Computer program enhances guidelines for gas-liquid separator designs

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Designers are often required to size separators or knockout drums for removing liquids from process gas streams. A Fortran computer program called "Vessel" has been developed to size both horizontal and vertical separators for known fluids' rates and physical properties.

A review of the design of horizontal and vertical separators preceeds the program listings.

Process vessels

Two principal kinds of processing vessels are used in the chemical process industries: those without internals and those with internals.

Empty separators (without internals) are drums that provide intermediate storage or surge of a process stream for a limited or extended period. Alternatively, they provide phase separation by settling.

The second category consists of equipment such as reactors, mixers, distillation columns, and heat exchangers.

In some cases, it is important to separate liquid and gas flowing simultaneously through a pipe. This simultaneous separation is necessary because the conditions of the flowing mixture and the efficiency of separation may vary widely. A separator for such duty therefore must be adequate.

In addition, constraints of space or weight often affect the choice of separators, the need to handle solids or effect a three-phase separation, and the requirements for liquid holdup. In practice, most separation problems are solved by knockout or surge drums or demister separators.

Knockout drums

A knockout drum is suitable for bulk separation of gas and liquid, particularly when the liquid-volume fraction is high with stratified or plug flow in the pipe (Figs. 1 and 2).

A knockout drum is also useful when vessel internals are required to be kept to a minimum; for example, in relief systems or in fouling service. It is unsuitable if a mist is being separated or if high separation efficiency is required.

Demister separators

A demister separator is fitted with either a vane demister package or a wire-mesh demister mat. The mat-type is preferred, al-

Fig.1

HORIZONTAL KNOCKOUT DRUM