9. Engineering better working or living environments Or **ICR0415**
10. Energy-efficient heating and cooling systems for buildings

Active Desiccant Integration with Packaged Rooftop HVAC Equipment

John Fischer – SEMCO, Inc.
SEMCO, Inc.
737 Terrell Crossing
Marietta, GA 30067

Tele: 780-850-1030
Fax: 780-850-0780
Email: johnfischer@worldnet.att.net

James Sand – Oak Ridge National Laboratory
Oak Ridge National Laboratory
1000 Bethel Valley Road
Bldg 3147, MS 6070, Room 224
Oak Ridge, TN 37831-6070

Tele: 865-574-5819
Fax: 865-574-9338
Email: sandjr@ornl.gov **(corresponding author)**

Abstract

Current research supports the requirements for revised fresh air ventilation standards calling for increased and continuous building ventilation to help assure safe and healthy indoor air environments. Indoor Air Quality (IAQ) problems ranging from unpleasant odors to microbial or mold infestation can occur if heating, ventilating, and air conditioning (HVAC) systems under-ventilate or inadequately dehumidify outdoor air used to provide fresh air ventilation in buildings. Off-the-shelf, packaged rooftop equipment used to air condition most facilities was not designed to handle the increased or continuous supply of outdoor air necessary to comply with building ventilation codes written to this new standard

The integration of a rooftop, unitary air conditioner with an active-desiccant module (ADM) described in this work allows the use of a standard rooftop air conditioner with a thermally regenerated active desiccant component to provide a compact, cost-effective, and simple to use packaged system for efficiently pre-treating and supplying ventilation air adequate to ensure healthy indoor environments. By designing a combined vapor-compression/active-desiccant system with the desiccant component positioned after a conventional cooling coil, the dehumidification effectiveness of the desiccant is significantly enhanced because it operates on cold, saturated, or nearly saturated, air leaving the evaporator. This "post-coil" rather than the normally used, "pre-coil" desiccant arrangement also minimizes the regeneration temperature required for the active-desiccant, allows for partial by-pass of air cooled by the coil for recombination with and post-cooling of the desiccated air, and a dramatically decreases overall size for the pre-conditioning unit. Major design challenges including desiccant wheel development, compact packaging, regeneration burner development, and control optimization were all addressed in building prototype units.

Extensive laboratory testing and two pilot field installations of the ADM/rooftop combination confirmed the superior performance of this system over alternative approaches used to precondition outdoor air. The ADM/rooftop combined system approach joins the major advantages of a conventional rooftop air conditioner (low first cost, simplicity, familiarity, and compact design) with the main strength of an active desiccant system (very dry air). Based on the results of this investigation and economic estimates, the combined, rooftop/ADM, ventilation air pretreatment system was determined to be a highly viable product for commercialization.