White Paper

Parker Hannifin Corporation
Filtration and Separation Division
242 Neck Road
Haverhill, MA 01835
phone: 800 343 4048
fax: 978 478 2501

www.parker.com/balston

Analysis of Coalescing Efficiency in Replacement Filter Elements

Allan Fish
Product Manager – Filtration
Parker Hannifin Corp.
Haverhill, MA
January 2013

Introduction

High efficiency coalescing filters are often specified when there is a need to protect sensitive equipment that is operated by compressed air. A high efficiency coalescing filter can tame the effects of oil, water, and particulates that are present in virtually all compressed air supply lines. A high quality coalescing filter element will typically have a rated filtration efficiency of somewhere 95% and 99.999+%. The required level of filtration efficiency is dependent upon the quality of the compressed air in the supply line, and the sensitivity of the equipment or process that is connected to the line. For example, when compressed air is used to propel paint to the surface of an automobile body, it is imperative that the compressed air be as pure as possible in order to avoid defects in the painted surface. Therefore, coalescing filters with very high efficiencies are often specified for critical applications.

Replacement Element Performance Comparison

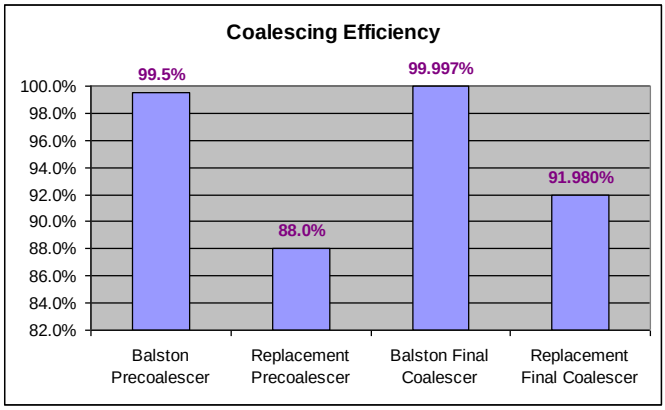
Recently, a customer asked about the use of "non-branded" replacement filter elements, purchased from a retailer over the internet, to replace a coalescing filter element in a Parker Balston brand filter housing. According to the customer, the web site clearly stated that "All our replacements meet or exceed OEM specifications", so the customer assumed that the performance of the replacement element would be as good as the performance of the Balston element. In order to answer his question, we decided to do some testing.

We ordered two different elements from the Parker Balston factory, and the same size and type non-branded replacement elements from an online ".com" supply source. This internet retailer stated "All our replacement elements meet or exceed OEM specifications".

The coalescing testing was performed in a laboratory in another Parker facility, and the tests were carried out according to ISO-12500 part 1, an international standard that specifies how the testing of coalescing filters should be performed. All of the coalescing efficiency testing was done in one day, using the same test equipment, and all of the elements were tested in the same Parker Balston filter housing.

When compressed air is used to propel paint to the surface of an automobile body, it is imperative that the compressed air be as pure as possible in order to avoid defects in the painted surface.

The graph below summarizes the results of the testing.



As you can see from the graph, the non-branded replacement filter elements did not meet or exceed the performance (or the specifications) of the Balston filter elements. In fact, the efficiency of the non-branded *final* coalescer was lower than the efficiency of the Balston *pre*coalescer!

Coalescing Efficiency With and Without Filtration

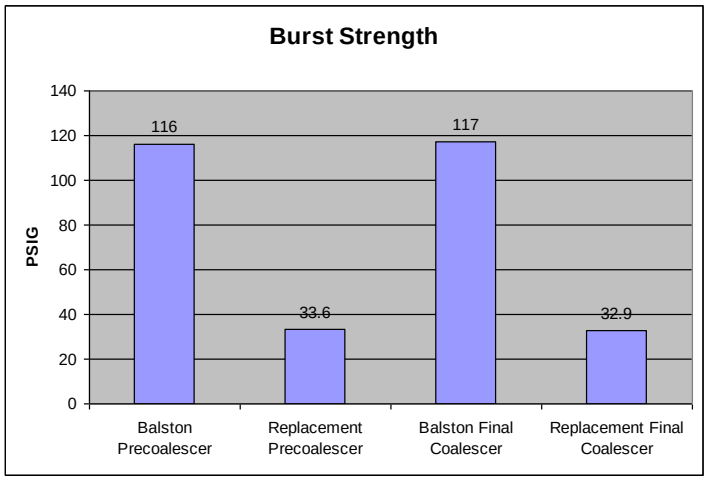
To put these efficiency numbers into perspective, let's look at the amount of oil carryover in a typical compressed air application. For these examples, we will assume that we have our filter installed on a compressed air line that is operating at a pressure of 100 PSIG, with an air flow rate of 100 SCFM, and an oil aerosol concentration of 10 ppm.

With no filtration, the amount of oil that is suspended in the compressed air amounts to 1.9 liquid ounces every 24 hours of operation. If we use the non-branded precoalescer, it would remove 88% of the oil, but 12% would continue downstream of the filter; in this case, approximately **0.23 ounces every 24 hours**. This is 2/3rds of a gallon over the course of just one year. If we were to use the Balston precoalescer, the amount of oil downstream of the filter element would be **0.0096 ounces every 24 hours**. This is only 3.5 ounces per year.

If we use the non-branded final coalescer, it would remove 91.98% of the oil, but 8.02% would continue downstream of the filter; in this case, approximately **0.15 ounces every 24 hours**. This is ½ a gallon over the course of just one year. If we were to use the Balston final coalescer, the amount of oil downstream would be **0.000058 ounces every 24 hours**. This is less than 1/10th of an ounce per year.

Robustness of Filter Element as Shown Through Burst Testing

Another important characteristic of a high quality coalescing filter element is robustness. The filter element must be able to withstand the dynamic changes in pressure, temperature, and air flow that occur on a regular basis in a typical compressed air system. One measure of robustness is the pressure at which the filter element bursts, or fails to contain contaminants. Burst testing was performed on new, unused Parker Balston elements, and identical testing was performed on new, unused low cost "equivalent" replacement elements obtained from the same online ".com" supply source. The results are shown in the graph below.



The filter element must be able to withstand the dynamic changes in pressure, temperature, and air flow that occur on a regular basis in a typical compressed air system.

The Parker Balston filter elements were able to contain the differential pressure generated by the test bench up to its capacity of 117 PSIG. The precoalescer filter element obtained from the .com supply source failed at 33.6 PSID, and the final coalescer element failed at 32.9 PSIG. In a typical compressed air system that operates at 100 PSIG or higher, it is quite likely that the filter element will experience moments where the differential pressure will be greater than 34 PSIG. It is critical that the filter elements can withstand high differential pressure if they are to continuously protect sensitive equipment or vital processes downstream.

Again, although the .com supplier clearly stated that "All our replacements meet or exceed OEM specifications", it is obvious that the low cost aftermarket elements do not perform at the same level as the original equipment Parker Balston filter elements.

Conclusion

When considering replacement elements for your high efficiency coalescing filter applications it is important to realize the cost of poor filtration efficiency performance in terms of significant contamination being constantly introduced over time to the critical and sensitive end use point.

In addition, the risk of filter element failure and the subsequent release of filter element fragments, oil, water, rust and pipe scale downstream to the intended application will translate into far more costly problems such as machinery downtime, damaged instrumentation, product recalls, contaminated finished product and excessive maintenance and repairs.

The risks and costs associated with the use of non-branded "knock off" filter element replacements far outweigh any savings realized on the purchase price.

The Parker Balston branded filter elements will provide consistent, high efficiency filtration performance with the ability and robustness to hold up to the most aggressive compressed air systems.

For more information, contact Parker Hannifin at 1-800-343-4048 or visit http://www.parker.com/balston.