NASA TECH BRIEF

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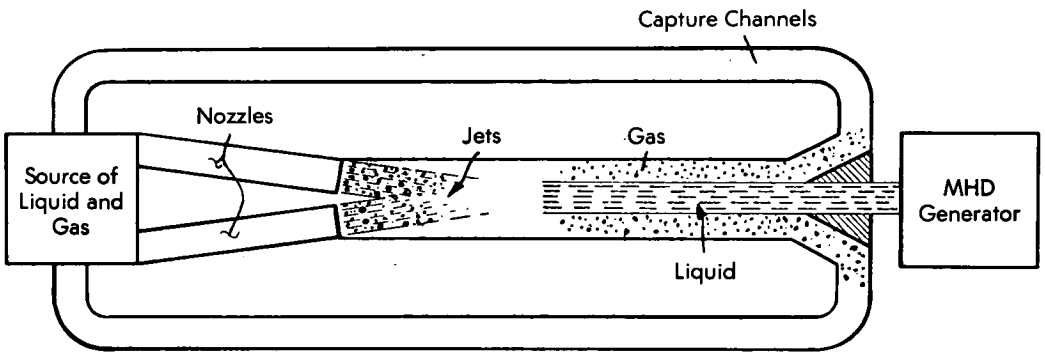
Separation of Gas from Liquid in a Two-Phase Flow System



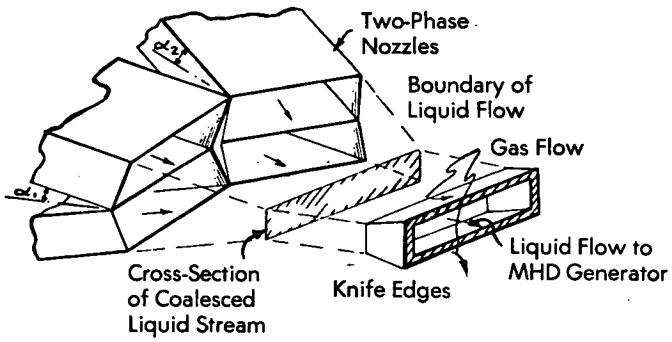
In a magnetohydrodynamic (MHD) electrical power generator, a stream of liquefied metal at a velocity of 90 to 300 m/sec is required as a source of input power. To obtain the high velocities required, gas–liquid mixtures at high pressure and relatively low velocity are passed through two-phase nozzles and allowed to expand into a region of low pressure. The gas–liquid stream which leaves a nozzle ordinarily is intercepted by a device which deflects the stream and causes separation of gas from the liquid, so that liquid is primarily directed to the generator; however, the solid surfaces of deflectors tend to reduce liquid velocity, and thus reduce cycle efficiency.

A new separation system has been devised to cause the jets which leave two-phase nozzles to impinge on each other, so that the liquid from the jets tends to coalesce in the center of the combined jet streams while the gas phase is forced to the outer periphery; thus, because liquid coalescence is achieved without resort to separation with solid surfaces, cycle efficiency is improved.

The above diagram of the new separation system indicates two discrete two-phase nozzles connected to a source of gas and liquid; the jets leaving the nozzles are represented as liquid (broken lines) and gas (dots). Because of the angle between the centerline of each nozzle and the centerline of the central channel, the two jets leaving the nozzles impinge on each other so that a stream of highly concentrated liquid is formed about the center of the channel, while the gas is forced to concentrate between the outer limits of the liquid stream and the channel's walls. Knife-edged members deflect the gas into the capture channels which, in turn, direct the gas back to the source. In practice, the liquid is returned to the source after passing through the generator.

The second diagram represents a cross-sectional view of the channel's inlet end at the exhausts of four two-phase nozzles. The cross-section of the coalesced liquid is easily controlled by adjustment of the relative positions of the exit ends and the cross-section of the jets produced by the various nozzles.

(continued overleaf)



Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,648,083). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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