Effective Condensate Processing Improves Plant Efficiency

Increased productivity and product quality, plus reduced energy consumption and water treatment are some of the many benefits of condensate drainage and recovery. The TLV® GP/GT PowerTrap® series provides the perfect solution for optimizing condensate processing in many applications.

1. **Prevention of Heat Exchanger “Stall”**
   - Stabilized temperature control improves product quality
   - Elimination of water hammer prevents equipment damage and improves safety
   - Prevention of corrosion caused by condensate accumulation
   - Some models are designed for installation with a lower filling head (min. 155 mm, 300 mm, etc.)

2. **Effective Condensate Recovery**
   - Energy recovered from condensate reduces boiler fuel costs
   - Reusing water reduces water treatment costs
   - Reduces effluent treatment and disposal costs

3. **No Cavitation**
   - Recovery of hot condensate up to 220 °C possible without cavitation
   - Low filling head allows use with equipment situated at low levels
   - Eliminates the seal, bearing and impeller damage that can occur in standard centrifugal pumps

4. **No Electricity Required**
   - Ideal for use in areas requiring explosion-proof equipment, and areas with no electrical supply
   - Reliable mechanical operation eliminates the need for complex level controls
   - Quick and easy to install and maintain
TLV’s PowerTrap® Series—
The Total Solution to Heat Exchanger “Stall”

■ Importance of “Stall” Prevention

“Stall” prevents condensate from being discharged from heating equipment. It results in:

● **Process Temperature Swings**

As the “stall” cycle repeats, the steam pressure in the equipment varies above and below the back pressure, causing product temperature and quality fluctuations.

● **Water Hammer Damage**

Water hammer can occur when backed-up condensate re-evaporates, or as incoming hot steam hits cooler backed-up condensate and instantly condenses.

● **Tube Corrosion and Damage**

Backed-up condensate in the equipment can form carbonic acid, which results in tube corrosion. Equipment temperature fluctuations can cause thermal shock and fatigue damage to tubes.

TLV’s PowerTrap® series provides complete condensate drainage, the key to eliminating “stall” and its related problems. Optimum performance can now be yours with the PowerTrap®.

■ A Closer Look at the “Stall” Cycle

1. When the demand for heating energy is high, the control valve is wide open, $P_1$ is greater than $P_2$, and condensate is discharged from the trap.

2. When the demand decreases, the control valve throttles in order to reduce the heating energy, and $P_1$ drops.

3. If $P_1$ drops to $P_2$, or below, the trap can no longer discharge condensate against the back pressure. Condensate then backs up in the heat exchanger, and the equipment becomes condensate logged. This condition is known as “stall”.

4. When condensate is backed-up inside the equipment, the product temperature falls. The system compensates by opening the control valve again. $P_1$ increases and, when it becomes greater than $P_2$, condensate is forced out through the trap, and the cycle begins again.
1 Built-in Steam Trap Improves Performance (GT Series)

- Automatically switches between pump and trap operation, in response to process conditions
- Internal trap mechanism always matches pump output, with no damage to trap, and eliminates need for sizing
- No need for external steam trap means simplified compact design and lowered installation costs
- Trap body and plug are both stainless steel for minimum leakage and maximum life

2 Snap-action Mechanism Maximizes Life

- Heat-treat hardened stainless steel internals
- Durable nickel-based alloy compression coil spring*
- The instantaneous snap-action mechanism simultaneously opens or closes motive medium inlet and exhaust valves, preventing erosion and resultant leakage
  * Except GP/GT5C

3 Low-maintenance Design Reduces Labor

- Easy inline maintenance, without removal of piping*
- Fast and easy cleaning of intake valve by simply opening a plug to remove (GP/GT14, GP/GT10, GP10F, GP/GT5C)
- Non-cavitating design eliminates the seal, bearing and impeller damage that can occur in standard centrifugal pumps
  * GP10F, GP/GT5C - motive medium piping must be removed

4 Stainless Steel Check Valves* for Durability

- Center guided check valves CK3MG and CKF3MG are used for maximum reliability even with dirty condensate (GP/GT14, GP/GT10, GP/GT10L, GP10F)
- Newly developed swing type check valve CKF5M enables use with a filling head as low as 300 mm (GP/GT14L, GP/GT10L), 350mm (GP/GT14M)
- Lasts longer than bronze check valves
- Quiet operation
  * GP/GT5C are equipped with internal stainless steel check valves

5 Economical Unit with Retrofitable Mechanism

[Only available in some countries]

- One-piece pump assembly for easy installation and maintenance and retrofit to pump bodies of certain other manufacturers
- Lighter-weight model, with straight-through connection for easy installation
When GT inlet pressure is greater than back pressure, the GT acts as a trap, continuously discharging condensate. When inlet pressure is less than back pressure, condensate cannot be discharged, so it accumulates in the body, causing the float to rise. As the float rises, the trap opens, although condensate still cannot be discharged. When the float reaches its highest position, the trap is fully open and the snap-action mechanism actuates, instantly both opening the motive medium intake valve and closing the exhaust valve. The motive medium pressure forces out the condensate, and the float falls. The snap-action mechanism re-sets, instantly opening the exhaust valve and closing the intake valve. The cycle then repeats.

GT14/GT14M/GT14L
GT10/GT10L
Mechanical pump with built-in trap

GT10F
Mechanical pump with retrofitable mechanism

GT5C
Compact mechanical pump with built-in trap

GP14/GP14M/GP14L
GP10/GP10L
Mechanical pump

GP5C
Compact mechanical pump

Materials

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* Cast stainless steel available as option  ** Stainless steel available as option  *** Not shown

Operation

Pump/Trap: GT10

1 GT Trapping/Filling Cycle
When GT inlet pressure is greater than back pressure, the GT acts as a trap, continuously discharging condensate. When inlet pressure is less than back pressure, condensate cannot be discharged, so it accumulates in the body, causing the float to rise. As the float rises, the trap opens, although condensate still cannot be discharged.

2 GT Discharge Cycle
When the float reaches its highest position, the trap is fully open and the snap-action mechanism actuates, instantly both opening the motive medium intake valve and closing the exhaust valve. The motive medium pressure forces out the condensate, and the float falls. The snap-action mechanism re-sets, instantly opening the exhaust valve and closing the intake valve. The cycle then repeats.

Pump: GP10

1 GP Filling Cycle
The pump body is equalized to the inlet receiver (usually atmospheric) by the open exhaust valve. This allows condensate to drain by gravity into the pump, where it accumulates and causes the float to rise.

2 GP Discharge Cycle
When the float reaches its highest position, the snap-action mechanism actuates, instantly both opening the motive medium intake valve and closing the exhaust valve. The motive medium pressure forces out the condensate, and the float falls. The snap-action mechanism re-sets, instantly opening the exhaust valve and closing the intake valve. The cycle then repeats.
# Systems for Many Different Applications

The TLV® PowerTrap® series meets a variety of condensate processing needs.

## Closed System

**System Overview**

- Equipment
- Exhaust pipe
- Reservoir
- Power Trap

**Benefits**

- No need for external steam trap (GT model features built-in trap)
- No flash steam discharge
- Small reservoir
- Use with vacuum equipment possible

**Notes**

- Only one piece of equipment possible per system
- Equipment has minimum height requirement to ensure that condensate flows naturally by gravity (approx.: GP/GT14, GP/GT10 - 0.8 m; GP10F - 1 m; GP/GT14M - 0.35 m; GP/GT14L - 0.3 m; GP/GT10L - 0.3 or 0.5 m; GT5C - 170 mm)

**Approx. Max. Pump Discharge Capacity**

- Less than 8 t/h (GT10)
- Less than 5.5 t/h (GT14)
- 8 t/h and greater (install pumps in parallel)

**Model**

- Mechanical pump with built-in trap GT14/GT10
- Mid-size mechanical pump with built-in trap GT14M/GT14L
- Compact mechanical pump with built-in trap GT10L/GT5C

**Some Application Examples**

- Large process/flow, such as: re-boilers, large heat exchangers
- Small to medium process/flow, such as: room heaters, small to medium heat exchangers

## Open System

**System Overview**

- Equipment
- Condensate recovery line
- Receiver
- Power Trap

**Benefits**

- Collection of condensate from multiple equipment possible
- Can be used where trap is lower than receiver, such as equipment situated near grade (providing there is sufficient differential pressure)

**Notes**

- Separate steam trap required for each piece of equipment
- Requires venting pipe to discharge flash steam to atmosphere

**Approx. Max. Pump Discharge Capacity**

- Less than 9 t/h (GP10, GP10F)
- Less than 6 t/h (GP14)
- 9 t/h and greater (install pumps in parallel)

**Model**

- Mechanical pump GP14/GP10/GP10F
- Mid-size mechanical pump GP14M/GP14L
- Compact mechanical pump GP10L/GP5C

**Some Application Examples**

- Large process trap discharges, such as: cylinder dryers, platen presses
- Small to medium process trap discharges, such as: recovery: trace lines & mains, small to medium heat exchangers

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### Closed System (GT)

**Sample Application:**
Condensate Drainage & Recovery from Heat Exchanger

- Collection of condensate up to 185 °C possible
- Prevents clouds of steam from affecting the work environment

### Open System (GP)

**Sample Application:**
Condensate Recovery from an Open Tank

- Collection of condensate up to 100 °C possible
- Makes it easy to design systems that can easily obtain pressure differential

**CAUTION**
Pipe all atmospheric discharge to a safe area
**Closed System**

1. Check valve
2. Strainer; 40 mesh or finer
3. Gate valve or needle valve
4. Gate valve or ball valve
5. Air vent
6. Steam trap

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**Open System**

1. Check valve
2. Strainer; 40 mesh or finer
3. Gate valve or needle valve
4. Gate valve or ball valve
5. Steam trap

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**CAUTION**

- In closed system applications where steam condensate is pumped, use steam as the motive medium.
- The height of the condensate outlet on the equipment must be at least: filling head + diameter of reservoir.
- Please read the instruction manual to ensure safe usage.

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- The vent pipe and overflow pipe should discharge to a safe place.
- Please read the instruction manual to ensure safe usage.
Installation Piping Example for GT5C

Inlet/outlet check valves and motive medium intake valve unit are removable while connected to the piping. The unit can be disconnected by removing only 2 bolts. The body can be disassembled by removing six bolts while still connected to the piping.

Only motive medium intake pipe - no exhaust pipe necessary.

Inlet/outlet piping is linear, streamlined and efficient.

Built-in air vent and check valves minimize external installation.

Usable with low condensate outlet heat exchangers.

Actual installation differs depending on the desired discharge capacity and operating conditions, etc. See product specifications data sheet (SDS) for details.

Easy Maintenance
Simple Installation

Condensate Outlet Height of 170 mm

Specifications

Values attained using a TLV CK3MG (screwed) or CKF5M/CKF3MG (flanged) check valve, unless otherwise indicated. GP/GT5C have a built-in check valve.

<table>
<thead>
<tr>
<th>Model</th>
<th>GT14</th>
<th>GP14</th>
<th>GT10</th>
<th>GP10</th>
<th>GT14M</th>
<th>GP14M</th>
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Dimensions (mm)

Connection*1

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<tr>
<td>Carbon Steel PO</td>
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<td>—</td>
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<td>—</td>
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</tr>
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</table>

Size (mm)

Pumped Medium, Inlet | 80 | 50, 80 | 80 | 80 | 50, 80 | 80 | 40 | 25 | 25, 40 | 25 | 80 | 25 |
| Pumped Medium, Outlet | 50 | — | 40 | 25 | 25 | 50 | 25 |
| Motive Medium, Inlet | 25 | 15 |
| Pump Exhaust Outlet | 25 | 15 | 15 | 25 | 10 | 8 |

Max. Oper. Press. PMO | 1.4 MPaG | 1.05 MPaG | 1.4 MPaG | 1.05 MPaG |
Max. Oper. Temp. TMO | 200 °C | 185 °C | 220 °C | 185 °C |
Max. Oper. Medium Press. | 1.0 – 1.4 MPaG | 0.03 – 1.05 MPaG | 0.03 – 1.4 MPaG | 0.03 – 1.05 MPaG |
Max. Allow. Back Press. | 1.05 MPaG*2 | 1 MPaG*2 | 1.35 MPaG*2 | 1 MPaG*2 |

Motive Medium

GT Series: Saturated Steam
GP Series: Saturated Steam, Compressed Air, Nitrogen

Pumped Medium

GT Series: Steam Condensate
GP Series: Steam Condensate, Water

Filling Head (mm) Standard: 860

Pumping Medium

GT Series: Steam Condensate
GP Series: Steam Condensate, Water

Steam/Air Consumption*3 |

| 1.7 kg steam | 2 kg steam |
| 6 m³ compressed air*2 | 6.5 m³ air*2 |

*1 S = screwed, F = flanged
*2 Motive medium pressure minus back pressure must be greater than 0.05 MPa
*3 Do not use with toxic, flammable or otherwise hazardous fluids.
*4 Do not use for fluids with specific gravities under 0.85 or over 1, or for toxic, flammable or otherwise hazardous fluids.
*5 Measured from grade.
*6 Measured from grade
*7 Equivalent consumption of air at 20 °C under atmospheric pressure

Pressures and Temperatures

| Pressure Shell Design Conditions (NOT Operating Conditions): |
| Maximum Allowable Pressure (MPaG) |
| TMA: GP/GT14, GP/GT10: 1.4 (C.I.), 1.6 (C.S.); GP/GT14M, GP/GT14L, GP/GT10L: 1.6 (C.I.), 2.1 (C.S.); GP10F: 1.05; GP/GT5C: 1.0 |


Full product details (sizes, pressures, capacities and materials) are included in the individual specification data sheets (SDS).

**CAUTION** To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.