



Electronic Cigarettes



IFIC Forensics Case Study
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■ Technical Excellence : Rapid Response

E-Cigarettes Introduction

The electronic cigarette was invented by Chinese pharmacist Hon Lik, who patented the device in 2003 and introduced it to the Chinese market the following year. Numerous companies are now selling e-cigarettes to customers around the world.

Electronic cigarettes are an increasingly popular way for people to reduce the amount of tobacco they smoke or to stop smoking altogether and are sold in numerous retail outlets.

Common names include:

- Smokeless cigarettes
- E-cigarettes
- E-cigs
- Personal vaporizer (PV)
- Electronic nicotine delivery system (ENDS)

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**Cartridge Style
E-Cigarette**



**Re-Fillable Tank
Style E-Cigarette**

Component Parts

E-cigarettes have three main parts:

- Rechargeable lithium ion battery (powers the atomizer, normally 3.7volts)
- Vaporization chamber (atomizer) this heats the fluid to a fine vapour.
- Cartridge (contains the e-liquid)

The lithium ion battery powers the e-cigarette and can be charged using a charger similar to those used for mobile telephones, games consoles and tablets.

The charged battery is connected to the vaporization chamber, which is a hollow tube that contains the electronic controls and an atomizer (the component that creates the vapour).

The user of the e-cigarette attaches the cartridge containing nicotine liquid to the vaporization chamber. The tip of the cartridge serves as the e-cigarette's mouthpiece.

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Component Parts Cont.....

The e-liquid contains:

- Nicotine
- Propylene Glycol and Aqueous Glycerine
- Flavourings

E-cigarettes have a battery-operated heating coil that gently heats nicotine liquid from a cartridge or re-fillable tank, enabling the user to inhale a nicotine vapour (commonly known as Vaping).

The rechargeable lithium ion battery have been known to catch fire if they are overcharged, defective or damaged. Any internal defect may cause a short circuit during the charging process in which 'thermal runaway' may result.

Lithium batteries should also have a safety vent in order to vent rather than explode if the internal components of the cell become overheated and the internal pressure exceeds a safe limit. If the battery does vent the battery material normally ignites immediately.

Charging

Suppliers of e-cigarettes often supply a 'USB' connection with the e-cigarette and then inform the buyer that it can be plugged into any type of charger that they have in their possession. The issues with this advice are:

- An incorrect charger may be used
- The USB may be connected into a non-approved mains power transformer
- The USB connector may be used in conjunction of a forged charger which may bring upon its own problems.

The incident attended by us, the occupier stated that the e-cigarette battery had been connected to the 'USB' connector supplied with the e-cigarette and that all seemed well.

The occupant placed the battery on charge at 1100 hours and left the property. When she returned **25 minutes** later she became aware of the fire in the living room.

Known Failures

There have been a number of issues regarding the charging and subsequent failure of the lithium ion batteries whilst on charge, often with catastrophic results.

In April 2014 in Richmond, North Yorkshire a barmaid was working behind the bar when an e-cigarette battery exploded whilst being charged.

The e-cigarette was placed on charge to the top right of the image, It can be seen in the left of the image that the hot lithium ion battery components of the e-cigarette have been ejected some distance when failure has occurred. Sparks are also observed.

The hot ejected lithium ion battery material could ignite combustible materials upon which it falls.



The video can be viewed at:

<http://www.youtube.com/watch?v=mXgFk7RMjL4>

Known Failures Cont....

These images are taken from 2 separate sources and both indicate the identical mode of failure of the e-cigarette battery resulting in overheating and ejection of the lithium ion battery material.

A number of Fire and Rescue Services have begun to show an interest in e-cigarettes as a possible cause of ignition and there is growing concern that, in common with any other consumer product, there may be an unregulated illegal supply and some charging mechanisms may not comply with UK standards.

Merseyside Fire and Rescues Service have compiled a short report into E-cigarettes which can be located at:

www.esfrs.org/document/.../electronic_cigarettes_MFRS_June_2014.pdf



Electrical Safety Council

Electronic cigarette in a green blister pack with USB charger. The cut-off device of battery charger fails to work to prevent lithium battery from overcharging, this could cause the device to overheat and explode or catch fire.

The product does not comply with the Low Voltage Directive and the relevant European standard EN 62133 Voluntary measures: Recall of the product from end users. The manufacturer may not have provided a way to exchange your product. This product is dangerous, please stop using it immediately.

The Electrical Safety Council recommends that anyone who discovers they have an electrical item that has been recalled should stop using it until it has been checked by the manufacturer

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Product Recalls

Product recalls can be located at:

- <http://www.eccauk.org/forum/forumdisplay.php?fid=43>
- <http://www.uk-afi.org/>
- <http://www.esfrs.org/document/pdf/blackmuseum/EcigsDoHalert.pdf>

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Kanger EVOD Recall Notice

The following notice was issued by KangerTech for EVOD Batteries (Issued 07/18/2013) We have not sold any of these devices but are passing on the notice in the event that any of our customers might have purchased these from another supplier.

RECALL There has been a recall issued for all EVOD BATTERIES manufactured before June 24th 2013!!!

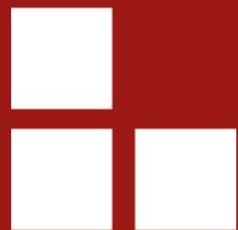
These batteries could possibly EXPLODE during charge. If you've purchased Evod batteries, contact the vendor for directions on return/replacement.

The potential faulty EVOD batteries are as below:

- All EVOD 650mAh batteries in matte black, yellow, blue. Rest colours we sent before June 24.
- All EVOD 1000mAh batteries in yellow, green. Rest colours we sent before June 24.
- All EVOD starter kits in yellow. Rest colours we sent before June 24



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