Saturation in Liquid/Gas Coalescence

Mark Hurwitz, Pall Corporation

Problem Description:

A liquid/gas coalescer is a non-woven fibrous sheet of filter media, usually formed into a cylinder or pleated cylindrical pack, which is used to remove liquid droplets from gas process streams in situations where the concentration of droplets is low (less than about 1000 parts per million by weight) and the droplet size is small (less than about 10 microns). The flow of gas and droplets is generally radially outward through the pack. The droplets interact with the fibers, which are randomly oriented and cross each other at many points. Through these interactions, the droplets coalesce to larger sizes and eventually migrate to the outer surface of the pack where they are released at a size large enough to be separated from the gas by gravity. In a typical installation, the axis of the pack is vertical so gravity tends to drive a higher concentration of captured droplets at the lower end.

If the concentration of droplets within the sheet becomes too large, the gas flow will exert too large a force, the coalescing process will be disrupted, and random sized drops will be released, many as small as the original drops in the feed stream. This condition is called saturation. We are interested in understanding the conditions under which saturation is likely to occur, and possibly finding optimal combinations of gas velocity, fiber diameter, fiber spacing and fiber surface energy to minimize its effects.