EVALUATION OF HEAT EXCHANGER FOR DOMESTIC HOME BY OPTIMIZATION TECHNIQUE

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Abstract

An exchangers are a commonly used to heat the water in domestic home. The heat exchangers are installed to convert cold water into hot water as usually. The heat exchangers, which convert cold water into hot water work at the state of low pressure below atmospheric pressure. Heat exchangers are condensing steams also somewhere, however significantly more expensive. In the present research, a problem related to evaluation of domestic heat exchangers is solved. To choose domestic heat exchangers, the authors considered five parameters such as Reliability, Efficiency, Maintenance, Green Perfromnace, and Deprecation. The objective data are collected from heat exchangers purchasing house. A dynamic optimization method is applied to select domestic heat exchanger. The results are represented in conclusion section.

Key words: Condenser, power plant, data, evaluation

1. Introduction and literature review:

A domestic heat exchangers is a device or mechanical unit, is used to condense a hot water from its gaseous to its liquid state or liquid into gaseous form. The latent heat is transferred to the surrounding environment. Domestic heat exchangers can be made as per numerous designs, and come in many sizes ranging from small to very large. A refrigerator also uses heat exchangers to get rid of heat extracted from the interior of the unit to the outside air. Heat exchangers are used in air conditioning, industrial chemical processes such as distillation, steam power plants and other heat-exchange systems too. The selection of domestic heat exchangers requires proper analysis. Some domestic heat exchangers are manufactured the based on shell and tubes, are extremely expensive but will require little maintenance. Other selections are much more expensive and maintenance too and many even adversely impact the household electric bills. Removing copper from those components is time-intensive and expensive, especially when considering the cost of replacement capacity in today's competitive electricity markets. A few literature are conducted to choose parameters to domestic heat exchangers evaluation.

Described that the steam generated from boiler in medical waste incinerator is seldom used due to its production and parameters are unstable. The three different utilization systems, namely power generation with adoption of condensing steam turbine, co-generation and combined cooling heating and power system (CCHP) of steam generated from the heat recovery boiler of 72t/d medical waste incineration in a hazardous waste disposal center are investigation respectively. The result showed that the CCHP may be a good choice taking into account cooling in summer and heating in winter. Investigated the recovery of low waste heat, which can generate the electricity for saving energy and reducing pollutant and CO_2 emission. In order to improve the waste energy recover rate and energy utilization efficiency, it is concluded that heat transfer analysis, thermal heat exploitation is indeed. Described the design of three unique thermoelectric generators developed to supply electric power in natural gas fields. This generator used in the gas field as the first generator *(1948)*, described uses the difference in temperature between the hot and cold legs of the glycol natural gas dehydrator cycle to produce power for cathodic protection of the well. The second system uses waste heat from the pilot light of the gas dehydrator boiler to produce power for electronic instruments. The third system used waste heat from the gas dehydrator boiler stack to provide power for instruments, communications, and other uses around the well site. Designed the energy recovery technology of aquatic products processing plant, including refrigeration heat recovery and ice-making cooling recovery. Three heat recovery plans are compared and analyzed, and two ways about cooling recovery of ice-melting pool are compared. The results of analysis show that different heat recovery modes have different energy efficiency [4]. Proposed a theoretical research to work out the basic key theory of fluidized bed, the Eulerian continuum model was adopted to research the fluidized bed, which focuses the complex heat and mass transfer accompanied by the process that high-temperature blast furnace slag particles were cooled by air stream, and the theoretical research was carried out to gain the optimized parameter matches of the fluidized bed. The simulation was carried out from the size of particle and the gas supply velocity, and showed that for the particle of 3mm and 4mm size, v=2.68m/s is the best condition for the both size particle.

Provided the first experimental report they draw out the effect of heat transfer coefficient on the basics of length, thickness and pitch of fins and also reduced the friction factor and Colburn modules. As the practical demand of plate fin heat exchanger has increased experimental studies [**5**]. The authors brought to a conclusion that small offset spacing (length/dh), fin thickness and a large number of fins per inch will give better heat transfer [6]. set up a statically relationship between the variables from earlier experimental heat transfer and fluid flow friction data for plate fin heat exchanger of offset fin and by using these statically relationship (untested offset fin geometries can be predicted realistically and accurately within the parameter range of the correlation) one can predict virtually and correctly within the parametric range of newest offset plate fin heat exchanger having no previous tested data **[7],[8],[9],[10].** The references [11-26] helped the author to understand data analysis and choosing effectual technique.

3. *Domestic Heat Exchangers Optimization Method*:

The formula is used for normalization.

$$x_{ij}^{*} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^{2}}} \qquad (1)$$

Here x_{ij}^{*} denotes i_{th} OPTIONS of j_{th} c and criteria.

(X*ij Reliability+ X*ij Efficiency- X*ij Maintenance+ X*ij Green Perfromnace- X*ij Deprication) (2)

4. Case research:

This is a case research of domestic/house. This housekeeper is looking for a domestic heat exchanger for own house. The home keeper desire to choose domestic heat exchangers based on objective data are represented in Table 1.

Table. 2, Table. 3 and Table. 4 show data vs domestic heat exchanger's parameters. Tbale.5 shows aggregated data. The Table. 6 reveal the normalized data.

Table 1: Domestic heat exchanger parameters

Measurement	Domestic heat exchanger parameters
Performance evaluation	Reliability
	Efficiency
	Maintenance
	Green Perfromnace
	Deprecation

Table 2: Data given by industrial professional vs parameters for Domestic heat exchanger**-1**

Parameters	WP1	WP2	WP3	WP4	WP5
Reliability	0.95	0.95	0.90	0.85	0.80
Efficiency	80%	80%	80%	80%	70%
Maintenance requirement	2	2	3	2	4

Green Perfromnace	100%	100%	100%	90%	95%
Deprecation	7% of its total price	10% of its total price	8% of its total price	7% of its total price	6% of its total price

Table 3: Data given by industrial professional vs parameters for Domestic heat exchanger**-2**

Parameters	WP1	WP2	WP3	WP4	WP5
Reliability	0.96	0.95	0.92	0.85	0.80
Efficiency	80%	80%	82%	80%	70%
Maintenance	2	3	3	2	4
Green Perfromnace	100%	90%	100%	90%	97%
Deprecation	7% of its total price	7% of its total price	11% of its total price	7% of its total price	9% of its total price

Table 4: Data given by industrial professional vs parameters for Domestic heat exchanger**-3**

Parameters	WP1	WP2	WP3	WP4	WP5
Reliability	0.96	0.97	0.92	0.90	0.80
Efficiency	80%	85%	82%	85%	75%
Maintenance	2	3	3	2	4
Green Perfromnace	90%	90%	100%	100%	97%
Deprecation	7% of its total price	7% of its total price	11% of its total price	7% of its total price	9% of its total price

Table 5: Aggregated data vs parameters

Parameters	Domestic heat exchanger-1	Domestic heat exchanger-2	Domestic heat exchanger-3
Reliability	0.89	0.896	0.91
Efficiency	78%	78%	81%
Maintenance	2.6	2.8	2.8
Green Perfromnace	97%	95%	95%
Deprecation	8% of its total price	8% of its total price	8% of its total price

Table 6: Normalized data

Parameters	Domestic heat exchanger-1	Domestic heat exchanger-2	Domestic heat exchanger-3
Reliability	0.011	0.011	0.011
Efficiency	0.008	0.008	0.009
Maintenance	0.092	0.106	0.106
Green Perfromnace	0.013	0.012	0.012
Deprecation	0.875	0.863	0.862

Conclusion:

To select Domestic heat exchanger, the authors considered five industrial Engg factors such as Reliability, Efficiency, Maintenance, Green Perfromnace, and Deprecation. The data collected from five people of a home, want to purchase Domestic heat exchanger. They assessed data as they monitor the performance in of same domestic heat exchanger in other houses. Domestic heat exchanger purchasing 3, has score

(-0.935) is seen best than other two. The results are Domestic heat exchanger purchasing ***-1-0.936***, Domestic heat exchanger purchasing ***-3-0.937***, ***and*** Domestic heat exchanger purchasing ***-2-0.935.***

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