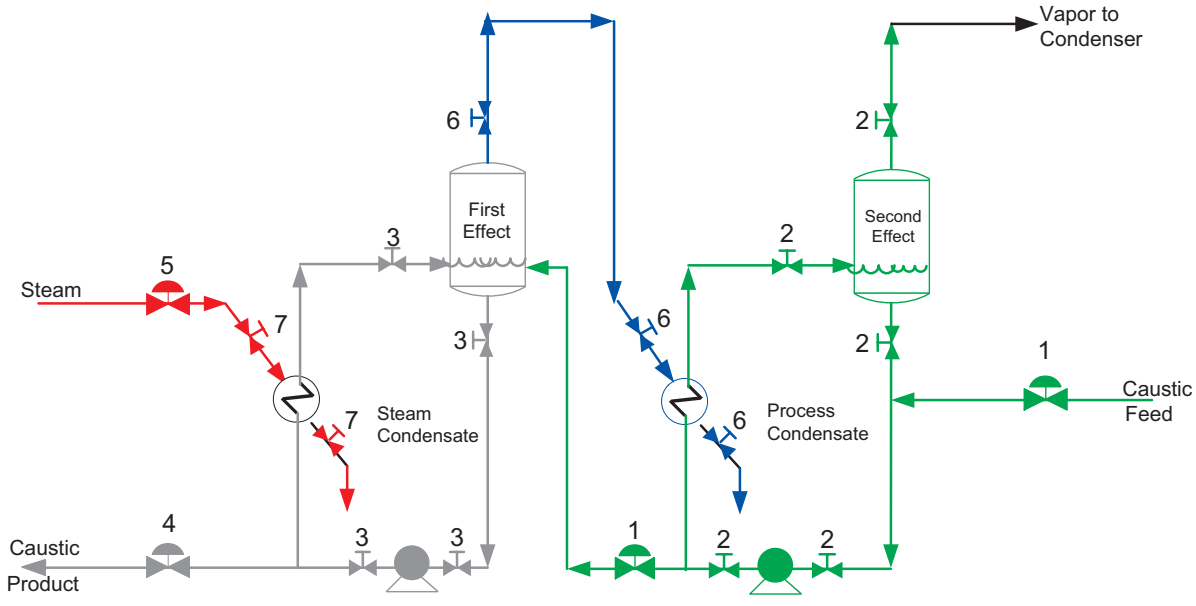
Chlorine
Caustic Evaporation



Caustic Evaporation
(Membrane Cell)

Manual Isolation

2 4" - 10" (100 – 250DN) 815L 11 3600 XZ
w/ Gear Actuator

3 3" - 6" (80 – 150DN) 815L 11 7200 XZ
w/ Gear Actuator

6 3" - 4" (80 – 100DN) 815L or W 11 3600 XZ
w/ Gear Actuator
Alt.
2" - 3" (50 – 80DN) 7150 31 3600 XT

7 10" - 18" (250 – 450DN) 815L or W 11 2236 XZ
w/ Gear Actuator

Rotary Control

1 3" - 8" (80 – 200DN) 815L 11 3600 XZ
w/ QPX Actuator w/ Positioner *

4 3" - 6" (80 – 150DN) 815L 11 7200 XZ
w/ QPX Actuator w/ Positioner *

5 8" - 16" (200 – 400DN) 815L or W 11 2236 X
w/ QPX Actuator w/ Positioner *

* Positioner can be:
NE Style Electro Pneumatic
NP Style Pneumatic
ND Style Digital

Chlorine Processing

There is a significant difference between the processes required to prepare commercial caustic solutions from chlorine cells. Mercury cells produce marketable 50% NaOH directly from the decomposers. Diaphragm cells produce a much lower concentration of NaOH (10 – 12%) and it contains nearly equal amounts of salt. Membrane cells, like diaphragm cells, produce caustic (32% NaOH) that is not up to commercial concentration, but the liquid contains very little dissolved salt and requires significantly less processing than diaphragm cell liquor.

Evaporation

Diaphragm and membrane cell liquor requires concentration to obtain commercial grade of NaOH. Because of the unique difference in liquor characteristics, processing of diaphragm cell liquor is more extensive. About 6 lbs. (2,721 grams) of H_2O per 1 lb. (453 grams) NaOH needs to be removed from diaphragm cell liquor. Besides the evaporation of large amounts of H_2O, precipitated salt is removed, cooled and recycled through brine saturation and treatment. About 1 lb. (453 grams) of H_2O per 1 lb. (453 grams) of NaOH needs to be removed from membrane cell liquor. The amount of H_2O to be evaporated from the cell liquor means that diaphragm cell liquor requires a 3 – 4 stage evaporation process. Temperatures tend to be higher in the processing of the liquor. This may require valves of higher pressure class and more noble material. Two or three stages are normal in a membrane cell plant. A two effect membrane cell evaporator with backward flow is shown.

Valve Requirements

The evaporation process doesn't present any challenges from a pressure prospective. Temperature, however, has an affect on material selection. Attention is important regarding this detail. Chlorine Institute Pamphlet 94 Table 5.4.3.1 is a good source for this data.

There is extensive use of modulation control and isolation valves in the evaporation process. First and second effect control valves modulate from either liquid level or temperature control from the evaporators (1). Caustic discharge control is modulated by caustic density or temperature (4). First effect heat exchanger temperature is controlled by modulating 100 psi (6 bar) steam flow (5). There are a substantial number of manual isolation valves on pumps and evaporation tanks (2, 3), and heat exchangers (6, 7).

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