



AVD[®]

www.AVDFIRE.com



**ADDRESS THE BURNING ISSUES SURROUNDING
LITHIUM-ION BATTERY FIRES**



AVD FIRE IS A DIVISION OF DUPRÉ MINERALS.

DUPRÉ MINERALS WAS FOUNDED IN THE EARLY 1950'S. BASED AT NEWCASTLE-UNDER-LYME, STAFFORDSHIRE, WE MANUFACTURE AN EXTENSIVE RANGE OF HIGH QUALITY PRODUCTS, SERVICING THE VERMICULITE, PRECISION CASTING, FRICTION AND REFRACTORY INDUSTRIES.

The processing and manufacture of Vermiculite continues to be one of our core business markets. The established Dupré brand inspired the development of some of the world's most advanced Vermiculite product formulations.

Applications for crude and exfoliated Vermiculites include fire extinguishing agents, dispersions, insulation, friction, horticulture, construction, packaging and wherever lightweight or heat resistant properties are required.

Dupré Minerals is a 100% owned subsidiary of Goodwin PLC based in Stoke-on-Trent. Goodwin PLC have patents worldwide covering the use of AVD as a fire extinguishing agent.

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AVD IS A REVOLUTIONARY NEW FIRE EXTINGUISHING AGENT SPECIFICALLY DESIGNED FOR LITHIUM-ION BATTERY FIRES.

It is environmentally friendly and is made from the naturally occurring mineral vermiculite. AVD offers superior performance to both control and extinguish flammable lithium-ion battery fires. AVD's enhanced fire extinguishing properties, when compared with conventional extinguishing products, make it the only fire extinguishing agent you should consider for lithium-ion battery fires.

AVD is applied in the form of a mist. The vermiculite particles within the mist are deposited on the surface of the burning fuel to create a film over the top of the fire. This film instantly dries and because of their high aspect ratio the platelet particles overlap and bind together, producing a non flammable oxygen barrier between the fire and the atmosphere.

AVD high performance Lith-Ex extinguishers are designed to target high risk fires of a limited size. They are suited to confined spaces such as homes, hotel rooms, vehicles, public transport, aviation, marine or leisure and dedicated processes, where in all instances fires need to be suppressed in their infancy before developing into a fully established fire.



e-Cigarettes



Laptops



Mobile Phones



Domestic



e-Bikes & Scooters



Drones



Automotive



Industrial



Aviation



Marine

Are you prepared for a lithium-ion battery fire?



WHAT IS AVD?

AQUEOUS VERMICULITE DISPERSION



AVD fire extinguishing agent, is composed of high aspect ratio vermiculite platelets in water; vermiculite is the name given to a group of hydrated laminar aluminium-iron-magnesium silicates.

AVD is a new and revolutionary extinguishing agent which has been developed during the past few years in response to the demand for products which can deal with high temperature flammable metal fires and lithium ion and lithium polymer battery fires. AVD offers a significant performance improvement over conventional extinguishing agents when applied to these very particular fire types.

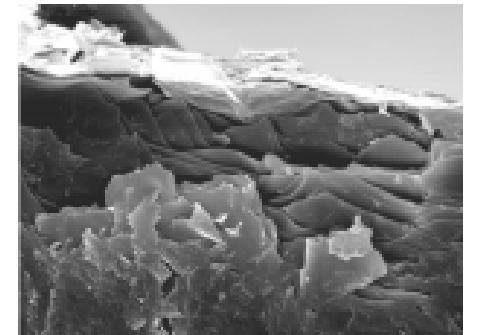
AVD has undergone extensive testing with a variety of delivery systems and is suitable for application using standard fire extinguishing equipment via a specialized misting nozzle.*

WHAT IS AVD?

- A natural mineral-based fire extinguishing agent.
- A gold/brown, stable, aqueous suspension of vermiculite platelets. AVD is non flammable and has excellent thermal insulation properties.

TYPICAL PROPERTIES OF AVD

- AVD has a solids content of 16-18%
- AVD has a viscosity of 2,000 to 4,000 cP.



*This nozzle can be supplied by Dupré upon request.

LITH-EX



Battery Recycling Facilities



E-Scooter & E-Bike Manufacturers & Rental



Workshops

2Ltr

6Ltr

9Ltr

100-250 Wh

250-500 Wh

500-750 Wh

Home & Office

1Ltr

60-100 Wh

Are you prepared for a lithium-ion battery fire?

25Ltr

Over 750 Wh

E-Vehicle Charging



Fire & Rescue Services

Mobile Phone & Laptop Repair Stores

500ml

Under 60 Wh

Over 750 Wh

50Ltr

Energy Storage



LITH-EX FIRE EXTINGUISHERS

AVD offers a range of lithium battery fire extinguishers to help fight the flames and prevent the propagation of fire. Ideal for use in factories, offices and other locations where lithium battery technologies are prominent.





500 ml



1 L



2 L



6 L

9 L



25 L

50 L



Extinguisher AVD Type	LITH EX AEROSOL	LITH EX 1 L	LITH EX 2 L	LITH EX 6 L	LITH EX 9 L
Brim Full Capacity / ml	794	1,240	2,520	7,780	11,325
Fill Volume AVD Agent / ml	500	1,000	2,000	6,000	9,000
Approx. Weight Agent / kg	0.545	1.1	2.2	6.6	9.9
Approx. weight of Unit / kg	0.690	2.1	3.9	10.7	15.0
Cylinder Ø / mm	65	85	110	170	170
Cylinder Height / mm		320	380	522	664
Unit Height / mm	300	350	410	530	672
Handle		Metal - Red	Metal - Red	Metal - Red	Metal - Red
Hose		N/A	N/A	Yes with Magnet	Yes with Magnet
Base		Integral Base & Wall Bracket	Integral Base & Wall Bracket	Green PP	Green PP
Bracket				Wall Hanger	Wall Hanger
Fire Rating		3A	5A	13A	13A
EN3 Certified	Not Applicable	Not Allowed *	Yes	Yes	Yes
Propellant	Nitrogen (He Tracer)	Nitrogen (He Tracer)	Nitrogen (He Tracer)	Nitrogen (He Tracer)	Nitrogen (He Tracer)
Operating Pressure / bar	10.8	15	15	15	15
Operating Temperature	+5°C to +50°C	+5°C to +60°C	+5°C to +60°C	+5°C to +60°C	+5°C to +60°C
Approx. Discharge Time / s	90	25	50	120	180
Discharge Range / m	2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0
Packaged Unit l x w x h / mm	100 x 72 x 320	102 x 104 x 360	125 x 128 x 420	197 x 267 x 525	199 x 226 x 670
Units per Box	6	10	6	1	1
Box Dimensions / mm	250 x 230 x 320	394 x 535 x 226	444 x 392 x 265	N/A	N/A

Extinguisher AVD Type	LITH EX 25 L	LITH EX 50 L
Volume of Agent / l	25	50
Agent	AVD	AVD
CE / PED	Yes	Yes
Aproximate Weight in Working Order / kg	55	100
Height ~ / mm	970 ±10	1090 ±10
Width / mm	558	558
Cylinder Ø / mm	350	350
Typical Hose Length / m	5	5
Propellant	Nitrogen (Helium Tracer)	Nitrogen (Helium Tracer)
Operating Temperature Range	+5°C to +60°C	+5°C to +60°C
Working Pressure / bar *	8	8
Supply Bottle / bar	160	160
Discharge Time / mins	3.5	7
Attack Distance / m	5	5

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FIRE SUPPRESSION PRODUCTS

The complimentary product range including Fire Blankets and Fire suppression kits can be applicable to the same categories and we recommend the provision of both product groups as part of your fire safety strategy.



SMALL & LARGE FIRE SUPPRESSION KIT

The Fire Suppression Kit is the perfect solution for the effective control and suppression of Lithium-ion battery fires. Equipped with a choice of Lith-Ex extinguishers this fire resistant bag is designed using technical fabrics to withstand temperatures in excess of 1000°C.

The kit provides the initial extinguisher to suppress the fire and a bag for the safe suppression and removal of the extinguished device. Typical applications are mobile phones, tablets, and laptops.

PROVIDES

- Safe storage of extinguished devices
- Reduces risk of explosion after fire has been extinguished
- Withstands temperatures in excess of 1000°C



SMALL KIT INCLUDES

- Fire resistant bag
- Choice of Lith-Ex extinguisher options from the Aerosol and Lith-Ex 1 litre
- Safety Gloves
- Safety Glasses

Kit can be supplied without an extinguisher

DIMENSIONS/WEIGHT

Closed with Aerosol
220 mm x 400 mm
Total Weight ~2.2 kg

Open Without Extinguisher
440 mm x 415 mm
Total Weight ~1.5 kg

Closed With 1 Litre Extinguisher
220 mm x 400 mm
Total Weight ~3.6 kg



LARGE KIT INCLUDES

- Fire resistant bag with flame arrester
- Choice of Lith-Ex extinguisher options from the Aerosol, Lith-Ex 1 litre and Lith-Ex 2 litre units.
- Safety Gloves
- Safety Glasses

Kit can be supplied without an extinguisher

DIMENSIONS/WEIGHT

Suppression Bag Open
690 mm x 540 mm
Total Weight ~2 kg

Closed Without Extinguisher
510 mm x 540 mm
Total Weight ~2 kg

Packaged With 2L Extinguisher
550 mm x 270 mm x 100 mm
Total Weight ~5.9 kg



BATTERY FIRE BLANKET

AVD Fire have developed a specialist range of fire blankets specifically for the Lithium-ion battery market. Our Blankets are capable of withstanding extremely high temperatures for a prolonged period of time as well as being robust enough to offer protection against potential debris and shrapnel expelled during a battery fire event.

These qualities make our Lithium-ion battery fire blankets an important part of your passive fire protection strategy.

If your organization is connected to the production, storage and transportation of lithium-ion batteries and associated devices you will need a comprehensive strategy which incorporates passive and active fire suppression systems.

Easy to store and easy to deploy.

Available in a wide variety of sizes, please contact us with your requirements.

TYPICAL PROPERTIES

- Working temperature up to 1000°C
- Fire resistant technical fabrics
- Fire resistant re-enforced multi-layered edge lining
- Fire resistant industrial stitching
- Handling loops on all corners



FIRE RESISTANT CONTAINER

The Fire Resistant Container (FRC) is an innovative product that protects potentially flammable goods against the threat of fire. The exceptional insulation properties are achieved by the use of a unique combination of technical textiles which prevent the propagation of both internal and external fires.

The Fire Resistant Container provides the perfect solution for transporting and storing potentially combustible products, such as batteries, fireworks and other flammable chemicals.

Make an enquiry to discuss your lithium battery fire protection needs today.

FRC DIMENSIONS:

- 300 mm x 250 mm x 250 mm
- Flame arrestors included
- Other sizes available to order.



THERMAL RUNAWAY

- Overcharging
- Overheating
- Penetration
- Crushing
- Short Circuit

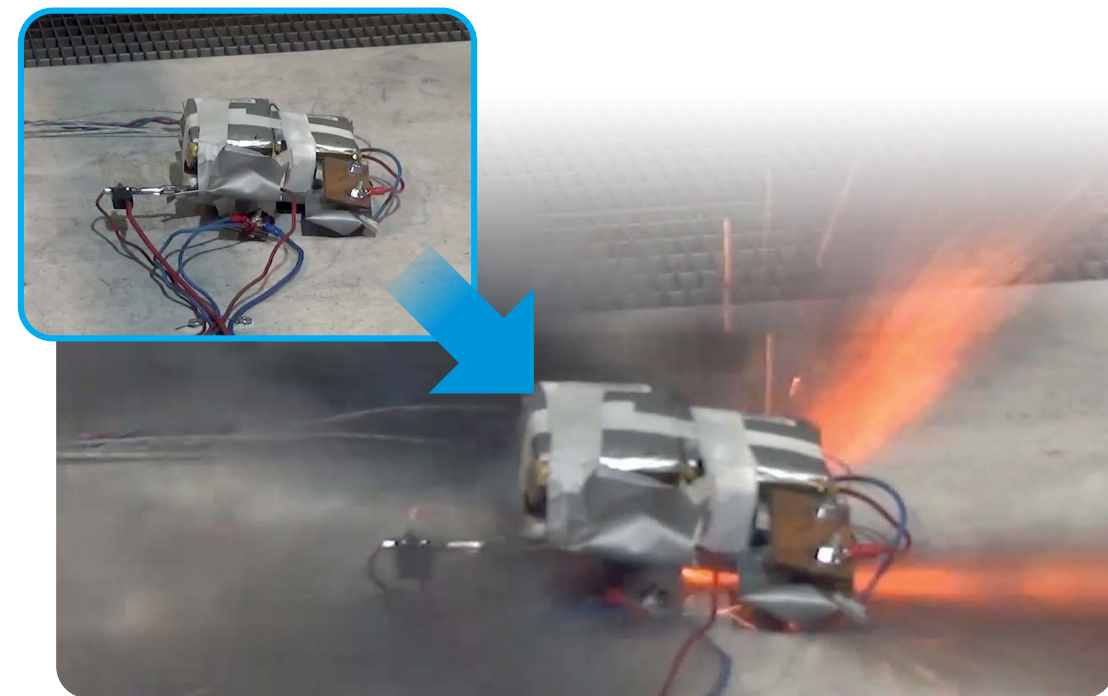
Examples of typical consumer goods and industrial products that may pose a fire risk:

- Mobile phones and portable computing equipment
- Children's toys
- Electric bikes and scooters
- Radio controlled vehicles, watercraft, aircraft
- Power tools
- Radio communication equipment
- Health service and hospital monitoring and test equipment

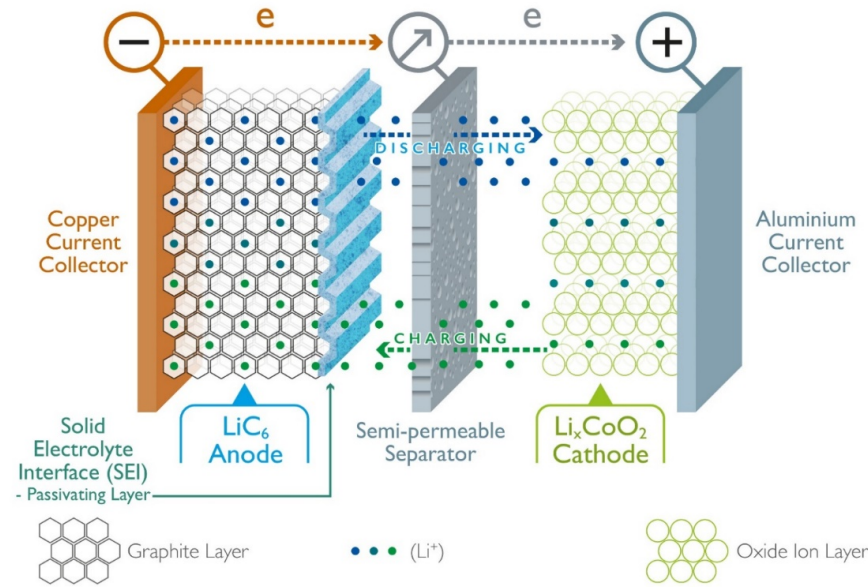
The batteries in these devices can be damaged and pose a fire risk. When there is a short circuit or the cells overheat then the electrolyte can decompose into flammable gases which can then ignite. This process is called thermal runaway and propagates throughout the battery pack resulting in the complete destruction of the cells.

Testing has shown that typical water, powder and foam extinguishing agents are not effective in extinguishing these fires and they frequently re-ignite.

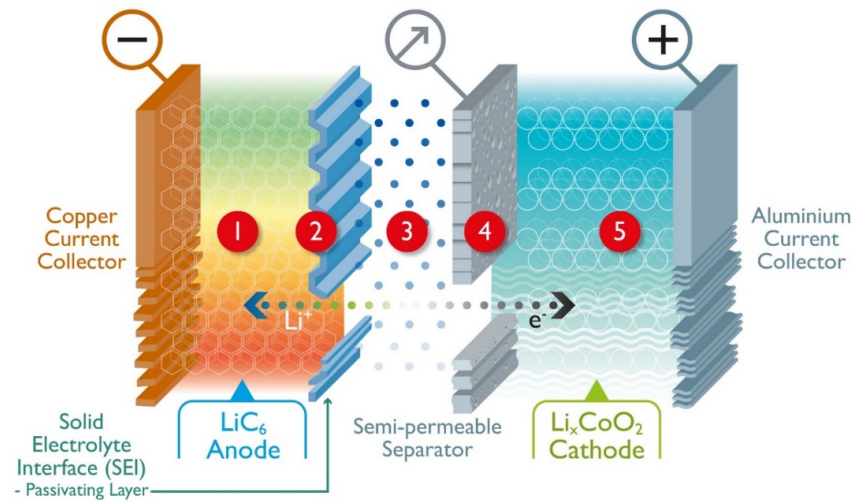
Third Party testing has proven Lith-Ex to be effective in suppressing and extinguishing lithium battery fires. It is also proven that Lith-Ex prevents re-ignition by forming an encapsulating barrier over the battery cells.



EXPANDED VIEW OF A LI-ION BATTERY ASSEMBLY



THERMAL RUNAWAY IN A LITHIUM ION BATTERY



- 1 Heating starts
- 2 Protective layer breaks down
- 3 Electrolyte breaks down into flammable gases
- 4 Separator melts, possibly causing a short circuit
- 5 Cathode breaks down, generating oxygen

HOW DOES AVD WORK?

The vermiculite particles within the mist are deposited on the surface of the burning fuel to create a film over the top of the fire. The film instantly dries and, because the high aspect ratio platelet particles overlap and bind together, a non-flammable oxygen barrier between the fuel and the atmosphere is produced.

This process has a cooling effect on the fuel source and, as the water content in AVD is evaporated, the vermiculite platelets begin to build up and the fire is brought under control.

The process is shown in four numbered steps:

1. **When the Batteries go into thermal runaway they start to smoke.** (Image of smoking battery pack)

2. **Eventually the cells rupture and release hot flammable gases.** (Image of a battery cell rupturing and emitting a flame)

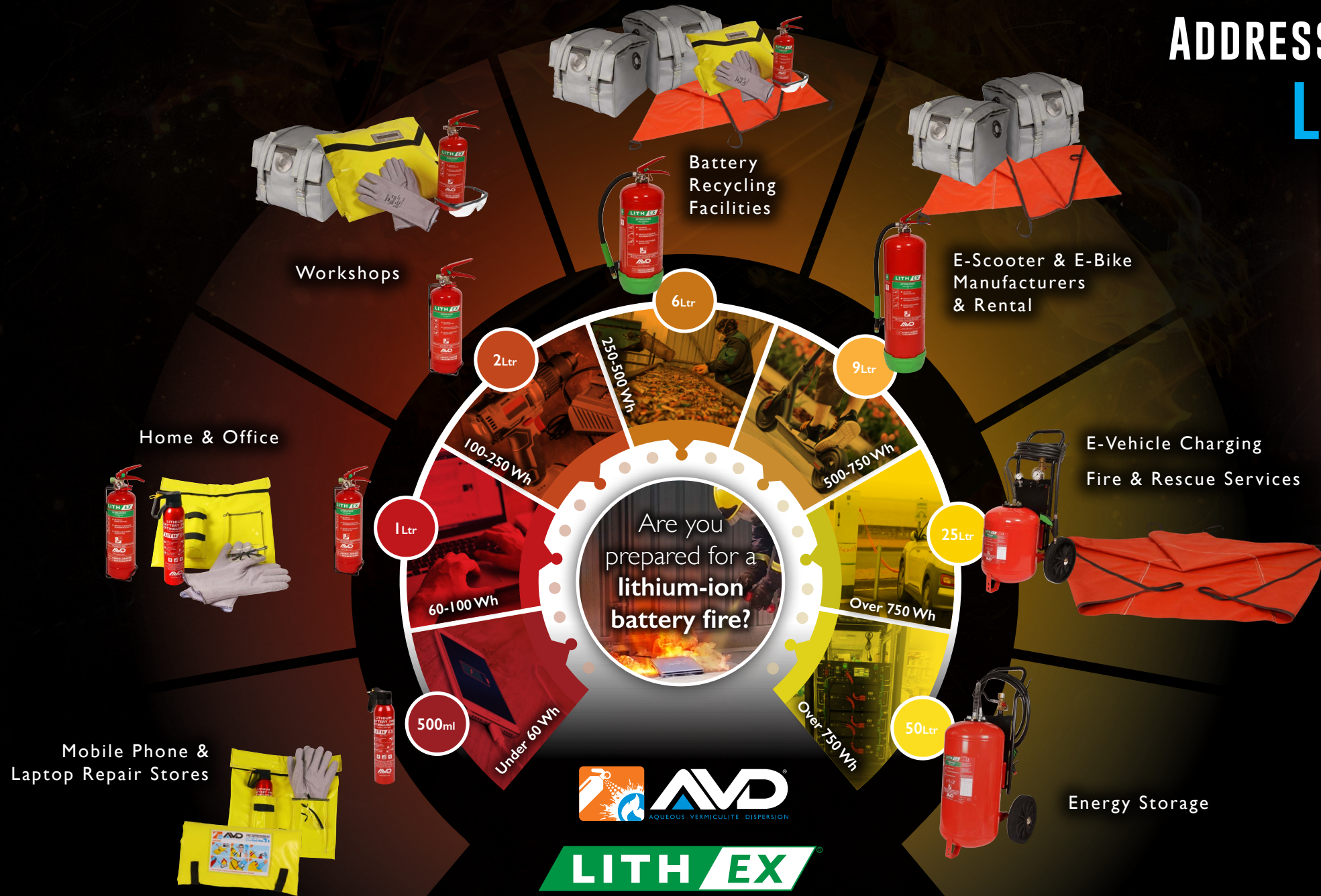
3. **The AVD is applied as a mist and the water content knocks down the flames and cools adjacent cells.** (Image of a firefighter spraying AVD mist onto a burning battery pack)

4. **As the water is driven off, AVD forms a film over the cells, providing 3 functions:**

- A thermal barrier
- An oxygen barrier
- An electrical barrier

 (Image of the battery pack covered in a white, crusty AVD film)

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Proven results on
lithium-ion battery fires



AVD[®]



Effectively extinguishes
Class A and Magnesium fires

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☎ +44 (0) 1782 383124

✉ info@avdfire.com



Suitable for
portable & fixed systems



Environmentally
friendly



Kite
Marked



CE / UKCA
Marked

EN3-7

Certified to
EN3-7



Marine
Equipment
Directive

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