ABOUT YIELDS AT FLAME AND ELECTRICAL FURNACES USED IN THE TECHNOLOGICAL OPERATIONS OF THE HEAT TREATMENTS

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Abstract: *It should be taken into account a number of factors, such as: technical treatment type (temperature), shape and size of the piece, manufacturing series etc. The difficulty costing in that the same heat treatment can be performed in different furnaces and the same furnaces may be used for further heat treatment. The optimal solution can establish only after some comparative assessment of different types of furnaces, taking into account the constructive particularities and technical and economic parameters*.

Keywords: the heat treatment, furnace, electric, flame

1.INTRODUCTION

It is obtaining of some heat treated pieces, of superior quality and at a low cost,it has imposed continuous improving and diversification of machinery for making these specific operations. In a first form, their grouping can be done in heating equipment, cooling equipment and auxiliary equipment and installations.

Heat treated pieces of superior quality and low price require the perfection and various equipment specific to this operations.

The classification of these equipments is as follows:

- the heating equipments;
- the cooling equipments;
- the ancillaries.

The among of these, the largest share it occupies by 70% of the heating equipments. The most important heating equipment are the furnaces. These can be designed according to the dimensions of the part, the heating temperature, process automation, etc.

When choosing a furnace must take into account a number of factors such as: technical treatment type (temperature), shape and size of the piece, manufacturing series ş.a. The difficulty consists in the fact that the same the heat treatment can be performed in different furnaces, and the same furnace may be used for further the heat treatments.

The optimal solution it can be established only after some comparative assessment of different types of furnaces, taking into account the construction features and technical and economic parameters.

2. THE CLASSIFICATION OF FURNACES

The classification of furnaces is made depending on:

a. the heating temperature:

-up to 300^{o}C can be achieved low return, heating of nonferrous alloys.

-between 300-550 ^{o}C medium return, the nitriding, etc.

-between 500-750 ^{o}C subcritical annealings, high return, stress relief annealing.

-between 700-950^{o}C tempering steel and cast irons, homogenising annealings at the nonferrous metal alloys;

-between 900-1150^{o}C heating of refractory steels, homogenising annealing of the allied metal alloys.

-between 1100-1350 ^{o}C the rapid tempering steels, sintering of metal carbides.

The furnaces can have normal and controlled atmosphere and can be mechanized. Lately a large share have the electric furnaces.

a.the way of heating: with flame, with electric current, with resistors ferrous, by induction.

b.after the way of use: with continuous operation, periodically.

c.after maneuvering the pieces: horizontal, vertical.

For individual or small series production room type furnaces with periodically operating are most used. Their serving can be performed manually (small pieces) or mechanical, for which purpose using the appropriate devices.

The heating furnaces it can be ensure by flame or electric, in both cases enabling the use of radiant tubes or muffles for better uniformity of temperature inside the furnace chamber or use the controlled atmospheres.

After the form and layout of the room,the hearth of furnaces can be horizontal, which in turn can be fixed or mobile, and vertical furnaces.

The furnaces must have an large enough power to heat the atmosphere, pieces and cover the losses.

Since the electrically heated installations have a series of advantages compared with the flame:

- can be better temperature uniformity in the environment heating;
- can concentrate the large quantities of oxygen in low volume;
- the temperatures can be adjusted more finely, from 5 in 5 ^{o};
- lends itself easier at the automation;
- it have a better efficiency and they are becoming more widespread.

In figure 1 is presented the flame furnance:1-burner; 2-the hearth; 3-flue for the dispersal of gases.

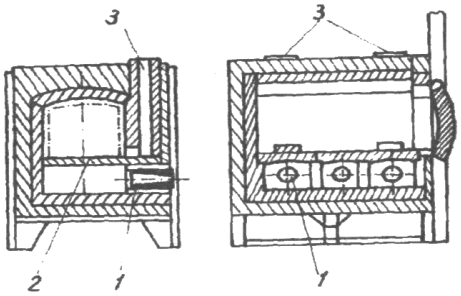

Fig.1

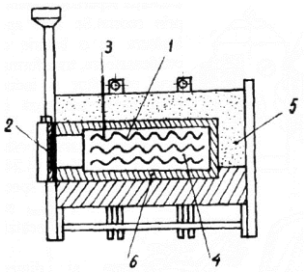

Fig.2

In Figure 2 presents the furnace with heating through electric resistance.

1-the heating elements; 2-door; 3-the thermocouple; 4-the workroom; 5-the refractory lining; 6-the refractory hearth from steel.

3. THE COMPARATIVE DATA CONCERNING THE FUEL CONSUMPTION AND ENERGY AND THE YIELD OF FURNACES WITH FLAME AND ELECTRICAL

The comparative data on fuel and energy consumption and yield with the flame and electric furnaces are shown in Table 1.

Tab.1 The classification of furnaces, consumption of combustible, energy and their performance

The type of furnace	The heat treatment applied	Temperature °C	The flame furnace			The electrical furnace		
			Kcal/kg		η %	Kcal/kg		η %
			useful	real		useful	real	
The discontinuous room	The stress relief annealing	550	76	400	19	0,09	0,14	76
	The tempering, normalization	850	170	450	23	0,21	0,32	66
	The homogenization annealing	900	178	850	21	0,22	0,45	49
	The case-hardening in solid medium	950	182	500	12	0,23	0,90	25
	The case-hardening in gaseous medium	920	180	700	26	0,23	0,40	51

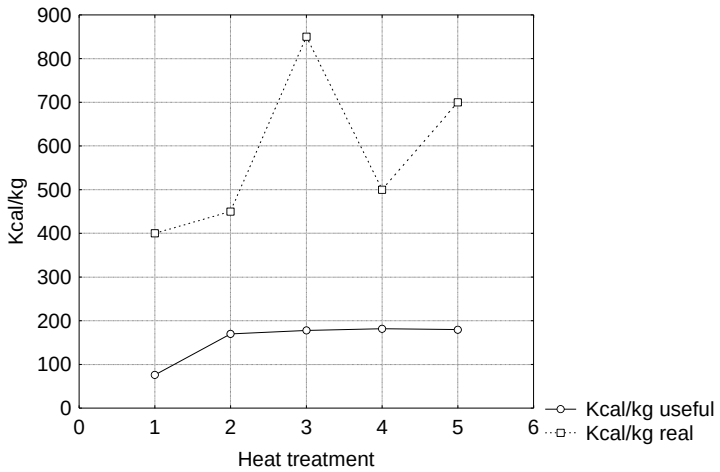

Fig.3 The graphs of combustible consumption useful and real, of fuel furnaces

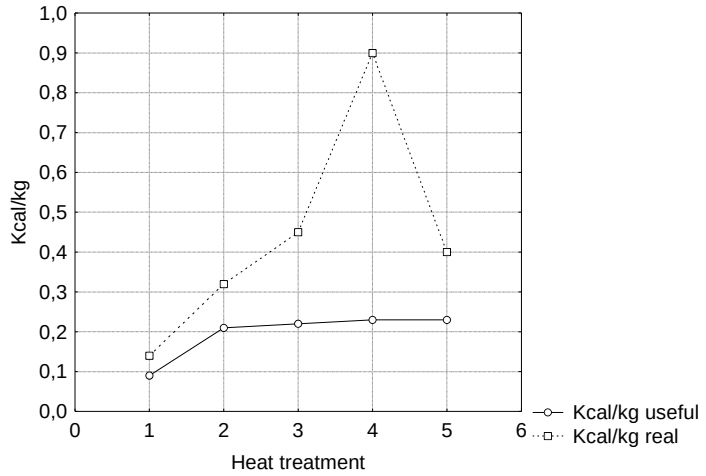

Fig.4 The graphs of energy consumption useful and real, of electrical furnaces

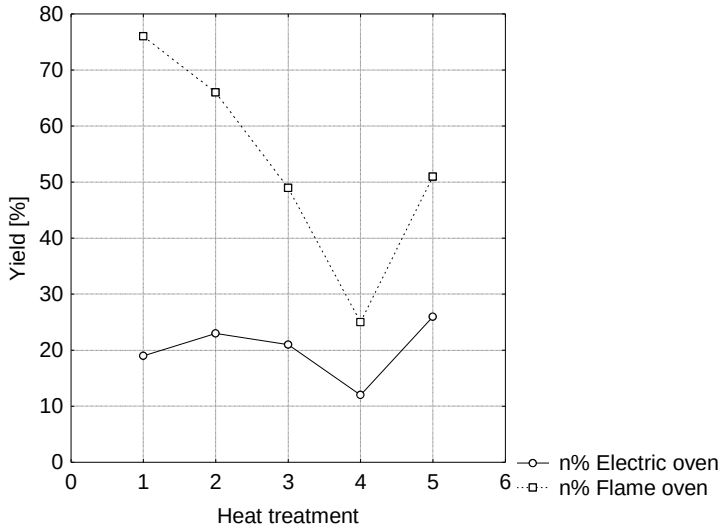

Fig.5 The graphs of yields to the combustible and electrical furnaces

In the figure 3 are presented the graphs of combustible consumption, of the furnaces flame. In the figure 4 are presented the graphics the energy consumption of electric furnaces. In the figure 5 are presented the graphs of yields combustible and electrical furnaces. It is observed that the yield at electric furnaces is higher than the the combustible furnaces.

4.CONCLUSIONS

When choosing a furnace must take into account a number of factors such as: technical treatment type (temperature), shape and size of the piece, manufacturing series etc. The difficulty consists in the fact that the same the heat treatment can be performed in different furnaces, and the same furnace may be used for more heat treatment.

The optimal solution can be established only following comparative assessment of different types of furnaces, taking into account the construction features and the technical and economic parameters. The furnaces must have a high enough power to heat the atmosphere, the pieces and cover the losses.

Since the electric heating installations have a series of advantages compared with the flame:

- it can better equalize the temperature in the medium of heating;
- it can concentrate the large quantities of oxygen in small volume;
- the temperature it can be adjusted finer, from 5 to 5 ^{o};
- it lends itself more easily to the automation;
- it have a better yield

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