THE GAMGRAM

No. 9 **FILTER VESSEL ACCESSORIES** **APR. 2013**

Several of the topics discussed here are in other GamGrams. The title of this one is also in GamGram 38. This GamGram is meant to bring all the information together in one place.

Several years ago, there was a bid opening for a new fuel system at a medium sized airport. The engineer was not experienced on Jet Fuel systems and the filtration was not specified in detail.

When the fuel farm was completed, the oil company inspected it. The inspector pointed out that there was no automatic air eliminator, no pressure relief valve, no differential pressure gauge, no sampling connections, no water control and no drain valve.

The contractor's excuse was that the specification said the vessel had to meet API-1581 and the vessel literature said the vessel met 1581. He considered any accessory as "optional". The oil company did not agree.

Accessories are an important aspect of any filter vessel. So what do you need?

Pressure Relief Valve
Every vessel needs a pressure relief valve. This is really just meant to protect the vessel from *Thermal Expansion*. Thermal expansion takes place when the heat from the sun warms a vessel that isn't under flow. The heat causes the fuel to expand, and this can increase the pressure well above a safe level, resulting in leaks or even vessel failure. A pressure relief outlet should be plumbed back to storage, see GramGram 37.

Air Eliminator
An automatic air eliminator is needed in almost all cases. The air eliminator releases small amounts of air, foam or vapor from the vessel. Air in the vessel can easily cause a static fire inside the vessel, possibly even causing an explosion. See GamGrams 7, 15 as well as 37 and the end of GamGram 39. However, some (rare) vessels are designed to not trap air. All air eliminators should be equipped with an outlet check valve with reliable seals, preferable a S/S valve with soft seals. Its outlet should also be run back to storage.

Differential Pressure Gauge
A differential pressure gauge tells you the difference (differential) between the filter inlet pressure and outlet pressure. The filter may have an inlet pressure of 30 psi and an outlet pressure of 28 psi. The difference is 2 psid (d for "differential").

With clean elements, the difference may be very low, typically 1 to 5 psid, but as the elements become clogged, this differential pressure increases. If the difference becomes too great, element failure can take place. This can result in contamination getting into the aircraft and a disaster.

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The best differential gauge overall is a piston-type direct reading differential pressure gauge. The great advantage of a piston type gauge is that it requires little maintenance and is easily calibrated in place, per EI, JIG and ATA/A4A procedure. Of course, our Gammon Gauge is the leader in this field.

test valve is a necessity on every piston gauge, but optional when you buy it, because any good 3-way ball can be used as a test valve. We recommend our pushbutton test valve as it is inexpensive, automatically returns to the normal position and includes a 300 psi relief to protect the gauge from thermal expansion.

Note that at low flow rates, the differential is less. At very low flow rates, there may be no measurable differential pressure. For this reason, we recommend against greatly oversized vessels, unless you install a reduced number of elements and "blank-off" some element mounts. For more information, see GamGrams 1, 44 and 56.

Accessories include "peak-hold" for recording the highest readings, and a switch to automatically sound an alert or shut down a system (required on "monitor" filters used in hydrant systems). New digital output accessories are under field test as this GamGram is being written.

Sampling Connections
The type and size of connection varies around the world, but we strongly recommend a sampling connection on the inlet and outlet of every vessel. It is the only way that you can obtain samples of the fuel to determine if the filters are removing a contaminant in your system. Of course if you have two vessels in series, you only need a total of three sample connections, inlet, outlet, and one in the middle. See GamGram 6.

Manual Drain
An obvious necessity, used to obtain quality control samples as well as to drain a vessel when changing the elements. We recommend that this be kept away from walkways to prevent the valve from being accidentally kicked open. As a secondary safety device, a camlock cap serves as a good alternative to a pipe plug, as it seals well and you don't need a wrench to open it.

Manual Air Vent
While not absolutely required, a manual ball valve, located on top of the vessel, is helpful. To drain a vessel to change elements, air has to get in somewhere to replace the fuel that you drained out. Not to be used under pressure, this valve simply allows draining the vessel for service.

Water Control
All filter separators should have some form of water control. This is because a filter separator is supposed to remove water and collect it. Obviously, it can only hold a small amount of water and if this is exceeded the water goes downstream. A method of stopping the flow before that capacity is reached is necessary, or the filter separator provides very little real protection.

There are float type, electronic type and water absorbing (third stage filters) methods for this. Float and electronic type should be purchased with built-in testers. See GamGrams 42, 47 and 48.

Sump Heater
On a filter separator, if the temperature can go below freezing, you should have a drain line heater or a sump and drain heater combination. Larger vessels often have two heaters, for the sump and the drain. Be SURE to turn off heaters before you drain vessels for service, to prevent fires. See GamGram 30.

Sight Glass
Some people strongly believe in sight glasses on filter separator sumps. We don't agree. These glass tubes are vulnerable to clouding, freezing and physical damage.