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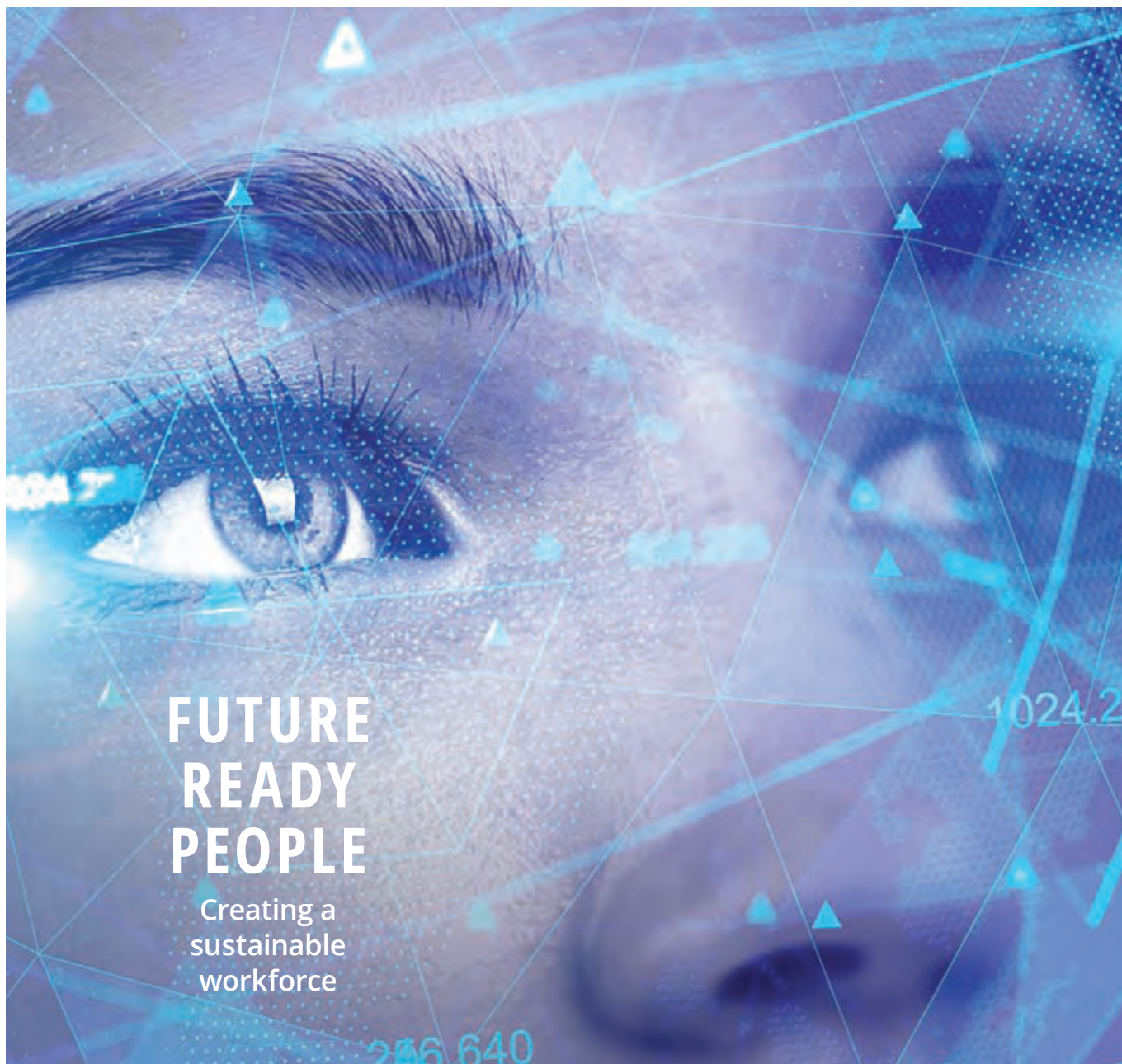
#### LEGAL UPDATE

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# Investigating white goods' FIRES

Government statistics for England<sup>1</sup> in 2019/20 show there were 3,862 fires in dwellings caused by faulty appliances and leads. Over half were determined to have originated at tumble dryers, washing machines, fridge freezers and dishwashers - white goods.

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**Burgoynes** undertakes around 250-300 fire investigations a year that have originated at white goods, usually instructed on behalf of property insurers, manufacturers, suppliers or other interested parties.

While the instructions often indicate the fire originated at a white goods appliance (usually communicated to the occupier by the attending fire service), the fire investigator has to first confirm the origin of the fire. Witnesses are asked about early observations of the fire, while interpretation of burning patterns and electrical evidence obtain indicators regarding the point of origin.

In the case of under-counter white goods (situated beneath kitchen worktops) the fire is sometimes confined to the appliance and the pattern of burning can be straightforward. However, caution should be exercised, as in one recent case, a fire that was seemingly limited to a washing machine was actually determined to have

originated at the hob of the adjacent electric cooker. Burning debris from the fire on the hob had fallen to involve a pile of clothes on the floor and the fire had spread to the washing machine.

In other environments, such as appliances located in congested garages or timber outbuildings, the spread of fire and consequential damage can be much more severe. They can also provide a challenging fire scene. In such cases, other potential causes of fire, including other electrical equipment and the activities of the occupiers, have to be considered before arriving at an origin at the white goods appliance.

Once identified as the likely origin, the fire investigator should determine the make, model and age of the appliance. The reliability of witness information can vary, from the provision of full purchase documents and user manuals, to a vague recollection of the make and (usually underestimated) guess at the age. Again, caution should always be taken, as one owner once provided full purchase documents for a dishwasher that was disposed







of several years prior to the fire (the fire having occurred at the replacement dishwasher).

Manufacturer's markings and product details, usually printed on a sticker, can sometimes survive a fire and be identified easily. However, in many cases, paper and plastic stickers are destroyed by the fire. The London Fire Brigade and Electrical Safety First have recently campaigned for indelible marking of electrical appliances to make them easily identifiable after a fire.

One example where indelible marking proved very useful was in a range of Bosch dishwashers manufactured between 1999 and 2005 that were subject to a manufacturer repair action due to a risk of fire. The product details were stamped on the inside edge of the metal door and were almost always legible after the dishwasher had caught fire. At present, indelible marking of electrical appliance is not mandatory, but the Government has been asked to introduce this as a safety standard<sup>2</sup>.

If there are no surviving markings to indicate the manufacturer of the appliance, Burgoyne's fire investigators for instance, can call on a wealth of knowledge from colleagues and our library. An appliance 'mug shot' database, which is a compilation of images of undamaged white goods, is a useful tool to help identify unknown fire damaged appliances. By comparing case mouldings and aperture patterns, a manufacturer can sometimes be identified.

After positively identifying an appliance that has caused a fire, a library search can also check for recalls or service actions and in-house records of previous cases to assist the investigator of any known faults. With regards to recalls, the average success rate of an electrical product recall in the UK is just 10-20%<sup>3</sup>, so many recalled white goods continue to be used in homes and businesses. On this subject, in addition to indelible markings on appliances, safety

campaigners have also called for a central hub for product registration and product recalls, so consumers can easily register their electrical appliances and quickly establish if any are included in a safety recall.

The fire investigator will also ask questions of the owner relating to the provenance of the appliance

and any service or repair history. If an appliance has been worked on or is secondhand (with an unknown history), a subrogated claim against the manufacturer may not be straightforward and other parties might need to become involved.

Having positively identified an appliance that has caught fire and established that its age is not outside of any legal limitation period, fire investigators from interested parties will usually undertake a joint destructive examination to identify the precise origin and cause.

## Dishwashers and washing machines

In the cases of dishwashers and washing machines, the cause of fire is often a high-resistance electrical fault. Nearly all modern dishwashers and ➤

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washing machines are cold fill, so the water is heated electrically within the appliance. During heating, a significant electrical load (current) is drawn.

High-resistance (or resistive heating) faults can occur at loose or poorly formed electrical connections. When under an electrical load, the high resistance of a poor connection can result in heat generation, which can further degrade the connection and increase the resistance. After many cycles of heating and degradation, the resistance of the connection can reach the point where temperatures generated under load are sufficient to ignite adjacent combustible materials and initiate a fire.

After a fire, unique localised melting at an electrical connector can be indicative of a high-resistance fault. Examples of such have been seen at door switch connections, printed circuit boards and heater relays, often carrying the electrical load associated with the heating circuit. Depending on the nature of the fault and the usage of the appliance, a developing high-resistance fault can take many years to result in ignition.

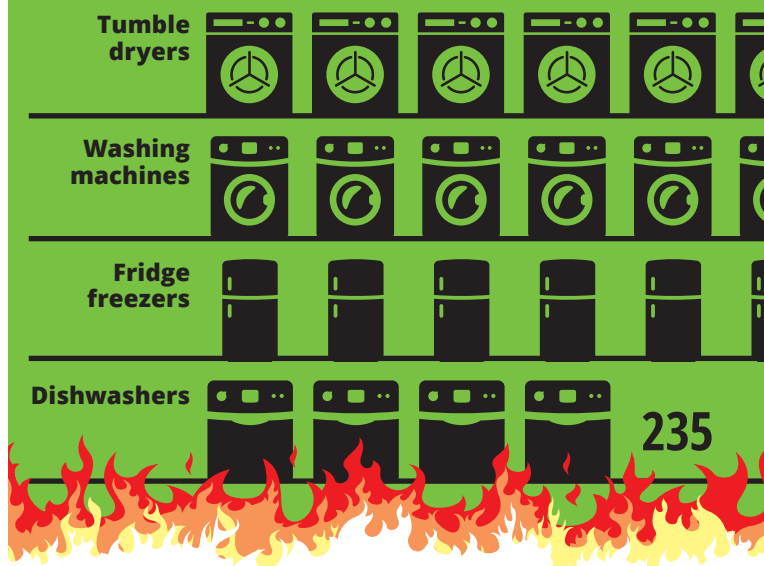
### Fridges and freezers

Failures at fridges and freezers include high-resistance faults at connections to the compressor and failures at start capacitors. Electrical faults caused by water ingress have also been seen at timer switches for defrost heater circuits of frost-free fridge freezers. Fires at fridges can be severe due to the involvement of combustible plastic and foam insulation at the rear of the appliance. Metal backing on fridges and freezers, common in US manufactured appliances, has been shown to shield the foam insulation from the electrical components at the rear of the fridge, which is where fires most likely originate.

On 11 July 2019 the standard for the manufacture of fridges and freezers in the UK was revised, effectively banning the future manufacture of foam and/or plastic-backed refrigeration appliances. However, the

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### Fires in England in 2019/20 by appliance



standard does not ban the sale of plastic-backed fridges already in the supply chain or in the second-hand market. There are millions of foam and/or plastic-backed fridges in use throughout the UK.

### Tumble driers

Fires at tumble dryers have received a high level of media attention due to the safety notice issued by Whirlpool in 2015 relating to various models of Hotpoint, Indesit, Creda, Swan and Proline tumble dryers. These appliances were identified as being at risk of catching fire due to the potential build-up and ignition of lint. The repair action involves modifications of the rear of the appliance casing, to reduce the likelihood of lint escaping into the casing, collecting around the rear drum seal and becoming ignited by the heater element. Unfortunately, for the fire investigator,

there is seldom any remaining positive evidence to confirm ignition of lint in a tumble dryer. However, if the fire occurred while the appliance was in use and an electrical fault can be discounted, lint ignition often is the only remaining plausible



cause. Other causes of fires seen at tumble dryers include the ubiquitous high-resistance electrical fault and failures at motor run capacitors.

A number of fires have originated at tumble dryers in commercial laundries and in premises such as pubs, restaurants and beauty salons, where towels or other items contaminated with vegetable-based oils have been laundered and dried. At elevated temperatures, tumble drying oil-contaminated items can initiate a self-heating process. If the load is not cooled fully after drying and is stored in a pile (for example, if the tumble dryer is stopped mid-cycle and the load is left in the drum), oil-contaminated items can self-heat to ignition. Depending on the conditions, the duration from stopping the dryer to ignition can vary widely but is typically three to six hours. More information about self-heating of laundry can be found on the Burgoyne's website.<sup>4</sup>

As manufacturers learn from past mistakes, developments in the design and manufacture of white goods will no doubt result in fewer fires of the type that have been seen over the last decade. However, new technologies, including smart appliances controlled remotely, may provide the fire investigator with new challenges in the future. ●

#### References

- <sup>1</sup>[gov.uk/government/collections/fire-statistics](https://www.gov.uk/government/collections/fire-statistics). Similar statistics are published for Wales, Scotland and Northern Ireland, although are reported differently and so the data cannot be combined to give totals for the UK.
- <sup>2</sup>[publications.parliament.uk/pa/cm201919/cmselect/cmbeis/156/15606.htm](https://publications.parliament.uk/pa/cm201919/cmselect/cmbeis/156/15606.htm)
- <sup>3</sup>[electricalsafetyfirst.org.uk/product-recalls/](https://electricalsafetyfirst.org.uk/product-recalls/)
- <sup>4</sup>[burgoyne.com/articles/2017/03/domestic-tumble-dryer-fires-another-hazard-self-heating](https://www.burgoyne.com/articles/2017/03/domestic-tumble-dryer-fires-another-hazard-self-heating)

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Founded in 1968, Burgoyne's is an international partnership specialising in the investigation of fires, explosions and other major incidents. Burgoyne's' expert forensic scientists and engineers advise clients across the legal, insurance and commercial sectors, including loss adjusters, insurance brokers, solicitors, police forces, government departments and industrial corporations. **[burgoyne.com](https://www.burgoyne.com)**