Nova Scotia Energy Research and Development Forum 2012

F. Handan Tezel

Biography

Professor Tezel started her undergraduate studies in Chemical Engineering at the Middle East Technical University in Ankara, Turkey and later transferred to Worcester Polytechnic Institute (WPI) in Massachusetts where she received her undergraduate degree in Chemical Engineering in 1979.

She then moved to Canada to continue her graduate work, receiving her M.Sc.E. and Ph.D. degrees in Chemical Engineering from University of New Brunswick in 1981 and 1986, respectively. Professor Tezel joined University of Ottawa in 1988, following two years of Post-Doctoral studies at the University of New Brunswick. Professor Tezel is currently the Vice Dean (Research) for the Faculty of Engineering at the University of Ottawa.

In 2004, Professor Tezel has spent a sabbatical leave at Air Products and Chemicals, Inc. in Allentown, Pennsylvania, as a Research Engineer working in their Adsorption Technology Center. She has been elected to serve on the board of International Adsorption Society. She is also representing Canada on the International Energy Agency (IEA) Task Force for Solar Energy and Thermal Heat Storage (Task 4224).

Presentation Abstract: Thermal Energy Storage in Adsorbent Beds for Solar or Waste Heat

Solar thermal collectors collect solar radiation in transfer media (such as rocks, liquids, gases, etc.) as thermal energy. These media can store the thermal energy, transfer it elsewhere or transfer it to another form of energy. If this thermal energy is going to be used for space heating, it is better to store it as thermal energy, rather than converting it to electricity and then converting the electricity back to thermal energy. Since no conversion can be 100% efficient, with every conversion in the system, the overall efficiency decreases.

The system developed by Prof. Tezel's group and modeled in this study would be a thermochemical heat storage system. Dry air would act as a transfer fluid and be heated to around 250°C using a solar thermal collector or waste heat. This transfer fluid would then be used to regenerate an adsorption column filled with adsorbent pellets. Once regeneration is completed, the dry adsorbent could hold the solar energy transferred to it for an indefinite period of time until moist air would be allowed to pass through the adsorption column and release the energy as heat in an exothermic adsorption process. This heat can be used for space heating.

In this study, adsorbent screening and modeling the system was carried out and an adsorbent was found to have an energy density of 200 kWh/m^3 which was much higher than the maximum energy density reported in the literature (165 kWh/m^3). This energy density was further improved to 250 kWh/m^3.