

ISSUE

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Consultant

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QUARTERLY
JOURNAL OF FORENSIC ENGINEERING
FIRE CAUSE INVESTIGATION

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SEAL's Information Loop!

After 30 years, we're still getting information to you, in the hope you find some part valuable in your everyday work.

With the recent addition of the "Consultant" blog to our "loop" of communications, we hope you get a chance to read some of the articles published from the newsletter and also some exclusive articles you'll only find on the blog. Upcoming, more information on fuel contamination, starting with part 2 of the article published in this issue.



The Diesel “Bugs”

The common diesel ‘bug’ is the fungus *Hormoconis resinae* that can produce a large biomass of mycelia (fungal matting) in a short period of time if the conditions are favorable. *Hormoconis resinae* is called “diesel bug” in the

diesel fuel industry and “jet fuel fungus” in the aviation industry.

The mycelia of *Hormoconis resinae* excrete acids that can break down weaker tank material such as aluminium.

Water, nutrients and warmth are the pre-requisites for “bugs” to rapidly grow, blocking filters and damaging engine fuel components. Water can be either free water (fresh or salt) or emulsified water. Free water may have come from faulty bulk storage tanks, or from rain or sea water entering through fuel tank filler caps with faulty seals. Nutrients can include the alkanes in the fuel, dead “bugs” and even the fuel tank material. Warmth is usually from the local ambient conditions, but diesel tanks in engine rooms and non-cooled high flow return lines into small fuel tanks will increase the diesel tank temperature.

Long storage of diesel fuel also increases the potential of “bugs” to grow.

continued from Consultant, no. 3

Fuel Contamination



Brian Haygood, P.E.
Consulting Engineer

Breakdown part 2

In a previous article on fuel contamination, we spoke in general terms about fuel contamination issues. In this article, we will discuss some specific examples of how vehicle and fuel system design have caused more fuel contamination claims. The fuel supply chain in the US hasn’t changed appreciably since 2003, but the number of diesel trucks with fuel system and related engine failures has risen dramatically since then, according to the service managers I’ve interviewed. The big change is that the fuel systems in use in Dodge, Ford, and GM diesel engines have become less tolerant of small particles as the fuel systems have been tailored to achieve higher gas mileage and lower emissions. That, coupled with a few design flaws, has led to an increased number of fuel system problems.

The design flaws are generally related to the following categories:

1. Roll-over Vent Valves
2. Clogged Fuel Injectors
3. Diesel Particulate Filters (DPF)
4. General Fuel Contamination

Roll-over Vent Valves



If a vehicle rolls over, you don't want fuel spilling out of the fuel tank. However, you do want air to be able to move in and out of the tank as barometric pressure changes, fuel is added, used, or expands with temperature changes.

The picture above shows a fuel tank rollover vent valve; one of two on this particular vehicle's fuel tank. There is no hose and no filter on the nipple of the vent, and sandy particles are visible inside the nipple.



This picture was taken after the technician dug out the dirt collected around the valve so you could see it.

DIRT

In a future blog post at <http://sealconsultant.blogspot.com/>, we'll talk more about the above categories. In the meantime, for further information please contact, Mr. Brian Haygood at 903-566-1980, ext. #156 or bhaygood@sealcorp.com. ✧



The cobbler's children never have any shoes...



Kelley M. Stalder, P.E.
Electrical Engineer

Every culture has a version of the above commentary on the human condition. We are often capable of recognizing and correcting the problems of others, while seemingly unable to identify and correct our own issues. The Bible has many examples of this absence of perspective; the two we most frequently remember are the admonitions, “physician, heal thyself” (1) and “remove the log from your eye before you try to remove the speck from the eye of another.” (2)

In that vein, I present a little self-evaluation of the fire safety of my own home. I’ll be the first to admit that I do NOT have a residential sprinkler system. Yes, I know that the statistics are quite clear on this; that most civilian fire fatalities are the result of a residential fires. (3) Nevertheless, I, like a vast majority of the population, have chosen not to spend my money on this type of protection.

I do have working smoke detectors and Carbon Monoxide (CO) detectors. I replace the batteries as recommended, the detectors are two years old, and most with dual electrical sources. The National Fire Protection Association

(NFPA) recommends replacing smoke detectors every ten (10) years. (4)

So, having set the stage, I present the troublesome journey through my home: Above is the inside of my dryer.



Note the collection of lint inside the cabinet even though the lint trap is cleaned after every cycle! Some manufacturers recommend annual cleaning of the entire appliance by a qualified service technician. Needless to say, I cleaned this dryer out. Even with all the protective devices in the world (and this dryer has several), such a load of lint is not good for operation of the dryer.

Next, I present the circuit breaker for my air conditioning unit. This is just

as it was found. I had not looked at it in years. At some point, the cover plate was removed by a service technician and never replaced. Of particular interest is the left side of the breaker where the large black wire is connected to a terminal.

Notice the scorched area, indicating that some degree of heating has occurred here. No such pattern is present on the other terminal (red wire).



When the breaker was removed, it fell apart and revealed an arc-damaged contact on this side of the breaker. The arcing had been going on for some time. The breaker was not tripped, so this means it was not making good contact. Each time the

compressor motor shut off, more likely than not, an arc was produced. This arcing produced pitting of the contacts and made the contact surface a little less uniform and the contact area smaller. The entire box and breaker have been replaced.



I present this journey, not as a means of terrifying anyone, but to advise that there are many potential issues in any residence. It is important to give due consideration not just to the obvious, visible problems in your home, but to the long-term potential issues that might result in a fire. ✧

1 - Luke 4:23

2 - Matthew 7:1-5

3 - The U. S. Fire Problem, National Fire Protection Association (NFPA), 2011, <http://www.nfpa.org/itemDetail.asp?categoryID=953&itemID=23071&URL=Research%20&%20Reports/Fire%20statistics/The%20U.S.%20fire%20problem>, URL reviewed August 7, 2012.

4 - Ahrens, M., Smoke Alarms in US Home Fires, NFPA, September 2011, <http://www.nfpa.org/assets/files/pdf/os.smokealarms.pdf>, URL reviewed August 7, 2012.





Blackbox: Progress!

All Vehicles equipped with a Blackbox are required to record the below information:

- Forward deceleration
- Maximum deceleration
- Time from accident to maximum deceleration
- Speed, vehicle indicated
- Engine throttle, % full (or accelerator pedal, % full)
- Service brake, on/off
- Ignition cycle, crash
- Ignition cycle, download
- Safety belt status, driver
- Frontal air bag warning lamp, on/off
- Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver
- Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver
- Multi-event, number of events (1, 2)
- Time from event 1 to 2
- Complete file recorded (yes/no)

Most people have heard of retrieving the flight data recorder or aircraft black box and downloading that information after an aircraft accident. Similar devices have been incorporated into many recent automobiles sold

in the United States. While the earliest black boxes were introduced by General Motors (GM) in selected vehicles in 1974; the incorporation of black boxes began in earnest in 1994. As a result, twenty-eight (28) manufacturers have incorporated the black box. That list of

manufactures is shown in Table 1 below. Many of the manufacturers in the table below began incorporated black boxes in 1994 and have continued to do so. That number is soon to rapidly increase as new federal requirements take effect September 1, 2012.

Acura	Geo	Lancia	Pontiac
Buick	GMC	Lexus	Saab
Cadillac	Holden	Lincoln	Saturn
Chevrolet	Honda	Mercury	Scion
Chrysler/Fiat	Hummer	Mitsubishi	Sterling
Dodge	Isuzu	Nissan	Suzuki
Ford	Jeep	Oldsmobile	Toyota/Scion

SEAL engineers are currently capable of downloading black boxes from the list of manufactures shown above. The number of vehicles include all of the different models and years of manufacture. As you might imagine the number of vehicles that we are capable of downloading is now in the hundreds.

The equipment for successfully downloading a black box is not simple. It requires diagnostic

equipment and a multitude of cables since standardization is incomplete.

Our engineers are able to retrieve data that are recorded in the few seconds before a traffic collision. That information includes (see sidebar):

- Speed
- % gas pedal
- Brake application
- Seat belt use
- Deceleration
- Plus others ☆

continued from Consultant, no. 4

Worlds United...

FIGHTING AND INVESTIGATING



Gabriel Moreno,
CFEI Proctor
Special Investigator



This will be the final installment on how the two worlds of firefighting and fire investigation collide.

In a previous installment in this series, I referenced National Fire Protection Association publication 921 (NFPA) and the scientific method. The ultimate goal in any fire cause and origin investigation is to determine the source of the fire, and also provide all parties involved with the knowledge they require to conclude their claim.

Fire investigation may involve several different people working together towards the ultimate goal of determining the fire causation. There are often private fire investigators and law enforcement officers working together. Each has their own reasons for investigating the fire scene. The private fire investigators are interested in civil liability including issues involving fire spread, fire damages, fire protection systems, and causation. The law enforcement officers, such as a firefighter or fire chief, can offer valuable information that was obtained during the initial firefighting activities. The cause of the fire could be a result of a product malfunctioning, or defective work by a contractor. This is why it is necessary for the fire investigator to have both and understanding of fire chemistry as well as fire dynamics.

Listed below are some examples of fire causation.

An undetermined fire is where any opinion regarding the cause of the fire is less than probable or where the fire is still under investigation. Cause may be determined at a later date if new information or evidence is discovered.

Another cause could be a natural fire. This is a fire that is not caused by any direct human intervention for example lightning, earthquake or wind.

Another factor in fire determination could be accidental in nature. This type of fire does not involve any intentional human act to ignite or spread the fire.

A factor that we do not want to see is an incendiary fire. This is described by NFPA 921 as a fire that is intentionally ignited. This type of fire would be considered arson.

What does this all mean?

Determining the causation of a fire and ultimately concluding the claim is the ultimate goal of both private fire investigators and firefighters. There are several different causes of fire as mentioned above, and there are never any two scenes that are alike. As a fire investigator, if we use the scientific method and the guidelines of NFPA 921 there should be no issue in the determination of fire causation and the rightful conclusion to a claim. ✧



FCI: On The Fire Scene.

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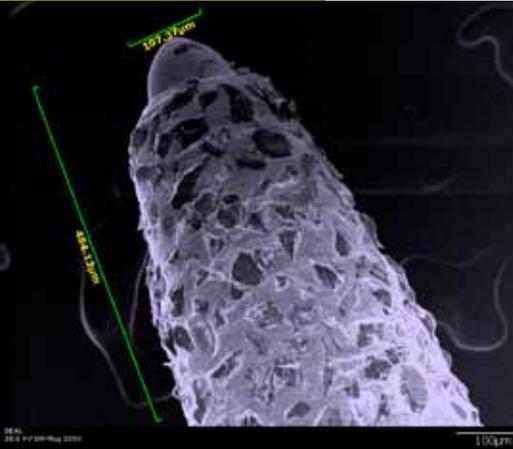
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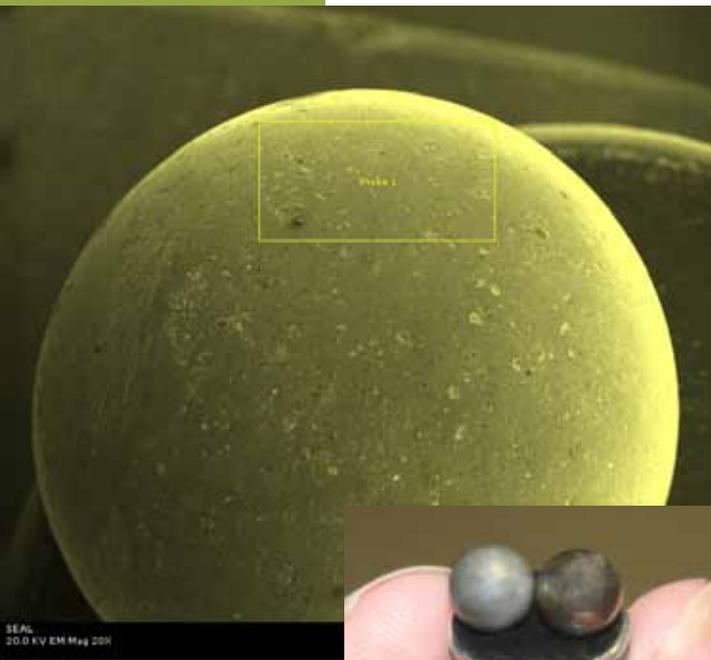


Last Quarter: The Answer!

HINT:

It's the Noise that Makes You Cringe.

A. Seeing a dentist drill bit at this magnification, it truly takes on the appearance of a foreign landscape. If you look closely you can see the uneven wear “grooves” and the end of the bit which has been completely worn down. Also, those bits of rock on the surface are diamonds!



This Quarter: The Perspective!

This quarter, we thought it would be cool to show you, a before and after of the object that is being scanned. The ball bearing to the left is the object magnified at just 20x with our in-house Scanning Electron Microscope (SEM). Some of the features you can make out on the bearing are rust pits along the surface. At normal view the ball bearing looks to be a perfectly round.

Next quarter, we're back with “CAN YOU NAME IT?” offering you a chance to win! Correct answers will be placed in a drawing for a **\$100 dollar Visa Card**.

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