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Industrial loss investigations can vary in scope, and quantum is often in the magnitude of millions of dollars. Often a comprehensive technical analysis of an industrial accident produces conclusions that can provide clarity to questions of liability and subrogation opportunities.

For example, consider a case in which Sintra Engineering was retained to investigate the apparent failure of an emergency standby hospital generator. The generator had been in operation for 27 years and was one of a pair of 940 HP units. The generator was taken out of service as a precautionary measure after oil samples indicated a mechanical problem. Further inspection revealed relatively large pieces of metallic debris in the crankcase. There was concern that the presence of foreign material could mean that the generator had been compromised and may be subject to failure. This necessitated a mechanical inspection and Sintra Engineering was retained to provide technical oversight.

The inspection began with a review of the generator's maintenance history. The failed generator had been rebuilt twice in its lifetime; once due to a catastrophic failure of the adjacent generator and once due to a failed gearbox. A detailed inspection was then conducted, which revealed unusual internal wear on the engine bearings. This wear was consistent with the contamination of the oil system due to glycol leaking from the cooling system. Records of the regular oil sampling

indicated that the coolant leak had been going on for some time, but this did not explain the large debris in the generator. Because the debris could not be explained by the wear on the bearings, the engine was carefully disassembled to look for the source. There was, however, no evidence of damaged engine components that could be matched to the debris in the crankcase.

After careful analysis, it was concluded that the internal damage to the generator was due to a combination of normal wear/tear and previous maintenance, but not due to any recent work performed on the generator. The debris was found to be a 'red herring' and completely unrelated to the problems in the generator. The debris had been in the generator for an extended period of time and likely had been left in the crankcase from the previous rebuild. Independent technical oversight was required due to the specialized nature of this equipment and proved valuable in resolving the claim.

In some cases technical insight is not only required to answer the question of why an accident occurred, but to ensure the right steps are taken to remediate following the loss. In one case, Sintra Engineering was retained to investigate an accident that occurred when a \$2 million treater tank was significantly damaged. The treater tank was being prepared for transport to Fort McMurray. While the tank was being loaded onto a trailer it rolled off to the side. This unplanned roll caused damage in excess of

\$500,000. A detailed review of the incident revealed that one of the hydraulic valves had been left in the closed position causing the tank to roll.

The treater tank required repair and the insurer requested technical oversight to ensure that the unit was reasonably repaired respecting betterments. To that end, Sintra Engineering was also retained to supervise the reparation process to ensure that only repairs related to the incident were undertaken. To accomplish this, the condition of the treater was documented. Next, the metallurgical fittings and connections in the damaged sections were tested to ensure that the connections were not compromised and still in accordance with applicable standards. The entire repair was supervised by Sintra Engineering to ensure that repairs were designed and tested according to the pressure vessel codes using approved methods by the Alberta Boilers Safety Association. Technical oversight meant that the repair of the vessel was completed at a cost savings of over \$100,000.

The complexity of both the insurance issues and the equipment involved in industrial accidents often requires specialized technical knowledge to assist in resolving the claim. Specialized forensic expertise can provide technical insight to identify cause and oversee repair such that claims can be resolved and normal business operations can resume as quickly as possible.

Free Seminars at Your Office... *Lunch on Us!*



Sintra Engineering would like to share some of our unique investigative experiences to help you better understand how forensic engineering analysis can assist you in resolving insurance claims. We would be pleased to buy your staff lunch and present a seminar on any of the following topics:

Who Was at Fault? – we review how an accident reconstruction can assist in resolving liability decisions.

What's Holding You Back? – we provide an overview of the types of occupant restraint systems that can be found in vehicles, how they can be examined for evidence of use during a collision, and how they play a role in mitigating occupant injuries.

Big Brother is Watching – we review heavy truck engine control modules (ECMs), what information they can record, and how that info can be used to assist in resolving liability.

When the Stakes are High – we take a look at specific case studies with large loss property claims and explain the management process involved.

Answers Out of the Ashes – we demonstrate our method of determining origin and cause from sifting through ashes and debris.

Burning More Than Just Rubber – we walk you through how our engineers work backwards to determine the origin and cause of a vehicle fire.

Every (Fracture) Face Tells a Story – we take you through the process of diagnosing failures from examining the evidence to various testing techniques.

Collateral Damage – we examine common industrial equipment failures and describe the ripple effect that these losses can have on continued operations.

Don't Get Zapped! – see how an electrical engineer analyzes electrical systems to determine origin and cause of a fire.

Was It Really That Bad? – we show how a biomechanical assessment can help answer the question 'could that vehicle accident have caused those injuries?'

Slips and Trips Go Far Beyond 'Oops' – we do a comparison of possible injury outcomes from falls on surfaces that comply to code, to falls on surfaces that don't.

All presentations are AIC accredited for one hour of continuing education credit. If there is a forensic engineering topic of interest that is not on this list, please contact us. We would be pleased to develop a custom lunch hour presentation for you. To book a seminar call us at 1.877.244.6251 or visit us at www.resolvematters.ca.

Consumer Product Recalls



It is important to be aware of consumer product recalls before beginning any forensic investigation. Faulty products or components can often be the source of failure, can contribute to an accident or injury, or be responsible for a fire. For more information on recalls contact us at 1.877.244.6251.



Chrysler and Volvo Recall Vehicles Due to Fluid Leaks and Airbag Defects

This recall affects some 2010 models of Chrysler cars and pickups – approximately 5,860 in Canada. The U.S. National Highway Traffic Safety Administration reported that steering fluid hoses can separate at the crimped end and leak fluid on the engine, potentially causing a fire.

Due to airbag system deployment failure, approximately 1,160 Volvos in Canada have been recalled. Certain S80 sedans and XC70 crossover vehicles from the 2010-11 model year and model year 2010 V70 wagons are affected.



GE Profile and Monogram Dishwashers Recalled Due to Fire Hazard

This recall affects 5,322 GE Profile and GE Monogram dishwashers manufactured for Canada from July 2003 to December 2006.

It has been determined by GE that water condensation can drip onto the electric control board, potentially causing a short circuit and resulting in an overheated connector.

GE asks affected consumers to not use the unit until repaired and to disconnect the electrical supply by shutting off the fuse or circuit breaker controlling it.



Evenflo Recalls Car Seats After Crash Test Failure In Simulated Collision

Approximately 4,500 Evenflo car seats have been recalled in Canada after Consumer Reports found that two of the units failed in a simulated 48km/hr frontal impact collision, causing the seat's plastic shell to crack and the harness to loosen.

This recall affects Evenflo Maestro Combination Booster Seat Units manufactured up until April 26, 2010. The company has designed a kit that includes an easy to install bracket that will reinforce the car seat and it is distributed to owners at no expense. The affected model number in Canada is 31011057C.

On, Off or Tripped?



Analyzing Circuit Breakers After a Fire

When investigating the origin and cause of a building fire, one of the primary items to examine is the electrical panel, and specifically, the positions of the circuit breakers in the panel. Positions of the breakers post-fire can provide clues as to the origin and cause of the fire. Are all the breakers on? Are all the breakers off? Have any of them tripped? While evaluation of the positions of the circuit breakers in the electrical panel is an important step in any fire investigation, it's not as straightforward as one might think. Even when circuit breakers are found in the tripped position after a fire, it doesn't necessarily mean that the fire was caused by electrical activity. Nonetheless, the positions of the circuit breakers in the panel can be used in combination with other evidence and known facts to help piece together how the fire occurred.

Circuit breakers are designed to 'trip', or disconnect an electrical circuit automatically, when too much current is flowing through the circuit. Circuit breakers can have three positions: on, off, or tripped. Under normal operating conditions, a circuit breaker in the on position permits current to flow through the circuit, and the circuit is said to be 'energized'. When in the on position, every circuit breaker is designed to remain on until a pre-determined threshold is reached (combination of current and time).

When the amount of current flowing through a circuit exceeds the threshold of the circuit breaker, the circuit breaker is designed to trip and disconnect power from the circuit. The tripping function of a circuit breaker happens automatically when a current overload condition occurs. In addition, circuit breakers have an off position so that any circuit in the electrical panel can be de-energized manually. A circuit breaker in the off position has not typically been subject to abnormal conditions; it's simply been switched off manually.

There are various manufacturers of circuit breakers we typically find in our homes. While many brands have three distinct positions (on, off, and tripped), at least one popular brand of residential circuit breakers, the Cutler-Hammer brand, only has two positions: on and off. When a Cutler-Hammer circuit breaker trips, it goes to the off position. As a consequence, you can't

tell just by looking at it whether or not a Cutler-Hammer circuit breaker was manually switched off or had tripped during a fire. There are ways to determine whether or not the circuit breaker was off or had tripped, but it usually involves x-raying the component or opening its housing.

While circuit breakers are designed to trip under overcurrent conditions, there are other conditions which can cause a circuit breaker to trip. Circuit breakers have both magnetic and thermal thresholds, so they can also trip if their surrounding environment gets too hot. Though far less common, a defective circuit breaker in the panel may have failed to trip in response to an excessive current draw on a circuit. In the case of a house fire, it's possible that some of the circuit breakers in the electrical panel may trip due to the heat of the fire, not necessarily as the result of an overcurrent condition. Furthermore, tests have found that circuit breakers may also trip if they are exposed to significant mechanical shock. If a circuit breaker is dropped or hit with enough force, it could trip, even if no overcurrent condition is present.

Alternative scenarios must be ruled out when examining an electrical panel. Did someone turn the circuit breakers off after the fire had ignited? Firefighters typically ensure that there is no live power in the building while they are trying to extinguish a fire. In rare cases, some people 'steal' power from other sources or from their neighbours, so while the circuit breakers in their electrical panel may be in the off position, the home's electrical circuits may still be energized via extension cords or other illegal wiring from neighbouring buildings. Furthermore, there are instances when fires can start due to an electrical problem that wouldn't cause the circuit breakers to trip in the first place. High resistance connections and in-line arcing are conditions which would not typically cause a circuit breaker to trip.

The positions of the circuit breakers in an electrical panel can provide important insight into origin and cause investigations. However, it is important to evaluate all the circumstances and possible scenarios which could have led to positioning of the breakers to ensure a thorough analysis of the factors contributing to the origin and cause of a fire.



Commercial Vehicle ECMs



It is becoming common knowledge that modern passenger vehicles have the capability to record information about a vehicle in the moments before, during, and after a crash. This information is typically recorded by a vehicle's air bag control module, which is equipped with an Event Data Recorder (EDR) component. However, when it comes to heavy trucks that typically do not have air bags, there may be some question as to their ability to record collision-related information. Commercial vehicles are equipped with engine control modules (ECMs), which provide some vehicle specific information.

Answers to some common questions about heavy truck ECMs:

What is an ECM?

The acronym stands for *engine control module* or *electronic control module* and is the generic term used to describe the computer module on a commercial truck engine that monitors and controls engine functions.

Can an ECM record information?

Yes, ECMs can record specific engine parameters, configuration settings, usage details, trip data, fault codes, critical fault events, and sudden deceleration events. The information recorded depends on the particular engine manufacturer, model and year (not the make of the truck).

What truck models have an ECM?

Most trucks manufactured since the early 1990's will have ECMs. In order to determine the kind of ECM on a particular make of commercial vehicle, the make and model of the engine on the truck must be known.

Will an ECM record information during a collision?

Yes, some ECMs have the capability to store information when a critical fault is detected (e.g. loss of oil pressure) or when the

truck's speed suddenly decreases due to hard braking or a sudden impact. The information recorded by the ECM depends on the engine year/make/model, but will typically include vehicle speed, engine speed, cruise control status, brake status, clutch status, and diagnostic trouble codes.

How much information will be recorded by an ECM?

This depends on the engine year/make/model, but will vary from as low as 13 seconds to as long as 2 minutes surrounding the event.

Can the information from an ECM be downloaded?

Yes. Although all ECMs can be accessed, each engine type requires different software and hardware. If an ECM is still installed on the vehicle, then it can be accessed through a universal connection located under the dashboard using software specific to the particular engine manufacturer. If the ECM has been removed from the vehicle, then the ECM needs to be accessed with specific hardware.

Is ECM data reliable for understanding how and why a collision occurred?

Yes, and No. ECM data can be extremely useful in understanding what transpired leading up to and during a collision. However, in some instances ECM data may not be consistent with the physical evidence and can be inaccurate. Trained collision reconstructionists should be retained to properly interpret the data in conjunction with a review of the physical evidence and consideration of human factors.

If you have a question about whether a specific ECM will have information that could be downloaded and related to a particular collision or event, please contact Sintra Engineering at 1.877.244.6251.

ask an expert

Return Undeliverable
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