Thermomechanical pulping

Overview of the process

Thermomechanical pulping, TMP, is precisely named. Pulp is made by heating the chips with steam and mechanically separating the fibers in a pressurized refiner. While high in energy consumption, TMP produces strong fibers, and clean steam can be recovered.

The process

Chips are fed to a presteamer and are steamed with process steam from the refiners. A feeding screw (plug feeder) moves the chips to a pressurized refiner which separates the fiber via mechanical means (e.g. between rotating disc plates).

The refiner is followed by a cyclone to separate the pulp from the process steam. The pulp is often refined in two stages. The process steam is taken to the heat recovery unit to produce clean steam.

The results

The Pre-steamer is heated with the process steam via valve PCV-1 to typically 1 to 2 bar or 130 to 140 °C (15 to 30 psig, 266 to 284 °F). After a retention time of couple minutes, the pressurized chips is fed to the refiner. The refiner may be fed with fresh steam via valve PCV-4, during startup, to increase the pressure up to 4...5 barg or 150 °C (60...75 psig or 300 °F).

The refiner discharges the pulp and steam to a cyclone. The cyclone separates the steam from the pulp. The valves (PCV-1, PCV-2) in the process steam line control the pressure in the refiner. During production this steam is sent to heat recovery, while in the start-up it goes to the steam stack for disposal. The TMP pulp (35 %) is discharged through valve PCV-3 from the first stage refiner to the second stage and from there to further treatment in the screening, cleaning etc.

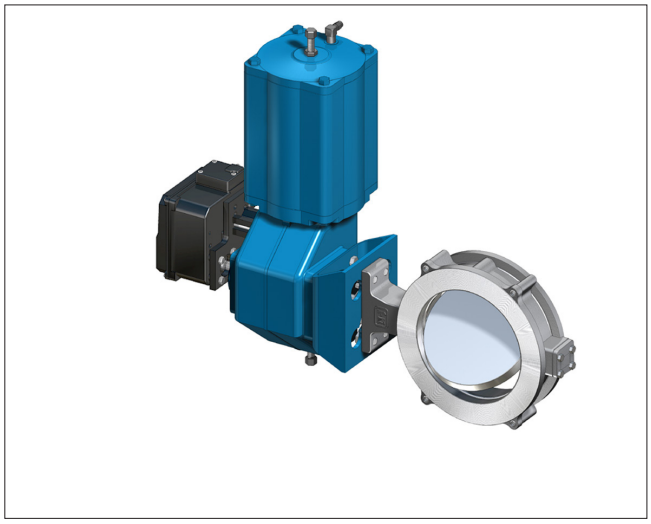
Valve selection

The control of fresh steam in PCV-4 can be easily accomplished by the R series segment valve. The process steam, however, has a tendency to contain ersin end fibers which can build up and result in potential plugging problems in valves PCV-1 and PCV-2. Neldisc™ has performed well in this application. Because of fines and fibers present the use of Q-Trim™ in the process steam must be evaluated with care.

The TMP discharge (blow) valve PCV-3 contains TMP pulp (35 % consistency), and steam/condensate. Because of the high pressure drop of the system, this valve must withstand erosion. One solution is a segment type valve, flanged, expanded outlet with stellited internals. Also metal seated ball valves are used. The water (white or fresh) control valve should all be R series segment valves for optimal control.

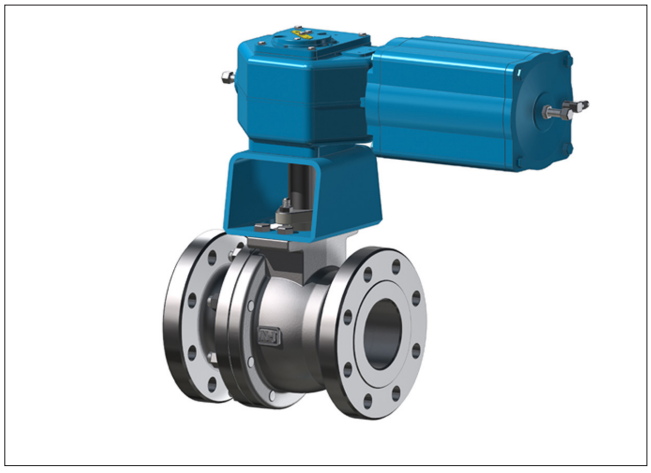
Not shown in the drawing is a refiner relief valve which will discharge the refiner contents quickly when needed to protect the refiner (exceeding a set pressure, broken plates, etc.). Full bore ball valve, M series, with locked seats (P) equipped with a fail open quick action actuator should be selected.

VALVE SELECTION			
Tag	**Application**	**Recommended**	**Alternate**
PCV-1, PCV-2	Steam (process)	Neldisc™ triple eccentric disc valve	Wafer-Sphere™ butterfly valve
PCV-3	Refiner blow	R2_S V-port segment valve	M series
PCV-4	Steam (fresh)	R series V-port segment valve	M series
--------	Water (control)	R series V-port segment valve	M series
--------	Refiner relief	M series ball valve P seat	--------



Neldisc butterfly valve

Wafer-Sphere butterfly valve



M series ball valve

R series V-port segment valve

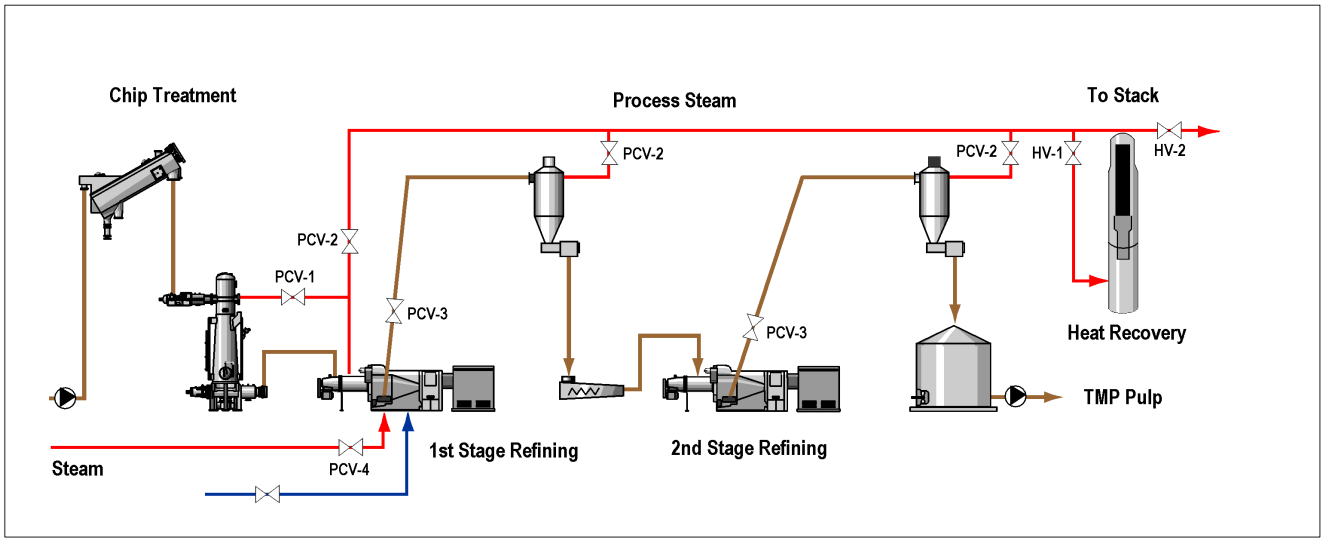


Fig. 1. The two stage TMP system.

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