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U.S. PATENT
NO. 2,144,978
1222

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Baldwin offers superior protection against dirty fuel

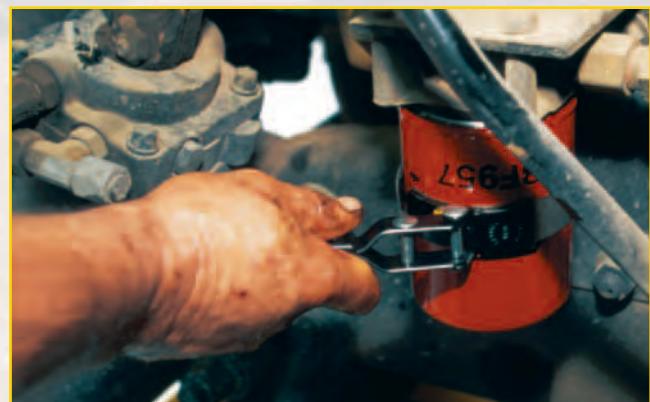
Dirty fuel is a fact of life. Even with the development of cleaner-burning fuels, contaminants are still a major concern when it comes to fuel systems.

- No. 2 diesel fuel is one of today's most variable fuel sources. Its quality and purity range unpredictably from very good to very poor.
- Current API specifications allow "acceptable" levels of impurities (sulfur and wax) and contaminants (dirt, ash and water). It's likely that these regulations will weaken even further in the future.

The deterioration of fuel is inevitable. Contaminants are introduced into the fuel system through mixing, transferring, and storage.

Baldwin Filters has a full line of fuel filters to protect today's engines from contaminants. With spin-ons, elements, fuel managers and fuel/water separators, Baldwin has the filter to fit most applications.

In addition, the DAHL/Baldwin fuel/water separators offer an additional line of defense for applications where significant amounts of water need to be removed. DAHL fuel/water separators feature a unique, patented depressurizer cone that spreads the flow of fuel, allowing greater separation of water and dirt from fuel.





Baldwin: The Basics of Fuel Filtration

Micro-organisms can quickly become major problems. Colonies of fungus and bacteria, both aerobic and anaerobic, feed on your fuel. Commonly known as humbugs, they spread rapidly in the presence of moisture. They ride along with the fuel, easily pumped from one tank to another.

As the micro-organisms accumulate, they will spread through the fuel system and quickly plug the fuel filter. A coating of slime will develop over the entire surface of the media. Chemical treatment with a biocide is the only effective solution to the problem of bacterial and fungal growth.

Contaminants arrive in your fuel in two forms — precipitates and particulates.

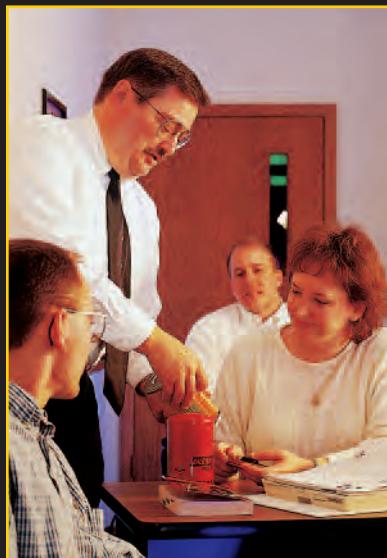
Precipitates are non-combustible materials formed when fuel oxidizes. They may also form if, as sometimes happens, two incompatible fuels are blended.

Significant swings in temperature accelerate the precipitation problem. Because precipitates are generally heavier than fuel, they tend to settle to the bottom of tanks. Decanting or carefully drawing off the fuel will leave the precipitates behind.

Particulates, sometimes called "asphaltines," are black, tar-like contaminants. A residue of the refining process, particulates plug filters quickly. There is no known chemical treatment for the removal of these contaminants.

Wax, in moderation, is a desirable fuel component — it adds energy to the fuel. In operation during cold weather, however, control of wax becomes necessary, usually by applying additives or changing to a higher grade of diesel fuel. Like water, wax begins to thicken at colder temperatures. As wax gels, it can restrict and eventually stop fuel flow. Wax thickening involves a couple of critical temperature points:

- *Cloud point* — the temperature at which solid crystals of wax begin to form — the fuel looks opaque, but it still flows.
- *Pour point* — the temperature at which the gel forms — the fuel cannot be poured.



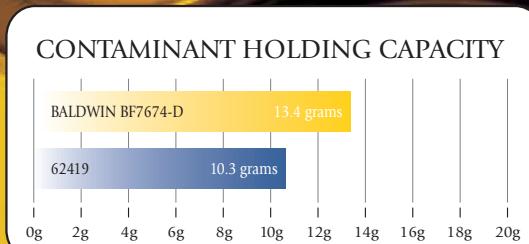
PURE PERFORMANCE : TESTED TIME & AGAIN

Pure Performance: tested time & again

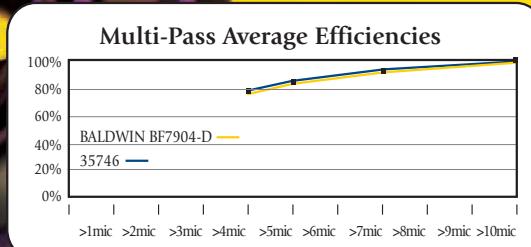
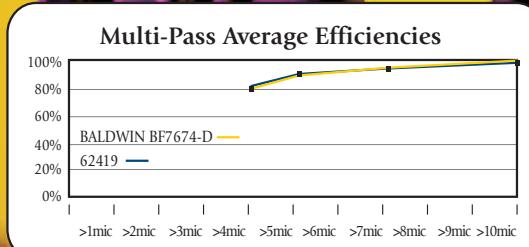
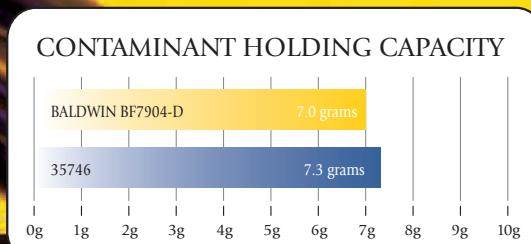
SAE J905 and ISO 19438 are industry standard filtration performance tests for determining the contaminant holding capacity and contaminant removal efficiency.

Baldwin fuel filters mean pure performance, system protection and hours of trouble-free operation for all types of equipment.

Baldwin vs. Leading Competitor



Baldwin vs. Leading Competitor



SAE J905 Test: Capacity: Flow Rate 2 gph, PTI Fine Test Dust, Dust Add Rate 2g/1g, Termination 5 psid.

ISO 19438 Test: Efficiency: Flow Rate 0.8 gph, ISOMTD/5520M Test Dust, Termination 5 psid, Particle Size (microns)

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Dirty fuel can rob you blind.

You know that a restrictive fuel filter has immediate effects on engine performance - none of them good.

And while you don't regularly anticipate fuel filter plugging problems can be noticed immediately in loss of power. This is why proper maintenance is essential for maximum engine performance.

Fuel filters usually come in pairs, primary and secondary. Some systems operate with only a single filter and certain other systems depend on a fuel filter and an optional fuel/water separator.

Primary fuel filters are:

- more open, built to capture only large contaminants.
- less restrictive.
- designed to protect the transfer pump from abrasives.
- mounted on the vacuum side.

Secondary fuel filters are:

- tighter, built to capture small contaminants.
- designed to protect the injection pump from the very fine abrasives that would otherwise damage sensitive injection equipment.
- mounted on the pressure side, usually pressurized to 20 to 60 psi.





Fuel Filters Protect Against Contaminants

Potentially the most damaging of the contaminants, water destroys the lubricative properties of fuel. With lost lubricity, the fuel can scour pumps and even blow out injector tips. At colder temperatures, water in the fuel can freeze and contribute to total fuel stoppage.

The good news is, water can be removed from fuel — within limits. There are three common mechanisms for water removal:

- **Stripping.** A silicon-treated medium inhibits the passage of water, but allows fuel to flow freely.
- **Coalescing.** Gravity drags water droplets (heavier than fuel) out of slow-flowing fuel.
- **Absorption.** A filter medium with a high affinity for water and a low affinity for fuel absorbs the water in the fuel.

Some OEMs use fuel/water separators relying on a stripping mechanism. Several difficulties occur with these separators:

- Plastic bowl separators are subject to road hazards and chemical attacks, resulting in cracks and leaks.
- Replacement bowls are not easily available, and the replacement process is difficult, increasing costs and downtime.
- The configuration of the plastic bowl creates an additional path for leaks.

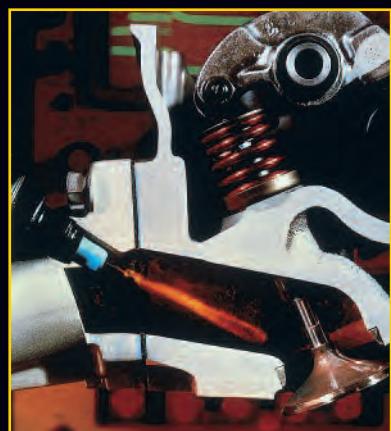


PHOTO PROVIDED BY ROBERT BOSCH CORPORATION



Baldwin Filters' Expanding Line of Series I & Series II Fuel/Water Separator Filters

Baldwin Filters' innovative fuel/water separator design incorporates a removable, self-venting drain valve into the filter's assembly for full compatibility with OE designs. All OE drain valves, sensors and bowls may be used with this Baldwin housing design. These filters provide the performance expected of Baldwin-designed products.

Advantages of Baldwin's Fuel Filter/Water Separator Design with Removable, Self-Venting Drain Valve

- The OE raised "keys" have been removed to allow universal fit on multiple OE fuel bases. This makes filter installation easier as no alignment to the mounting head is necessary.
- Color coding for primary and secondary filters helps determine, at a glance, that the proper filter is being installed.
- Metallic - primary filters are painted red and secondary filters are painted white.
- Polymer - primary filters have red labels and secondary filters have white labels.
- A removable, self-venting drain valve is standard on these filters. The filter can be used with the drain only or with the OE bowl or sensor.
- The hard plastic internal seal has been replaced by a pliable elastomeric seal, providing a positive sealing surface.
- Both filter series include a full range of standard flow and reverse flow elements.

**OE
Fuel Filter/Water Separator**



Plastic Bowl

**Baldwin
Fuel Filter/Water Separator
with OE Bowl**

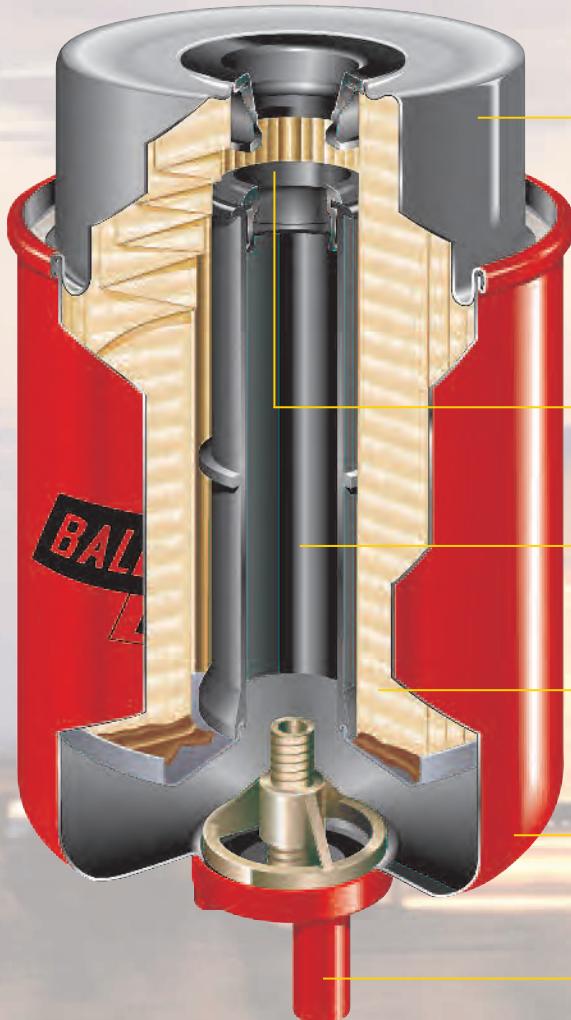


Removable
Drain Valve

Quality Fuel/Water Separator Filters

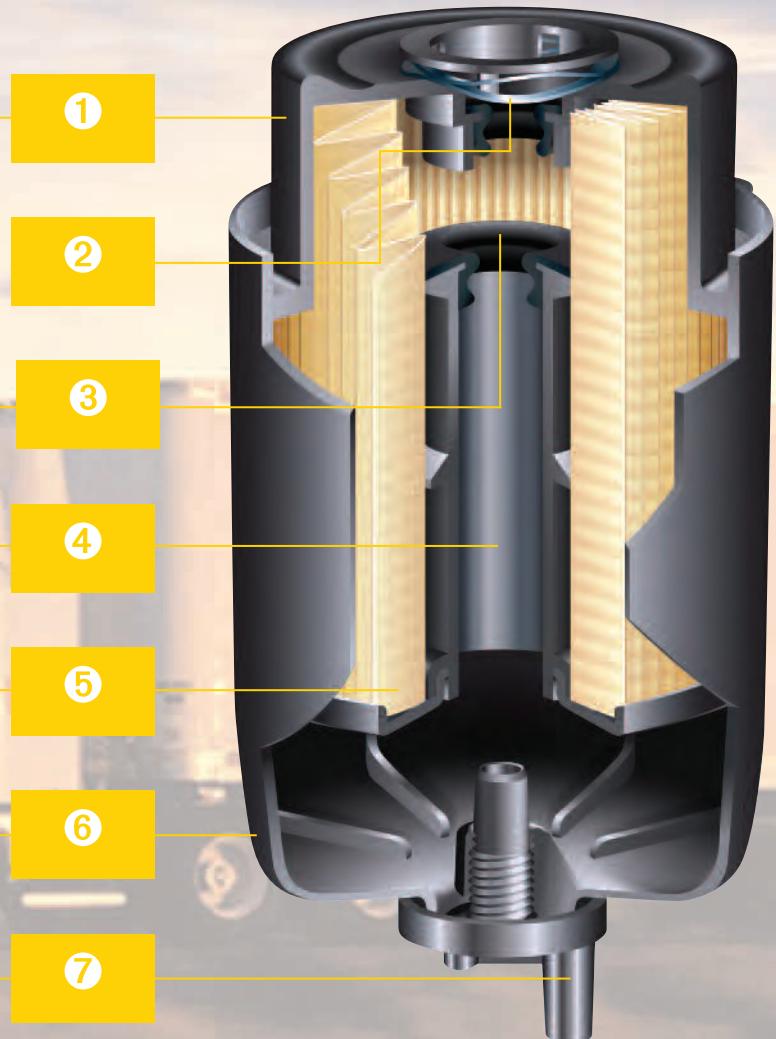
Series I Design

Replacement filters for Stanadyne® FM100
fuel systems (Non Gen III design)



Series II Design

Replacement filters for Stanadyne® FM10
fuel systems & FM100 fuel systems (Gen III design)



1 *Raised Keys* eliminated for universal fit on multiple fuel bases.

2 *Wave Spring* (Series II only) provides installation resistance for proper fit.

3 *Pliable Elastomeric Internal Seal* replaces hard plastic material, providing a positive sealing surface.

4 *Centertube* helps prevent collapse caused by a sudden difference between internal and external pressure.

5 *Highly Effective HydroShield™ Media* repels water and other contaminants, while assisting in the removal of water from the fuel.

6 *Heavy-Duty Housing* provides unequalled burst- and pulse-withstanding strength.

7 *Removable, Self-Venting Drain Valve* adds versatility for universal fit with OE bowls and sensors.

Baldwin Filters...known for Quality!



Baldwin is the industry leader in heavy-duty filters. Our multi-million dollar research and testing facility anticipates an ever-increasing demand for filters that meet or exceed original equipment specifications.



Long before the industry adopted the philosophy, Total Quality Management guided our manufacturing and distribution processes. Baldwin continues to earn preferred vendor status, such as the TS 16949 and ISO 9001 certification.



We're committed to giving our customers the best products and services in the filter marketplace. It's a commitment based on continued engineering of our production facilities, ongoing training of our employees, and refinement of already sophisticated research operations.

