \forall j \quad (1\text{-}6)$$

The following table shows the scores assigned to the parameters by decision-makers

Step One: normalized using a simple method

T-2 :Normalized matrix using simple method

Depreciation of equipment	Station location	Efficiency of Equipment	Motor rotation speed	Quality Parts
0.012	0.016	0.046	0.013	0.037
0.012	0.016	0.046	0.013	0.042
0.012	0.049	0.046	0.013	0.037
0.062	0.016	0.041	0.101	0.047
0.012	0.033	0.030	0.089	0.037

The second step determines the entropy of each indicator (Ej): Ej values were calculated using equation 1-3, the values shown in Table 3.

The third step is to determine the degree of uncertainty or deviation of each index: (Dj) dj values were calculated using equation 1-5, the values shown in Table 3 .

The fourth step is to determine the weight of each indicator: (Wj) Wj values were calculated using equation 1-6, which can be seen in Table 3. The final priority is shown in Table 4.

T -3: Criteria weights based on Shannon entropy calculations

Station location	Depreciation of equipment	Rotation speed Electromotor	Quality Parts (Brand Type)	Efficiency Equipment

0.31	0.31	0.310	0.31	0.31	K
1.07	1.07	1.10	1.11	1.17	Ej
-0.07	-0.07	-0.10	-0.12	-0.17	Dj
0.13	0.134	0.18	0.22	0.32	Wj
5	4	3	2	1	Rj

Evaluation indicators using Analytic Hierarchy Process (AHP)

The first step: building the hierarchy. First step in AHP is drawing a graphical representation of the problem in which the objective criteria for achieving the desired objectives and options will be shown.

The second step: judge preference (paired comparisons) and weighting:

T-3 : Paired comparisons of indicators

Station location	Depreciation of equipment	Rotation speed Electromotor	Quality Parts	Efficiency Equipment	
7.00	7.00	6.00	1.00	1.00	Efficiency Equipment
5.00	4.00	6.00	1.00	1.00	Quality Parts
3.00	2.00	1.00	0.17	0.17	Rotation speed Electromotor
2.00	1.00	0.50	0.25	0.14	Depreciation of equipment
1.00	0.50	0.33	0.20	0.14	Station location
18.00	14.50	13.83	2.62	2.45	Total

Then the normalized comparison matrix set up and the weighted averages of each indicator are:

T-4 Normalized matrix and the weighted average for each indicators

Average weight of each indicators	Station location	Depreciation of equipment	Rotation speed Electromotor	Quality Parts	Efficiency Equipment	
0.42	0.39	0.48	0.43	0.39	0.41	Efficiency Equipment
0.35	0.28	0.27	0.43	0.38	0.41	Quality Parts

0.11	0.17	0.14	0.07	0.06	0.06	Rotation speed Electromotor
0.07	0.11	0.07	0.04	0.09	0.06	Depreciation of equipment
0.05	0.05	0.03	0.02	0.08	0.06	Station location

Ranking effective options to reduce energy consumption based on weight Station indicators by TOPSIS method

Step Zero: obtaining Decision Matrix : In this study, decision matrix has 19 options and 5 indicators that indicators "Efficiency of Equipment" and "quality parts" as profit indicators and three indicators "electro-motor rotation speed", "equipment depreciation" and "location, Station," the were introduced as a cost index.

T-5 : Obtaining Decision Matrix

The initial matrix of indicators and Options of TOPSIS		0.32	0.22	-0.19	-0.14	-0.13
		Profit	profit	cost	cost	cost
		Efficiency Equipment	Quality Parts	Rotation speed Electromotor	Depreciation of equipment	Station location
1	Electro main engine compressor	8	9	6	9	9
2	Main fan compressor	9	9	6	9	8
3	Electric water pump	8	8	6	9	9
18	Boardof Dispenser	9	6	7	1	7
19	UPS	7	6	6	8	8

Step one: normalized decision matrix

Each of the measurement values are dividedof same indicators:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \qquad (1\text{-}10)$$

T-6 : normalized decision matrix

Square root of sum the Efficiency Equipment	Square root of sum the Quality Parts	Square root of sum the Rotation speed Electromotor	Square root of sum theDepreciation of equipment	Square root of sum theStation location	Divide each cell by Square root of sum the Efficiency Equipment	Divide each cell by Square root of sum the Quality Parts	Divide each cell by Square root of sum theRotation speed Electromotor	Divide each cell by Square root of sum theDepreciation of equipment	Divide each cell by Square root of sum theStation location
64	81	36	81	81	0.22582	0.25517	0.21807	0.30779	0.30084
81	81	36	81	64	0.25405	0.25517	0.21807	0.30779	0.26741
81	36	49	1	49	0.25405	0.17011	0.25442	0.0342	0.23398
49	36	36	64	64	0.1976	0.17011	0.21807	0.27359	0.26741
1255	1244	757	855	895	The sum of each column				
35.4259	35.27038	27.51363	29.2404	29.9166	Sum of squares of each column				

Second step: weighting the normalized matrix The decision matrix is a parametric and must be numeric, in order to decision maker is given weight of each indicators. Set of weights (w) is the normalized matrix (R) is multiplied.

T-7 :Second step: weighting the normalized matrix

Multiplied by the weight Divided by the square root of the sum of each cell of Efficiency Equipment	Multiplied by the weight Divided by the square root of the sum of each cell of Quality Parts	Multiplied by the weight Divided by the square root of the sum of each cell ofRotation speed Electromotor	Multiplied by the weight Divided by the square root of the sum of each cell ofDepreciation of equipment	Multiplied by the weight Divided by the square root of the sum of each cell ofStation location
0.07226	0.05614	-0.0414	-0.0431	-0.0391
0.0813	0.05614	-0.0414	-0.0431	-0.0348

0.0813	0.03743	-0.0483	-0.0048	-0.0304
0.06323	0.03743	-0.0414	-0.0383	-0.0348

Step Three: Determine the ideal solution and negative ideal solution: Virtual two options to consider as the worst and best solutions.

T-8 : Step Three: Determine the ideal solution and negative ideal solution

	Most suitable and the most unsuitable of Efficiency Equipment	Most suitable and the most unsuitable of Quality Parts	Most suitable and the most unsuitable ofRotation speed Electromotor	Most suitable and the most unsuitable ofDepreciation of equipment	Most suitable and the most unsuitable ofStation location	
MAX	0.0813	0.05614	-0.0345	-0.0048	-0.0087	Suitable
MIN	0.0542	0.0374	-0.0622	-0.0431	-0.0391	Unsuitable

Fourth step: Gain size of distance distance between each n-dimensional alternative assess Euclidean method.Means far from i options, from positive and negative ideal alternatives.

(1-11)

$$S_{i-} = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \qquad i = 1,2,3,\cdots,m$$

(1-12)

$$S_{i-} = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \qquad i = 1,2,3,\cdots,m$$

T-9 : Fourth step: Gain size of distance

the most suitable Division of Efficiency Equipment	the most suitable Division of Quality Parts	the most suitable Division ofRotation speed Electromotor	the most suitable Division ofDepreciation of equipment	the most suitable Division ofStation location	the most unsuitable Division of Efficiency Equipment	the most unsuitable Division of Quality Parts	the most unsuitable Division ofRotation speed Electromotor	the most unsuitable Division ofDepreciation of equipment	the most unsuitable Division ofStation location
-0.009	0.000	-0.007	-0.038	-0.030	0.018	0.019	0.021	0.000	-0.077
0.000	-0.019	-0.014	0.000	-0.022	0.027	0.000	0.014	0.038	-0.068
-0.018	-0.019	-0.007	-0.034	-0.026	0.009	0.000	0.021	0.005	-0.072

Step Five: Calculate the relative closeness to the ideal solution: This measure is obtained by the formula:

$$C_{i*} = \frac{S_{i-}}{S_{i*} + S_{i-}} \qquad 0 \prec C_{i*} \prec 1 \qquad (1\text{-}13)$$

Step Six: Ranking Options Finally, options are ranked according to the descending order.

T-10 : Ranking Options

1	Electro main engine compressor	0.93
2	Main fan compressor	0.853
3	Electric water pump	0.7033
4	Fan oil pump	0.6911
5	Water Heater	0.673
6	Oil Heater	0.6702
7	Dryer Heater	0.668
8	Blower motor	0.6617
9	Air Dryer	0.6584
10	Air compressor	0.6521
11	Fan canopy	0.6499
12	plc	0.6139
13	Main lighting	0.5697

14	Emergency lighting	0.5633
15	Even Svlvnyd	0.5371
16	G & F Equipment	0.4835
17	SCADA	0.4589
18	Board of dispenser	0.456
19	UPS	0.4483

Data Envelopment Analysis (DEA)

Since CNG station capacity is different (Station capacity is the amount of gas in terms of cubic meters is compressed by the compressor in an hour) and it is possible for a particular capacity are multiple providers contracted to the National Iranian Oil Products Distribution, Therefore, equipment efficiency and inefficiency of each of them is important for private investors. Since the nature of some indices is genus of productivity, efficiency of finite number of homogeneous decision maker units (equipment Station) are inputs and outputs in the case of multiple so Data envelopment analysis to determine the boundary between the performances of existing competitors in the supply of equipment was used.In this study, the relative scale is used as follows:

$$S = \frac{CCR}{BCC} \qquad (1\text{-}14)$$

As noted above, any Station depending on the inlet pressure and capacity are classified into the following types:Capacity: 2000 (Nm3/H)250pascal -Capacity: 1500 (Nm3/H)250pascal -Capacity: 1200(Nm3/H) 250 pascal - Capacity: 1000(Nm3/H) 250 pascal - Capacity: 750 (Nm3/H) 250 pascal - Capacity: 750(Nm3/H) 60pascal - Capacity:750(Nm3/H) 250 pascal -Capacity:250 (Nm3/H) 60pascal and Capacity: 2000 (Nm3/H)250 pascal .

The survey was conducted on 176 sets of CNG Station with a capacity of 2000 (Nm3 / H) and inlet pressure of 250 kPa, 70 Station facilities (40 percent) use equipment Tamkargaz (TGC), equipment for 48 Station (27%)use Havayar Equipment (HY) and equipment 58 Station (33 percent) as well as equipment from other suppliers (RMG, TAM and SAFE).

The highest levels of efficiency in equipment Havayar (HY) obtained with studies done using one of the reasons UNLOADING (to prevent freewheeling engine) engine used by the supplier is such that the most effective direct consumption of electric motors could be turned off, thus eliminating the no-load no-load losses achieved. It is actually a simple method for permanent monitoring and automatic control. Most of the no-load power consumption of less importance is given to the no-load current, whereas most current at full load is about. Average relative efficiency of each of the suppliers is as follows:

T -11 : Average relative efficiency of each of the suppliers(Capacity: 2000 (Nm3/H)250pascal)

Supplier	(HY)			(TGC)			(RMG)			(TAM)		
Equipment	S	CCR	BCC	S	CCR	BCC	S	CCR	BCC	S	CCR	BCC
Electro main engine compressor	0.098	0.94	0.958	0.098	0.97	0.989	0.098	0.92	0.938	0.098	0.97	0.989
Main fan compressor	-	-	-	-	-	-	--	-	-	-	-	-
Electric water pump	0.098	0.73	0.744	0.098	0.72	0.734	0.098	0.75	0.765	0.098	0.72	0.734
Fan oil pump	-	-	-	-	-	-	--	-	-	-	-	-
Water Heater	1	1	1	0.098	0.96	0.979	0.098	0.98	0.999	0.098	0.96	0.979
Oil Heater	1	1	1	0.098	0.91	0.928	0.098	0.98	0.999	0.098	0.92	0.938
Dryer Heater	0.098	0.73	0.744	0.098	0.93	0.948	0.098	0.92	0.938	0.098	0.93	0.948
Blower motor	0.098	0.73	0.744	0.098	0.82	0.836	0.098	0.74	0.754	0.098	0.82	0.836
Air Dryer	0.098	0.9	0.918	0.098	0.72	0.734	0.098	0.78	0.795	0.098	0.72	0.734
Air compressor	-	-	-	0.098	0.85	0.867	0.098	0.85	0.867	0.098	0.85	0.867
Fan canopy	1	1	1	0.098	0.85	0.867	0.098	0.99	1.009	0.098	0.99	1.009
PLC	1	1	1	0.098	0.94	0.958	0.098	0.96	0.979	0.098	0.94	0.958
Main lighting	1	1	1	0.098	0.98	0.999	0.098	0.96	0.979	0.098	0.94	0.958
Emergency lighting	1	1	1	0.098	0.96	0.979	0.098	0.96	0.979	0.098	0.96	0.979
Solenoid valve	1	1	1	0.098	0.95	0.969	0.098	0.95	0.969	0.098	0.95	0.969
G & F Equipment	1	1	1	1	1	1	1	1	1	1	1	1
SCADA	1	1	1	0.098	0.91	0.928	0.098	0.92	0.938	0.098	0.91	0.928
Board Dispenser	1	1	1	1	1	1	1	1	1	1	1	1
UPS	1	1	1	0.098	0.98	0.999	0.098	0.9	0.918	0.098	0.9	0.918

T-12:Average relative efficiency of each supplier's capacity 2000 (Nm^3 / H)

(HY)	(TGC)	(RMG)	(TAM)	(SAFE)
0.681661	0.198257	0.198257	0.198257	0.188235

For other capacitiessimilar calculations doneIn order to avoid too much information, the results are as follows:

Capacity: 1500 (Nm3/H) 250pascal : The lowest efficiency equipment in the (DRESSER) obtained from the survey conducted by one of the main reasons for using motors larger than required in the Station to supply.

Capacity: 1200 (Nm3/H) 250 pascal : Highest effectiveness Pars Compressor equipment (PC) obtained from surveys conducted with one of the main reasons is the use of high-efficiency motors. These engines have High cost. However, 30-20% of the added initial cost will be offset by lower operating costs. Another advantage of efficient engines is with low impact on the function of voltage fluctuation and load when the engine is in the details.

Capacity: 1000 (Nm3/H) 250 pascal : The highest effectiveness of the equipment Delta (DELTA) obtained with the survey conducted one of the reasons the method used to reduce load on the engine is from this Supplier .Certainly one of the best ways to reduce the load on the engine's electrical costs.

Capacity: 750 (Nm3/H) 250 pascal : Average relative efficiency of each supplier's capacity is equal and can not be commented.

Capacity: 750 (Nm3/H) 60 pascal : Average relative efficiency of each supplier's capacity is equal and can not be commented.

Capacity: 500 (Nm3/H) 250 pascal : The highest level of efficiency in equipment Pars Compressor (PC) obtained due to the mentioned

Capacity: 250 (Nm3/H) 60pascal : Average relative efficiency of each supplier's capacity is equal and can not be commented.

Conclusions

In this research, a case study in the Oil Products Distribution Company in Tehran, Shannon entropy method for calculating the relative importance (weighting) of the indicators were. After running the Shannon entropy, the experts prefer to choose the sub-criteria affecting energy consumption was calculated positions

In order to consistency indicators together and objective investigation of hierarchical AHP was used to prioritize the major indices extracted (options) of the TOPSIS method was used for the purposes of this study, and due to the Genus nature and boundaries of performance indicators and options positions of options in different capacities were determined using the technique DEA.

According to research findings, it can be concluded that the Main factors affecting energy consumption respectively CNG Jayga state indicators "Efficiency of Equipment", "quality parts", "rotation speed electric", "equipment depreciation" and "location Station" were ranked first to fifth. Also according to the specific weight of each sub-criterion, sub-criteria are most important to the "main engine compressor electro", "Main fan compressor", "electric water pump", "fan pump oil" and "water heater" was and other sub-criteria are next in priority.

Recommendation for future researches

Reasons for the increase or decrease of energy consumption data mining are classified.Future researchers can be identify parameters influencing energy efficiency one and dual fuel stations.TOPSIS technique can be effective against ANP technique that takes into account the interrelationships of variables and indicators noted measure.Rankings following parameters (options) techniques using AHP and fuzzy TOPSIS is conducted.Factors influencing the increase or decrease energy consumption model using AMOS or LISREL software are reviewed.can be used with other techniques such as indicators weight and gained FAHP.

Limitations of the study

With regard to energy consumption and reduce or increase the impact of such climate, humidity and dryness of the air and other environmental factors

Those are uncontrollable and unpredictable, so check the exact rate of consumption is not available.

Since quality can have a major effect on the energy dissipation is

To evaluate the energy efficiency equipment suppliers in the country, the quality of input power for all equipment in the ideal case was assumed.

When assessing the amount of savings, the use of a minimum guaranteed Efficiency of is more reliable because all motors must be equal to or greater than the size of the computation, thus landlord is located.

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