Beckett CORPORATION

Technical Information Bulletin

9/15/2022

Tigerloop®

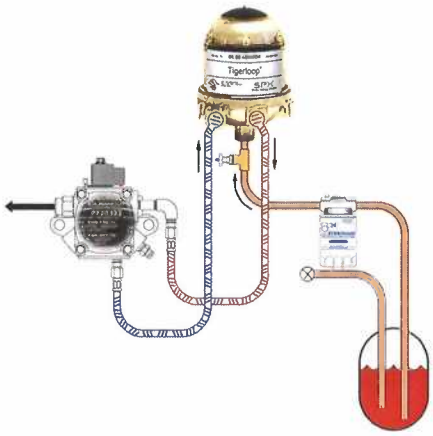
Automatic Oil De-Aerator

Improve Burner Performance with Tigerloop® Oil De-Aerator

Tigerloop Oil De-Aerator eliminates many common oil heating problems which prevent a burner from operating at peak performance. A Tigerloop will remove air from the system, delivering foam-free fuel to the nozzle, and reducing issues caused by cold fuel — benefits which ultimately provide for cleaner, maximized combustion.

Simply put, Tigerloop® continuously separates air & gas from heating oil. Automatically!

Tigerloop® advantages



- Safely handles suction line air leaks
- Reduces running vacuum for clear, foam free oil at the nozzle
- Less dirt/sludge is transported in the system
- Reduces yellow metal contact when using biofuel
- Removes air entrained in the oil during transporting and delivery
- Provides the best possible conditions for the fuel pump
- Extends filter element life
- Preheats the oil for cleaner combustion reducing fuel consumption
- Solves common nozzle dripping issues, which cause soot build-up
- Reduces the high cost of repeat service calls due to time to troubleshoot

How Tigerloop Works

Having a Tigerloop is better than either a single pipe system or a 2 pipe system. Here's how it works:

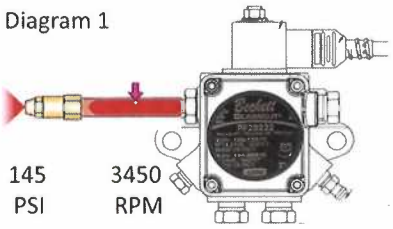
Tigerloop directs oil through a check valve (inside the Tigerloop) and then through the pump. The pump gives the nozzle its rated volume (i.e., 1 gph) and then sends the excess 19 gph back to the Tigerloop to be de-aerated. As oil rises in the Tigerloop, air escapes from the top vent until a float lifts and seals the vent. When the vent seals, the Tigerloop builds pressure (about 1/3 psi). The pressure opens a valve sending de-aerated oil

back to the pump, creating the loop. If any air reaches the Tigerloop, the float drops, the vent opens, and the air is removed. The float rises again sealing the Tigerloop.

Problems with air in the system (Nozzle)

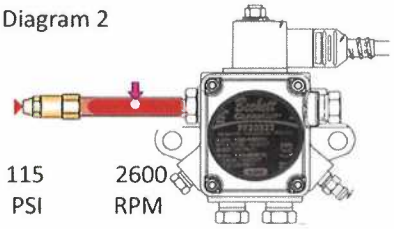
Diagram 1 shows a cut-away of a pump/ nozzle operating normally, except for the air bubble lodged in the nozzle line. The bubble is deceivingly small, since its size has been compressed by the pressure in the nozzle line. As long as the oil pump operates, the bubble will remain small and compressed, having no effect on burner operation.

Diagram 1



145 PSI 3450 RPM

Diagram 2

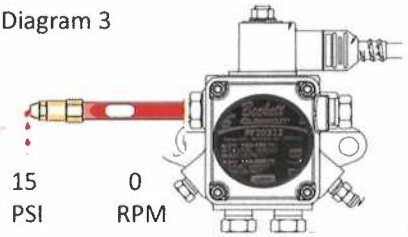


115 PSI 2600 RPM

However, when the pump shuts down, it is a different story. As the pump's rpm decreases, the piston will close against the nozzle seat, cutting off the flow of oil from the pump, but not the flow of oil from the nozzle. The expanding bubble has taken over for the pump in supplying the pressure, pushing oil out of the nozzle. (diagram 2).

Oil flow does not cease until the bubble has expanded back to its original size and nozzle line pressure has dropped to zero (diagram 3). The result is virtually no cut- off, with sooty, smoky shutdowns. A solenoid valve will not help this problem. It is strictly a problem caused by air bubbles.

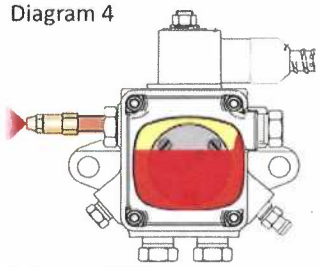
Diagram 3



15 PSI 0 RPM

Problems with air in the system (Pump)

Diagram 4

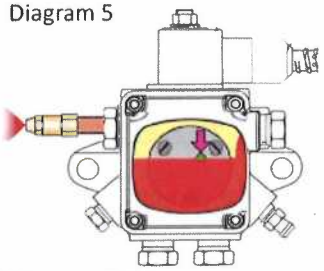


145 PSI 3450 RPM

The level of oil does not fill the entire chamber. This is normal because during bleeding the oil level only rises high enough to just cover the inlet to the gear set, about two-thirds of the way up the strainer chamber. This air cushion formed at the top quiets the hydraulic whine of the gear set and does not affect pump operation. As long as the inlet to the gear set stays covered, all is well. (diagram 4).

But, if air enters the pump, it will immediately rise to the top, pushing down the oil level in the strainer chamber and partially uncovering the inlet to the gear set. The gear set starts gulping air and oil and the pressure becomes unstable, resulting in poor combustion, noise, rumbling, and pulsation. (diagram 5).

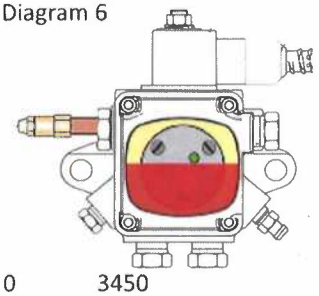
Diagram 5



115 PSI 2600 RPM

Problems with air in the system (Pump) cont.

Diagram 6



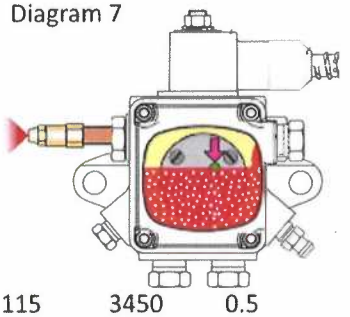
0 PSI 3450 RPM

If enough air enters, the oil level drops completely below the inlet to the gear set, the pressure is lost and the burner eventually locks-out. (diagram 6).

The second kind of bubbles are gases which come from dissolved vapors and volatiles that are drawn out of the oil when it is exposed to vacuum.

The higher the vacuum, the more bubbles produced. Diagram 7 shows what is going on in the strainer chamber of the oil pump. The bubbles drawn out of the oil rise to the top of the strainer chamber, the oil level falls, the gear set gulps foamy oil, pressure becomes unstable, and the burner eventually locks out.

Diagram 7



115 PSI 3450 RPM 0.5 INHG
7.25 PSI suction head

Cold Oil Applications

Oil Preheating – Introduction

- Cold fuel temperatures (even above the cloud point) result in inefficient and delayed light off (hard light off).
- This is a result of the energy needed to get the fuel to the phase transition.
- Historically, some burners have used nozzle line heaters (pre-heaters) to aid in ignition.
- Testing was conducted to determine what effect the Tigerloop deaerator has on fuel temperatures at the nozzle.

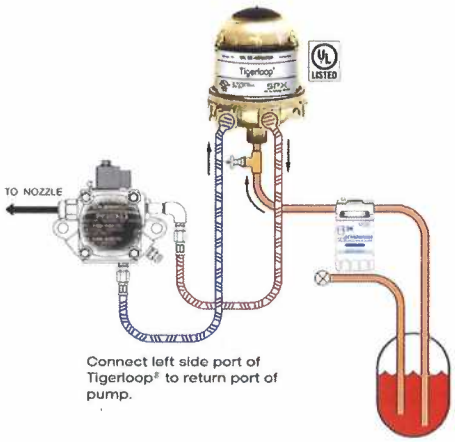
Oil Preheating – Testing

- To quantify the thermal effects of a Tigerloop, an AFG burner was tested.
- The burner was setup with a 0.85 gph Delavan nozzle at a pump pressure of 140 psi.
- The hardware was tested in two pipe configuration, using a Tigerloop and a Tigerloop Ultra.
- For all tests, the tank was conditioned to 29°F.
- In all configurations, the burners were cycled five (5) minutes on, five (5) minutes off.

Takeaway (cold oil testing)

For thermal effects, when comparing two pipe to the Tigerloop, the Tigerloop adds an additional 23.8°F (average) degrees of warming to the supplied fuel at the nozzle (over two-pipe).

Tigerloop® Applications



Tigerloop is suitable for most light oil burner applications.

Here are just some possibilities:

- Boilers (Steam Boilers, Thermal Fluid Heaters, Hot Air Generators and Hot Water Boilers)
- Furnaces
- Ovens (like bakery ovens)
- Portable heaters
- Driers (like Agricultural Dryers, Food Processing Dryers, Textile Dryers)
- Incinerators (Non-Ferrous Melting, Heat Treatment and Ceramic Kilns)
- Paint Shops (like Automobile Paint Shop)
- Road Construction (like Bitumen Tank Heating and Hot Mix Plant)

Tigerloop® - An oil pump's best friend

Conclusions

The Tigerloop® is the optimal solution for reliable, environmentally safe and cost-effective oil heating.

Environmental regulations and the development of products like the Tigerloop® are eliminating the use of two-pipe systems.

Several countries in Europe have already identified the risks of two-pipe systems and established laws that forbid its use.

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