THE GAMGRAM

No. 15 **FILTER SEPARATOR FIRES** **JULY 1977**
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Have you ever opened a filter separator and found evidence of a fire? Burned areas on the elements? Blackened surfaces on the inside of the vessel? Do you really know what caused those explosions? Do you know that this problem is easily prevented?

Some of our readers may believe we are idiots to propose that fires actually occur in filter separators, but some of you know from experience that this is not fiction.

These fires are caused by pumping fuel into a filter separator when it is empty. Suppose that you have changed the filter elements, bolted the cover and now turn on the pump. Fuel rushes into the coalescer elements (remember -- they flow inside to outside) and out into an empty vessel with foam, froth, spray and a super-abundance of electrostatic charges. All you need now for an explosion is oxygen -- and there it is, in the vessel. Presto! A flash fire!

For too long a time it was thought that sump heaters caused these fires. As we operate in a climate with cold winters and need heaters to prevent ice formation, it was easy to be tricked into this theory. We now believe that heaters may aggravate the problem when they are left operating when the vessel is drained to a level that exposes the thermostat to air. As air is a poor heat conductor, the heater boils the fuel but the air around the thermostat stays cold. The result is a fuel vapor filled vessel. Now turn on the pump and force electrostatically charged fuel into the vessel -- and guess what happens!

Those of you who have an antistatic additive in your fuel should not think you are exempt from this problem. The additive does not reduce the static charging rate at all; in fact, the additive increases the charging rate, but these charges will bleed off more rapidly because the additive increases the rate at which electrostatic charges are conducted through the fuel. When an empty vessel is being filled by charged fuel spraying into air, there is ***zero*** time for "conductivity" to bring plus and minus charges back together again. There are such very simple methods to prevent fires in filter separators:

1. Educate personnel to fill a filter separator slowly. Lacking laboratory data, we suggest a conservative rate of one thirtieth (1/30) of the flow capacity. A 600 gpm vessel would be filled at about 20 gpm. If the scientists can determine a better rule, we will be glad to publish it in a later GamGram.

   Remember, static charging usually increases as fuel flow velocity increases.

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2. Install check valves above automatic air eliminators to insure that the vessel will not drain backward into an underground storage tank. Check valves in pump suction piping frequently leak. See Bulletin 52 for a check valve designed for this application. If air cannot enter the vessel, there is no backflow.

   A subtle advantage of a check valve above the air eliminator is that it prevents draining the sump for water checks unless the pump is turned on. See GamGram 5 for a discussion of this subject.

3. If you have sump heaters, install indicator lights to warn personnel that the power is turned on. Hang up a sign, "Filter Separator Must Be Full When Power Is On".

A secondary advantage of a full filter separator is elimination of pressure surges and shock loads on elements when a pump is turned on. After all, a centrifugal pump can produce flow velocities that far exceed the rated flow of the filter separator if the fuel it is pumping is only displacing air. Impact forces and surges caused by this situation have destroyed countless numbers of elements.

Our preferred method for filling a vertical filter is to leave the cover off until the vessel is nearly full. The procedure is to close the inlet valve and turn on the pump. Then crack open the valve and adjust flow rate visually -- by how fast it enters. Don't let it spray about. When the level approaches the top flange, close the inlet valve, stop the pump and install the cover. Then open the valve again the same amount and finish filling. You will know when the vessel is full, because air will stop flowing out of the automatic air eliminator. Although this procedure may frighten some readers, we feel it is both effective and safe.

When trailers and railroad tank cars are off-loaded through a filter separator into a storage tank, some operators allow the pump to force large quantities of air into the filter vessel in an attempt to empty the drop hose. This is an extremely poor practice, not only because of the fire hazard in the filter separator but because air blasts upset the coalescer element structure and can cause dirt to migrate through the element.

Has your moustache ever been burned while you were changing filter elements? Maybe you have no moustache, but you could singe something else if you use the same procedure that caused one accident. Here is what the technician did. He changed the elements in a vertical Jet A filter separator and washed the internal surfaces with JP-4. He installed the coalescer elements using the manufacturer's recommended practice of leaving the poly-bag in place except for opening the threaded end. This procedure is urged, because it insures that dirty hands will not contact the element. The next thing he did was to pull off the poly-bags. This caused a fire, because the action of sliding the bag off of the element generated a high static charge. The JP-4 ignited and so did his moustache!

RESOLVE:

- Be sure to drain ***all*** of the fuel from a filter separator when you are changing elements. Wash down the inside of the filter separator with Jet A.
- Before installing coalescers, pull poly-bag partially off, leaving only enough of the element covered as is required for a handhold.
- After the element is installed, pull the bag the rest of the way off -- slowly. Don't yank the bag off. The faster you pull, the larger the potential spark.