

Program sizes solid desiccant dryer for natural gas

A.K. Coker A.K.C. Technology Sutton Coldfield, U.K.

A computer program "Dryer" has been developed to enable designers and process engineers to size a solid desiccant dryer for removing moisture from gas streams.

The program will determine the total amount of water adsorbed in the dryer, dimensions of the dryer, total heat required to regenerate the dryer, and other pertinent requirements.

Design procedures involve calculations for water pickup, desiccant volume, desiccant bed diameter, gas velocity through the bed, vessel weight, and dryer regeneration requirements.

The equation box contains the required equations and terms.

The design is based upon the following assumptions:¹

- Temperature difference between the heater outlet temperature and peak vessel outlet temperature of 50° F.

- Average bed temperature based on 75% of the bed at heater outlet temperature and 25% at the peak vessel outlet temperature, Equa-

tion 10.

- Specific heat of 0.12 BTU/lb-°F. for steel and 0.25 BTU/lb-°F. for the desiccant

- Heat of water desorption of 1,400 BTU/lb of H₂O adsorbed.

- Flat heads used on vessel ends and steel density of 480 lb/cu ft.

- Total vessel weight in-

crease of 10%, for supports.

- Heat losses to the dryer during heating period calculated at 5%.

Water removal

Liquid water and sometimes water vapor are removed from natural gas to prevent corrosion and the

formation of hydrates in transmission lines, and to attain the water dew point requirement for sales gas. Many sweetening agents employ an aqueous solution for treating gas. Therefore, dehydrating the gas naturally follows its treatment. Techniques employed for dehydrating natural gas are:

- Dehydration by refrigeration

- Absorption by liquid desiccants

- Adsorption by solid desiccants

- Hydrate point depressant injection.

Adsorption is a process that involves the transfer of a material from one phase to a surface where it is bound by intermolecular forces. The process can involve either the transfer from a gas or liquid to a solid surface or the transfer from a gas to a liquid surface.

The adsorbate is the material being concentrated on a surface. The material on which the adsorbate accumulates is called the adsorbent.

Fig. 1

