REMBE® Research+Technology Center GmbH

Center for explosion testing and battery safety

ilac-MRA
DAkkS Deutsche Akkreditierungsstelle D-PL-21054-01-00

Plant safety and process optimization

We test your plant components and materials for you

That means, we will develop the appropriate test setups and conduct the necessary tests for you. Benefit from more than 45 years of experiencein the field of global explosion safety! If necessary, we can also organize external approvals by Notified Bodies.

Our Portfolio

Explosion test

To ensure the functional safety during developement and approval of explosion protection systems, explosion tests will be performed.

Components, units, housings or protection systems will be put to acid tests at the RTC.

Research, validation or certifcation of the test object can be performed during respective developing phases.

For certification of protection systems the whole process will be performed with consultation of a Notified Body.

Standards and Procedures

Following standards and appropriate procedures are in acc. with the accreditation DIN EN ISO/IEC 17025:2018.

- Test of housings, equipment, devices and vessels in acc. with DIN EN 14460 „Explosion resistant equiment“
- Test of explosion venting devices in acc. with DIN EN 14797 „Explosion venting devices“
- Test of flameless explosion venting devices in acc. with DIN EN 16009 „Flameless explosion venting devices“
- Test of explosion suppression systems in acc. with DIN EN 14373 „Explosion suppression systems“
- Tests of slide valves, rotary valves in acc. with DIN EN 15089 „Explosion isolation systems“
- Test of pipe isolation in acc. with DIN EN 16020 „Explosion diverters“

Test equipment

Explosion examination

To examinate explosions on devices in large scales, test equipment in different sizes and with high pressure resitances are available. A wide range of pipe sizes and plant components are available for the tests to verify the realistic installation distance.

Test in non-atmospheric conditions

Examinations under special process technologic conditions

Due to high pressure resistances (PN 16/25) of our test equipment, test under Non-atmospheric conditions (e.g. increased process pressure) can be carried out.

Examinations under special process technologic conditions are a specialty of RTC due to decade-long experience in the field of explosion protection

Dust explosion tests on protection systems

Varius test media to verify the requested application area (Intended Use) are available.
Dust explosion test on protection systems can be carried out with dusts from ST1 up to ST 3, metal dusts, fabric dusts or melting dusts (e.g. requirement of DIN EN 16009).

Gases of explosion group I (e.g. Methane), IIA (e.g. Propane), IIB (e.g. Ethylene) or IIC (e.g. Hydrogen) are permanent on stock. Generating hybrid mixtures of different compositions to meet customers requirements is possible with this wide portfolio.

Functional safety

Devices and Components

Devices and Components which have to fulfill a certain function during an explosion, can be tested under realistic conditions at RTC. This question often appears for components for explosion isolation. Standarised processes in acc. with DIN EN 15089 (Explosion test) are in scope of RTC.

Should process technologies been tested, the only solution is often an examination.

Examples from our test history are:

- Rotary valve with product barrier
- Stuffing screw
- Flame proof of filter medium etc.

Proof of functional safety

Safe expensive protection systems

Are you able to proof the functional safety, you can avoid the use of expensive protection systems at real applications.

Plant operators all over europe have been able to make this experience with the RTC and appreciate this advantages.

Fire tests

The requirements to structural fire protection have increased during the last years

Under consideration that more than a hundred people reside inside special buildings like hospitals, care facilities and production facilities of the industry next to material assets which are built in or stocked worth more than a couple of million euros, individual fire examinations are useful.

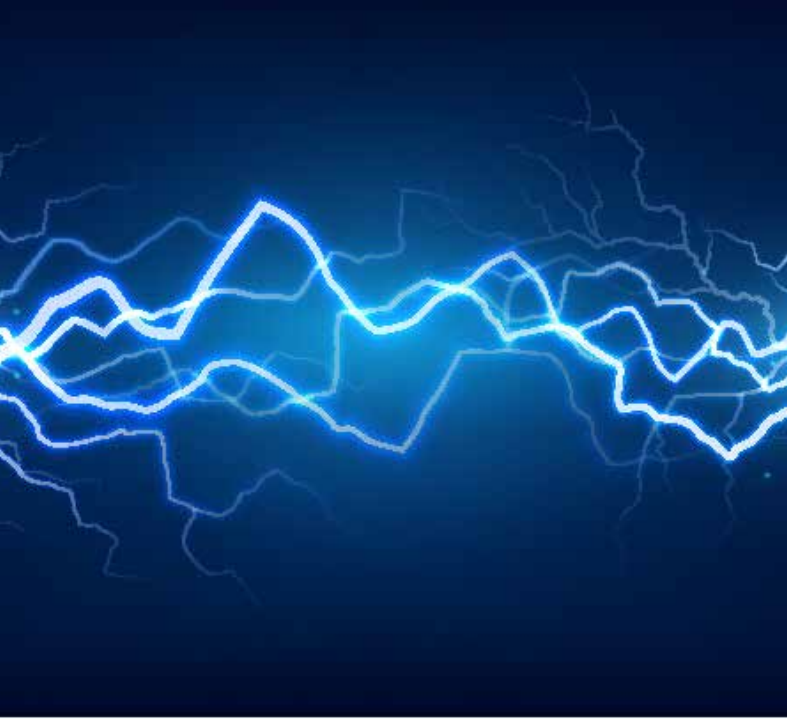
Fire protection concept

To protect those special buildings, risk assessments are needed or fire procection concepts are written down in acc. with buidling regulations.

One part of these concepts are fire tests. On behalf of our customers, RTC carries out realistic fire tests with different tasks. E.g. combustion tests with different combustible coolants to use these insights for risk assessments have been carried out in the past.

Based on the background, that different extinguishing systems for fires are available on the market, the intended use can be reviewed to its operative efficiency and in short notice at RTC.

But also fire test with battery systems are a big task of RTC. Further Information regarding fire tests for battery safety can be found under section Battery Safety at our homepage.



Arc discharge

Preventive measures

So called arc discharges endanger plants of high-voltage range, medium-voltage range and low-voltage range. Preventive measures like SF6 blanketing and shut-off system are common ways to protect housings and switchgears from enourmous energies.

Damage and Destruction of the plant

Accidentally generating arc discharges causes big thermal loads and high pressures inside the plant. This leads to damages of the housing and escaping flames up to complete desctruction of the plant.
To develop effectiv protection measures, those accidents have to be recreated, by storing high electrical power and expensive test stands.

Developing of test procedures

Evaluation of safety

Within intense research we developed test procedures to recreate pressure loads and escape of flames compared to electric internal arc at the RTC. These procedures allow an evaluation of the safety of the plant by minimum effort. This is especially asked for fundamental studies or modifications on existing systems. Tests like this can be carried out relatively fast and simple.

Pressure test

Dominate high process pressures on your plants or can high pressures occur in case of emergency? Which effects could these kind of events mean to the integrity of the generell system?

Not all components can be calculated correctly due to their geometry, material combination or operating temperature. One solution could be pressure testing. These tests can be carried out hydraulical with pure fluid impact or in special cases with gasous media.

Explosion resitant equipment

Test in acc. with DIN EN 14460

At explosion resistant equipment additional impact due to an explosion occur. At RTC these tests are carried out in compliance with DIN EN 14460. Explosion tests support the construction of difficult plants and help to save material and unnecessary safety margins. Due to this process, large-scale plants and complex finite element calculations methods (FEM) have been validated or optimized.

Thermal Runaway of a Lithium-Ionen-Battery

In case of a thermal runaway of a Lithium-Ionen-Battery short-circuits often occur inside the battery cell.
This short circuit leads to electrical arc discharges and heat. By this phenomenom the electrolyte inside of the battery turns into vaporization. These vapour/gases are highly flammable and lead at the presence of a ignition source to a fire or explosion.

Those reactions depend highly on the charge level (so called Status of Charge „SOC“) of the battery. The higher the SOC the stronger and faster the reaction proceed.

Fire and explosion hazards of energy storage systems

The fire and explosion hazards of energy storage systems like Lithium-Ionen-Batteries has to be considered as critial.
Especially large storage system with high energy density have to be controlled thermical and electrical. The arrangement of the storage modules and the correct placing of procection concepts requires sophisticated know-how.

RTC conducted a series of examinations and is able to recommend which safety measures are needed. This applies both stationary plants as well as mobile concepts for rail, truck or automotive industries.

Industries and Applications

Equipment & Plant Engineering

Implement new processes and methods

The innovative strength of the german and european equipment and plant engineering is about to implement and develop new processes and methods in large-scales and efficient ways.

Many processes have been developed in laboratories and are difficult to transfer into industrial scales. Safety risks and hazards of exothermical reactions (explosions) can be evaluated and assessed with our decade-long experience.

Material savings and cost optimization

These evaluations lead to material savings, cost optimization during production and process optimization to a higher safety level.

Our Specialties

Examination of processes for innovative equipment and plant engineering are our specialties. Tests under realistic conditions delivery direct results.

- Functional safety
- Explosion tests
- Pressure tests

Energy & Power Plants

Supply reliability and potential accidents

The innovative focus of the energy sector suffers from risks due to supply reliability and potential accidents. By research, RTC has examined the risks of arc discharge, analized thermal runaway of battery systems and is able to provide informations about functional safety.

Test and test capacities for:

- Arc discharge
- Battery safety
- Functional safety

Usability of these examinations are obviously reducing downtimes and increasing process safety

Renewable Energies

What are renewable energies?

Renewable energy is energy from sustainable sources like hydropower, wind energy, solar power, biomass and geothermal energy. In contrast to fossil fuels like crude oil, natural gas, hard and brown coal and uranium ore, those energy sources do not consume theirselfs. Renewable energies are stocked for example in stationary battery systems or in gas stores. High energy density and concentration on tiniest space lead to critcial situations. RTC knows potential solutions from pratically oriented examinations.

Accidents

In case of an accident unintentional reaction like arc discharge, thermal propagation from Lithium-Ionen-Batteries or leakage of gases can occur.

Explosion Protection Systems

Funktions- und Explosionssicherheit

Latest explosion protection systems fulfill highest safety standards and has to be approved and certified in acc. to recognized standards. Working on committees allows RTC insights about upcoming changes of guidelines and directives. New or changed standards lead to new test requirements for functional and explosion safety.

Optimization of existing products

Extension of Protection Systems

Permanent pressure on costs to the manufacturer of explosion protection systems requires an optimization or the extension of application limits of existing products. The decade-long experience and knowledge to requirements from business and standards at RTC lead to advantages for the manufacturer of explosion protection systems by performing explosion tests.

Alternative Drives

Everybody talks about climate change and fossil fuels are not endless available

Classic drives like diesel engines or gasoline engines could be worn out in close future. Constant increase of requirements to reduce CO_2 emmisions, an exit out of classic drives is indispensable. To ensure usual mobility alternative drives are needed without any CO_2 emmissions.

Electric Mobility

Electric mobility is the first alternative drive. This is by far the most well-known alternative drive.

By special financial support of electric mobility of the german federal government, new admissions of electric vehicles increases. Electric power is stored and provided by batteries – mostly Lithium-Ionen-Batteries. In case of malfunction of a Lithium-Ionen-Battery a short-circuit can occur inside the battery cell. Through the short-circuit light arcs and heat can arise. These phenomenons turn the electrolyste inside the battery into vaporization.

Steam/Gases are highly flammable and can lead to a fire or an explosion in case of an ignition source. This reactions depends on the charge level of the battery. As higher the charge lever as heavier and faster the reaction/explosion normally will be.

Technology with Hydrogen

Another alternative drive is hydrogen – the so called fuel cell technology.

Inside the fuel cell electric power is gained from hydrogen. This happens by reversal electrolysis. Hydrogen and atmospheric oxygen reacts into water, warmth and electric power arise. Latter drives the electric engine.

Hydrogen is a highly flammable gas which subjects to exothermal reaction or to an explosion in case of presence of an ignition source and the right mixing ratio. These phenomenons can be examined and developed at RTC. Safety concepts and variant solutions can be worked out by these results.

Certificates

Test of protection systems and devices

The accreditation in acc. with DIN EN ISO/IEC 17025:2018 from DAkkS confirms, that REMBE® Research+Technology Center has the competence to execute test of protection systems and devices to use in explosive hazardous areas. Many customers required this kind of service. We are able to perform these service and further tasks.

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DAkkS
Deutsche
Akkreditierungsstelle
D-PL-21054-01-00

References

„The explosion demonstration classed as an outstanding event at the AZO facility, impressive for new and even long-time employees, something that you don't get to see every day…"
Gerhard Nied
Former technical director AZO GmbH + Co. KG

„Very good cooperation during the standardization work through professional expertise and closeness to the customer."
Kees van Wingerden
Chairman CEN TC 305 WG 3

„…cooperated perfectly with REMBE® for many years in many test institutes. Deep Profound scientific know-how…"
Richard Siwek
Owner FireEx Group

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