



Learning from others- an update on the LIBRIS Project or When Sparks Fly...

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Jonathan Buston

The PreLIBS/LIBRIS Projects:

- Recognise that the current generations of lithium ion technology is likely to be used in EVs for the next 3-10 years.
- Understand these safety issues

L  BR  S



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LIBRIS



Thermal Propagation Test



- New developments from the Chinese Standards
- Key Requirement:
 - Alarm of a 'thermal event' 5 minutes before the event impacts upon the passenger compartment

Thermal Propagation Test

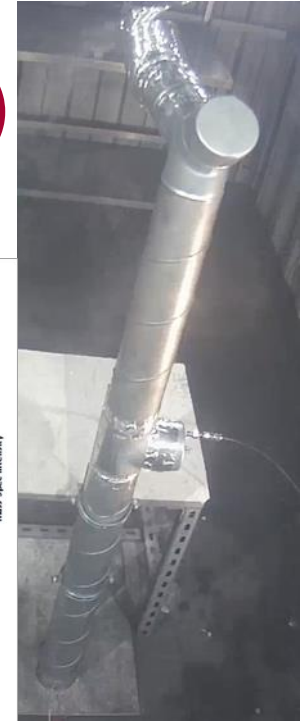
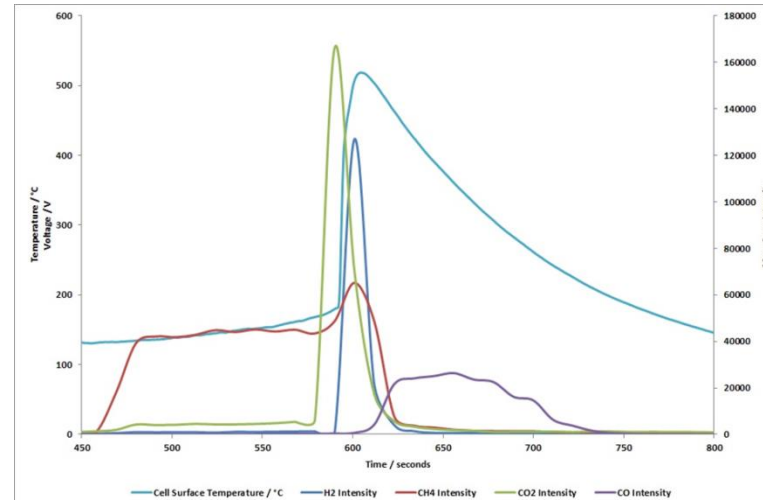
- Reliable detection of an event
- ‘Managing’ the event for 5 minutes
- Developing a testing strategy to reliably put a pack into thermal propagation, according to the standard specifications

Gas Generated

- Quantity



- Identity (real time)



How to quantify cell failure

- Flame height/duration
- Forces generated
- Pressure
- Outcome on the cell

Four types of cell failure: 1

Smoke and fume, little or no flame



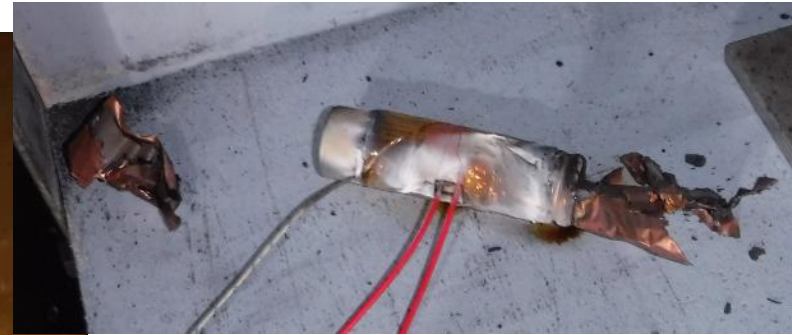
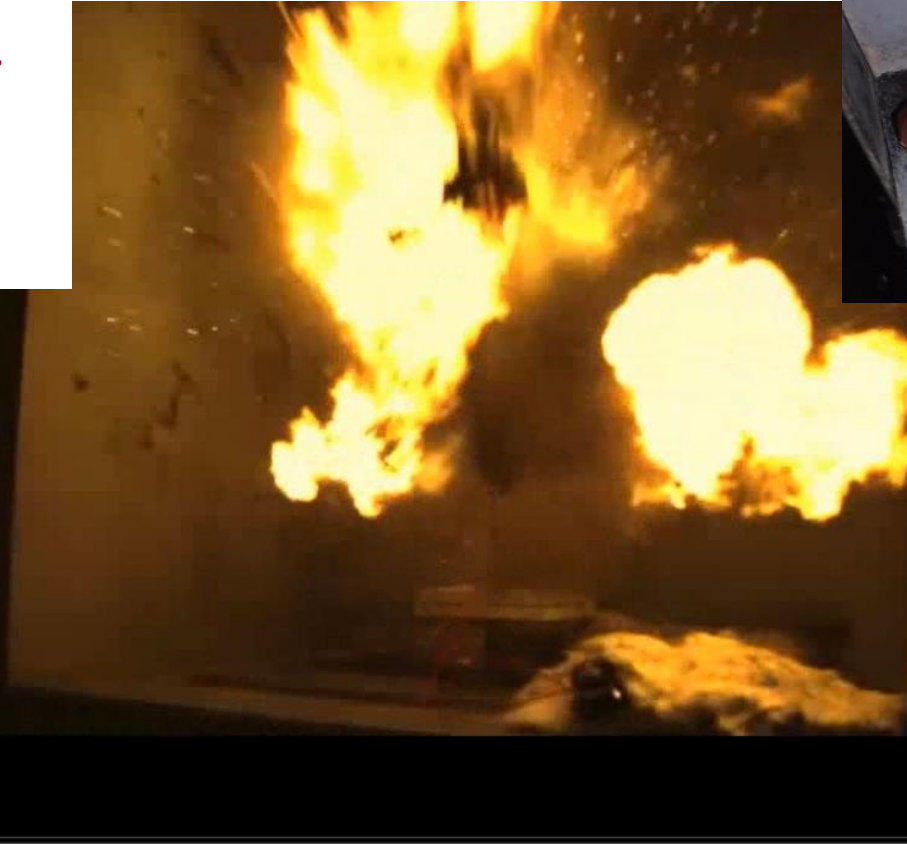
Four types of cell failure: 2

Jet flame



Four types of cell failure: 3

Fireball-
jellyroll
ejected



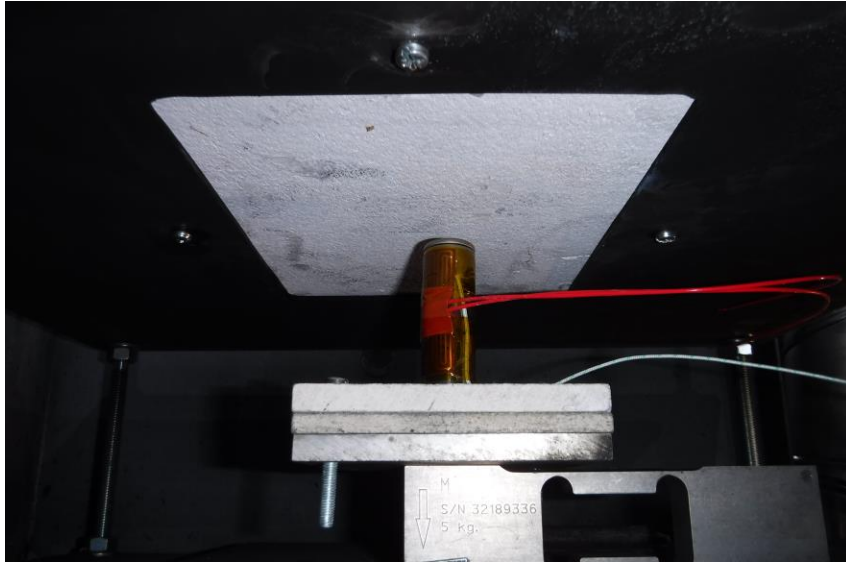
Four types of cell failure: 4

Complete can rupture



File: n024 100% soft initiation.mp4 Rate: 1000

Forces generated

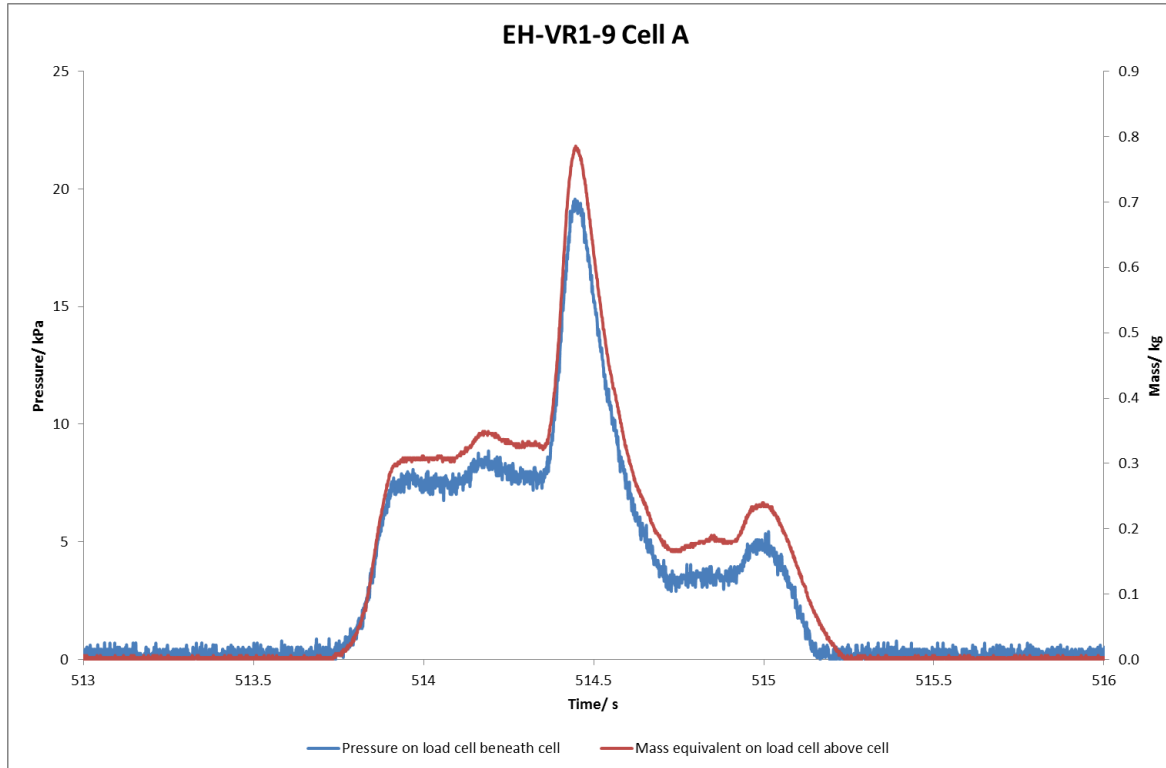


Before

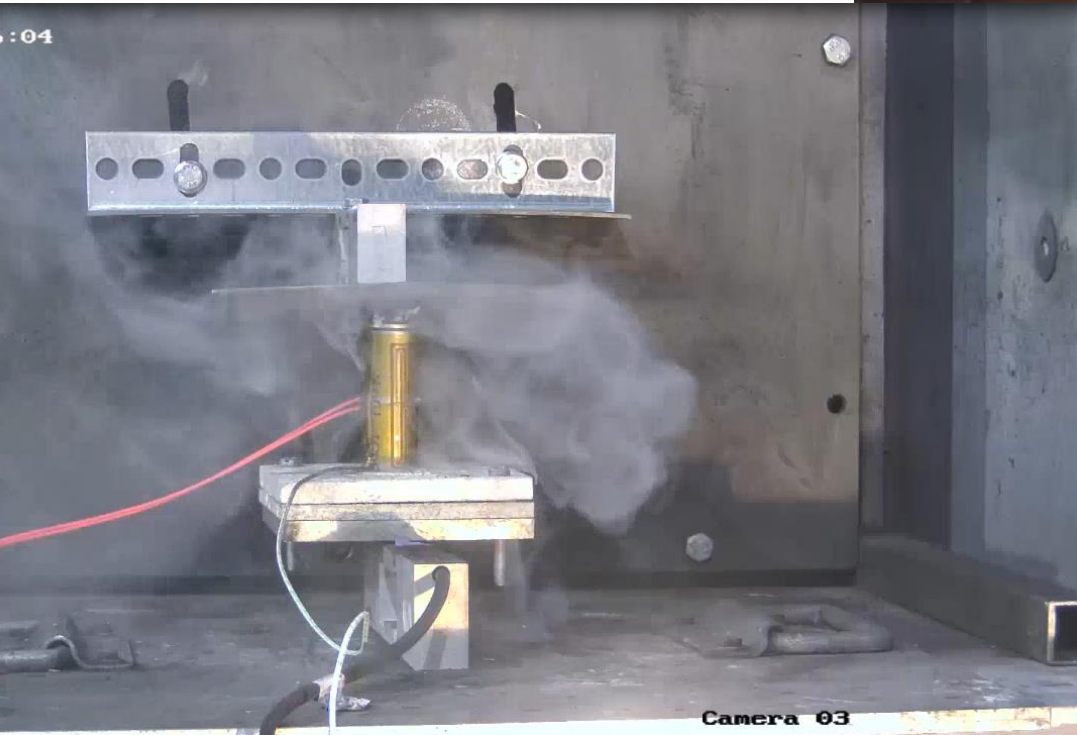


After

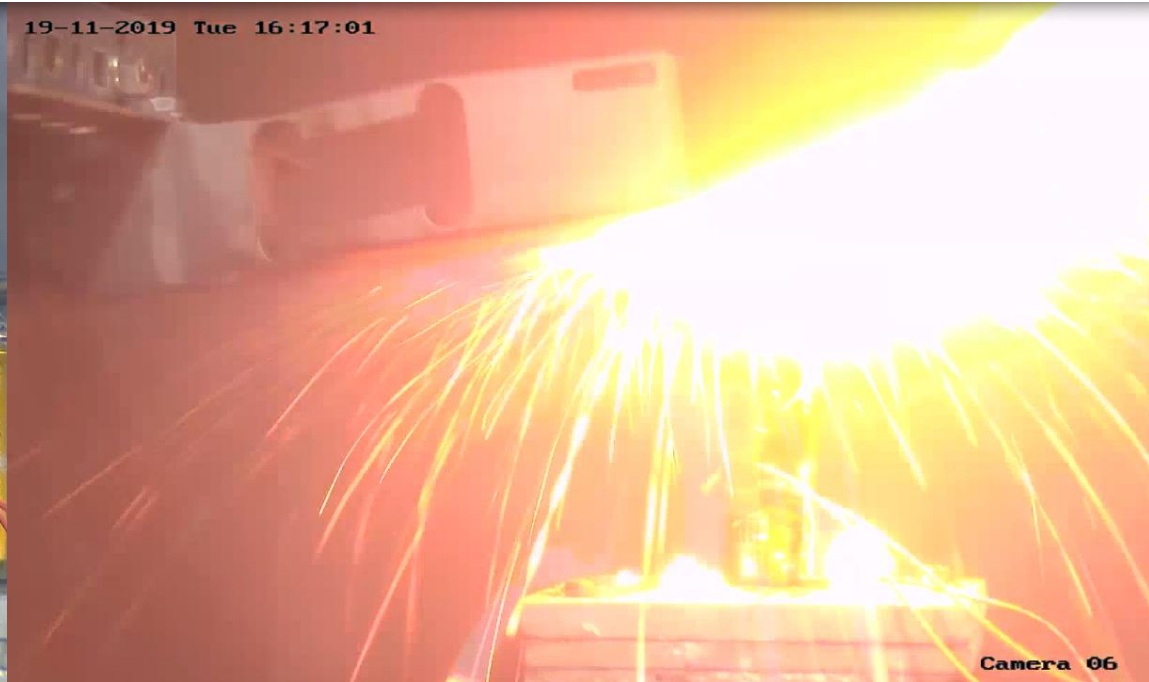
Forces Generated



Forces Generated



Forces Generated

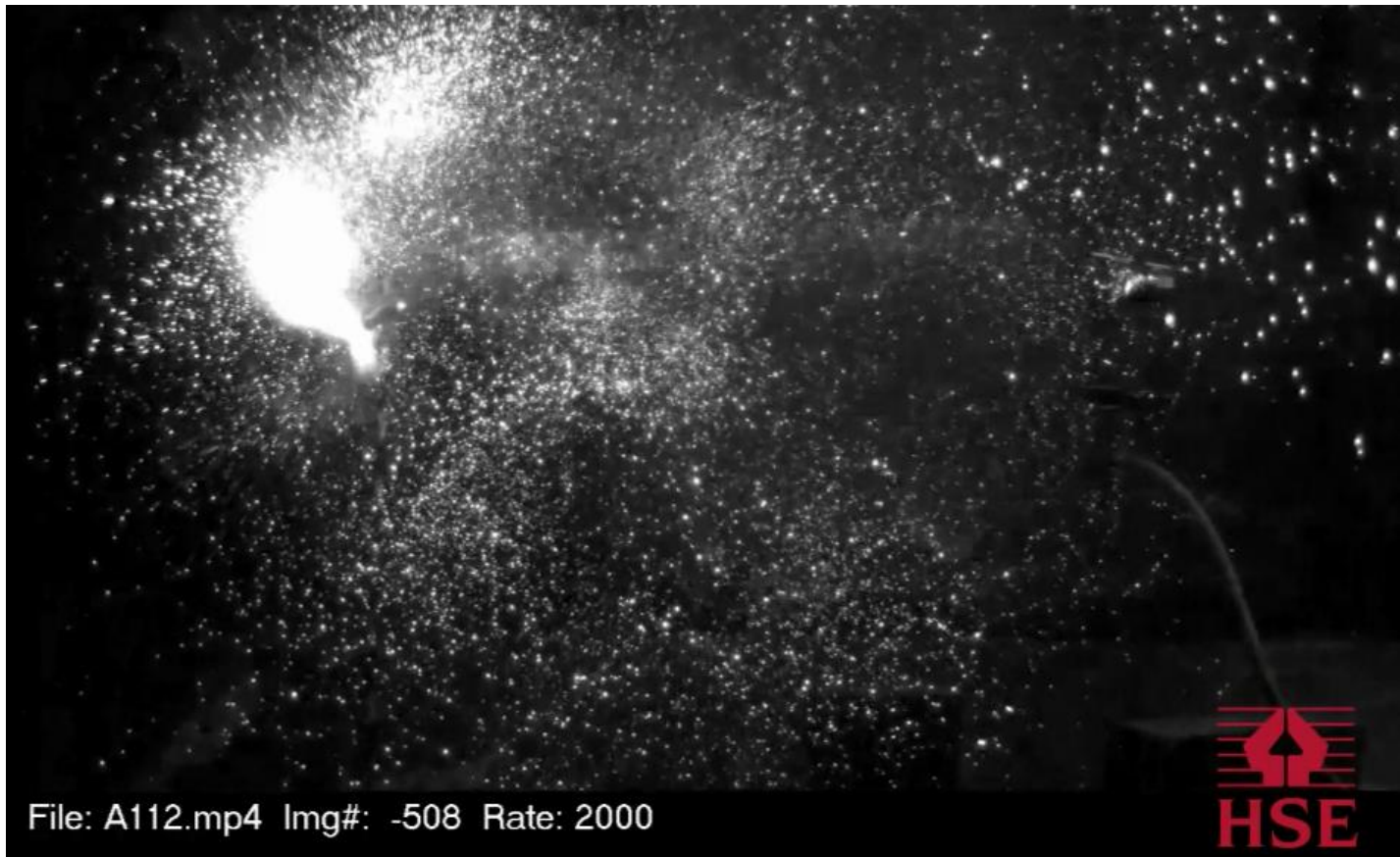


Damage caused

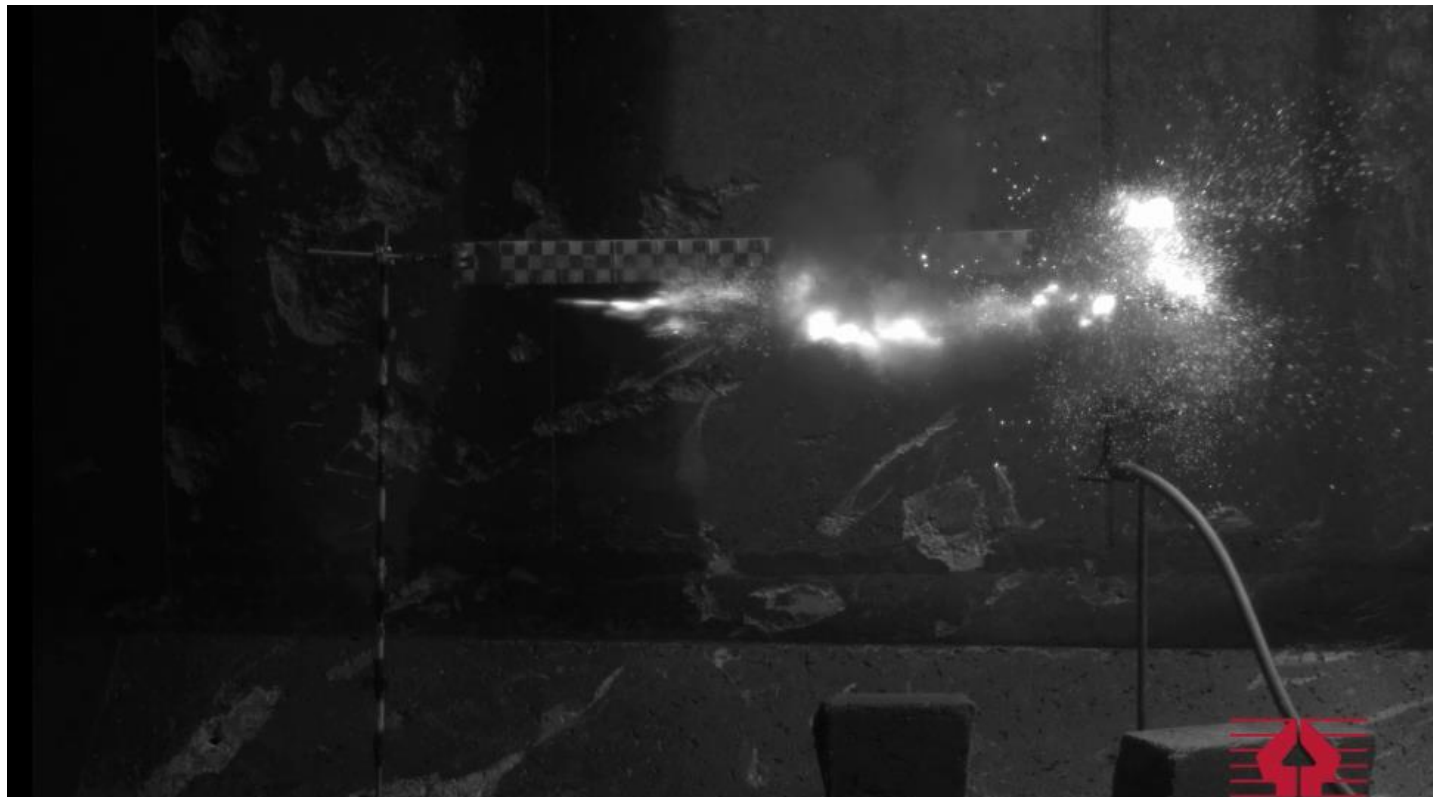
- 2.5mm Aluminium plate, 9 cells underneath



Projectiles: Type 2 failure



Projectiles: Type 3 failure



“Standard” Fire- Blocks of cells



“Standard” Fire- Blocks of cells



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Camera 03

Thanks to



All project partners



Innovate UK

UK Research
and Innovation

HSE Staff

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Conclusions

- Plenty of batteries are out there NOW, and may cause, or be involved in fires
- Fires involving batteries behave differently
 - Non-linear growth
 - Projectiles
 - Just because you see no flames... doesn't mean the event is finished!
 - Fumes/smoke and residues?



Conclusions

- Lithium ion batteries are here

but

...More batteries are coming!



- Big lithium batteries are here!

but

....Even bigger batteries are coming!

For those who vape...



Current Test Facilities

- 'Abuse test' chamber
- Cell level charging/cycling
- ARC Calorimetry
- Realtime gas analysis
- Pressure vessel for gas quantification
- HD Video
- High Speed video and Thermography etc



Up and Coming Additional Test Facilities

- A second ‘abuse test’ chamber
- A third bigger ‘abuse test’ chamber for modules



Parts have arrived at HSE, Buxton, but due to Covid-19, they have not yet been assembled/commissioned.

Questions?



jonathan.buston@hse.gov.uk

+44 203 028 2037