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NASA TECH BRIEF

Design Method for Adsorption Beds

The problem:

Carbon dioxide is constantly generated by the human breathing cycle so that a carbon dioxide removal cycle is required whenever humans are confined over long periods in any space lacking an air-changing capability. There have been several submarine accidents in which crews were lost due to this phenomenon although ample oxygen was available in the enclosure. For time increments of up to 14 days, the problem has been overcome by a system of carbon dioxide removal through adsorption on expendable lithium hydroxide beds. Such a system is, however, useful for longer periods only where bulk and weight are not considerations; otherwise a regenerable system is required.

The solution:

A study has been made to define the parameters required to design regenerable adsorption beds for long-term life support systems. A typical system includes synthetic geolite to remove the carbon dioxide and silica gel to dehumidify the atmospheric gas prior to its passage through the geolite beds.

Bed performance is evaluated from correlated test data which include adsorption characteristics, heat and mass transfer, and pressure drop. A linearized solution of the dynamic mass transfer equations is included to provide a simplified method of bed design. This method is used to find the optimum design for a typical four-bed regenerable, isothermal carbon dioxide removal system. The results of this simplified analysis are compared with those of a detailed digital computer study which reveals that the simplified method predicts system weight approximately 10 percent higher than the detailed evaluation, an acceptable accuracy for preliminary design calculations.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65)

Reference:
NASA-CR-891 (N67-37320), Engineering Criteria for Spacecraft Cabin Atmosphere Selection

Patent status:

No patent action is contemplated by NASA.

Source: J. Jackson and R. Blakely of
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