

AN APPROACH FOR AUTOMATION THE OPERATING OF THE ROTARY LJUNGSTROM TYPE PRE-HEATER (I)

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Abstract: One of problems for all rotary Ljungstrom type pre-heaters is to optimize the number of rotation of the heat wheel. Due to the many sources of boiler inefficiency, the temperature of flue gas changes, it is necessary to change the number of rotation of heat wheel. This paper presents a logical scheme of operating the rotary Ljungstrom type pre-heaters, taken into consideration only the exit temperature of flue-gas changing the flow of natural gas.

Keywords: heat wheel, number of rotation, flue-gas, logical scheme.

1. INTRODUCTION

It is obviously that the number of rotation of heat wheel must be changed due to the many factors, like the coal characteristics, air-fuel ratio, burner characteristics, fouling of heat-transfer, atmospheric conditions, load. One way to know the number of rotation of heat wheel is to determine the maintaining time for the hot side of the heat wheel, which is obtained by an apparatus (variant 1) that is described in this paper. Also, in this paper is presented a logical scheme of operating the rotary Ljungstrom type pre-heaters, which takes into consideration only the exit temperature of flue-gas in order to avoid corrosion due to sulphur from the fuel mixture lignite-gas.

2. APPARATUS DETERMINING THE MAINTAINING TIME (VARIANT 1)

The Ljungstrom pre-heater consists of metallic elements that are alternately heated and cooled. These metallic elements are contained in a heat wheel that rotates in a casing. Hot flue gas flows through one side of this heat wheel and heats the elements, while the air to be heated flows through the other side.

The apparatus determining the maintaining time of metallic elements of the heat wheel in flue gas (variant 1) is made from the following parts, as is shown in fig.1: 1-connecting for the entrance of flue-gas; 2-tap; 3-thermocouple; 4-heat accumulator, whose the length L is equal with the length of the route of flue-gas through the pre-heater; 5-connecting for the exit of flue-gas; 6-tap; 7-thermocouple. The heat accumulator has the metallic filling (8) identically with the metallic filling of the heat wheel to assure the same conditions of thermal heat.

The apparatus has also, as is shown in fig.1: 9-connecting for the entrance of compressed air; 10-tap; 11-connecting for the exit of compressed air; 12-tap. The compressed air is introduced to cool and clean the metallic filling of the heat accumulator after each experiment.

The apparatus goes around the heat wheel (13), makes a bypass, being connected with the duct (14) to enter the flue-gas and with the duct (15) to exit the flue-gas. In the same time, the apparatus has no connection with the combustion air.

This apparatus determines the the maintaining time of metallic elements of the heat wheel in flue-gas till the temperature measured with the thermocouple (7) becomes equal with the temperature measured with the thermocouple (3).

The priority of this apparatus determining the maintaining time was patented under the number 119905 and published by OSIM in BIP (Buletin de Informare Periodică) nr.4 from 2005 at the page 82.

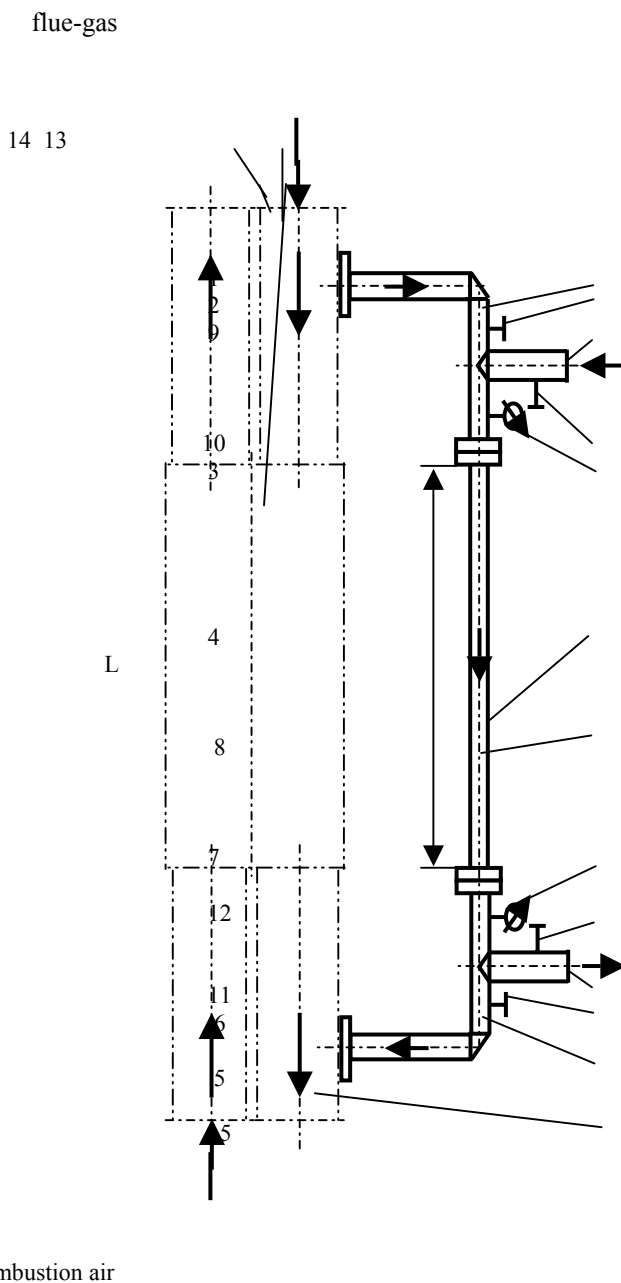


Fig.1. The apparatus determining the maintaining time of metallic elements of the heat wheel in flue-gas till the temperature at the exit becomes equal with the temperature at the entrance (Variant 1).

3. SIMPLIFIED LOGICAL SCHEME TO OPTIMIZE THE NUMBER OF ROTATIONS OF THE WHEEL OF ROTARY LJUNGSTROM TYPE PRE-HEATER

The apparatus presented above has some inconveniences like the impossibility to ensure a perfect thermal insulation and the faucets that resists to the abrasive action of flue-gas.

In the same time, it is obvious that is necessary to optimize the number of rotations of the wheel of rotary Ljungstrom type pre-heater.

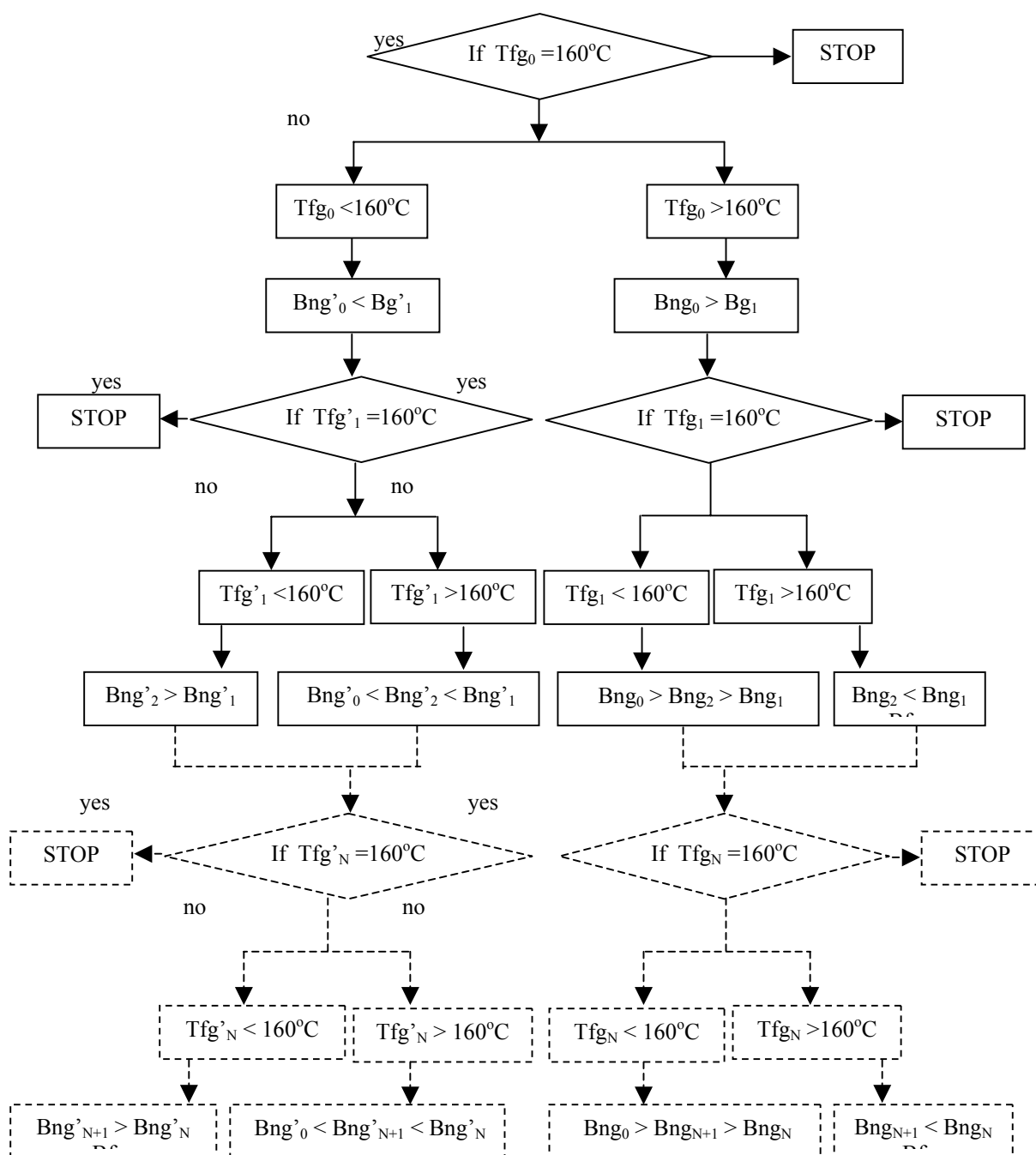


Fig.2

The used logical scheme of operating the heat wheel:

$T_{fg0}, T_{fg1}, T_{fg2}, \dots T_{fgN}$ – the exit temperatures of flue-gas at the right branch;

$B_{ng0}, B_{ng1}, B_{ng2}, \dots B_{ngN}$ – the flow of natural gas at the right branch;

$T_{fg'0}, T_{fg'1}, T_{fg'2}, \dots T_{fg'N}$ – the exit temperatures of flue-gas at the left branch;

$Bng'_0, Bng'_1, Bng'_2 \dots Bng'_N$ -the flow of natural gas at the left branch;
 ----- module to repeat.

One logical scheme of operating the heat wheel may be written as follows (Fig.2):

- the checking of the temperature of flue-gas at exit from the pre-heater;
- the increasing or the decreasing of the flow of natural gas in the mixture lignite-natural gas in order to achieve the desired temperature of 160°C ;
- no change of the number of rotation of heat wheel.

4. CONCLUSIONS

The necessity of improving the efficiency of the rotary Ljungstrom type preheater is obvious. There are many attempts in this order. One of them is a device to determine the maintaining time necessary for the metallic elements from heat wheel.

Also, the automation of the running of this heat exchanger is required.

In this paper is presented a device to determine the maintaining time necessary for the metallic elements from heat wheel.

In the same time is given a logical scheme to automation the operating by changing the flow of natural gas of the rotary Ljungstrom type preheater, which takes into consideration only the exit temperature of flue-gas in order to avoid corrosion due to sulphur from the fuel mixture lignite-gas.

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