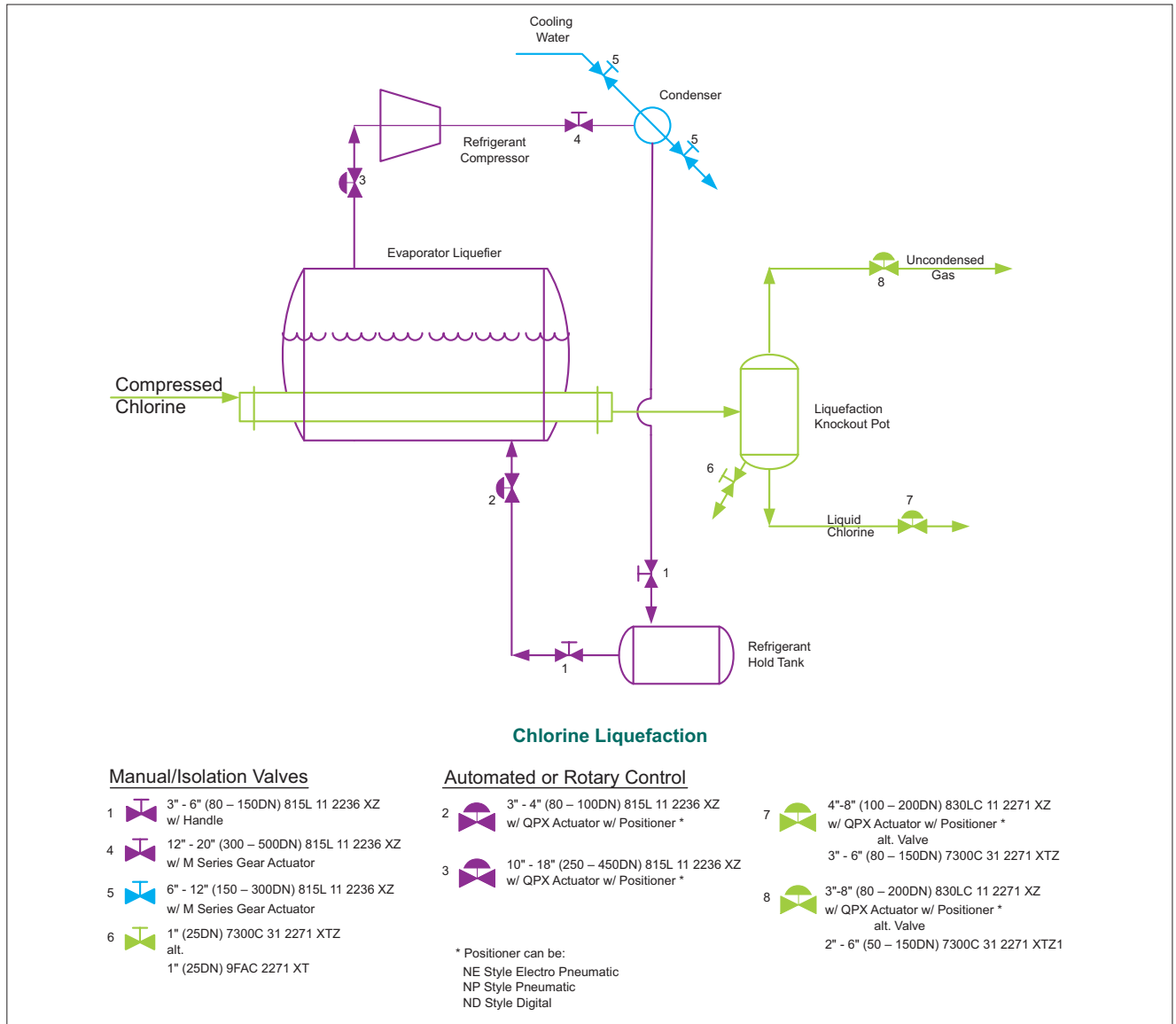


Chlorine Liquefaction



Chlorine Processing

Cl₂ is liquefied so the material can be safely and conveniently stored, transported and consumed. Liquefaction occurs when the previously compressed Cl₂ is cooled to a sufficiently low temperature.

Liquefaction

Liquefaction is normally a staged process. Normal practice is to liquefy most of the Cl₂ under relatively mild conditions and then increase the pressure of the gas or reduce its temperature in stages. Operating stages at different temperatures often requires the use of two different refrigerants. For simplicity, a single stage is shown.

Liquefaction (Con't.)





Some impurities in the Cl₂ gas entering liquefaction are non-condensable. These leave liquefaction as a vent steam carrying Cl₂ with them. This "tail gas" cannot be released to the atmosphere. The most common approach to disposing of the "tail gas" is:


- Synthesis of a useful product from the Cl₂ (HCL, Bleach, FeCl₃)
- Destruction of the Cl₂ by scrubbing with alkaline material
- Enhanced recovery of Cl₂ from the gas via absorption / desorption or enhanced liquefaction


Valve Requirements



Liquefaction is a staged process. Two types of refrigerants are used. We are showing the first stage for simplicity. The refrigerant is at 0°F (-18°C) and 30 – 60 psi (2 – 4 bar) valves. Valves range in size from 3" – 20" (80 – 500DN) ANSI Class 150. Carbon by 316SS is typical material of construction. Second stage refrigerants (not shown) are at about -20°F to -40°F (-28°C to -40°C) and 45 – 75 psi (3 – 5 bar). The valves tend to be smaller than stage 1. Because of low temperature, 316SS is required (ASTM352 crade LCB or LCCB is acceptable.)

Neles Solution

High performance Wafer-Sphere™ valves with handles or gear actuators are used to isolate the refrigerant holding tank (1 ) and condenser. Wafer-Sphere modulation control valves control refrigerant level (2 ) and pressure in the evaporator liquefier (3 ). A manual isolation valve is located in the refrigerant line at the condenser (4 )

Cooling water to condenser is about 70°F (21°C) and 90 psi (6 bar). Carbon by 316SS is the recommended material. High performance Class 150 lugged Wafer-Sphere valves with gear actuators are used to isolate the condenser from the cooling water system (5 )

Compressed chlorine is cooled in liquefiers and transfers to the liquefaction knockout pot where uncondensed tail gas leaves the liquefaction process. Located in the tail gas line, high performance ANSI Class 300 lugged Wafer-Sphere valves (8 ) of Carbon Steel with Monel® trim maintain compressor pressure at 45 psi (3 bar).

Liquid chlorine leaves the liquefaction knockout pot. The chlorine is modulated by a high performance ANSI Class 300 lugged Wafer-Sphere control valve that modulates the rate of Cl₂ consumption (7 ) . Carbon Steel with Monel trim is the recommended material. If the chlorine is going to storage, a modulating valve may not be required. A 1" (25DN) flanged ANSI Class 300 Cl₂ valve functions as a drain on the knockout pot (6 )

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