The dehumidification of moist air before using in drying process could not only reduce the energy consumption but also improve the performance of drying process. This paper presents the performance of a new concept, which was designed as follows: the ambient air flows parallel to a silica gel bed. Silica gel removes a certain amount of the humidity of incoming air depending on moisture content and bed saturation. The regeneration of the bed occurs passively due to induced air circulation by the silica gel bed acting as a solar chimney. Three beds are proposed to be installed at three sides of the drying cabinet (Eastern, Southern, and Western).

A vertical bed was designed as a glass covered wall of a drying chamber. The silica gel bed is 0.6 width and 1.0 m height. It is design allows us to adjust the thickness. The silica gel particles are 2-5 mm in diameter with a bulk density of 670 kg/m$^3$. An experimental setup was developed. It can control inlet air temperature, moisture ratio and air mass flow rate. Experiments for both active adsorption and passive regeneration were carried out under real conditions during summer. It can be concluded that a silica gel bed thickness of 0.03 m and 0.02 kg/s air flowrate are recommended for the active adsorption process. Solar passive regeneration rate is about 0.04–0.06 kg/h.