THE CLARIFIER

Includes issues from 1995-1998 *March 1998*

This issue offers a collection of past *Clarifier* articles related to aviation and fuel handling.

CDF® Cartridges at Continuous Low Flow

Velcon has reviewed test data on its CDF cartridges, and recommends the following:

1. CDF cartridges should not be used continuously below 25% of the rated capacity. For example, the CDF-230K cartridge has a rated flow of 30 USGPM - this cartridge should not be used continuously below 7.5 USGPM.

2. Record differential pressure at all times at each fueling. Refer to the chart below to determine the cartridge change-out differential pressure. This chart shows the recommended change-out differential pressure for reduced flow rates.

3. For multi-fueling operations, rotate the refuellers or hydrant carts to guarantee that a single vehicle is not always used at low-flow rates. If a vehicle is used continuously at low-flow and change-out differential pressure curve is not used, and a vehicle is suddenly used at a high-flow rate, it could result in an extremely high differential pressure.

4. Our concern on flow rates does not apply to normal fueling operations - in almost all instances it is recognized that the fueling rate for an aircraft changes during the fueling operation - and does not present a problem.

5. Please note that Velcon plans to

See "CDF® Cartridges" on page 2

The JFK Airport fuel farm underwent reconstruction to achieve greater efficiency.

JFK Airport Receives a Face-Lift

New York's JFK Airport recently completed a major remodeling at its fueling system. The need was to protect the airport fuel system from dirt, water, and the possibility of ruptured elements. The design had to be able to handle anything a pipeline could throw at it, and it had to be able to do all this simply, cheaply, and automatically.

The job was rated at 2,450 gpm. Velcon designed a custom F/S vessel model to meet the requirements. The vessel is now a standard production vessel (P/N VV-4356150, prefilter P/N VF3644150).

There is a combination of two filtration banks, each made up of a prefilter and filter separator. Each bank handles the full system flow rate. The system normally flows through only one bank. If that bank experiences high differential pressure or a trace of water, the system shifts to the other bank. If that second bank experiences high differential pressure or a trace of water, both filter banks are automatically activated, reducing flow through each bank by half. If water builds up, automatic drains remove it. If too much water builds up, the slug valves close, protecting the fuel farm.

The tanks involved are floating roof tanks, with no fixed roof. We did not use oversized vessels, we used two parallel vessel banks and achieved the same goal with our control system.

The new system has prevented the infiltration of contaminants and reliably removed water, protecting the tankage.

Plans are now underway for a total of three such systems at JFK, and other bases have expressed interest in this design.⌘

**** Thanks to Jim Gammon for his assistance in writing this article.***

September 1997

Commissioning Cartridges

In our May 1997 issue of **The Clarifier**, we referred briefly to the commissioning cartridges in the "Frequently Asked Questions & Answers" section. In general, we strongly recommend that any filter vessel in line during initial commissioning, or the initial system "flush", be fitted with a full set of filter cartridges.

The reasoning for the cartridges initial "flush" is to ensure that the pipe scale, dirt or other particles do not get downstream in the outlet chamber of the vessel or caught in "pockets" of the downstream pipe. Once caught in the outlet chamber or downstream pipe, it takes literally "forever" for these particles to work themselves loose. And when they do, they can cause problems for downstream meters, equipment and airplanes (or lead to suspicion that the filter elements are bypassing).

If a customer wants to install a set of less expensive commissioning filters in place of coalescers in a filter/ separator vessel, we offer the following inside-to-out flow filter elements:

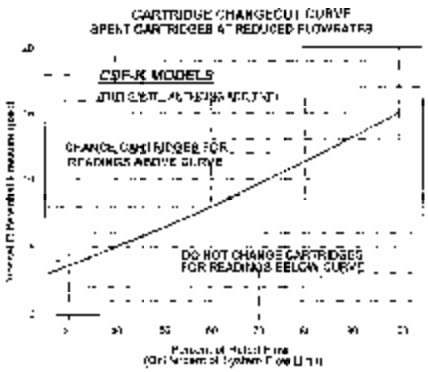
Open-Ended:	**Threaded-Base:**
FI-622FG5	FI-633FG10TB
FI-644FG10	FI-644FG10TB
FI-644FG5 ⌘	

January 1998

CDF® Cartridges

Continued from page 1

conduct more low-flow rate testing of CDF cartridges. We will keep you informed on any data that develops during these tests. ⌘



January 1998

Clay Treatment Material

In the present and existing literature on the clay material Velcon uses in our clay treatment canisters, we refer to either 50 to 80, or 60 to 90 mesh size. We are unable to get these mesh sizes any more.

We have run laboratory and field tests on the 30 to 60 mesh size that can be supplied and have found that efficiency and life of the 30 to 60 mesh size clay is similar to that of the 50 to 80 mesh clay. Therefore, the clay canisters that we are now producing, our CO-718CE and CO-618CE, both contain the 30 to 60 mesh size clay.

This 30 to 60 mesh clay is the same type of clay used previously, just sieved to a slightly larger mesh size. It is attapulgus clay, Low Volatile Material (LVM), sometimes referred to as "fuller's earth". Please refer to our Velcon data sheets 1222, 1223 and 1231 for further information on clay vessels, clay treatment, and clay elements. ⌘

January 1998

Revised End Caps on CDF® Cartridges

Velcon has qualified to the IP Specifications new end cap material and epoxy for bonding the end caps to the CDF cartridges. The end caps are made of glass-filled nylon material. The caps are adhered to the filter media with a two-part epoxy. This end cap material and epoxy are the same as presently used in our I-6xx85/87TB series end caps.

We will begin manufacturing the CDF's with the new end caps and epoxy in February 1998. The end caps will appear slightly different (less "shiny") than our present acetal end caps. ⌘

January 1998

The VF-609 is Now Available

The VF-609 is a versatile filter housing designed for use with several different high performance ***Aquacon*®** filter cartridges.

The unit features include:

• Positive Water Removal • Positive Water Holding • Pressure Increase • Effective Dirt Removal

Applications include:

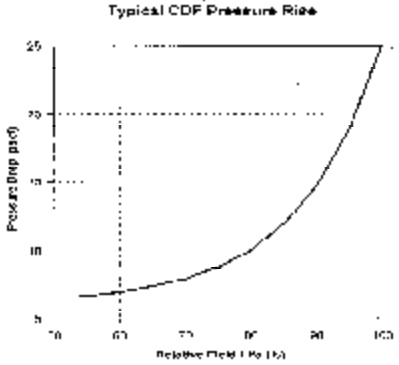
• Jet Fuel • Avgas • Motor Gasoline • Diesel Fuel • Selected Solvents

For more information, please contact a member of the Order Entry Department. ⌘

September 1997

Changing out of CDF®Cartridges

A major oil company has requested we address the subject of differential pressure, particularly when a major refueling is approaching. If the differential pressure has reached 23 psi and changeout is at 25 psi, it can be seen from the curve below that the time interval between 23 psi and 25 psi is only 3-4% of the cartridge life. In this instance, it may be prudent to change the cartridges at 23 psi, rather than have 25 psi reached during refueling of an aircraft. ⌘



May 1997

Threaded Base Filter Elements

We have had a number of threaded base filter elements available for over four years, but we're still surprised by customers (and some Distributors!) who are not aware of them. The advantages of threaded base filter elements are much easier installation and removal, plus the easier cleanout of the deckplate. (Just think of the "fun" in a vertical vessel with all the long tie rods when it comes time to remove the accumulated dirt from the deckplate before installing the new open end filter elements!!)

Here are the model numbers of the available threaded base filter elements:

FO-629PLF2TB
FO-629PLF5TB
FO-644PLF1/2TB
FO-644PLF1TB
FO-644PLF2TB
FO-644PLF5TB
FO-644PLF10TB
FO-644PLF25TB
FO-656PLF2TB
FO-656PLF5TB

These threaded base filter elements screw easily onto the Velcon 6000T screw base adapters. Existing filter vessels with the 6" OD, 3-1/2" ID open end elements can easily be modified to the screw base adapters and threaded base elements. Try it! - You'll like it!! ⌘

May 1997

Aquacon® ACI Series with Threaded Base Ends

There is an extensive line of newly qualified ACI series cartridges with threaded base ends now available. Using these cartridges eliminates the need for additional hardware thereby easing the conversion process in filter/separator vessels. ⌘

September 1997

Swimming Pools and Float Controls

How many readers are aware that some refueler vehicles at airports around the world also serve as "Swimming Pools"? Not intentionally, of course, and the only things "swimming" in them are dead birds, bugs, leaves, etc. We personally saw a 3" bug in one "pool" a year ago on one refueler in South America.

These "swimming pools" form when leaves and other matter (possibly ice and snow) plug up the hoses attached to the inside corners of the guard rail around the top of the refueler. The guard rail protects the dome covers from being crushed in the event of a refueler turnover.

If the hoses from the inside of the guard rails plug up, water will accumulate inside of the guard rails during the next rain or snow. Then, next time the refueler pumps fuel into an airplane, water enters the fuel tank through the open vents in the dome covers.

AHA! But if water gets into the refueler tank, and reaches the Filter/Separator vessel, it will be coalesced out of the fuel. True, but too much water in the vessel will eventually pool around the separators; then it will be forced downstream into the plane.

HOWEVER, we know that properly designed F/S vessels on these refuelers (at least the ones meeting the ATA-103 Spec.) will have a Water Defense System in conjunction with the API-1581 qualified F/S. How many of these water defense systems are checked periodically to ensure they work properly??

We know of at least 3 occasions where float controls and/or electronic water sensing probes were not functioning properly, and LOTS of water got onboard the airplanes (one within the last 6 months). We also hear that one or more of these water defense systems may have been intentionally bypassed by some "sharp-witted" operator.

So, you can see the connection between "Swimming Pools" and "Float Controls" on your refuelers. Ensure "swimming pools" can't form on the tops of your refuelers, and ensure your water defense systems work properly.

Because some companies have been concerned about improper checking/working of the F/S water defense systems, more and more refueler and servicer F/S vessels are being converted to the IP Monitor Specification qualified ACI-6xx01CTB screw base ***Aquacon***® cartridges in place of the coalescer elements. Conversion is easy - no hardware needed when switching from a screw base coalescer to the screw base ACI-6xx01CTB cartridge. Try it - you'll sleep better at night, and you will have a "warm, fuzzy" feeling when flying overseas on one of those ETOPS flights. ⌘

September 1997

JP8+100

JP-8+100 is currently being delivered into-plane at approximately 40 US Air Force and Air National Guard bases. The +100 additive was originally designed to increase the thermal stability of the JP-8 fuel by 100 degrees F. It also keeps the fuel systems in certain aircraft (such as the F-16, F-15, T-38, etc.) clean and decreases the maintenance time on the engines. A big cost savings!

Velcon's ACI-44001C (national stock no. 4330-01-439-2319) and ACI-63301CTB (national stock no.4330-01-439-2314) ***Aquacon***® cartridges are used by the Air Force when the +100 additive is injected into JP-8. ⌘

September 1997

Velcon Filters Inc. CO-718CE Clay Canisters

Direction of flow is from out side to inside. Maximum rate of flow per canister is 7 USGPM. The lower the flow rate, the better, since the longer the residence time (time of contact between the fuel and the clay) the more efficient the clay becomes in removing surfactants.

See Velcon Data Sheets 1223 and 1231 for technical details on the clay and CO-718CE cartridges. See the ASTM Manual No. 5, Manual of Aviation Fuel Quality Control Procedures for more information on clay treatment.

It is emphasized that clay treatment is not a mechanical filtering process. The clay adsorbs surfactants from the fuel in a surface attachment process. This can be likened to magnetic attraction of magnetic particles by a magnet. Because it is not a mechanical filtering process, relying on differential pressure buildup to change clay canisters is not reliable. Monitoring the MSEP or Swiftkit values upstream and downstream of clay is the only reliable indicator for predicting when to change clay. If the differential pressure across a clay treatment vessel reaches 15 psid, it has long ago stopped removing surfactants and is now an expensive, and not too efficient prefilter.

Care should be used when removing and installing clay canisters to insure against bypass or tearing of the outerwrap. When removing the canisters when they are stacked 3-high, for example, remove one canister per tie rod carefully so that the outer wrap does not scrape adjacent canister end caps. If there are 31 stacks or tie rods in the vessel, remove the top 31 canisters. This will help prevent tearing of the outer wrap and spilling of spent clay in the vessel bottom, which could increase time spent in cleaning the deckplate before installing the new canisters.

After the old canisters are removed and the deckplate is cleaned, install the bottom tier of 31 canisters carefully. Do not drop the canisters in place, but lower them carefully to insure proper centering on the mounting adapters. Then install the center plates, and the next tier of canisters, etc.. ⌘

September 1997

Paper Cone Inserts for Nozzle Screens

There have been a couple of Distributors who have reported fine particulate matter downstream of the final filter in low flow Jet Fuel or Avgas systems. This particulate matter is usually generated by rust from "black iron pipe" or other matter in the system. These original systems were not designed to meet todays requirements. Currently, stainless steel or steel pipe with an internal epoxy coating is used.

Jim Slaughter of Eastern Aviation Fuels proposed a paper cone insert to be installed in the 100 mesh nozzle strainer. We have since produced three different sizes of these paper inserts using 5 micron paper. The available part numbers are: FI-CONE5, FI-CONE5L, and FI-CONE5LL. Admittedly, these are "bandaid" fixes to poorly designed systems, but Jim advises they take care of the problem, protecting the airplane.

If anyone else wants to use the paper inserts in the nozzle screens, just send back the screen, advise the quantity of inserts, and we'll work up the inserts and mail back with one installed in the screen. Prices are available from your friendly Velcon Distributor. ⌘

May 1997

Synthetic Separators Now Available

Velcon successfully passed a Group II, Class B series of tests in a vertical test vessel with our long-lasting 85 series coalescers and new construction synthetic media separators. The separators in the test were model no. SO-644CSN. Flow rates for both the coalescers and separators are higher than previous Group II, Class B tests.

The synthetic separators are intended for those customers who want a low-cost, disposable, low static charging separator. The synthetic separators can be cleaned a maximum of two times.

API qualified flow rates in vertical Class B vessels with the synthetic separators will range from 209 to 1670 USGPM. Thus, most of the Class B vessels in the field can be retrofitted with the synthetic separators.

If you have a specific vessel you want to convert to synthetic separators and would like a Qualification Data Sheet, contact Rick Waite at tel: 719-528-7250 (fax: 719-531-5690) with the applicable vessel info (vessel model no., desired flow rate, and presently installed qty. and model numbers of coalescers and separators). ⌘

January 1997

Testing is Complete

Repeller™

Velcon recently passed an API Group II, Class B series of tests with our horizontal Filter/Separator using the new synthetic separator, the Repeller. Now qualified for flow rates up to 2,000 GPM, these separators used with appropriate coalescers can be placed in the Facet horizontal vessels. For similarity reports fax the details of the vessel, model number, desired flow rate, etc... and we'll provide you with the information you'll need for the conversion. ⌘

September 1997

Pre-Filter Confusion

In the March 1994 issue of **The Clarifier** we talked about the sizing of pre-filter (micronic) vessels. Quick summary: oversizing of the pre-filter vessels results in better efficiency of the elements; and it extends the time between element changeouts, which is an economic advantage for the terminals and refineries where available man-hours for element changes is at a premium.

Most manufacturers offer pre-filter elements in different nominal efficiencies, ranging from 1/2, 1, 2, 5 micron and higher. The lower the nominal micron rating, the "tighter" the element; and also the lower the nominal micron rating, the more expensive will be the element.

The question is often asked: "How much dirt will this xx micron rated element hold?" We filter manufacturers "dance around" this question because the particulate matter encountered at one location may be considerably different at another location. The particulate matter (size and type of particles) can also vary at a given location, depending on the source of the product (may get receipts from multiple suppliers). Barge deliveries and multi-product pipeline deliveries will probably result in more particulate matter.

To give an estimate to the customer, we say that "normally" we expect a 6" OD by 14-1/2" long pleated paper filter element to hold about three pounds of dirt before it gets plugged to 15 psid. The actual amount of dirt the element will hold depends on size of particulate (the smaller the particle size, the faster it will reach 15 psid); the depth of media (the thicker the depth, the more fine particulates it will hold for a given surface area); the type of particulate (the softer or "slimier" the matter, the faster it will reach 15 psid). Other factors, such as excess additive levels in the fuel can also plug up elements faster.

So, you can see we can't apply "rocket science" to our predictions of element life. We guess three pounds of dirt for a 14-1/2" long element, or nine to ten pounds for the 44" long elements, and then advise the customer that actual dirt removal before reaching 15 psid is dependent upon conditions at his site.

Many years ago the common pre-filter nominal micron rating for Jet Fuel and Avgas was five micron. We recommend the five micron filter for diesel, and it may be acceptable for Avgas, but we have switched our recommendations for Avgas and Jet Fuel. For Avgas, we recommend the two micron pre-filter. We have found that our two micron pre-filters result in about the same life as our five micron filters. We guess this has to do with the depth of the paper in the two micron elements.

We used to recommend the two micron pre-filters for Jet Fuel, but with the development of the API-1581 3rd edition qualified coalescers (our nominal 0.3 micron rated 87 series coalescer, and our 0.5 micron rated 85 series coalescer) we recommend the customer start with an oversized pre-filter vessel containing the one micron elements. If the customer still experiences frequent downstream coalescer changes, then we recommend he install the 1/2 micron elements.

The half micron pre-filter elements are more expensive, but field experience has shown that they usually out-last the one micron elements before changeout at 15 psid. Once again, this is due to the thicker media in the 1/2 micron elements. More and more customers have switched to the 1/2 micron pre-filter elements for Jet Fuel.

> "Using prefilters with larger micron rating than the coalescers is like trying to keep animals out of your house with a chain linked fence. It stops the dogs and cats, but the mice walk right in."
> *Howard Gammon, Gammon Technical Products*

We have also added more of the threaded base pre-filter elements to our product line. This makes it easier for changeouts (see accompanying article). We recommend installation of the single length threaded base or open-end filter elements for three reasons:

1. faster and easier installation;
2. less expensive than stacked, shorter elements;
3. less gasket seals to minimize bypass possibility.

We still get customers who complain about elements plugging up too fast when they insist that their fuel is "clean". Occasionally they want "more-open" filters to prolong the life. We hate to see this proposed in an Aviation Fuel system, because all they are doing is letting the dirt get closer to the airplane. The general QC principle in removing dirt and water from Aviation Fuel is to keep it as far away as possible from the plane. ⌘

Anti-Icing Additive - a Filter's Viewpoint

Anti-Icing Additive (sometimes referred to as AIA, FSII - Fuel System Icing Inhibitor, EGME, the new Di-EGME, Prist, or other tradenames) is intended to be added to aviation fuel (either Jet Fuel, or Avgas) to prevent water from freezing in flight, which could fuel starve the engine(s). Sometimes the Anti-Icing Additive is injected upstream of the filters, and sometimes is injected downstream of the filters. A lot of aviation fuel never sees AIA.

We want to point out some precautions to take when the AIA is in the fuel upstream of the filters. If the fuel contains some amount of free water which is coalesced out of the fuel in a filter/separator vessel, the free water which collects in the sump will have a good percentage of AIA in the water (we've heard as high as 25% or more). This water/AIA mixture, if left sitting in the sump too long (how long we don't know) can start working against the epoxy at the bottom of the vessel (or the aluminum in an all-aluminum vessel). Drain the vessel DAILY or more frequently if water is normally found in the sump to prevent epoxy bubbling away from the sump, which would result in rusting, or eating away the aluminum.

If the sump samples of fuel are hazy in appearance, with discolored water below (a brownish color, normally), it is a good bet that the coalescers are disarmed, and possibly by the AIA. If in doubt, have a single element coalescing test done on one of the coalescers. A clean appearing element can be disarmed.

If you have monitor elements (e.g., CDF's, ***Aquacon's***, or other water absorbing cartridges) in fuel containing AIA, our recommended changeout differential pressure is 15 psid. In fuel without AIA, or where AIA is injected downstream, the CDF's and ***Aquacon®*** cartridges can go to 25 psid before changeout.

If a filter manufacturer is asked to recommend where AIA should be injected, the answer will always be downstream. If you have no choice and it is already in the fuel, please check the sump samples for appearance and drain DAILY (or more frequently)!

Thanks to Walter Chartrand of Hammonds Technical Services for his review of this article. ⌘

January 1997

ATA-103 Acceptance of Full Flow Fuel Monitors

In our July 1996 CLARIFIER, we listed the reasons for the increasing installation of monitor vessels versus the traditional filter/separator vessels on refueler and servicer vehicles for into-plane fueling.

The 22 July 1996 reissue of ATA Specification 103, Standards for Jet Fuel Quality Control at Airports, states: "All aircraft fueling equipment must have a Filter/Separator or a Full-Flow Fuel Monitor." "Full-Flow Fuel Monitors must meet IP "Specifications And Qualification Procedures - Aviation Fuel Filter Monitors With Absorbent Type Elements", latest edition." "Full-Flow Fuel Monitors, when used in systems with static fuel pressure in excess of 180 psig, must be equipped with a differential pressure device which will prevent excessive inlet pressure from rupturing elements in the event of complete blockage."

The previous edition of ATA-103 allowed the full-flow fuel monitors, but only "with the written approval of the airline, which must be maintained on file by the vendor." The latest ATA-103 removes this written approval requirement, effectively giving approval for the use of IP qualified monitors on into-plane fueling equipment. ⌘

January 1997

Re-Epoxying of Existing Filter Vessels

Upon inspection or at normal element changes of older filter vessels in the field (clay, pre-filter, or filter/separator vessels) many of you have seen rusting at the bottom and/or sides of the vessels, with the epoxy coating chipped away. What is the procedure to re-epoxy coat these vessels? We have found that the "quick-fix" of re-epoxying the vessel in place usually does not result in reliable epoxy coating.

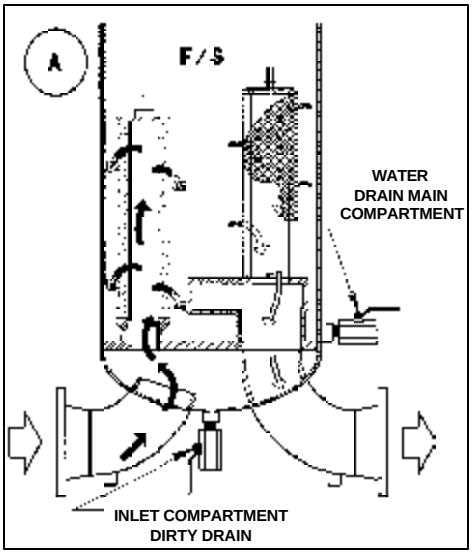
If a customer wants to re-epoxy the interior of an existing field vessel, we recommend the vessel be removed from the installation, and shipped to a shop that has sand-blast and epoxy paint facilities. To meet API-1581 requirements for the epoxy coating, the epoxy should meet the MIL-C-4556E specification.

We have found by "trial and error" that once the vessel is in the shop, this is the recommended procedure to get a proper epoxy coating:

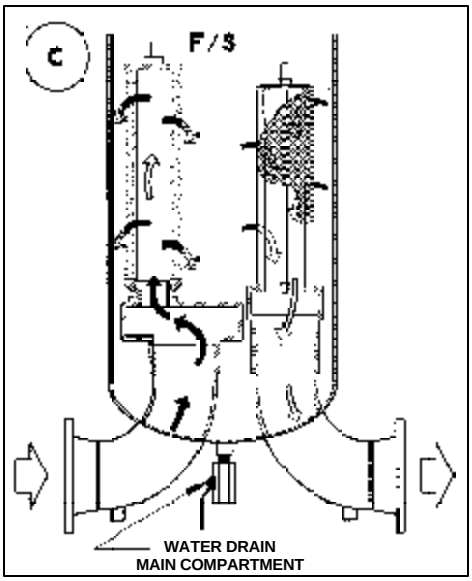
A. Sand-blast the vessel interior to "white" metal.
B. Allow the vessel to sit in the hot sun for a few days, or apply heat to the inside of the vessel. This step is very important as it draws out residual fuel from the metal. If the vessel was to be re-epoxied right after the initial sand-blast, this residual fuel in the metal will eventually bubble the epoxy away from the metal, resulting in cracked epoxy and rusting. This could occur within three to six months.
C. After the vessel has had the residual fuel "baked-away" (the metal now is free of water) a quick second sand-blast is applied.
D. The sand-blast material is removed, and the epoxy coating is applied in two layers, per the epoxy manufacturer's procedures.

Including shipment to and from the field location, the vessel may be out of service two to four weeks. Velcon can advise price and timing to re-epoxy existing field vessels. ⌘

May 1997



Schematic A *shows the F/S vessel with the coalescers mounted on a flat deckplate, and the separators on a manifold. The water drain is on the side. On older vessels, the water drain was also at the bottom, but it was offset from the center of the vessel.*

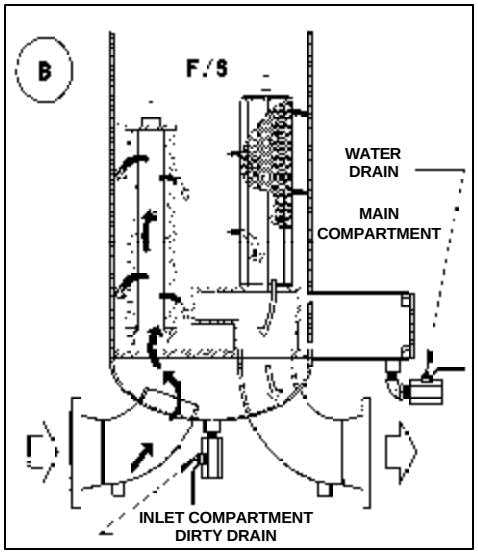


Schematic C *shows the coalescers and separators mounted on manifolds. There is only one drain for these vessels.*

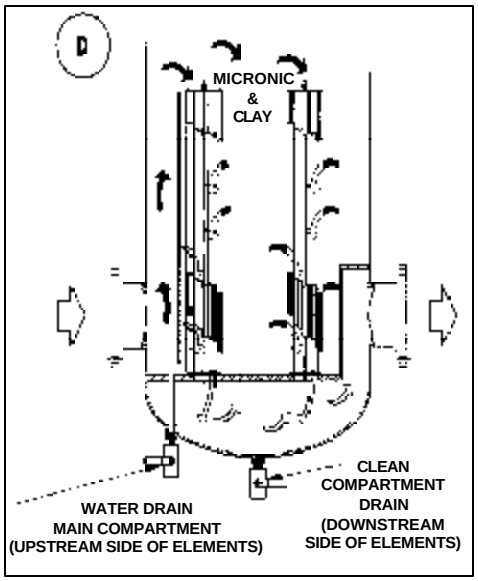
F/S, Clay, & Micronic Drain Function

The diagram shows three different configurations for Velcon vertical Filter/ Separator vessels, and the configuration of our vertical clay and micronic vessels. These illustrations may help to clear up some confusion as to which drain is which. There have been cases where customers have continually drained water and particulate from a F/S vessel only to find out later they were draining the Inlet (dirty) chamber instead of the Water drain (main compartment).

When draining the F/S vessels, after completely draining the main compartment, it is recommended to drain a few gallons from the inlet (dirty) compartment. This ensures that there is no fuel remaining in the coalescers when removed from the 6000T or open end adapters. If not drained from inside the coalescers, the fuel can slosh from the elements onto the deckplate, making the deckplate/ manifold cleaning procedure more laborious before installing the new coalescers. ⌘



Schematic B *also shows the F/S vessel with coalescers on the deckplate and separators on the manifold. The water drain is at the bottom of the float control chamber at the side of the vessel.*



Schematic D *shows the arrangement for vertical clay treatment and micronic (prefilter) vessels. The drain at the middle of the vessel is the clean compartment (downstream) drain. The offset drain is for the main compartment, and is used to drain accumulated water and loose particulate, and for draining the main compartment for element changeout.*

Does API "Certify" or Issue "Approval"?

The question comes up repeatedly as to whether the American Petroleum Institute (API) issues formal Certification or Approval for API-1581 qualified F/S vessel/element combinations. The short answer is "NO".

In the FOREWORD section of API Publication 1581, Third Edition, May 1989, Reaffirmed December 1994, is the following wording:

"The specifications detailed in this publication are for the convenience of purchasers in ordering and manufacturers in fabricating filter/ separators but are in no way intended to prohibit either the purchasers or the manufacturers from purchasing or manufacturing equipment that meets requirements other than those contained herein."

"..the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use .."

Manufacturers can claim QUALIFICATION to API-1581 in F/S vessels that contain element combinations that have been tested to the performance requirements, or meet the exacting Similarity Standards of API-1581. This puts the burden on the vessel/element manufacturers to run detailed performance tests and prepare Test Reports and comprehensive Similarity Data Reports for similar vessel/element com-binations.

It also puts the responsibility on the purchaser to either accept the word of the manufacturer, or preferably request the submission of a Qualification Data Report, more detailed Similarity Data Report, or possibly submission of the comprehensive (30 or more pages) Test Report from the manufacturer. API will not issue certification or approval. Some customers or users occasionally refer to "API Qualified coalescers or separators." This is not technically correct. The Qualification is actually a vessel/element combination. And the "qualified" flow rate for elements (gpm per inch of effective media length) will vary from vessel to vessel, depending on whether the vessel is fixed or mobile, vertical or horizontal, end opening or side opening, etc., etc.! Sound a bit complicated?! Just give our Distributors or our Colorado Springs office a call, and we'll be happy to advise you the most economical API-1581 Qualified vessel/element combination for your filter/separator vessel. ⌘

October 1996

Monitors For Into-Plane Refueling Equipment

We have seen a shift in the purchase of more monitor vessels versus the traditional filter/separator vessels for installation on refueler and servicer vehicles for into-plane fueling.

There are a number of reasons for this:

1. The monitor vessels with the CDF® cartridges are smaller in size, making it easier for the builders to assemble the vehicle.

2. The monitor vessels are lighter in weight, putting less of a load on the chassis.

3. The monitors do not need a water defense system, such as the float control or water detecting probe and slug valve. These require some attention to insure they will work properly in the event of a water slug. They also increase the initial cost and take up more space on the vehicle. The monitors with the CDF cartridges automatically provide the water defense system.

4. The CDF cartridges do not become disarmed by surfactants, as can occur with coalescer and separator elements.

5. The IP Monitor Spec. qualified monitors with the CDF cartridges are also qualified to withstand at least 175 psid before bursting. Coalescers are only certified to a burst strength of 75 psid. This difference in burst strength may have prevented a problem a few months ago at an airport in Africa where excess dirt and pressure burst coalescers, allowing lots of dirt into airplanes, with expensive airplane engine and fuel tank overhaul.

We see a number of companies specifying more monitors for the refueling vehicles. The users may occasionally grimace when the elements stop the flow, but they appreciate their dependability when they find that the flow stoppage is due to an unexpected water slug from an improperly purged hydrant line, improperly drained refueler tank, leaking fuel tank, etc.. Sure saves a lot of grief from dirt and water getting to the plane! ⌘

July 1996

CDF® Monitor Vessels

For a number of years the CDF Monitor Vessels that Velcon offered were fabricated entirely of aluminum (e.g., AHM-1230M; where the A was for aluminum, H for horizontal, M for Monitor, 12" nominal diameter, 30" long CDF's, and the M suffix is for Mobile equipment). We now offer these vessels made entirely of aluminum; or with carbon steel shells (epoxied interiors) and aluminum manifolds. The carbon steel vessels are considerably less costly than aluminum and are not much heavier. Both the aluminum and carbon steel monitor vessels are built to meet the Institute of Petroleum (IP) Monitor design and performance specifications. The numbering system is the same as the aluminum vessels above without the A prefix.

Companies specifying monitor vessels on their refuelers/servicers will be pleasantly surprised at the lower cost of the carbon steel monitor vessels versus aluminum monitor vessels. ⌘

January 1997

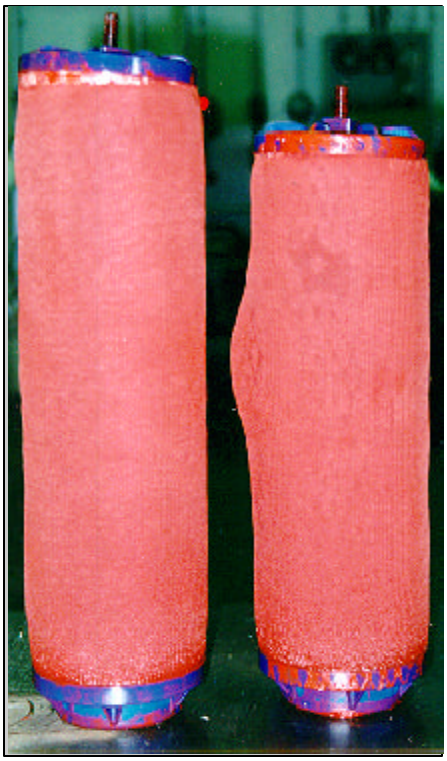
Visit Our Site on the Internet

Learn more about Velcon Filters by visiting our web site. We can be found at http://www.velcon.com. If you would like to place an order or send a message to us, our e-mail address is: vfsales@velcon.com. We're looking forward to hearing from uou.⌘

October 1996

Do You Have Burst Coalescers?

Recent incidents in different parts of the world point out that a number of operators do not know how to determine if they have burst coalescers. Differential pressures that exceed 15 psid, coupled with subsequent surge pressures, can exceed the burst strength of the coalescers.*



If the differential pressure (delta P) was rising to 15 psid or beyond, and subsequent readings show lower delta P readings at the same or higher flow rate, you can bet your hydrant servicer that one or more coalescers in the filter/separator vessel have burst.

When the strength of the coalescers is exceeded, and one or more coalescers burst (usually not all of the elements burst), there is no obvious visual or audio alarm to the operator. The vessel does not jump up and down and flow does not stop. Rather, contaminant from the burst elements proceeds quietly downstream, possibly right into the aircraft. (This did happen a few months ago and dirt was loaded onto more than one airplane! The planes got airborne and did not know of any problem until the filter blockage lights lit up on the warning panel. Although the planes were able to land safely, we suspect there were some very expensive engine, fuel system, and fuel tank overhaul costs.)

A F/S sump check after fueling the aircraft would have shown a problem with dirt. A delta P check would also show something wrong. The Gammon delta P limiter function, tied in with the differential pressure gauge would have prevented the burst coalescers. It may have eventually stopped the into-plane fueling, but better a delay at the airport than in-flight engine stoppage!

So, if you think you might have burst coalescers, how do you identify them?

- Check the water drain sump sample. Dirt here shows there is a problem.
- Drain and open the vessel. Collapsed and/or dirty separators will tell you there are burst coalescers.
- Burst coalescers are not so obvious. Sometimes there is only a slight "bubble-effect" on the outside sock and/or the end caps may be cracked.
- The sock may be torn, but not always. If you see a torn sock or "bubble" on the sock, remove the coalescer, cut away the sock and the foam. The torn screen outside of the fiberglass layer is proof of the burst coalsecer.

** The Velcon quality control requirements on the coalescers exceeds 75 psid.* ⌘

October 1996

The Kuala Lumpur International Airport located in Sepang, Malaysia is scheduled to open in 1998. The Velcon manufacturing plant located in Harlingen, TX is supplying a variety of equipment including: Filter/Separators, Filter Vessels and Clay Vessels. Pictured above is a portion of the first shipment which left Texas October 15. The second shipment is scheduled to leave in mid November. Stay tuned to the December issue of ***The Clarifier*** *for an update.* *October 1996*

Do API 1581 Cartridges meet MIL-F8901E?

The question is often asked if API-1581 "qualified" cartridges meet MIL-F-8901E.

MIL F-8901E is both a performance specification and, to some degree, a design specification. Paragraph 3.4.2 of MIL-F8901E states: "The filter-coalescer element shall be the standard military element (NSN 4330-00-983-0998) conforming to MIL-F-52308." The MIL-F-8901E also goes on to specify certain separator elements. Thus, to be in strict conformance with this specification, we would have to supply the NSN 4330-00-983-0998 coalescers, i.e., our I-4208C coalescers.

API-1581 is the commercial filter/separator performance specification. This is similar in a number of ways to MIL-F-8901E, but API-1581 is a more difficult set of individual test parameters. The big difference between these two specifications is that API-1581 requires the use of I-116 Red Iron Oxide in all the tests, including the double-inhibitor single element test, Series Three. In MIL-F-8901E, the inhibited test uses AC Coarse test dirt, making the military inhibited test much easier to pass than API-1581 Test Series Three. We have run API qualified elements to MIL-F-8901E, and they easily pass. However, the DOD elements qualified to QPL-52308 (MIL-F-8901E) will not pass the more difficult requirements of API-1581.

We have run numerous tests to API-1581, Group II, Class A, B, and C requirements. The U.S. Air Force and the U. S. Navy, aware of the differences in the two performance specifications, accept that if a vessel is qualified to API-1581, Group II, then that vessel/element combination will also be accepted as qualified to meet the effluent quality requirements of MIL-F-8901E.

In summary, we can state that our Velcon vessel/element combination meeting the similarity requirements of API-1581, will meet the effluent requirements of MIL-F-8901E.

October 1996

Spanish Posters Now Available

Velcon Filters, Inc. is proud to present to our Spanish speaking customers the "Safe and Sound" and "Pure and Simple" posters in Spanish.

The first poster,"Pure and Simple" features a full color design detailing fuel handling and delivery techniques. Important checks required by Air Transport Association of America, ATA-103: Standards for Jet Fuel Quality Control at Airports. Also included are guidance tips on how to detect contaminated AvGas or Jet Fuel. Written in easy to understand language.

"Safe and Sound," the second poster in the series, is also a full color poster detailing common problems in fuel filtration equipment and how to troubleshoot them. The poster describes proper operation of eight important filter system components including: Differential Pressure Gauge, Automatic Air Eliminator, and Sump and Drain Heaters.

For more details, please phone 800-583-1178.⌘

July 1996

It appears this person has not seen the Velcon video on coalescing. Many of you chuckle when you see the segment on not touching the sock with bare hands, especially when they are greasy! However, we've just received this element into our lab for testing.

If you would like to receive a complimentary copy of the video, please phone us and we'll send you one right away.

July 1996

Torque Recommendations 6000T Adapters and Velcon Coalescers

Recently, a broken anti-rotation adaptor lug was found inside a Velcon vessel with the 6000T screw based adapters installed. Though this is rare, improper installation of adapters and coalescers may result in element and /or hardware damage, or bypass. During the next filter inspection or changeout, the vessel should be checked to insure that all 6000T anti-rotation adaptor lugs are intact (not broken) and that all adapters, elements, and bolts are installed in accordance with the manufacturer specifications.

INSTALLATION SPECIFICATIONS

Velcon 6000T Adapter
Installation torque on 6000T Adapter: 15 ft. lbs.
Under torquing can result in loose adapters, bypass, and possible breakage of lugs during installation or removal of coalescers. Over-torquing can result in broken spokes of the 6000T adapter, with the same results above - loose adapters and broken lugs.

Velcon TB Coalescer
Installation torque onto 6000T Adapter: 30 ft. lbs.

Caution: In view of the above data, field personnel should be cautioned that manufacturer installation torques must always be utilized. Remember that too much torque may result in equipment failure, too little torque may result in bypass - hence proper torque is imperative. ⌘

December 1995

Velcon Completes Testing

Velcon Filters, Inc. has successfully completed two additional API 1581qualification tests of its 42" diameter Filter/Separator test vessel.

Qualification was done with the Group II Class B vertical vessel VV-4256 at 2052 USGPM with the high performance, long-lasting, 85 series Coalescers and the new "BZ" paper separators. This qualification allows replacement elements to be used for those vessels where disposable pleated paper separators are desired.

Qualification was also successfully completed with the Group II, Class A vertical vessel VV-4256 at 2202 USGPM. The 85 series coalescers and V series separators were used. The test allows qualification by similiarity of vessels up to 4404 USGPM for Class A service. Testing was conducted at Velcon's indoor jet fuel testing laboratory.

The 85 series coalescers are used to coalesce emulsified water and remove solid contaminants from hydrocarbon fluids. The largest single application is the filtration of aviation jet fuel. ⌘

October 1996

API-1581 Qualification for "DOD" F/S Vessels

Velcon has successfully qualified a vertical Department of Defense (DOD) Filter/Separator vessel to API-1581, Group II, Class B (and Class C) conditions at 600 USGPM with our I-44087 coalescers and 2nd stage TCS separators.

A large number of DOD F/S vessels have been converted to API-1581 at various military bases in order to get the extra protection provided by the API-1581 qualification with the I-44087

See "API-1581" on page 12

Ballast Type Float Controls Now Recommended

Ballast float controls are recommended in place of the normal float controls. With the ballast-type float control, a 10 second test of the push-button or lever will also test the buoyancy of the float ball. No need to introduce water into the Filter/Separator vessel or remove the float control to test buoyancy of the float in a bucket containing water. The ballast-type floats cost a bit more, but they are a major improvement over the standard design. And, they can be retrofitted to replace the existing standard float controls on the Filter/Separator vessels. ⌘

December 1995

Recent API Qual Test

In August of 1995 we ran a successful API-1581 qualification test to Group II, Class B conditions at 2500 USGPM in our VV-4256 test vessel with 18 each I-65485TB coalescers and eight each SO-646V separators. This test allows us to offer similarity data sheets in similar vertical vessels from flow rates of 625 USPGM up to 5000 USGPM. We've successfully run 31 API-1581, 3rd edition qualification tests and have received orders for large flow rate Filter/Separator vessels based on this test. ⌘

December 1995

API-1581

Continued from page 12

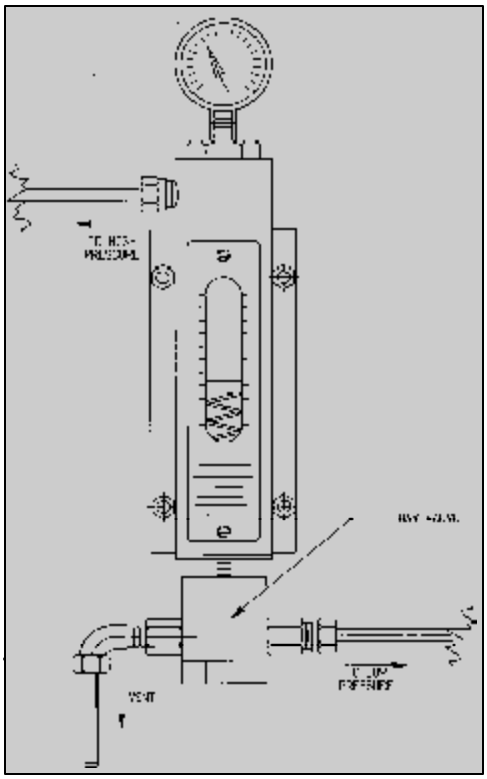
coalescers. The conversions require installation of a Gammon manifold for the TCS separators.

Excess military refuelers with the DOD F/S vessels have been purchased by various FBO's and other into-plane refueling companies. These F/S vessels can also be converted to meet the API-1581 requirements (as specified by ATA-103) with the I-44087 coalescers and TCS separators. ⌘

October 1996

0-15 PSID Delta P Gauges

We recently got involved in a problem where a customer was experiencing burst coalescers, but insisted the differential pressure never exceeded 15 psid. A returned unburst coalescer, from the vessel where one or more had burst, showed a differential pressure (delta P) of 30 psid at the normal flow rate at the customer's location.



Contradictory data?

It was found that the customer had a direct reading Gammon differential pressure gauge on the vessel, with the internal spring and scale set for a 0-15 psid range. The piston was at the bottom of the scale (and sight glass) when the operator took the reading. The top of the piston was at 15 psid, so obviously the delta P was only 15 psid (!?).

You can guess where this is heading! How does the operator, or anyone else, know in this case if the differential pressure is 15 psid, 25 psid, 30 psid, or more??

Velcon recommends the use of the 0-30 psid direct reading Gammon differential pressure gauges. And, of course, changeout of the coalescers at 15 psid delta P. Some operators offer that there is more accuracy in the 0-15 psid range gauges. This is true, but not so important. A few pounds of differential pressure one way or the other is not significant. API-1581 calls for a minimum burst pressure of 75 psid for coalescers. Velcon API qualified coalescers normally exceed 120 psid before bursting.

Our recommendation - if you have the Gammon direct reading differential pressure gauge with the 0-15 psid scale and internal spring, order a new 0-30 psid spring and scale from Gammon Technical Products and revise the gauge to 0-30 psid. This is particularly important for filter/separator vessels at fuel farms where the coalescers will be changed out on dirt buildup versus time. ⌘

July 1996

CDF® Fuel Monitor Cartridge Extracting Tool

Velcon Filters announces the availability of the CDF Fuel Monitor Cartridge Extracting tool. It's a safe, easy, and practical way to remove CDF cartridges. The tool features a collet clamping mechanism with a T-Bar extractor. Quality constructed out of aluminum, this extracting tool fits all Velcon CDF cartridges. Changeout time will be reduced every time because of the sure-fit. If you have additional questions, please contact the order desk at (719) 531-5855. ⌘

December 1995

Glad You Asked...

Answers to frequently asked questions

Q Can coalescers be reused after being allowed to dry?

A If coalescers are allowed to air dry for about two hours or more,and then reinstalled in the F/S vessel, we see a pronounced tendency for the elements to "grape" the water droplets, leading to excess water downstream. Thus, our recommendation is to replace the coalescers if they are exposed to air for more than two hours after being in service.

Exception: In a number of areas where coalescers can quickly develop a high differential pressure due to ice crystals forming inside the coalescers because of low fuel temperatures, a number of operators use two sets of coalescers to "keep the fuel flowing". When one set gets rapidly up to the recommended change out delta P (15 psid), the set of coalescers is carefully removed into a warm room and allowed to "thaw-out". The other set is installed and also changed out at 15 psid delta P, and the "thawed-out" set of coalescers is replaced in the F/S vessel. This swapping of coalescer sets continues until the fuel warms up or the coalescers build up 15 psid delta P due to particulate matter instead of ice. (These coalescers don't get water on the socks - the water is freezing in the pleated media area!)

Caution: Be sure to keep hands off the socks when handling the coalescers and place a plastic wrap over the elements when they are thawing out.

Note: Some operators might ask why not provide heating coils and insulation to keep the vessel warm and ice will thus not form. If you think about the amount of heat needed to warm up a flowing stream of fuel, at about 600 gpm flow rate, you can see (at least the thermodynamic engineers can!) that this is not a feasible solution. However, placing a couple of F/S vessels in parallel in a heated building and alternating flow from one to the other may reduce the workload in swapping coalescer sets. (Aren't you guys in Hawaii glad you don't have this problem?!!)

Q How do shrouds work?

A The shroud acts as the separator stage in a Filter/Separator.The shrouds used in these vessels are composed of two different types of material. The body of the shroud is a water repellant knitted polyester or flannel, while the bottom of the shroud is a fiberglass material. As water is coalesced by the coalescer, it is repelled downward by the body of the shroud which is fitted loosely around the outside of the coalescer. As the water gets to the bottom, it will accumulate, and the fiberglass material will allow it to pass through to the sump of the vessel.

Glad You Asked..

Continued from page 13

Q **Are Material Safety Data Sheets (MSDS) required for the products manufactured by Velcon?**

A The various filter vessels and filter elements that Velcon manufactures meet the definition of "Article" in section 1910.1200 (C) of the Code of Federal Regulations.

"Articles" do not need Material Safety Data Sheets (MSDS) as they are exempt under section 1910.1200 (b) (5) (iv) of the Code of Federal Regulations.

Q **How is the separator installed in vessel VV-1033?**

A The separator model number SI-818 is like a "Top Hat" and fits over the coalescer. Water droplets are repelled and drop in the anular gap between coalescer and separator.

Q **If I have a SPH-2 can it be converted to use an ACO-40901SP cartridge?**

A Yes, by attaching a steel bushing (P/N 08-490), the SPH-2 can be converted to an SPH-3. Permanently fasten with loctite 271. Then thread the ACO-40901SP onto the threaded bushing.

September 1997

Q **Does Velcon have any elements that can be used for commissioning Filter/Separators?**

A We recommend using the FI-6xxFG10TB series which can be used in place of coalescer elements. This ensures that the contaminant is retained inside these cartridges and does not enter the vessels. We also have our FO- 754PL05, which can be used for clay vessel commissioning.

Q **Can the Hydrokit be used in both jet fuel and avgas?**

A No, only jet fuel and diesel.

Q **How much water can the AC-718 series element hold?**

A This element can hold from two-four quarts of water, depending on the flow rates and viscosity of the fluid.

Q **What is the difference between an FO-436GA and an FO-436G?**

A The FO-436GA is five microns and the FO-436G is one micron.

Q **What is the mesh size of Velcon's Teflon element?**

A We use 200 mesh screen which starts off at approximately 72 microns - after teflon coating the aperture is approximately 68 microns.

Q **What is the flow rate of Velcon's ACI-62201C?**

A 89 USGPM - We are in the process of preparing new data sheets which will provide flow rates for both our ACI and ACO elements.

Q **Explain the procedure for reinstalling CDF elements.**

A In the rare case that CDF elements are re-installed we always recommend to fit new 'o' rings.

January 1997

Q **What is the water holding capacity of the following cartridges:**

ACO-62901C ACO-61401C CDF-230K

A The water holding capacity for the ACO-62901C is .75 gallons while the ACO-61401C is 0.375 gallons. The CDF-230K is 85ml.

Q **When you sump vessels should it be done under pressure?**

A According to ATA Specification No. 103, "Perform white bucket test of all working filter sump drains. Drain minimum of one gallon of fuel **under pressure** into white bucket. Immediately report abnormal amounts or condition of contamination to airline, especially if brown colored and/or brackish smelling water samples are observed. Record finding.

October 1996

Glad You Asked..

Continued from page 14

Q What is the shelf life of a filter element?

A First of all, it is extremely important that all elements are kept in their original packing and kept stored in a dry environment and away from the sun. Avoid extreme temperatures and moisture. Also ensure that elements are used in rotation. Most elements if stored correctly should be suitable for use up to five years. It's always wise to check gaskets, examine the seams and end cap adhesive.

Paper separator elements should receive careful attention and should be placed in service within one year of receipt. Some operators will permit paper separators being used up to two years in storage, but only if the elements have been carefully checked for dryness, brittleness and tears in the paper.

Q We were recently asked if clay cartridges can be used to improve fuel thermal stability.

A One of our customers has used clay successfully in their application. We're looking for anyone else who has experienced this problem and what steps were taken. Please contact us if you have any experience on this subject.

July 1996

Q Can we use Velcon coalescers with Stadis 450?

A Yes, API has issued an addendum to API 1581 stating that the test addition rate for Stadis 450 is 3.5 ppm, in place of 3/4 ppm of the discontinued ASA-3. Velcon has completed extensive testing and confirms that the 85 and 87 series are completely acceptable for use with Stadis 450.

Q What is the recommended procedure for filling a filter/separator by gravity flow?

A After filling the vessel by gravity flow, close the outlet and inlet valves, switch the pump on and slowly open the inlet valve to ensure that flow rate is no more than 30% of rated flow. Check that all air has been purged from the filter/separator and then fully open the inlet and outlet valves.

If there is air in a F/S vessel, and the pump is turned on, a fire or "internal explosion" could occur! It is important that all air be removed from the vessel before the normal flow rate is run through the vessel.

Q Can we use absorptive cartridges in place of 56" long coalescers?

A Yes, Velcon has recently completed Institue of Petroleum (IP) tests on its ACI 6XX01C Series for all models up to 56" long. Flow rate is 4 USGPM/Inch. Therefore, a 56" long ACI cartridge will handle a flow of approximately 220 USGPM.

These are just some of the questions that our Engineering Desk has been asked. If you have a technical question, please contact either:

Robin Mason (719) 528-7216
Greg Sprenger (719) 528-7251
Rick Waite (719) 528-7250

December 1995