

New Differential Pressure Gauge...Meets Global Demands.

New Differential Pressure Gauge Meets Global Demands.

The Finite Filter Division of Parker Hannifin Corporation located in Oxford, MI has found that one of the important quality elements of their coalescing filter line is their unique differential pressure gauges. The gauges are designed to allow an operator or maintenance person to quickly tell if the filter element is operating at optimum level or if it is in need of replacement. The firm recently introduced a new gauge. The development of this new gauge was critical as the gauge would be a filter monitor on the firm's entire line of H Series coalescing filter products.

Coalescing Air Filters

It is important to understand what a coalescing filter does. They are designed to pass air through a filter element, thereby capturing dirt, but oil and water aerosols are collected within the element, and passed through to the outside as liquids. The liquid water and oil are then drained to the bottom of the filter and eliminated from the air system. In many cases, complete removal of water and oil aerosols from the air system is critical to the production process. The coalescing air filter is used to remove oil aerosols from air that supplies spray painting operations, as even microscopic oil droplets can cause visible imperfections, such as "fish-eyes", on the surface

of the painted parts. In compressed air systems where air dryers are utilized, coalescing filters protect expensive desiccant beds from the damaging effects of oil and water aerosols present in unfiltered compressed air. Most coalescing filters are so fine, that they are also effective in removing bacteria, cigarette smoke, and virtually all traces of oil aerosols from compressed air. Coalescing filters are also commonly used to protect air tools, automated assembly equipment, and point-of-use breathing air systems, as well as many other applications.

From Pop-Up Indicator To Pressure Gauge

Dan Ryan, The Finite Filter Division's Chief Engineer and Product Development Manager for the new gauge commented, "To understand the importance of the gauge design it helps to know a little of the history of our gauge products. We used a simple pop-up indicator on our products for over 20 years. Then, a few years ago we felt we needed to pro-



Dan Ryan, Chief Engineer, Finite Division of Parker Hannifin

vide our customers with more information and we felt this could be provided with a differential pressure gauge. The differential pressure gauge located on the top of each coalescing air filter product alerts the customer that the filter is operating at optimum level, or it needs to be replaced.

Model 126... The First Differential Pressure Gauge

(Used from 1993 to 1998)

"For our first pressure gauges we went to a company called Mid-West Instrument located in Sterling Heights, MI that specializes in differential pressure gauge design and production. We worked closely with Mid-West on designing a new, custom gauge from scratch that would fit the same footprint as our pop-up indicator but would provide more information. The model 126, as it was called, used an aluminum body that was precision machined to a very



high tolerance. The 126 gauge also used a 316 S.S. piston and range spring. The gauge was very accurate. Mid-West produced between 15 to 20 thousand of the 126 model over a five year period. It was a very reliable and successful product.

The Challenge... Design a New, Global Differential Pressure Gauge.

"While the model 126 worked fine for five years, we found that the volume of our H Series product line was steadily increasing and that the gauge costs in relation to our overall coalescing filter product costs was cutting into our profit margins on our smaller filter housing. We decided we needed to reduce our gauge costs and also design a gauge that would be more in-line with our global marketing efforts. When we decided to develop an entirely new differential pressure gauge we contacted Mid-West Instrument as well as a number of other gauge manufacturers. We wanted to explore what other firms were doing in this field and be absolutely certain that the final gauge design was accurate, reliable and met all the specifications we felt were important for customers here in the US, and throughout the world.

Gauge Design Parameters

"First, like the original model 126, the new gauge had to fit the same footprint that is used on our pop-up

indicator. This was very important as all our filter products were designed with this same configuration at the top. To prevent our firm from having to redesign our products, the gauge design had to have two mounting holes and two sensing

product development team. This list included:

- Working pressure of 500 PSIG
- Gauge design had to prevent cross contamination between upstream and downstream air flow.
- Gauge location had to be a preci



New Global Gauge on Finite Filters - H-Series Coalescing Filter Product Line

holes exactly positioned to fit all model sizes of our compressed air and gas filter products. To ensure that the final gauge design met all our requirements we developed a critical list that the new gauge design had to meet, and developed tests it had to pass to make it acceptable to our

sion fit to existing mounting base.

- Face design graphics had to meet international requirements and provide for fast maintenance checks.
- Mounting design had to meet all specs to coincide with existing product mounting configurations, i.e. mounting brackets and pipe

fittings.

- Gauge had to attach quickly to a wide range of product sizes.
- Aesthetically, the gauge had to have a state-of-the-art appearance.
- The quantity price of the gauge had to be low enough to allow Finite Division to offer it to its customers at, or below current selling prices.
- A field installable switch option was required.

The four main points of our list included:

- Improvements over the existing model
- Quality
- Performance standards
- Aesthetics

Gauge designs were submitted from a number of gauge companies. We developed a number of critical tests that the gauges had to pass to be acceptable. If they failed any of the tests the gauge design was eliminated.

Hysteresis Test

The first criteria was the hysteresis—"a retardation of the effect when the forces acting upon a body are changed... lagging of values."

This simply meant that when you increase the pressure on a gauge, if there was very little hysteresis the pointer would follow the pressure very accurately. It would move up and back

down again as the pressure changed." If there was hysteresis, the pointer would stick at the zero point as you increased the pressure and then all of a sudden snap up a bit higher and higher. For example, when the actual pressure was 3 PSID, the pointer might still be stuck on zero. In a sense the gauge pointer caught up to the actual pressure, but it lagged behind in registering the true pressure. This was unacceptable because you were never sure what the true pressure was at any given point. This was a major problem with many of the other gauge manufacturer's designs.

Eliminating Cross Contamination

"The original 126 used a sliding 316 S.S. piston. This design worked fine on Mid-West's gauge design but we found on gauge designs from other firms that unless the piston and the bore are machined to very high tolerances, it has the potential for contaminating the outlet air. For

this reason we wanted a gauge design that would eliminate any chance of cross contamination."

Mid-West Develops An Innovative New Gauge Design

Fred Lueck, President of Mid-West Instrument said,

"First we try to understand what the customer must have and what they would like to have...and sometimes

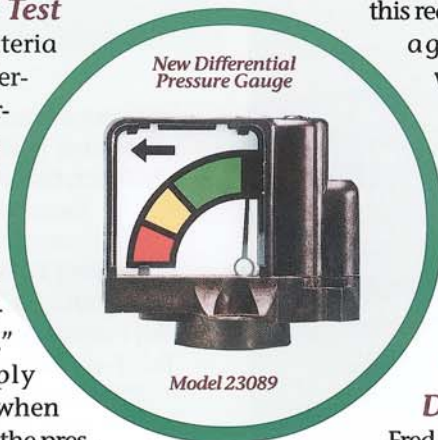
this is not the same. The "must have" for Finite Division's gauge design was that it had to exactly meet the unique mounting configuration used on all their H Series Coalescent Filter heads. If this didn't work, nothing else mattered. We were able to meet this requirement and several others that put us in the lead from a supplier standpoint. For example we understood the problems of friction and hysteresis as we had solved the problem before.

Plastic Versus Aluminum

An analysis of the customer requirements and specifications indicated that a product made from machined aluminum components would not meet Finite's cost target. This new product would need to use molded plastic pressure containing elements made from an engineered plastic with glass reinforcement to achieve the customer performance and cost requirements. Plastic was a material we were very familiar with as we design many of our pressurized gauges out of plastic. This also allowed us to develop a new diaphragm design with a rubber seal that eliminated two major problems. The new design resulted in low hysteresis and it provided positive isolation between the high and low side of the fluid. There was no chance of cross contamination.

Aesthetics of Gauge Design

"After Mid-West was selected as the final supplier for the gauge we worked very closely with Finite Division's product development team. To meet global use of the gauge we came up with the idea of using graphics instead of numerals



on the gauge face. Color coding was done with a large color band.

Green: Operating well, Pressure range: 0 to 7 PSID

Yellow: Cautionary stage, still operating within limits but starting to cost the filter user money to push the compressed air through the filter. Range: 7 to 11 PSID

Red: Exceeds manufacturer's rated recommendations for the amount of pressure across the filter. It takes a lot more pressure to push air through a dirty filter. The filter should be changed as soon as possible. Range: 11 to 15 PSID

3D Prototype Process

"Once we reached this final stage in design the customer wanted to see what this design would look like on the finished product. We used a stereo lithography process that showed the customer exactly what the final product would look like mounted on a typical filter head. This helped speed up the final approval process. The design process started in 1998 and the first gauges were shipped in the Summer of 1999."

New Gauge Available On Entire Product Line

According to Ryan, "The new gauge design is now available on Finite Division's entire H Series product line. It is being used as standard equipment on about 80% of the H Series Coalescing Filter product line now on all ports that are 3/4" and up to 3". The gauge is an option on our 1/4", 3/8" and 1/2" port filters. We have also been able to lower

the cost of the gauge on products where the gauge is an option. The gauges are being shipped all over the world and in the first 8 month of full production we have not had one gauge returned. We are providing our customers with added value in product performance at less cost. From a competitive standpoint, we feel we have also advanced the industry with a new standard of quality in a filter monitoring gauge.



Finite Division Headquarters
Parker Hannifin Corporation

Company Profile: Finite Filter Division Parker Hannifin Corporation

The Finite Filter Division of Parker Hannifin Corporation is a world leader in micro

glass filtration technology for compressed air and gas systems. Finite designs and manufactures compressed air and gas filtration

products for general industrial, fluid power, instrumentation, natural gas and micro-electronics markets.



Company Profile: Company: Mid-West Instrument

Location: Sterling Heights, MI

Founded: 1958

Management:

Fred Lueck, President

Michael Lueck, VP Eng. &

Quality Assurance

James Lueck, VP Manufacturing

Employees: 45+

Plant Size: 36,000 sq. ft.

Products: Differential Pressure Gauges, Switches, Indicating Switches, Portable Flow Measurement & Back Flow Test Kits, Delta Tube-Averaging Pitot Tubes, Pulsation Dampeners & Pressure Limiting Valves

Markets: Serving all basic air and fluid industries.

Product Distribution: International, All industrial areas of the world.

For more information on
**Mid-West Instrument
Differential Pressure
Gauges**
contact:

Mid-West Instrument

6500 Dobry Drive

Sterling Heights, MI 48314 U.S.A.

Toll Free: 800-648-5778

Ph: 810-254-6500

Fax: 810-254-6509

Web Site:

www.midwestinstrument.com

E-mail:

sales@midwestinstrument.com