

Ehningen: Fire of a high-voltage battery for electric vehicles in a test centre

Targeted use of F-500 enables rapid cooling

On Whit Monday, June 1, 2020, a high-voltage battery caught fire during a test at a test center of Bertrandt Technikum GmbH. The difficult handling of high-voltage batteries in the development stage as well as the rapid thermal treatment of the battery block resulted in a large-scale operation for the Ehningen volunteer fire brigade and the southern environmental protection platoon of the Böblingen district.

The municipality of Ehningen belongs to the district of Böblingen (Baden-Württemberg) and has around 9,200 inhabitants. Due to the central location in the district, direct motorway and S-Bahn connection, international companies are also settled with their headquarters. The municipality maintains a volunteer fire department with 69 volunteer firefighters and one firefighting employee. The number of operations has risen to between 60 and 70 in recent years. Due to the varied operational area, the Ehningen volunteer fire department is well equipped and has six emergency vehicles.

Weather

On Whit Monday, 01 June, the weather was sunny with 22°C. During the operation a light wind blew in east direction.

The object of operation

The local group is one of the leading engineering companies worldwide. Development services are offered here.

Most recently, the company premises were supplemented by a new building of a high-voltage battery testing center on an area of around 1,340m² May 2019. The battery testing center is thus considered one of the largest in Germany.

In total, it has a test room volume of 192m³, a high-voltage test capacity of 9,600 kW and a thermal capacity of 420 kW. The building is divided into six test rooms, each of which contains 16 m³ climate chambers with four high-voltage channels. The channels can be coupled together to test particularly high outputs of up to 1,600 kW. The climatic chambers have a temperature range of -40 °C to +120 °C. Furthermore, there are a total of four machine rooms in which twelve battery testers with an output of 400 kW each, a voltage of 1,200 V and currents of up to 1,200 A with a total of 24 high-voltage channels are available.

General

- Community of Ehningen: Böblingen district (Baden-Württemberg); more than 9,200 inhabitants; including industry of global companies with headquarters
- Fire brigade with 69 active members; between 60 and 70 operations per year; motorway A81 as well as railway line in the area of operation
- Corona alarm: Alarmed only train, approach BMA only with squadron on LF

Weather

- sunny, cloudless, 22 degrees Celsius, light wind to the east

Alerting/exploration

- 01.06.2020 at 16.10 o'clock; BMA alarm; moving out according to valid AAO
- ELW deployed with 1/1 at 16.15 h; LF with 1/5 (plus detector ZF) at 16.16 h
- Already on approach smoke development from battery center ascertainable
- BMA at the main building ELW; LF drives directly to the test centre
- Confirmation at the BMA: Triggering of smoke detector at the battery centre of climatic chamber 12. First briefing by security service; noticeable smoke development at the chimney of climatic chamber 12 bursting disk broken
- Request TLF to the scene (also deployed in 1/5)
- Full alarm triggered 4.27 p.m.

Further reconnaissance

- EL and ZF try to reconnoitre the situation in Halle
- Access via separate door in hall, hall however completely smoky
- Further investigation by two squads under PA in hall
- Fire source in climate chamber localized as burning e-vehicle battery
- Opening of a hall door (two doors) and positioning of a fan for smoke extraction

Firefighting operation

- Set-up of an extinguishing attack with a 3% F-500 Mixing directly into the climatic chamber (direct C-connection)
- Cooling success already after a few minutes and "fire under control" could be reported
- Water leakage from climatic chamber, as not intended for permanent flooding
- Request for change of clothing for contaminated emergency forces
- Assumption of contamination by hydrofluoric acid Alarm of the UZS-Süd (Herrenberg) at 16:51 with keyword 3UM
- Formation of a second section for fire water retention (retention "only" 5m³)
- USZ-South reports ready for action at 17:24. Consists of the following units:
 - Florian Böblingen 1/11 (1/1)
 - Florian Böblingen 1/46-2 (1/8)
 - Florian Böblingen 1/65-1 + AB dangerous goods (1/2)
 - Florian Böblingen 2/59 (1/5)
 - Florian Herrenberg 1/91 (1/2)
 - Florian Herrenberg 1/65 + AB-Environment (1/2)
 - Florian Herrenberg 2/41 (1/6)
 - Florian Herrenberg 1/24 (1/1) + P 250
 - Florian Herrenberg 1/52 (1/2)
 - Florian Sindelfingen 1/65-1 + AB respiratory protection (1/2)

Personnel in total: 41 persons

- Coordination of the operation via the ELW2 and the Böblingen district command group with the support of the chemical advisor.

Dangerous goods mission

1. Pumping of the extinguishing water from the retention basin into the extinguishing container in the courtyard
 2. Recovery of the battery and securing in an extinguishing box
 3. Construction and operation of a decon station
- Further operational section: "Supply and catering".

Personnel expenses

- Fire brigade: 84
- Police: 6
- Rescue service: 7
- THW: 2
- DRK OV: 13
- Consultant Chemistry: 1
- Bertrandt: Contact person on site

Conclusion

- Result was very satisfactory, no injuries
- Damage was limited to the climatic chamber and hall
- Battery did not reignite during transport in high-voltage box (filled with water/F500 mixture)
- Analysis of the extinguishing water Pollutant concentration very low, can be supplied by sewage treatment plant; PH value of 7
- Battery had a thermal runaway
- Increase in temperature
- Parts of the battery hit parts of the climatic chamber
- Discharge of the hazardous goods operation to the full extent not necessary, only decon unit will be alerted in the future
- Further measures taken with Bertrandt to be more effective in the future