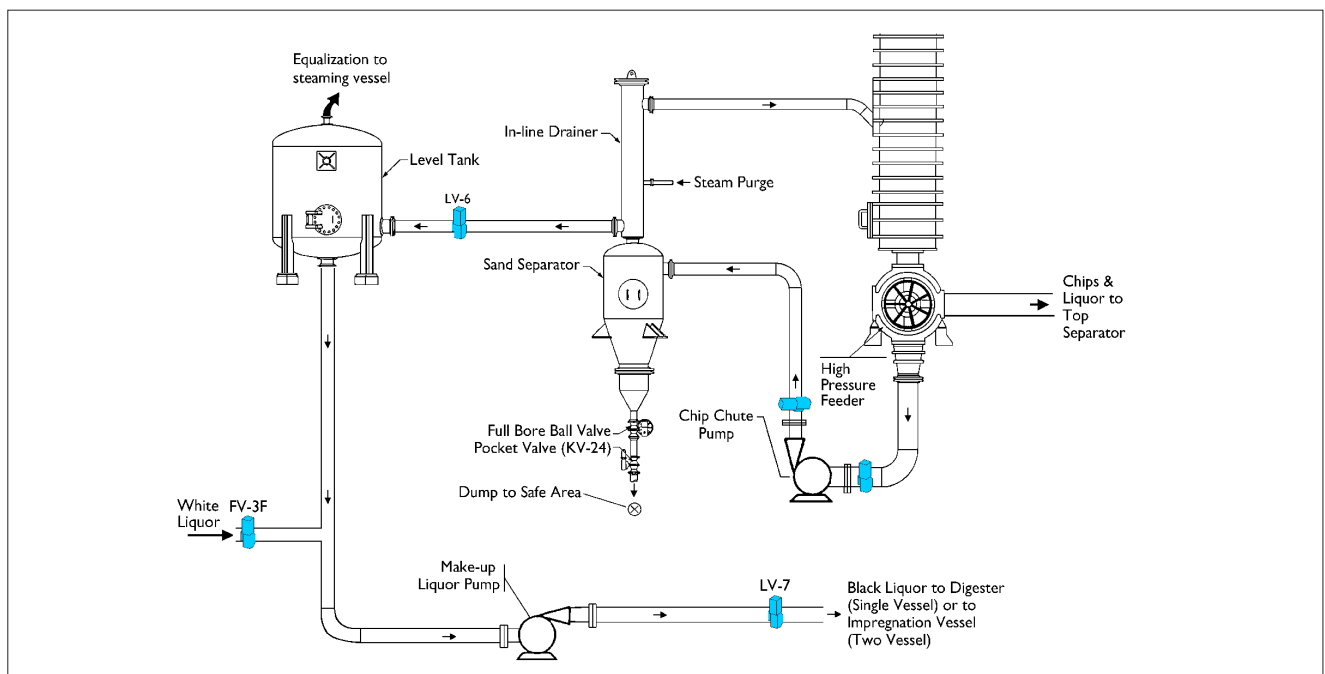


Continuous digester ANDRITZ Continuous Pulp Cooking System Liquor Screening, Cleaning and Make-up



Introduction and background

Continuous cooking is a method of chemical cooking in which wood chips and cooking liquors are fed at controlled rates into the pressurized digester, the chips move down through successive cooking zones within the digester and are continuously discharged at the bottom as pulp. The chip chute circulation flow loop and the application of valves from Valmet in this process will be addressed in this bulletin.

Process description

Since the transfer of chips from the feed system to the cooking vessel(s) is accomplished in a liquor filled system there are two liquor circulation loops required. The lower pressure loop is maintained by the chip circulation pump. This loop serves to transport the chips into the HPF, remove the leakage from around the rotor of the HPF and remove

the excess liquor displaced from the TC loop by the volume of chips added to it. When the chips are mixed with the chip chute circulation flow in the chip chute fines and sand on the chip surfaces are washed off and become entrained in the liquor. Several pieces of equipment are required in the chip chute circulation loop in order to deal with these fines, sand and excess liquor. The sand separator is a cyclone used to remove sand. The inline drainer is a profile bar screen used to separate the excess liquor for recirculation to the TC loop while keeping the fines and pin chips in the chip chute circulation loop for return to the HPF to be fed to the cooking vessel(s) via the makeup liquor pump. The level tank is used as a buffer for flow surges to the makeup liquor pump.

Tag #	FV-3F	x	Two Vessel System	x	Single Vessel System
Application:	White Liquor Flow to Liquor Make-up Line				
	White Liquor – Control Valve				
	FV-3F controls the flow of white liquor into the make-up liquor line. White liquor is usually added before the pump. The white liquor “recharges” (alkaline charge) the make-up liquor from the level tank flowing to the impregnation vessel.				
	Differential: Temp:	15-40 psid = 1-2,8 bar 170 °F = 77 °C	Shut-off: Flow:	70 psid = 4,8 bar 200-900 gal/min = 760-3400 liters/min	
Control valve	ASME		DIN		
Class:	150/300		PN 25		
Size:	4”		DN 100		
Recommendation:	M2DA04AP-B1C13-ND		M1LA100AP-B1C13-ND		
Comments:	Because of the potential for scaling, locked seats are required. If located before the pump, it is usually class 150. If located after the pump, it is usually class 300.				

Tag #	FV-4	x	Two Vessel System	x	Single Vessel System
Application:	Black Liquor Flow Control				
	Washer Filtrate (Diluted Black Liquor) – Control Valve				
	Tag FV-4 controls the addition of first stage washer filtrate (diluted black liquor) to the make-up liquor line and also to the suction side of the chip chute pump. Diluted liquor is added to the make-up liquor line to control temperature.				
	Differential: Temp:	60 psid = 4,1 bar 180 °F = 82 °C	Shut-off: Flow:	120 psid = 8,3 bar 500 gal/min = 1900 liters/min	
Control valve	ASME		DIN		
Class:	150		PN 16		
Size:	3”		DN 80		
Recommendation:	RECA03CJJST-B1C6-ND		REKA080AJJST-B1C06-ND		

Tag #	KV-24	x	Two Vessel System	x	Single Vessel System
Application:	Sand Separator Dump Valve				
	Sand-Liquor Mixture – On-Off Valve				
	The pocket valve at the bottom of the sand separator is a seal maintaining digester pressure when the sand is removed from the system. The Pocket Ball valve cycles or dumps every 5-10 minutes. Each cycle the valve remains in the “dump” position for approximately 20 seconds to be purged.				
	Shut-off:	30 psid = 2,1 bar	Temp:	240 °F = 116 °C	
Control valve	ASME		DIN		
Class:	150		PN 16		
Size:	6” or 8”		DN 150 or DN 200		
Recommendation:	M2CP__GB-P4000-LS		M1KP__GB-P4000-LS		
Comments:	The 145 degree actuator rotation and the body & ball purges have significantly improved the performance and cycle life of the dump valve. Experience shows that cycle life and performance can be extended and improved further by continuously purging the body cavity. NOTE: The purge water pressure must be higher than the system's pressure.				

Valves sizes and process data that are shown on this page are for REFERENCE ONLY.
To appropriately size a valve, use actual process data obtained from the system.

Tag #	LV-6	x	Two Vessel System	x	Single Vessel System
Application:	Chip Chute Liquor Level				
	Black Liquor – Control Valve				
	LV-6 controls the liquor level in the chip chute. Tag LV-6 is located between the in-line drainer(s) and the level tank.				
	Differential: Temp:	1-5 psid = 0,07-0,4 bar 250 °F = 121 °C		Flow:	Shut-off: 60 psid = 4,1 bar 600-1700 gal/min = 2300-6400 liters/min
Control valve	ASME		DIN		
Class:	150		PN 16		
Size:	8”		DN 200		
Recommendation:	M2CA08AP-B1C20-ND		M1KA200AP-B1C20-ND		
Comments:	Scraper style seats are required to remove scale build-up on the ball.				

Tag #	LV-7	x	Two Vessel System	x	Single Vessel System
Application:	Level Tank Level Control				
	Black Liquor – Control Valve				
	LV-7 maintains proper liquor level in the digester (single vessel) or in the impregnation vessel (two vessel system). LV-7 is one of the most demanding applications in the ANDRITZ digester system. Tag# LV-7 is located in the make-up liquor line after the make-up liquor pump. Cavitation, flashing, erosion, vibration and noise are all common with tag LV-7 in both the single and two vessel systems. During normal operation of the digester, erosion and cavitation tend to “wash out” valve bodies. Stellite lined bodies and 17-4 tunnel balls are common upgrades made to LV-7. Process conditions are most severe during start-up because there is full make-up liquor pump pressure on the valve inlet and zero pressure at the valve outlet.				
	Differential: Temp:	20-80 psid = 1,4-5,5 bar 250 °F = 121 °C		Flow:	Shut-off: 320 psid = 22,1 bar 1000-3000 gal/min = 3800-11400 liters/min
Control valve	ASME		DIN		
Class:	300		PN 25		
Size:	6”		DN 150		
Recommendation:	M2DA06AP-B1C17-ND		M1LA150AP-B1C17-ND		
Comments:	Q-trimmed Neles valves have been used with limited success to reduce cavitation and vibration. Fisher has used their V500 eccentric plug valve without success. The limited flow capacity and straight-through shaft make the typical eccentric plug valve prone to severe erosion and limited life.				

Tag #	QV-27	x	Two Vessel System	x	Single Vessel System
Application:	White Liquor Purge				
	White Liquor — On-Off Valve				
	QV-27 is an automated on-off valve controlling white liquor purge flow to the sand separator's dump line. The purpose of the purge is to minimize the accumulation of fines in the dump valve. Purge flow should be minimized. Excessive purge flow may prevent the sand from being dumping properly. Tag QV-27 is located above tag KV-24.				
	Differential: Temp:	60 psid = 4,1 bar 180 °F = 82 °C	Shut-off: Flow:	60 psid = 4,1 bar 10-40 gal/min = 38-151 liters/min	
Control valve	ASME		DIN		
Class:	300		PN 16		
Size:	1”		DN 25		
Recommendation:	M2DA01AP-B1C6		M1KA025AP-B1C6		
Comments:	Scraper seats are required.				

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