

Summary

In this thesis a natural gas fueled combi boiler was designed which in addition to providing domestic hot water, had the ability to provide indoor heating for an apartment with the area of 120 square meters. In the design process, it was assumed that the building was well-insulated with minimal heat dissipation and the presence of tap water and a domestic natural gas extension were standard.

Condensing technology (condensation of hot flue gas) was utilized as the design methodology. An Inox-Radial Heat Exchanger made of SA240-316Ti Stainless Steel with tube dimensions of 14×37.5cm and air gap of 36mm was employed. The LGM29 Modular Matrix Burner from Veissmann Manufacturing Company which had extremely low emissions ($\text{NO}_x=8.9\text{ppm}$ and $\text{CO}=5.9\text{ppm}$) was selected as the burner unit. Also a Grundfos KM-BUS Variable Speed Pump (700-2700rpm) was utilized for the heat pump. Also, in order to prevent the emission of condensed heavy fluids in to the air, a granulate neutralizing system was implemented which altered the pH to reach 6.5 and then discharged the now permissible fluid through a siphon into the drain. In order to control the combi unit, an intelligent control system was utilized. Also the implementation of an RF Wireless

Control System was considered for distant operation. Axisymmetric pipes were employed for simultaneous air intake and flue gas discharge. Results showed that with the implementation of condensing technology, while utilizing the same natural gas fuel like any other standard boiler in the market, a minimum 6% performance increase was observed. In addition, utilizing precision engineering in the design and manufacturing of parts especially the burner and heat exchanger and also employing security systems in order to increase operation reliance, posed a potential effective role in the reduction of possible injuries during installation and while in service.

In conclusion, according to assessments, although a condensing combination boiler requires a higher initial investment comparing to ordinary boilers available in the market, the implementation of such for home and office usage provides more energy and is cost effective due to lowered gas usage and minimal maintenance costs.

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