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Suitable Operating Conditions of Hot Water Generators Combined with Central Air Package Units: A Case Study of Tipco Building Group

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Abstract : The main objective of the study of the suitable operating conditions of hot water generators combined with central air package units: a case study of Tipco Building Group was to analyze the suitable operating conditions and energy-related costs in each operating condition of hot water generators combined with central air package units which resulted in water-cooled packages. Thermal energy from vapor form refrigerants at high pressures and temperatures was exchanged with thermal energy of the water in the swimming pool that required suitable temperature control for users with the use of plate heat exchangers before refrigerants could enter the condenser in its function to change the status of vapor form refrigerants at high pressures and temperatures to liquid form at high pressures and temperatures. Thus, if this was used to replace heat pumps it could reduce the electrical energy that was used to make hot water and reduce the cost of the electrical energy of air package units including the increased efficacy of air package units. Of the analyses of the suitable operating conditions by means of the study of the elements involved with actual measurements from the system that had been installed at the Tipco Building Group hot water generators were combined with air package units which resulted in water-cooled packages with a cooling capacity of 75 tonnes. Plate heat exchangers were used in the transfer of thermal energy from refrigerants to one set of water with a heat exchanger area of 1.5 m^2 which was used to increase the temperature of swimming pool water that has a capacity of 240 m^3. From experimental results, it was discovered after continuous temperature measurements in the swimming pool every 15 minutes that swimming pool water temperature increased by 0.78 ^{0}C 0.75 ^{0}C 0.74 ^{0}C and 0.71 ^{0}C. The rates of flow of hot water through the heat exchangers were equal to 14, 16, 18 and 20 litres per minute respectively where the swimming pool water temperature was at a constant value and when the rate of flow of hot water increased this caused hot water temperatures to decrease and the coefficient of performance of the air package units to increase from 5.9 to 6.3, 6.7, 6.9 and 7.6 while the rates of flow of hot water were equal to 14, 16, 18 and 20 litres per minute, respectively. As for the cooling systems, there were no changes and the system cooling functions were normal as the cooling systems were able to continuously transfer incoming heat for the swimming pool water which resulted in a constant pressure in the cooling system that allowed its cooling functions to work normally.

Keywords : central air package units, heat exchange, hot water generators, swimming pool
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