

Necessary amount of spray water for optimal flue gas condenser operation

Gundars Galindoms¹, Ivars Veidenbergs² (¹⁻² Institute of Energy and Environment, Riga Technical University)

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I. INTRODUCTION

A calculation model was developed to determine optimal flue gas condenser operation modes in evaporation and condensation zones. One of optimization parameters that could be changed is amount of water to be sprayed into flue gases. Optimal amount of spraying water was determined in various boiler operation modes.

II. METHODOLOGY

It is significant to recover heat from outgoing flue gases in boiler house. It is done using direct contact heat exchanger where water is sprayed into flue gases [1]. Unit consists of two parts - evaporation part where water is sprayed into hot flue gases to decrease its temperature and increase moisture content and condensation part where cooler water is sprayed into moistened flue gases to provide condensation thus recovering latent heat of phase change. This helps to reduce fuel usage and cleans and dries outgoing flue gases.

The calculation model and optimization software was developed to calculate optimal operational modes of condenser [2]. Main goal of evaporation part of the unit is to achieve maximum possible moisture content in flue gas in the end of evaporation part at specific flue gas temperature. Main goal of condensing part is to get highest possible condenser power at the bottom part of the unit [3]. In both parts there is a parameter that can be changed to get various output results and it is amount of sprayed water. This parameter was used as changeable optimization parameter.

III. RESULTS

Optimization calculations were performed using different boiler house output power values and corresponding gas flow rates and moisture content in flue gas values. Also various sprayed water temperatures in evaporation and condensation parts were taken into account in calculations.

Optimization results in evaporation part shown in Fig. 1.

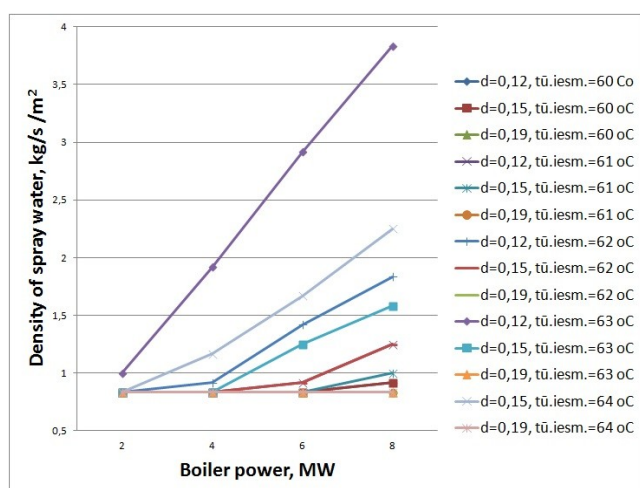


Fig. 1. Density of water in optimal evaporation part operational modes.

Density or necessary amount of sprayed water increases when boiler power increases and if temperature of spraying water increases.

Optimization results in condensation part shows that necessary amount of sprayed water was determined to get optimal results. This can be seen in figure 2. It can be seen that density of sprayed water varies from 12,4 to 13 kg/s m² or it is 43 to 45 kg/s in all used operational modes of boiler house.

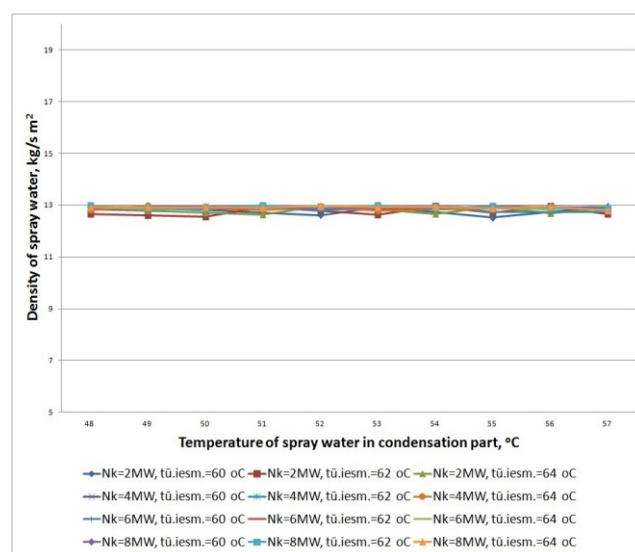


Fig. 2. Density of water in optimal condensation part operational modes.

It can be seen that while the determined amount of water to be sprayed is taken into account during operation, optimal performance of condenser unit can be achieved and water amount change into those determined boundaries does not significantly influence condenser unit output.

IV. CONCLUSIONS

Amount of necessary amount of water to be sprayed to achieve optimal heat exchanger operation modes was determined for both - evaporation and condensation parts of the unit. To achieve optimal operation mode in evaporation part necessary amount of water increases by increasing boiler power and if temperature of sprayed water increases. To achieve optimal operation mode in condensation part increase of boiler power and fluctuation of sprayed water temperature does not significantly influence condenser output. Though sprayed water amount should be within determined values.

V. REFERENCES

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