THE GAMGRAM

No. 18 **SINGLE ELEMENT TESTING** **SEP. 1978**
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Did you ever watch an inspector walk up to a refueler truck or cart, or refueling station with a check list several pages long to perform his duty as an inspector? Did you ever stop to think that he can test every single component on the refueler with one exception; he has absolutely no way to test whether or not the filter separator will remove water? He can check to see that the filter separator is dispensing clean fuel and he can also test for water with the Gammon Aqua-Glo Kit, but he has no way to determine whether or not the filter separator would stop water if none is there while he is inspecting.

In years gone by, some people have tested filter separators by injecting water upstream but too many people fear this direct approach. Many people have believed if a filter separator was capable of removing fine dirt particles (as indicated by running filter membrane tests upstream and downstream) that this was clear evidence that the filter separator was in good condition and that it would remove water if any happened to come along. This philosophy has been proven absolutely incorrect. Other people have had the audacity to state that they never have water in their fuel so there is no need to determine whether the filter separator will perform or not. However, when you propose to these people that they simply remove the filter separator, they quickly find many other reasons why they must leave it in service. Unfortunately, other people steadfastly believe that a periodic inspection, of the inside of a filter separator is adequate to tell them if the unit will perform satisfactorily. We strongly urge inspection and we thoroughly believe in using visual appearances as indicators of impending difficulties. However, no amount of inspection will make a coalescer “coalesce”, and it is absolute fact that a coalescer can look perfect and be completely unable to remove any water.

It was in 1969 that we introduced the first portable single element tester to the aviation refueling industry. We are happy to note a great increase in orders, because users of filter separators are beginning to recognize the fact that some of the elements they have in the field are not performing properly. The purpose of this GamGram is to spread our philosophy on the subject and to bring up a few interesting points that we hope will be useful to those of you who are planning to begin testing your coalescer elements.

Clearly, there is no substitute for a single element test if you really want to know the condition of a coalescer element. This is done by installing the used element in a chamber so that fuel can be pumped through it while water is being injected. All you have to do is to look at the element to determine if it is coalescing. You may wish to run Aqua-Glo tests to measure the exact water content of the effluent, but in most cases a visual inspection tells the story.

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If large water drops come off of the outside of the element, you can say that the element is in very good condition but if the water drops are extremely small, you can say that its performance is marginal. If the element produces a white cloud, you know that it is not performing satisfactorily. We call this “smoke” because uncoalesced water looks very much like smoke.

There are other phenomena that you can observe during a test. One of these is what we call “graping”. In other words, the drops that come off of the element look like a bunch of grapes because they seem to hang together in clusters. This is not a good situation and is clear evidence that the element is malfunctioning, even though it is not producing smoke. If you observe these grape clusters, you will note that they do not fall to the bottom of the sump rapidly. They seem to float about and sometimes actually rise instead of fall to the sump. This is because those “drops” are not really solid water drops at all. They are thin films or “bubbles” of water with fuel inside. Scientists would probably prefer to call these clusters a “foam” but we believe that “graping” is a better word.

While observing a single element test, the first water that comes out of the element usually tells you how good (or bad) the fuel was in the system, because it has been displaced by water that you are injecting. If the water is dark in color, you can suspect the presence of surfactant contamination, the most common cause of coalescer failure. Sometimes, you will note that an element will start to smoke and then later on it will begin coalescing. We believe that you should not decide that this is a good element, because “smoke” is water and it will obviously go into the airplane until such time as incoming water has washed surfactants away. As a matter of fact, it often takes many minutes or sometimes hours of flushing water through an element to cause it to regain an ability to coalesce. The object of the test is to learn if the element will protect the aircraft at the time it is removed and under the same conditions – not after artificially flushing the element.

The obvious conclusion from the above is that safety of operation is the primary advantage of single element testing. If you are going to rely on a filter separator to deliver dry fuel to aircraft that are carrying hundreds of people, it is a pretty good idea to run tests periodically to determine whether the coalescers will really do the job they are supposed to perform. Experience has shown that if you test one element from a set and the results are acceptable, the remaining elements can be left in service until a second test is performed in a reasonable period of time.

The pay-off in single element testing is that it can save money. It is not necessary to replace an entire set of elements on a periodic basis if a coalescing test proves that they are still in good condition.