Experimental Optimization of Two-Phase Feed Inlet Devices

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Separation processes, such as distillation unit operations utilize a major part of energy in the chemical industry. Moreover, droplet entrainment in the feed section of such apparatuses can noticeably decrease the efficiency and separation quality. The necessary counter-measures inevitably cause an increase in energy consumption and consequently higher operational costs. Thus, a reduction or complete avoidance of droplet generation in the feed section is desirable. Two-phase feed and flashing feed show the highest tendency for the formation of droplets and consequently requires specially designed inlet devices to minimize droplet entrainment.

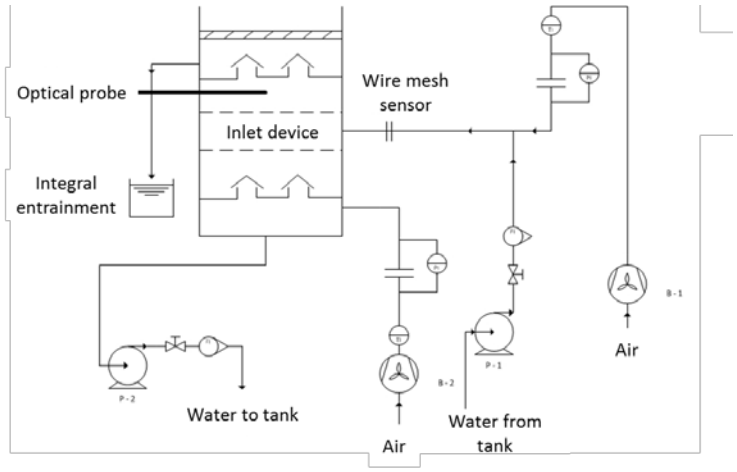

Figure 1: Flow diagram of the experimental apparatus.

In our experimental study we utilize an apparatus which is able to create various two-phase feed flows from air and water in a DN 50 feed pipe at atmospheric conditions (Fig. 1). This is achieved by varying the volume flow rates of the each phase and utilizing a spray nozzle for droplet generation. In this way typical flow regimes can be generated. These are adjusted according to the most common flow regime maps and characterized by visual appearance and a wire mesh sensor. These feed flows are used to investigate and optimize the performance of newly designed inlet devices installed in a test column of 440 mm inner diameter. An optical probe characterizes the resulting droplet size distribution above the inlet device. A combination of droplet separator and liquid collector, provides information about the total amount of entrained droplets. The acquired data is used for further comparison with other state of the art inlet devices which are similarly investigated.