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Title: Investigation of energy recovery with exhaust air evaporative cooling in ventilation system

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<AT>Investigation of Energy Recovery with Exhaust air Evaporative Cooling in Ventilation System

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<ABS-HEAD>Highlights► A model of Energy Recovery with Exhaust air Evaporative Cooling (EREEC) in ventilation is built to test the thermal performance experimentally.

► The results indicated superior saving due to using EREEC in ventilation. ► The inlet temperature is reduced by 2.2^oC at ambient temperature 24.4^oC and by 7.5^oC at highest ambient temperature 35.7^oC. ► Simulation results show that the base cooling load is deducted by 13.38%.

<ABS-HEAD>ABSTRACT

<ABS-P>Building ventilation is mandatory to provide occupants with comfort space. This ventilated air is considered as a waste of energy because the fresh air will enter the room at higher or lower temperature than the room temperature in summer and winter seasons. Moreover, as much as the temperature of fresh air is reduced, lower cooling load is needed. This will lead to reduce the capacity and the power consumption of HVAC system. Normally, energy recovery is used for this purpose. On the other hand, an additional cooling method (evaporative cooling unit) can be added to the exhaust air stream from the energy recovery to reduce its temperature and correspondingly reduce the fresh air temperature. In this research, a model of Energy Recovery with Exhaust air Evaporative Cooling (EREEC) in ventilation is built to test the thermal performance theoretically and experimentally in Mediterranean climate. The results indicated a superior saving due to using EREEC. The inlet temperature is reduced by 2.2^oC at ambient temperature of 24.4^oC and by 7.5^oC at highest ambient temperature of 35.7^oC. Additionally, simulation results show that the base cooling load can be reduced up to 13.38%. Moreover, the Payback Period of EREEC from annual energy saving occurred is around 8 years.

<KWD>Keywords: **Energy Recovery; Evaporation; Energy Saving; Environment; Ventilation; HVAC.**

<td:DefL>Nomenclature

<xps:span class=deft>A</xps:span> <xps:span class=defd>heat exchanger area (m²)</xps:span>

<xps:span class=deft>C</xps:span> <xps:span class=defd>Cost (JD)</xps:span>

<xps:span class=deft> \dot{C} </xps:span> <xps:span class=defd>Capacity rate (W K⁻¹)</xps:span>

<xps:span class=deft>C_p</xps:span> <xps:span class=defd>air specific heat (kJ kg⁻¹ K⁻¹).</xps:span>

<xps:span class=deft>EREEC</xps:span> <xps:span class=defd>Energy Recovery with Exhaust air Evaporative Cooling</xps:span>

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