ADMINISTRATIVE REPORT

Effects of Cabin Upsets on Adsorption Columns for Air Revitalization

Fellowship for W. Scot Appel

National Aeronautics and Space Administration

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Project Summary

The National Aeronautics and Space Administration (NASA) utilizes adsorption technology as part of contaminant removal systems designed for long term missions. A variety of trace contaminants can be effectively removed from gas streams by adsorption onto activated carbon. An activated carbon adsorption column meets NASA’s requirements of a lightweight and efficient means of controlling trace contaminant levels aboard spacecraft and space stations. The activated carbon bed is part of the Trace Contaminant Control System (TCCS) which is utilized to purify the cabin atmosphere.

TCCS designs oversize the adsorption columns to account for irregular fluctuations in cabin atmospheric conditions. Variations in the cabin atmosphere include changes in contaminant concentrations, temperature, and relative humidity. Excessively large deviations from typical conditions can result from unusual crew activity, equipment malfunctions, or even fires.

The research carried out under this award focussed in detail on the effects of cabin upsets on the performance of activated carbon adsorption columns. Both experiments and modeling were performed with an emphasis on the roll of a change in relative humidity on adsorption of trace contaminants. A flow through fixed-bed apparatus was constructed at the NASA Ames Research Center, and experiments were performed there by W. Scot Appel under the direction of Dr. John E. Finn. Modeling work was performed at the University of Virginia and at Vanderbilt University by W. Scot Appel under the direction of M. Douglas LeVan. All three participants collaborated in all of the various phases of the research.

The most comprehensive document describing the research is the Ph.D. dissertation of W. Scot Appel. Results have been published in several papers and presented in talks at technical conferences.

All documents have been transmitted to Dr. John E. Finn.
Dissertation


Publications


Presentations


