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A device for closed loop hollow fiber membrane dehumidification for high performance air cooling.

Abstract:

The present invention provides a method and a compact device for the conditioning of air, specifically cooling and dehumidification, via evaporative cooling in a stable, low cost efficient manner. The system comprises of Membrane-hygroscopic liquid dehumidification units, regeneration of spent hygroscopic liquid unit and mechanical air coolers. The regeneration unit contains membrane contactors, heat-exchangers and forward osmosis systems and membrane distillation systems. In this invention, firstly, Supply air is dehumidified by membrane-hygroscopic liquid dehumidification unit, water vapor from the air is diffused to hygroscopic liquid through the membrane pores and it dilutes the hygroscopic liquid. The dehumidified air is passed through the mechanical air coolers for energy efficient cooling. Secondly, the diluted hygroscopic liquid is regenerated by either membrane contactors or by combined forward osmosis and membrane distillation systems. The waste heat from air-cooler condenser unit is used in the regeneration process.

Fig 2.