THE GAMGRAM

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BEING AWARE OF CHANGES: THE KEY TO SAFE FUELING - PART 2

Please also see Part 1: GamGram 42

I think we can all agree that the white bucket is the best simple aviation fuel quality control tool we have in the field. If you're not sure, read on and perhaps then you'll agree. A glass jar or closed circuit sampler is almost as important. Visual tests have stopped many loads of contaminated fuel.

My first introduction to aviation fuel quality control was in 1969. I was just 16 years old. My father (Howard Gammon) needed to see more customers in as little time as possible. His customers were mostly at airports, so aquiring a small used airplane was an economical decision. Howard had flown long distances during WWII, so he knew the importance of fuel quality.

Howard stole a white porcelain saucepan from my mother's kitchen and this tool was with him for the next 40 years. We checked every tank drain and every engine fuel drain before every single flight. Mom forgave him!

In your job at the airport or fuel terminal, the key to quality control is also in looking for changes in test results, even if those results are within acceptable limits (See GamGram 42).

Since the first days of flight, fuel quality has been critical. Interestingly, the same primary tools used then are still important tools today: the white bucket and the clear glass jar or closed circuit sampler. These tools can detect significant levels of contamination, dirt, water - and anything else that can change the appearance of the fuel. The jar (at least 75 mm or 3" in diameter) excels at seeing water haze; the bucket is best for all other visual changes.

Yes, the industry added hydrometers and many other tests to help detect mixes of fuels, but to this day, more bad fuel has been found with a white bucket than any other quality control tool.

The bucket had to be VERY white and so the standard was a steel bucket coated with clear glass that was pigmented (colored) with pure titanium dioxide. This was the purest white coating available at the time and was simply called the "White Porcelain Bucket" (basically a larger version of my mother's white saucepan!). Yes, the white glass coating does chip off easily, but it was the best toolwe had.

Color is important in both jet fuel and avgas. The color of avgas should not change. While we do not dye jet fuel, it can be clear or yellowish. The important thing is that color is consistent. We have seen green and red jet fuel, as well as dark jet fuel. These were usually due to cross contamination.

But the "porcelain" white bucket has a weakness: it has a glass coating and therefore it is brittle and chips easily. It was proposed to put a rubber "boot" on the bottom, but a scientist pointed out that static electricity travels as a field from the bottom of the bucket to the surface it sits on, and a rubber coating would reduce safety.

So the industry tried white plastic buckets. The problems were discoloration and static electricity. We can add grounding/bonding features to white plastic buckets, but this didn't make the color reliable due to sunlight, so these plastic "White Buckets" with calibration and bonding hardware are not for color review, they are for membrane testing (D2276, see GamGram 25).

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We tried epoxy painted steel and some people use stainless steel buckets but at GTP we discovered that the powder-coating industry had a color standard and we settled on RAL9003 (or better) as the definition of the white that is needed. Of course, we now have competitors!

To determine this “plastic” coating’s ability to age without discoloration, we simply put a bucket of fuel outside and left it in the sun for six months. The bucket stayed white. We took that same bucket and a white porcelain bucket to an ASTM meeting and the group determined the new bucket coating was superior. It was accepted by the group, a meeting of ASTM D02, J05, “Fuel Cleanliness”.

So what can you discover about your fuel from a white bucket? Quite a lot!

But first, we need to establish what to do if the fuel is questionable due to color, haze, odor, particles, water, or any other attribute. In deciding that a batch of fuel is acceptable (or not) we suggest that density be the first test, as it is the easiest and fastest. Many (or most) locations do a gravity/density test automatically on every new shipment. See GamGram 19.

Establish who is ultimately responsible for the fuel quality and have them make any decisions when there is any doubt. This is usually the company that owns the fuel, or the user. The decisions made on any questionable fuel are up to them.

So what do you “look for”? The most obvious change to observe is, of course, color. If a sample is a different color than you are used to seeing, check upstream. For example, if you are checking incoming fuel, call whoever is sending the fuel. If they saw a lighter or different color, this may be a serious problem, a mix of fuels.

But also observe any haze, particles and literally anything different from your location’s “usual.” You are looking for change.

One common problem is haze. Haze can occur due to a reduction in the temperature of the fuel. Fuel holds some water in suspension, and no filter can remove it. It is dissolved in the fuel, like humidity in air, and as the temperature goes down, some will condense out, like fog, as haze in the fuel. A good example is a delivery far from the terminal, in cold weather. The fuel may cool down quite a bit in transit. This is not a QC problem, it is normal. But you should be looking for what’s normal at your location.

Another example of haze caused by temperature change is sumping a filter separator first thing in the morning. If you see haze in a sump sample, establish flow and flush the system so the hazy fuel flows back to storage and the filter separator can remove it on the next pass. Then test again.

Most cases of quality control failures are due to simple human error. A trailer number can be confused and a load of liquid fertilizer can be delivered, with the correct paperwork but in the wrong trailer, and only be discovered with the white bucket. (Yes, this happened once, but no white bucket test was done and the system was badly contaminated.) See also GamGram 20.

We’ve also seen (many times) aviation gasoline confused with jet fuel. In more than one case jet fuel has been delivered into aviation gasoline systems due to a miscommunication. This can be disastrous.

So be careful to always look for change and never allow a white bucket to gather spider webs or dust, it should be used **daily**.

It is often said in medicine and technology that “We stand on the shoulders of giants.” Perhaps in our industry we can say that we also “fly on the wings of giants.”