Forensics in focus

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Introduction - Professor James Lygate

Our strapline is Technical Excellence: Rapid Response. One of the functions of Forensics in Focus is to illustrate our technical excellence with informative articles which in this issue include the scientific method, fires in recycling plant and ship fire safety.

But what of Rapid Response?

We were the first forensic investigators to introduce a default service level to our clients regardless of whether or not we had a service level agreement in place. Over the past few years, we have been gathering statistics using our state of the art Praxis case management system. It measures our performance against our promises.

Our target for screen investigations is to deliver a report within 9 working days of being instructed. Our stats demonstrate that on average we complete the investigation in 5.5 working days. Similarly we say that we will report upon full investigations (on larger and more complex losses) in 22 days. On average the investigation is complete in half that time; 10.5 days.

All clients impress upon is the importance of receiving oral reports in order that they can take the decisions that need to be taken. The stats demonstrate that we deliver Sit Reps within 5 working hours of arriving on site and often before we leave the scene.

So to our strapline we add: Promises Delivered. Watch our website, LinkedIn and Twitter pages for the release of more information or if you are attending Airmic, come and get a coffee with us on Stand 115.

I am delighted to welcome David Gray to IFIC Forensics. He is a very experienced fire investigator who opened Burgoynes' offices in Singapore back in the 90's and has recently returned from living and working in the Middle East. David worked in the Met lab and like me, did his Masters at the University of Edinburgh where we both lecture on the fire investigation course each Easter.

John Gow writes about Ship Safety and makes observations about good practice raising a cautionary note regarding the proposed best practice guidance from Interferry. Shipping is a core activity and I continue to work on the 4th Edition of Fire Aboard. I am concerned at the mismatch between the designer's intent and the use by mariners of fire safety systems. For example, CO2 systems are designed to be deployed quickly after a fire is discovered, but some Masters only use CO2 in the last resort.

The forensic stores of Hawkins, Burgoynes and IFIC Forensics are stashed full of burned out white goods awaiting joint examination, a decision on liability or trial. The latest Fire Service advice is don't use your dishwasher, tumble drier or washing machine unless you are present to monitor it. The repair time on recalled appliances is up to 11 months. The foreseeable future is that there will be a continued stream of appliance fires and if the failure rate follows the precepts of the bathtub curve, we are likely to see the failure rate increase as these appliances wear out and reach the end of their life. Technical Excellence is at the core of what we do and we are in the process of setting up the IFIC Academy in which we open up our investigator training programme to our clients and partners. At our training weekend scheduled for June we will be focusing on the white goods issue ensuring that our investigators remain up to date with the evolving and varied hazards associated with appliance failures.

In this edition we also feature fires in recycling plants. Many of these fires are set deliberately and as the photographs indicate, are very difficult (and dangerous) to fight. As Deon Webber points out, fire water runoff is an issue and one with which our chemists can help.

Finally but by no means least, we discuss the scientific method which is at the core of what we do and the process by which we gather evidence and test hypotheses in order to reach conclusions as to the origin and cause of fires.

I hope this edition of Forensics in Focus helps demonstrate that we live up to our strapline – Technical Excellence: Rapid Response: Promises Delivered.

Fires in Waste Recycling Sites

Deon Webber

In 1999, the European Landfill directive was introduced to reduce the amount of refuse across the EU being transferred to landfill sites. Local and Central Government were forced to examine closely, the way refuse was collected and how it could be separated and recycled.

As a result of this and other legislation, recycling has become a growing part of our everyday lives, with every home now featuring a range of wheeled bins for the separation of waste and a huge growth of the recycling industry.

In 2013, the UK waste recycling industry supported 103,000 jobs and generated an estimated £6.8 billion in gross value according to DEFRA. As the number of waste processing sites have increased, the number of unregulated sites have fallen as the Environment Agency has brought them under the Environmental Permit regime. Many sites are located in urban areas near critical infrastructure, transport routes and communities.

The growth of the industry has led in recent years to a number of spectacular and damaging fires. Recycling site fires still average one per day in the UK. Though the number of fires in waste sites has declined since its peak in 2011, there still remains, each year, a number of high profile fires which have hit the headlines and caused huge financial loss, massive disruption to the surrounding areas, significant costs to local authorities and emergency services and had a catastrophic impact on the environment.

An example of such high profile blazes occurred in Dagenham during the closing ceremony of the Olympics in 2012. The fire, described by the Fire Commissioner as “The largest in London for several years”, required the mobilisation of 45 fire appliances and 200 firefighters. Another in July 2013 occurred at a plastic recycling site in Smethwick in the West Midlands. It is estimated that 100,000 tonnes of plastic burned, sending a plume of smoke 6000 feet into the air and which could be seen 60 miles away.

It is estimated that one million gallons of water were used to extinguish the Smethwick fire, over a period of nine days. As we all know, that water must go somewhere! Of huge concern to the Environment agency is not only the air pollution, fallout from the toxic products of combustion and greenhouse gases, but the devastation that can be caused by firewater runoff into water courses, which can contain hazardous substances and which may take years to recover.

The insurance industry too is concerned at the financial impact of these fires.

Costs borne by insurers include:

- Property and equipment damage
- Contamination and clean up costs
- Debris removal
- Penalties and fines
- Business interruption
- Adjusters and investigators fees etc.

Catastrophic fire at Smethwick in 2013.


Smoke plume seen for miles.


Burning tyres produce pungent black smoke.

These costs are ultimately borne by the insured through higher premiums, which can in turn have an effect on business viability. The average cost to insurers of a fire claim is estimated at £1.5 million, accounting for 12% of all industrial loss, (RISC Authority).

Recently, one insurer came out and stopped offering cover for the industry because of the high risks. The ABI has supported the move, stating that “greater investment in risk mitigation is required, in particular, sprinklers, fire detection systems and good-quality CCTV should be employed alongside a thorough fire safety management strategy and good on-site security”.

The causes of waste recycling fires are numerous and include accidental causes such as electrical fires, discarded smoking materials, other heat sources and even the spontaneous combustion of waste. Arson too is a problem and vigilance and effective security measures are vital in deterring would be fire setters.

One cause that is fortunately not so common now is the stray ‘Chinese Lantern’. CCTV at the Jayplas site in Smethwick was able to pick up one of these entering the site only minutes before the fire was discovered. A public outcry since the fire has led to a widespread boycott of sales of the lanterns.

Factors contributing to the size of these fires include the steady accumulation of waste leading to enlarged stacks with minimal separation between them. The commercial nature of recycling can lead to the amassing of waste until market prices are more favourable, leading to significant overstocking. Stock levels are regulated by Waste Management Licences, enforced by the Environment Agency.

In recent years, a call for action has led to various stakeholders combining to produce actions intended to halt the number of waste recycling fires. Under the umbrella of the Chief Fire Officers Association, organisations such as Waste Industry Safety and Health (WISH), Environment Agency, DEFRA, Environmental Services Association (ESA), insurers and other industry groups have joined forces to work collaboratively to effect a positive change and to find cost effective and achievable solutions that are proportionate to the risk.

Together they have produced formal guidance in the document “REDUCING FIRE RISK AT WASTE MANAGEMENT SITES”.

At the time of writing this article, a major blaze has been reported at a recycling centre in Birmingham. 100 firefighters are at the scene and the familiar plume of smoke can be seen across the West Midlands.

Clearly there is much work still to do in reducing the occurrence of this type of fire and the consequences of them. The insurance industry will be watching the waste recycling industry closely.

Fire takes hold at Birmingham waste recycling site.

Safey at Sea

John Gow

Courtesy of www.theatlantic.com

It's difficult to imagine a more troubling scene than to be awoken at night by the frantic banging on a cabin door and a crew member telling you to grab your lifejacket and go to the muster station. The sound of an alarm in the background, the smell of smoke and the steady murmurings of confused passengers gathering themselves for the unknown challenges ahead.

Combine this with darkness, the glow of reflected flames, rough seas and hours from the nearest help and the scene is set for perhaps the most frightening peril that anyone can experience.

Despite the increasing awareness and implementation of safety measures within the industry, this is a scene that many passengers and crew have faced in recent years. However, there is a danger that the continuing financial pressures across the globe will impact on safety within the shipping industry as maintenance, training and safety suffer because of the downward pressure on costs.

Data published in the Allianz "Safety and Shipping Review published in 2016" indicates that 'total' losses for 2015 declined 3% to 85 compared to the 2014 figure of 88, with large shipping losses on the decline by 45% over the past 10 years.

Whilst these figures are to be welcomed, the industry still reported a total of 2,687 casualties globally with casualty hotspots being identified across the regions.

Whilst the overall figures are decreasing fire still remains one of the top causes of casualties in the world fleet. Of particular concern is the risk to passenger ships and Ro-Ro ferries.

As passenger ships increase in size and with crew and passenger, combined, numbering in the thousands, it is clear that if fire occurs, this peril will be challenging for those on board to deal with.

The industry body 'Interferry' states that between 2010 and 2015 there have been "at least seven serious fire incidents" occurring on Ro-Ro passenger (RoPax) ships in Europe.

The risk of fire relating to RoPax ships has been brought to mind by the two most recent incidents which resulted in loss of life and the total loss of the ships.

The tragic events surrounding the casualties Norman Atlantic and the Sorrento are not far from the minds of those who suffered during the fire and subsequent rescue efforts.

The investigation findings for these two casualties have yet to be released but the media reports that on December 28th, 2014 the Norman Atlantic had left port with approximately 487 passengers on board. Shortly after leaving, a fire occurred on the open deck in the early hours, which quickly spread and took the lives of 13 people.

The rescue operation is reported to have lasted until mid-afternoon on December 29th.

In April of the following year a ferry en-route from Palma de Mallorca to Valencia caught alight. The Sorrento with around 160 passengers on board and a capacity, when full, for about 150 vehicles and a reported 954 passengers.

Courtesy of http://ioniantv.gr/

Courtesy of http://en.trend.az/

Fortunately, in this incident, no one lost their lives and all passengers and crew were successfully rescued.

These recent incidents have become the subject of much discussion, with the safety of passengers and vessels at sea being high on the agenda at a number of recent conferences around the world.

From the information available it is clear that the design of vehicle carrying ships, in particular, those with openings to the environment, create conditions optimum for supporting fire should one develop. Large vehicles in close proximity, in an open space, with low deck heads, when compared to overall vehicle height create ideal conditions in which fire can spread. These areas can be likened to those created in multi storey car parks, which have also experienced some significant fire events.

In an attempt to establish a common set of best practices, the industry body 'Interferry' in March 2016 issued guidance 'Interferry Ro-Ro Deck Fire Safety - Operational Best Practice Guidance'. This document is based on the outcome of a 2015 fire safety questionnaire and will form the basis of an Interferry submission to MSC 96. This is reference to the 96th session of the Maritime Safety Committee at the IMO Headquarters to be held in May 2016.

This guidance sets forth 7 key recommendations;

1. Training and drills should emphasise the importance of a rapid response team proceeding directly to the scene of the reported smoke/fire with fire extinguishers and without stopping to dress in fire fighting gear.
2. Training should also emphasise the importance of adopting defensive fire fighting posture after the initial response – the paramount requirements being, rapid establishment of containment boundaries on all sides of the fire, by means of a deluge system.
3. For voyages longer than 20nm, no passengers should be allowed access to any Ro-Ro deck when a ship is under way, without the expressed consent of the master or the designated officer. Passengers allowed shall be supervised.
4. During the voyage all vehicle decks should be continuously monitored – with particular attention to connected reefer units and electric vehicles – via technical equipment such as CCTV, by crew patrols or a combination of remote supervision and crew inspection.
5. The frequency of flushing deluge systems as prescribed in MSC Circ. 1432 9.3.1 should be increased form once to twice per five-year period.
6. All Ro-Ro passenger ships should be fitted with addressable fire detectors, as per the mandatory requirement for new passenger ships since 2010.
7. For installations in new ships, the deluge system should be manufactured from non- corrosive materials to prevent blockage.

It is clear that any measures taken to improve the safety of lives at sea have to be welcomed and I note that the full recommendations have yet to be published but as a former fire fighting professional, I urge a note of caution regarding the recommendation to:

"emphasise the importance of a rapid response team proceeding directly to the scene of the of reported smoke/fire with fire extinguishers and without stopping to dress in fire fighting gear".

The successful outcome of any emergency is dependent on a number of factors including, but not confined to:

- Adequacy of training, and
- Speed and weight of response

Adequacy of training is not just about the frequency that crews practice their safety drills. To ensure readiness, the training has to be realistic and test the competency of those taking part. On board a ship it is difficult to stimulate the imagination and to create realistic and safe scenarios. A simple measure that could be considered is the use of coloured filters over the visor of a breathing apparatus face mask. The use of green and red acetate, for example, creates a black out condition that means the wearer must learn to move through spaces using their senses whilst in a fully lit environment observed by safety officers who can ensure they are not placed at risk. This type of exercise can build confidence in the individual and the team, improving readiness and response should the unthinkable happen.

Courtesy of www.telegraph.co.uk

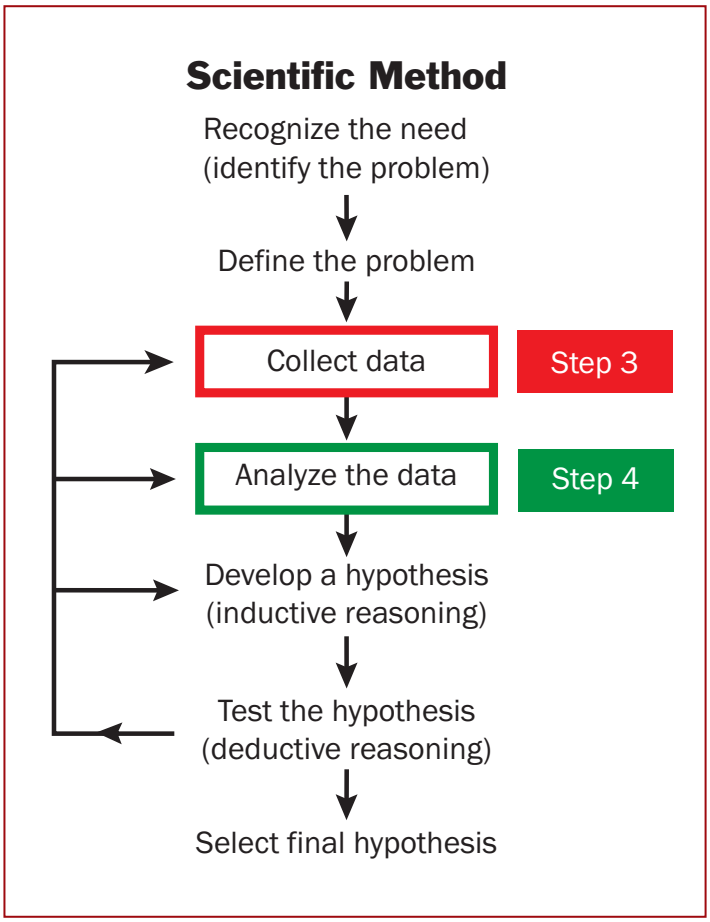
It is perhaps in the area of speed and weight of response that I urge the most caution. On board ship resources are limited as are crew numbers. It is essential that during any emergency situation, the deployment of firefighting teams is controlled not only to ensure the safety of the team, but to ensure the safety of the vessel. In my view the deployment of a rapid response fire fighting team without appropriate safety gear has the potential to risk both. It is possible that the recommendation, at item 1 above, is directed to those small fires, possibly no more than the size of a waste bin, that a crew member discovers and a fire extinguisher is close at hand. There is some sense in this approach but in those incidents where the actual situation is unknown or a significant distance has to be travelled to the scene of the fire, then crews must be prepared and adequately protected for any eventuality.

There is of course much more that has to be considered to ensure the safety of lives at sea including ship design and the adequacy of the installed fire protection measures and unfortunately this article cannot discuss the full range of factors involved. I have no doubt that the industry, despite the financial pressures, will continue to improve the safety of ships to ensure that we don't wake up to the headlines of hundreds lost at sea in a ship fire disaster! Doing nothing is not an option.

Collecting and Analysing Data for the Investigation

Eva McKiernan

After planning and preparing for the investigation the next stage is to gather and evaluate relevant information. This involves being guided by the third and fourth steps in the scientific method:



Step 3: Collect data
Step 4: Analyse the data

The information/data gathered will aid in the determination of:

a) Origin of the fire
b) Cause of the fire
c) Development and spread of the fire

Step 3: Collect Data

Sources of data at incidents are numerous and can include but are not limited to direct observations, measurements, photography, evidence collection, testing, experimentation, witness interviews. Verification of data collected should be undertaken if possible e.g. corroborating witness interviews.

Examples of data sources relating to determining the origin at fire scenes are:

Geometrical patterns –patterns of burning that have resulted on various surfaces; floor, walls, ceilings. Areas of clean burn (no soot) are interesting as the temperature has been high enough to burn off the carbon and soot depositing on this area. Smoke venting from openings and collapse of structural members including roofs and walls should be noted.

Time/temperature patterns – depth of char, spalling of concrete, calcination, distortion of steelwork.

Electrical indicators – operation of MCBs can provide information on the circuits which were first affected by fire or where incident appliances were connected.

Arc mapping can be used to locate and correlate electrical activity on cables to the origin and spread of fire.

Protection patterns – can provide information on whether appliances were plugged in and whether switches were in the on or off position at the time of the fire.

Determining whether a suspected appliance was energised when the incident occurred is essential.

Alarm and detection systems – Intruder and fire alarm systems sometimes have built in memory which can be interrogated for information on activations on the system.

This can help provide information on the area of origin or the presence of intruders at a property.

Monitoring stations can also provide details on activations on some systems.

Excavation and reconstruction – Clearing of debris to recover items of evidence and to determine fire patterns on covered surfaces is an important step in examination at a fire scene.

Due to firefighting activities and possible restoration works, debris can be removed completely from the areas of interest.

The examination of integral items of interest in their original location within the fire scene can provide additional information on fire origin and spread.

Witness evidence – interview of witnesses should be undertaken to determine pre-incident information and a history of the events. Information can also be obtained from CCTV systems, news reports and social media. Access to this information prior to attending the scene can aid in preparing and planning for the investigation.

Step 4: Analyse the Data

Evaluate evidence gathered during the data collection/origin determination stage. This should include first fuel ignited, viable ignition sources, oxidants, sequence of ignition. Evaluation should be by the process of inductive reasoning.

Inductive Reasoning

NFPA 921 Definition:
"The process by which a person starts from a particular experience and proceeds to generalisations. The process by which hypotheses are developed based upon observable or known facts and the training, experience, knowledge, and expertise of the observer."

The investigator should rely on his/her own knowledge, training and experience. All of the data collected should be assessed.

Research by the investigator might be required to inform themselves on a unique scenario, fuels present or ignition source.

Assistance from other investigators or experts in an individual field can aid the assessment.

Fully understanding the data collected is necessary to allow a hypothesis to be formed based on the facts and not speculation.

David Gray
Senior Investigator

IFIC Forensics is delighted to welcome David Gray to join the team as a Senior Investigator. David has over 35 years' experience in the scientific investigation of fires and explosions. He trained at the Metropolitan Police Forensic Science Laboratory in the 1970's where he was a founder member of the Fire Investigation Unit. David spent over 10 years in the public sector, before practising as a consultant in the private sector in the Far and Middle East. For many years, he ran his own business as a fire investigation and risk engineering consultant based in the Kingdom of Bahrain, where he pioneered the regular use of such consultants by the insurance sector in that particular region.

David graduated in chemistry at the University of York and immediately afterwards joined the Forensic Science Laboratory. His training included the chemical analysis of items from fire scenes. After two years of intensive training he became a Court reporting officer specialising in fire investigation. He was subsequently promoted to Senior Scientific Officer and handled many big cases of arson, murder, fatal fires attending Crown and Coroner's Court on many occasions. During this time he conducted many training sessions for crime scene investigators, police officers and the legal profession.

In the early 1980's, David took a paid sabbatical and studied Fire Safety Engineering at the University of Edinburgh where he gained his MSc winning the Graviner Sword as top student. Later that decade, David moved to the private sector based in Singapore serving the Far East region. He practised in a wide range of countries conducting fire and explosion investigations for a variety of clients including insurance and marine interests, the legal profession etc.

By the early 1990's David was based in the Middle East conducting fire and explosion investigations for a similar range of clients. He was encouraged to set up his own business by Insurers and Loss Adjusters and did so for the next 20 years, becoming very well known in the region. He investigated most of the big fire losses in the region during this period. To supplement his work, he acted as a fire risk engineering consultant for a variety of Insurance related interests including surveys of oil and petrochemical plants, power and water facilities, warehousing and shopping malls.

David has attended Court to give expert evidence in many jurisdictions worldwide including Crown and Civil Courts in the United Kingdom, Saudi Arabia, Bahrain, Kuwait, United Arab Emirates, Singapore, Malaysia, Hong Kong and Tanzania.

David is a Fellow of the Chartered Society of Forensic Sciences.