

# P<sup>3</sup>

## PISTON POWER PUMP

**Springless** Non-Electric Condensate Removal Pump

SPENCE







# Successfully managing your condensate is vital to having an efficient plant.

In this age of increasing energy costs, Spence Engineering Co., recognized the need for a more efficient and cost effective way for their customers to reap the benefits of returning condensate. To meet this need, Spence Engineering proudly introduces the all new P<sup>3</sup>-PistonPower Pump™ series of non-electric condensate pumps. With its unique springless dual-piston design, the P<sup>3</sup> is designed for returning condensate more reliably and efficiently than any currently available spring design, non-electric pump as well as centrifugal pumps.



INCREASE PRODUCTIVITY  
INCREASE PRODUCT QUALITY  
REDUCE ENERGY CONSUMPTION  
DRAMATICALLY CUT COSTS

## Why Return Condensate?

In a steam system, steam transfers its energy in the form of heat and the by-product of this process is condensate as the steam changes phase from a vapor to liquid. When this change occurs, between 10-25% of the heat energy created by the boiler remains in the removed condensate. Therefore, when condensate is not being returned, valuable energy is being wasted!

### Effective Condensate Recovery Cuts Costs By:

- Using less fuel/energy by reproducing steam from already high temperature condensate
- Reducing the maintenance of boiler water make-up and chemical treatment
- Minimizing disposal of high temperature condensate
- Reducing boiler blowdown

## Why is Pumping & Removal Necessary?

Pumping is necessary when the condensate return pressure is higher than the process/source condensate pressure. This includes the vertical rise that the condensate needs to climb. In any system with a heat exchanger or process equipment, there needs to be removal of the condensate to provide a stable environment.

### Efficient Removal:

- Improves product quality by stabilizing the system temperature
- Prevents excessive corrosion from sitting condensate
- Improves safety and prevents equipment damage and noise caused by water hammer

## Why Doesn't Everyone Return Condensate?

Historically, all pump designs utilized a spring-snap mechanism intended to insure the shift of the valve positions. Over time and under many operating conditions the spring/ snap mechanism would fail or leak and therefore, no longer pumped. When the mechanism failed, it was difficult and costly to repair. It was also problematic if the system was located in a remote or dangerous location.

Centrifugal pumps, another option, also present problems, such as the need for electricity, failure of mechanical and rotary seals and issues with cavitation.

# Spence Engineering's Answer: The P<sup>3</sup> Advantage

## A More Reliable Non-Electric Condensate Pump

The all-new patent-pending P<sup>3</sup>-PistonPower Pump™ from Spence Engineering is designed specifically to remove condensate under all operating conditions, even those in which previous non-electric pumps came up short.

By designing and providing a new mechanical pump design, Spence Engineering has tackled the major issues encountered during the use of the currently available mechanical pumps; pump life, reliability, maintenance, capacity, steam consumption, and heat exchanger stall.

### NEW VALVE DESIGN

- Valves on top of the pump remove vital components from potentially dirty or corrosive condensate.
- Made of all Stainless Steel components
- Uses a more reliable, longer lasting spool-type valve design rather than a metal-to-metal globe-type design
  - Over time the metal-to-metal globe design wears down reducing the capacity
  - Spool-type design uses special polymer seals which reduce wear and friction
- Larger orifice allows more motive by reducing the cycle time

### NEW SPRINGLESS LINKAGE DESIGN

- Cleaner, simpler design
- No spring to break
- Minimal pivots points, movement, and force eliminate friction and wear and possibility of stalling or sticking
- Smoother operation, no hard impacting or shocking from the spring snap
- Made of all Stainless Steel components

### 3 YEAR/3 MILLION CYCLE WARRANTY

## New Design Advantages

The inspiration for designing the revolutionary new pump was to provide a more dependable pump for condensate recovery however, reliability is just the beginning of story for the all-new P<sup>3</sup>-PistonPower Pump™. The more rugged, long lifetime dual-piston design has created an extremely versatile, efficient and easy to maintain pump mechanism for almost all applications and environments.

### Increased capacity compared to similar spring design pumps

- Due to a combination of larger orifice, less friction, and longer travel
- Therefore, this may allow you to use a smaller pump than was previously allowed saving you money and valuable space.

### Easy Maintenance

- Secondary piston can be accessed and replaced from the top.

### Able to work up to 300 psi motive steam pressure

### Interchangeability

- Mechanism can fit in most current spring pumps out on the market today

### Extremely versatile, can be used no matter what flow conditions are present

- There is no minimum flow required and it can operate as needed, from almost no load up to its rated maximum capacity.

### Requires no electricity or controls

- Ideal for remote or hazardous locations,
- Makes installation easier and less costly
- Reduces overall costs associated with operation and maintenance.

### Greater efficiency

- Uses the steam already present in the system.
- It can also use air or other pressurized gas.

### No cavitation issues & no mechanical/rotary seals

- Reduces maintenance costs
- Increases the temperature capability.

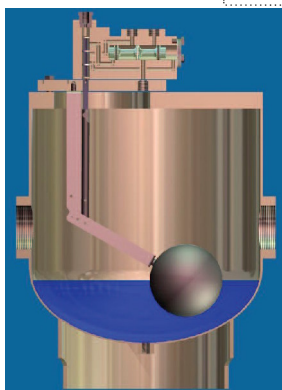
## How It Works

The all-new P<sup>3</sup>-PistonPower Pump™ is different than all other non-electric condensate pumps seen before. Previous designs utilized a spring-snap mechanism to shift the valve positions. The P<sup>3</sup> PistonPower Pump™, however, does not rely on a spring to shift the

valve positions, but rather a dual piston design that acts as a spool selector valve. This springless design solves the biggest issue with previous designs, poor reliability. When the P<sup>3</sup> is in operation it undergoes four distinct phases during a single cycle.

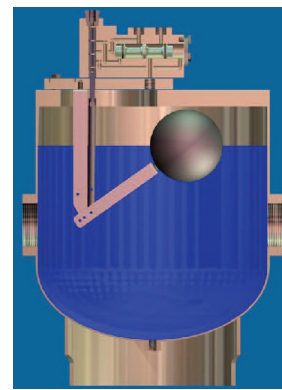
### PHASE 1

When the pump is first put into service the float is down and the tank is empty. Once liquid starts to flow to the pump it gradually raises the float, which is directly attached to the primary piston, which was also initially in the down position.



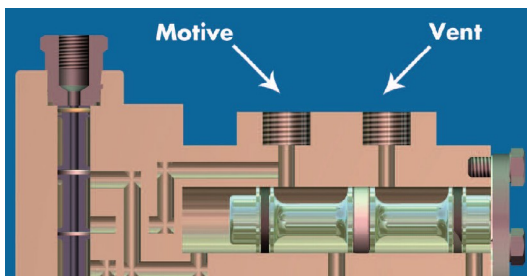
### PHASE 2

When the tank becomes full at the top of the float/piston travel, the primary piston opens a port directing the motive pressure to the left side of the secondary piston pushing it to the right.



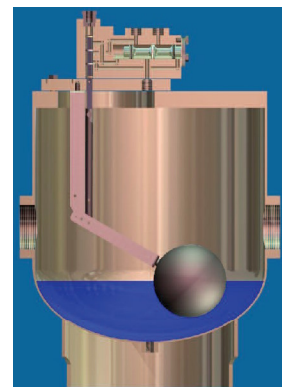
### PHASE 3

At this point, the motive pressure is directly connected to the tank, pressurizing it and forcing the liquid out the outlet check valve.



### PHASE 4

As the motive forces the liquid out, the float and primary piston fall. When it reaches the bottom of its travel, the primary piston opens a port, again directing the motive pressure to the secondary piston, but to the right side this time which pushes the secondary piston to the left. The pressure in the tank is vented and is ready to fill again and repeat the cycle.





# Spence Engineering Company

## A History of Innovations

Spence Engineering Company is an ISO 9001 certified custom manufacturer of steam specialty & fluid control devices. The Spence product offerings include: valves, pressure & temperature regulators, desuperheaters, noise reduction devices, steam separators & filters, condensate pump systems, steam traps, strainers, actuators, pneumatic controllers, pipe couplings, suction diffusers, condensate drains, steam filters, mufflers, pilots, noise suppressors, pressure transmitters & unions. Spence is the industry's leader in the steam equipment regulation field, with sales offices throughout the United States, Europe, Asia, Central and South America, and the Middle East.

Spence Engineering is the manufacturer of Nicholson Steam Trap, offering a full line of steam traps and clean steam products and Rockwood Swendeman Cryogenic Valves.

Spence Engineering Company products are used in a wide range of applications including: HVAC systems, feed water & fuel systems, heat exchangers, district energy systems, water purification systems, pulp & paper industry, chemical &

petrochemical industries, food, beverage and dairy industries. Spence regulators are used extensively in heating systems, institutions, public utilities, district heating systems, process systems, and major industrial plants.

Since its founding in 1926, Spence Engineering Company has engineered for reliability and longevity. It was the lack luster performance and the frequency of maintenance calls for pressure reducing valves of the 1920s that inspired Paulsen Spence to design the Spence Type ED in 1925. The ED was the first normally closed, pilot-operated, diaphragm actuated pressure regulator and it revolutionized the way energy producers supplied low-pressure steam to their customers by providing greatly improved accuracy in pressure control. Since its earliest days Spence has continued its "History of Innovation" with new product development and improvements to Spence's "quality first" manufacturing philosophy. This has enabled Spence to develop and manufacture quality steam specialty and fluid control products that meet the changing needs of today's HVAC and Industrial marketplaces, just as Paulsen Spence did in the early 1900s.









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