

Washing machine effluent may provide clues in dryer fire investigations

Investigators are becoming increasingly aware of the possible role spontaneous combustion of cooking oils (and other oils) plays in residential clothes dryer fires.

As a prudent investigator, you should consider that spontaneous combustion, rather than a defective dryer, caused a fire. If the fire consumes the load in the dryer, though, what's left to test?

Previous Fire Findings' tests suggested lint from the last load may contain residual oil that can provide clues. (See related stories in Fire Findings, Vol. 4, Nos. 3 and 4, Vol. 6, No. 4 and Vol. 7, No. 1.)

Now Dale Mann and Michael Fitz of MDE Forensic Laboratories, Inc., have another suggestion for testing the hypothesis that spontaneous combustion may have been involved in a dryer fire.

by Dale C. Mann and Michael M. Fitz, P.E.

More than likely, someone washed laundry in a washing machine before transferring it to a dryer. And if she or he didn't subsequently wash another load in the washing machine, the effluent from the washer may contain identifiable oils that can be directly associated with the load in the dryer.

The ability to recover residual oil from water is an advantage at a scene where a dryer fire is the suspected cause. The washer pump and its contained water will likely survive the incident due to the pump's noncombustible construction and location near the floor inside a metal housing.

Triglyceride oils that are subject to spontaneous heating are only moderately soluble in water, which is partly why they aren't fully removed in the wash cycle. It's also reasonable to expect residues of these oils to remain in the water inside the washing machine pump after the wash cycle is complete.

To test this theory, we added 1 cup

corn oil (about 8 ounces) to four used cotton and cotton/polyester bath towels (4.3 pounds dried weight) and distributed the oil evenly. We washed the towels in a stackable washer/dryer combination using 1 cup of laundry detergent in the regular 15-minute wash cycle with hot water followed by the standard double rinse.

After the final rinse cycle, we took 60-milliliter samples (about 2 ounces each) of the residual water in the washing machine pump by removing the hose on the back of the washer and draining the pump.

We washed the towels two more times without drying them and sampled the wash water after each final rinse. Residual corn oil was recovered from the final rinse water after each of the three wash cycles, which is consistent with the analysis of dryer lint reported previously in *Fire Findings*.

Using American Society for Testing and Materials (ASTM) methods, we processed and analyzed the 60-ml water samples. (The method for testing for oil in water is not meant to be quantitative; rather, we interpret the samples for positive or negative results. This means we don't determine how much oil is present, only that the oil is or is not present.)

Consider testing even if dryer load remains are available

Even if some of the load remains after a dryer fire, an added benefit to checking for water in the washer pump is that we may be able to identify the class of oil in the rinse water.

These oils can be categorized as having no potential for self-heating (such as animal fats), low potential for self-heating (such as olive or peanut oils), moderate potential for self-heating (such as corn or fish oils) and high potential for self-heating (such as tung or linseed oils).

Only oils that have not oxidized can be analyzed. Once the molecule has polymerized or hardened, it is no longer soluble in organic solvents. Therefore, if the dryer contents heated to the point of spontaneous combustion, most of the available oil has either polymerized or been consumed in the resultant fire.

This was demonstrated in an analysis of several laboratory-induced spontaneous combustion fires using linseed oil. The analysis sometimes failed to isolate the residue of the original oil. The oils left in the wash water weren't exposed to the heat in the dryer, however. Thus, we could still identify oils if they were present.

This test provides another opportunity to detect self-heating materials if the dryer contents are too severely damaged for routine analysis, and it allows us to test for flammable liquids in the last load run through the washer (as long as a different load wasn't in the washer at the time of the fire).

Preserving effluent for sampling

Here's how you can preserve the water for sampling:

- Remove the drain hose (if it's still attached)
- Tip the washing machine to drain the pump reservoir
- Store the remaining wash water in a clean jar with a leakproof lid.

The sample is relatively stable and no refrigeration is necessary on a short-term basis.

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