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. Cooling and discharging the pulp from the digester and the application of valves from Metso Automation in this process will be addressed in this bulletin.

**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. Cooling and discharging the pulp from the digester and the application of valves from Metso Automation in this process will be addressed in this bulletin.

**Process description**

**TV-2**
- Application: Chip Bin temperature control
- Steam saturated with black liquor
- Controls Flash Steam to the chip bin for Atmospheric Pre-steaming. TV-2 and TV-2A operate together to control the steam to the chip bin.
- Flow: 20,000 to 80,000 lb/hr

**PV-5**
- Application: Steaming Vessel Pressure Control

**HV-5A**
- Application: Steaming Vessel Relief Screen Cleaning

**HV-25**
- Application: Steaming Vessel Sightglass Purge
- Digester heater condensate or hot water
- Used to wash the sightglass of fines and liquor.

**TV-4**
- Application: Low Pressure Steam Desuperheating

**TV-2A**
- Application: Chip Bin temperature control
- Fresh Steam
- Controls Fresh Steam to the chip bin for Atmospheric Pre-steaming. TV-2 and TV-2A operate together to control the steam to the chip bin.
### Tag # FV-12A & FV-12B
- **Application:** Blow Line Flow Control
- **Differential:** 74 psid = 5.1 bar
- **Temp:** 180 °F = 82 °C
- **Shut-off:** 220 psid = 15.2 bar
- **Flow:** 2000 gal/min = 7600 liters/min
- **Control valve:**
  - **Class:** 300
  - **Size:** 4", 6", 8"
  - **Class:** 300
  - **Size:** 4" , 6" , 8"
  - **Recommendation:** M2DA__AP-B1C__-ND, M1LA__AP-B1C__-ND
- **Comments:** Common upgrades for customers experiencing problems with valves FV-12A and FV-12B are stellite body liners and 17-4 tunnel bore balls with "chamfered lips". When ordering a stellite liner you must change the P seat to a K seat. Some customers that are unable to control with FV-12A and FV-12B will instead control with HV-90A and HV-90B.

### Tag # FV-14
- **Application:** Inner Counter-Wash Flow
- **Differential:** 5-130 psid = 0,3-9 bar
- **Temp:** 170 °F = 77 °C
- **Shut-off:** 350 psid = 24 bar
- **Flow:** 100-1000 gal/min = 380-3800 liters/min
- **Control valve:**
  - **Class:** 300
  - **Size:** 4"
  - **Class:** 300
  - **Size:** 4"
  - **Recommendation:** REDA04CJST-B1C6-ND, RELA100AJST-B1C6-ND

### Tag # HV-81 (RO3)
- **Application:** Blow Line Isolation
- **Differential:** 235 psid = 16,2 bar
- **Temp:** 185 °F = 85 °C
- **Flow:** 2500 gal/min = 9500 liters/min
- **Control valve:**
  - **Class:** 300
  - **Size:** 12", 14", 16"
  - **Class:** 300
  - **Size:** 12", 14", 16"
  - **Recommendation:** M2DB_AS12-B1C40-SV, 12=large 1/4" male, M2DB_AS13-B1C40-SV, 13=large 1/4" female, M1LB_AS/12-B1C_, 12=large 1/4" male, M1LB_AS/13-B1C_, 13=large 1/4" female

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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.
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### HV-87

**Application:** Blow Line Pressurization

<table>
<thead>
<tr>
<th>Tag #</th>
<th>HV-87</th>
<th>Two Vessel System</th>
<th>Single Vessel System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

- Dilute Black Liquor (Dilute Black Liquor)

HV-87 is used to pressurize the blow line before opening HV-81 during start-up. Tag # HV-87 can also be used to “unplug” the blow line.

- **Differential:** 10-50 psid = 0.7-3.4 bar
- **Temp:** 170 °F = 77 °C
- **Flow:** 165 gal/min = 625 liters/min
- **Shut-Off:** 350 psid = 24.1 bar

### Control valve

<table>
<thead>
<tr>
<th>Class</th>
<th>ASME</th>
<th>DIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>300</td>
<td>PN 25</td>
</tr>
</tbody>
</table>

- **Size:** 2"
- **Recommendation:** M2DA02AP-B1C9-ND

### KV-20 (A-D)

**Application:** Wash Extraction Switching

<table>
<thead>
<tr>
<th>Tag #</th>
<th>KV-20 (A-D)</th>
<th>Two Vessel System</th>
<th>Single Vessel System</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

- Black Liquor — On-Off

Tag #’s KV-20A, KV-20B, KV-20C and KV-20D control the flow of black liquor through the extraction screens at the bottom of the digester. The extracted liquor is pumped via the Wash Circulation Pump to the Wash Circulation Heater.

- **Shut-off:** 10 psid = 0.7 bar
- **Flow:** 1500 gal/min = 5680 liters/min
- **Temp:** 245 °F = 118 °C

### Control valve

<table>
<thead>
<tr>
<th>Class</th>
<th>ASME</th>
<th>DIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>300</td>
<td>PN 25</td>
</tr>
</tbody>
</table>

- **Size:** 8"
- **Recommendation:** B2B08AABD-B1CU11-SV-F-SS

### KV-20E, KV-20F

**Application:** Wash Extraction Switching (Backflush)

<table>
<thead>
<tr>
<th>Tag #</th>
<th>KV-20E, KV-20F</th>
<th>Two Vessel System</th>
<th>Single Vessel System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

- Black Liquor — On-Off

Tag #’s KV-20E AND KV-20F operate opposite the Wash Extraction Switching valves (KV-20 A-D) to “backflush” and clean the wash screens.

- **Shut-off:** 250 psid = 17.2 bar
- **Flow:** 100 gal/min = 380 liters/min
- **Temp:** 245 °F = 118 °C

### Control valve

<table>
<thead>
<tr>
<th>Class</th>
<th>ASME</th>
<th>DIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>300</td>
<td>PN 25</td>
</tr>
</tbody>
</table>

- **Size:** 3"
- **Recommendation:** LW5CBY03AAANAT-B1J8

### Comments:

- Stellite bearings with hard facing on the shafts bearing surfaces are required because of the high cycle rate (350,000 cycles per year). Tag #’s KV-20E and KV-20F must shut-off tightly when closed, to allow for proper extraction through the switching valves (KV-20 A-D). Current designs manufactured today do not use there valves.
Valves sizes and process data that are shown on this page are for REFERENCE ONLY. To appropriately size a valve, use actual process date obtained from the system.

### Tag # HV-90A & HV-90B

| Application: | Blow Line Isolation
|-------------|---------------------
| FV-12A & FV-12B are designed to be the isolation valve for the primary and secondary blow lines respectively; however, they are supplied with positioners so that they can be used to control flow at low production rates to assist FV-12A or FV-12B. Tag's HV-90A and HV-90B are continuously subjected to erosion and vibration from the high velocity of the stock flow.
| High levels of sand and/or other tramp material from the chip feed stock will ultimately cause premature valve body and ball erosion.
| Shut-off: 250 psid = 17,2 bar
| Flow: 2200 gal/min = 8300 liters/min
| Temp: 190 °F = 88 °C

**Control valve**

**ASME**

- **Class:** 300
- **Size:** 8"
- **Recommendation:** M2DA08AP-B1C20-ND
- **Comments:** Common upgrades for customers experiencing problems with valves HV-90A and HV-90B are stellite body liners and 17-4 tunnel bore balls with "chamfered lips". When ordering a stellite liner you must change the P seat to a K seat. Some customers that are unable to control with FV-12A and FV-12B will instead control with HV-90A and HV-90B.

**DIN**

- **Class:** PN 25
- **Size:** DN 200
- **Recommendation:** M1LA200AP-B1C20-ND

### Tag # PDV-18

| Application: | Digester Outlet Device Differential Pressure
|-------------|------------------------------------
| PDV-18 adds cool liquor to dilute the chip mass in the area of the outlet device to allow for rotation of the scraper mechanism.
| Differential: 5-130 psid = 0.3-9 bar
| Flow: 100-1000 gal/min = 380-3800 liters/min
| Temp: 170 °F = 77 °C

**Control valve**

**ASME**

- **Class:** 300
- **Size:** 4"
- **Recommendation:** REDA04CJST-B1C9-ND

**DIN**

- **Class:** PN 25
- **Size:** DN 100
- **Recommendation:** RELA100AJST-B1C9-ND