

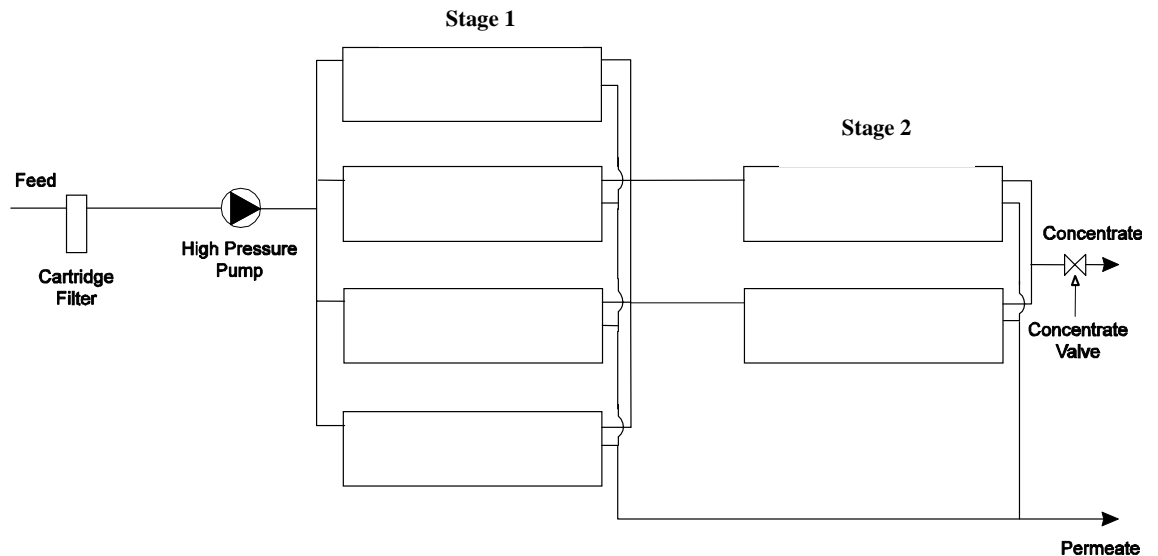


FILMTEC Membranes System Design: Multi-Stage System

Multi-Stage System

Systems with more than one stage are used for higher system recoveries without exceeding the single element recovery limits. Usually two stages will suffice for recovery up to 75%, and three must be used for higher recovery. These numbers are based on the assumption that standard pressure vessels with six elements are used. For shorter vessels housing only three elements, for example, the number of stages has to be doubled for the same system recovery. Generally speaking, the higher the system recovery, the higher the number of membrane elements that have to be connected in series. To compensate for the permeate that is removed and to maintain a uniform feed flow to each stage, the number of pressure vessels per stage decreases in the direction of feed flow. A typical two-stage system using a staging ratio of 2:1 is shown in Figure 3.5. The staging ratio is defined as the ratio of pressure vessels in two adjacent stages, upstream vessels: downstream vessels.

Figure 3.5 Two-stage system



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