

## Particles in Hydronic Systems

The life and efficiency of a heating or cooling system is greatly dependent on clean system water, because solid particles interfere with the proper operation of a hydronic system. During the construction process, dirt and debris in a hydronic system are unavoidable and can be found anywhere in the system. The nature of these particles varies and may include metal particles from abrasive or chipping processes during construction, welding beads, soil, rust, paint particles, oil-based pipe coatings, and oil residue from thread cutting or pipe sealants.

During system operation, new solid particles are generated from erosion, corrosion, scaling, and debris originating from biological growth. Excessive chemicals can initiate reactions that largely contribute to the formation and accumulation of dirt particles. Certain cleaning techniques may also loosen settled deposits that will flow through the system.

Dirt can be divided into three categories:

- Those with lower specific density than water
- Those with equal specific density as water
- Those with higher specific density than water

Even very small particles with a higher specific density can do as much damage as the larger particles depending on the viscosity and the velocity of the water.

## Problems due to Particles in Hydronic Systems

Dirt can have a very negative effect on a hydronic system and its components. Problems can include:

- Erosion:** Solid particles (dirt) continuously collide with the system components. Erosion can cause almost as much damage as cavitation to pump impellers, bearings, valves, controls, flow restrictions, and at higher flow rates, even the piping.
- Energy Losses:** ...through filters and strainers. As filters and strainers become filled with dirt particles, flow becomes more restricted. Flow restriction causes increased pressure drops, and results in a lower flow rate and lower overall system efficiency.
- ...through centrifugal solids separators. Centrifugal solids separators require high velocities that cause high pressure loss and additional electrical costs.
- ...through heat exchangers. Dirt deposits reduce heat transfer efficiency, reducing the overall system efficiency.

Erosion, energy losses, component wear, and reduced system efficiency all result in increased maintenance and unnecessary costs.

Strainers, filters, or centrifugal separators are installed to trap the larger dirt particles from the circulation to reduce system deterioration. Strainers and filters are only capable of trapping those particles that are larger than the mesh size, while centrifugal separators can only remove the larger particles with a significantly higher density than the fluid. Smaller and lighter particles are still able to pass through these units and cause problems throughout the system.

## **Separation of Dirt**

Now available from Spirotherm, the Spirotrap® line of dirt separators removes most system dirt down to the smallest particles and may be combined with already installed air eliminators.

The Spirotrap dirt separator operates very much like the Spirovent air eliminator. The turbulence-free zone below the flow in a Spirotrap is responsible for the separation of dirt, just as the turbulence-free zone above the flow in the air eliminator is responsible for the elimination of air. The Spirotube inside the Spirotrap creates a low-velocity area that forces dirt particles to be separated from the flow.

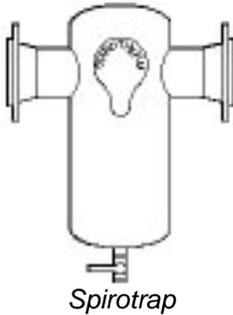
By removing system debris, the Spirotrap guards against erosion of system components such as circulator impellers, bearings, seals, valve mechanisms, and controls. The Spirotrap will never require system shut-downs, costly replacement cartridges, or additional high-head circulators to operate, and performs without a significant increase in pressure drop (an important first-cost consideration in circulator selection).

An ordinary strainer or filter becomes clogged with more and more dirt particles during circulation. With each pass, the amount of collected dirt increases, eventually covering the surface of an in-line strainer or filter. These products become a flow barrier and result in increased pressure drops. The more the dirt builds up, the higher the pressure drop. The Spirotrap's new dirt separation technique allows for collection of separated dirt at the bottom of the unit, away from the flow. Blockages do not occur, and flow remains constant without high pressure drop, increasing system efficiency while reducing component corrosion and wear. As a result, the system requires less maintenance.

## Spirotrap Dirt and Spirotrap Drain

Inside the Spirotrap, the Spirotubes create a low velocity area that forces debris with higher specific density than water to the dirt collection chamber at the bottom of the unit. The free space at the bottom of the unit provides enough space to collect and store separated dirt. Collected debris is easily flushed by opening the bottom valve.

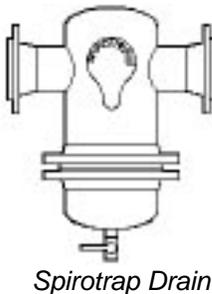
Figure C-1



This type of dirt separation offers several advantages over a traditional strainer or filter:

- Virtually no maintenance and no replacement filters.
- Will not block the flow.
- Minimum pressure drop; always constant.
- Can be blown down while the system is fully operational.
- All solid particles are separated to below 25 microns.
- Straight in-line connection ports allow for easy installation.
- No bypass or isolating valves required.
- No backwash cycle or large fluid loss.

Figure C-2



The Spirotrap Drain models (figure C-2) feature a removable head for bundle inspection and cleaning. Tubes are fabricated to tube sheets at the top and bottom for ease of removal.

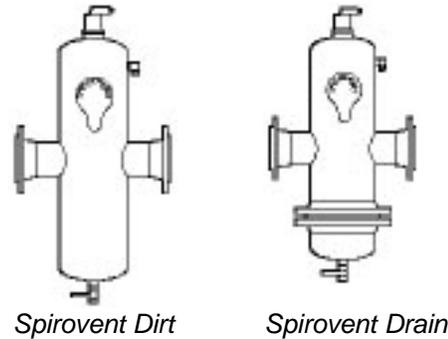
## Spirotrap HV (High Velocity) Dirt and Drain Separators

The Spirotrap HV Dirt and Drain Separator was exclusively designed for full-flow high volume fluid systems such as central plants and district heating/cooling. It allows a maximum entering water velocity of up to ten (10) feet per second, and offers all of the unique benefits of the standard Spirotrap dirt separators. The extended shell and longer Spirotube medium provide for the greater velocity and higher efficiency. Because the Spirotrap HV units are designed to handle higher velocities than the standard series, no change to piping design selection is required. The HV series often match pipe size and can be installed in-line, unlike traditional strainers and filters that operate under high pressure losses and usually require installation in a sidestream.

## Spirovent Combined Air Eliminator/Dirt Separators

The Spirovent combination air eliminator/dirt separator is a unique, dual-purpose device that combines the Spirovent air eliminator with the Spirotrap dirt separator to eliminate air and separate dirt at the same time. Both the shell and the Spirotubes extend above and below the flow to achieve air- and dirt-free system water; two full-flow functions in one easily installed product.

Figure C-3



## Spirovent Dirt and Spirovent Drain

The Spirovent Dirt unit combines the Spirovent Air Eliminator with the Spirotrap Dirt Separator to remove both air and dirt from system water. The Spirotube remains the core of the Spirovent Dirt unit. The Spirotube creates a low velocity area inside the Spirovent that allows air bubbles to rise and dirt particles to sink, keeping the system permanently free from air and dirt. It requires little maintenance and works without strainers or filters. Because it has all of the advantages of both the Spirovent Air Eliminator and the Spirotrap Dirt Separator, corrosion, cavitation, component wear, and frequent breakdowns caused by air-saturated, dirty water are no longer system concerns.

## Spirovent HV (High Velocity) Air Eliminators/Dirt Separators

The Spirovent HV combination unit has been developed especially for high volume fluid systems where higher velocities are found. It allows a maximum entering water velocity of up to ten (10) feet per second, and offers all of the unique benefits of the standard Spirovent dirt and drain units. The extended shell and longer Spirotube medium provide for the greater velocity and higher efficiency of the HV series. Because they are designed to handle higher velocities than the standard series, no change to piping design selection is required. The HV series often match pipe size.



Proprietary Catalog Data – Contact Local Spirotherm Representative for Technical Assistance



Proprietary Catalog Data – Contact Local Spirotherm Representative for Technical Assistance

**Notes:**