DEKRA

BROCHURE

Unique Testing Solutions for Process Safety

The Importance of **Process Safety Data and Laboratory Testing**

Comprehensive process safety testing is necessary to develop the data on which fire and explosion hazard assessments and incident investigations should be based. Our goal is to prevent and control fires, explosions, and accidental chemical releases in chemical and process industries. Collecting the necessary process safety data, including asset information and process information backed up with effective process safety testing solutions is the cornerstone of achieving this goal.

Our testing portfolio is designed to facilitate a complete understanding of the properties of substances that are used in or arise from a given process. The data derived from these tests can indicate potential risk factors in handling or storing the materials and is used to develop an effective process safety management (PSM) system. Indeed, no PSM system is complete without the data gathered from testing. Our laboratory tests focus on assessing the flammability, combustibility, and thermal properties of materials, and specifically determining the temperature, pressure, and other conditions under which a fire or explosion will occur.

Compliance with National and International Regulations

In some cases, process safety tests are also performed to ensure compliance with national or international regulations or authorities (ATEX and OSHA, for example) that mandate testing to determine the sensitivity, reactivity, and stability of process materials. Compliance is a strong motivator for organizations to order tests, but a robust PSM system goes beyond mere compliance. It integrates as much process safety data and information as possible to collectively combine measures that protect the plant, personnel, and environment as the Basis of Safety.

Developing and Improving Processes with Process Safety Data

A further consideration when it comes to testing is timing. Certainly, when a new process is in the development stage testing makes sense. A thorough knowledge of the properties of all the substances that will come into play provides a framework for designing a safe and effective process and PSM system. This is wise financially speaking in that precautions and safety measures can be integrated from the start rather than retrofitted at an additional cost.

"With the **right testing**, leaders can target mitigation efforts to remove the hazards and **assure process safety excellence.**"

What may be overlooked however, is that once a process is up and running development does not come to a standstill. To keep pace with changes in technology and other innovations, industries are constantly seeking to improve their processes. This may involve changes in the materials used, machinery, storage, handling, transport and more. Here it is essential to remember that any change can impact the safety of a given process. Fundamental steps, first and foremost testing, need to be revisited and reevaluated in light of alterations to the process.

We understand the tests and the underlying science, and have experience modifying standard tests and developing new tests to generate the data and information that our clients and we need to assess the safety and performance of new products, materials, technologies, and processes.

Comprehensive Process Safety Testing Services

We are highly-qualified experts in PSM and enthusiastic advisors, supporting our clients to reach safety targets without compromising efficiency and productivity and to create safe operating parameters with precision and confidence. Combining the best scientific capabilities in the business with our deep understanding and experience in testing, we equip you with the information you need when you need it.

Advantages for **Global Enterprises**

The benefits we provide are both technical, in the form of unparalleled expertise, and economic, with cost-efficient solutions and time-saving, streamlined processes. We uniquely offer:

- **State-of-the-art laboratories & full-scale testing site**
- **Downstream consulting for optimal test data application**
- **Complete testing, assessment & data interpretation**
- **Customer-centric and tailored testing services**
- **Support to ensure proper application of test data**
- **Flexible delivery**
- **Upstream consulting for targeted, cost-effective testprogram specification**
- **Tailored programs and bespoke test solutions for specific situations**

Testing Capabilities

We conduct over 300 tests with standardized testing procedures, with capability to also conduct unusual or complex customized testing.

Flammability / Combustibility Properties of Powder, Dust, Gas, Vapour, Mist and Hybrid Atmosphere

- Powder flammability
- Particle size and moisture content
- Minimum ignition energy (MIE)
- Minimum ignition temperature of a dust cloud (MIT cloud)
- Minimum ignition temperature of a dust layer (MIT layer)
- Minimum explosible concentration (MEC)
- Limiting oxygen concentration (LOC)
- Explosion severity (Kst, Pmax), 20l and 1m3
- Thermal stability tests
- Hybrid atmosphere testing
- Liquid / gas / vapour flammability
- Autoignition temperature (AIT)
- Closed-cup and open cup flash point
- Fire point testing
- Upper and lower explosive limits (UEL and LEL)
- Explosion severity (Kg and Pmax)
- Minimum ignition energy (MIE) – of a gas or vapour
- Aerosol and foam flammability
- Flame speed measurements
- Custom high temperature and high pressure flammability testing per clients specific needs
- ISO 817 Annex C Burning Velocity
- Constant Volume Burning Velocity

Fire and Flammability Tests

- ASTM: flammability, burn, ignition, temperature

Explosive Properties

- DSC and structured analysis for explosive classification (or exemption)
- Koenen tube, time / pressure test, shock test
- Impact sensitivity and friction sensitivity
- Effect of fire and thermal stability
- Blast chambers for energetic-materials testing

Electrostatic Testing for Powders, Liquids, IBC's, Liners, Footwear, Process Equipment...

- Liquid and powder resistivity / conductivity
- Charge relaxation time
- Liquid / powder chargeability
- Materials surface resistivity & charge relaxation: bags, gloves, surfaces, boots
- Determination of electrostatic properties of GRG containers: surface resistivity, resistance to earth, etc
- FIBC's and RIBC's
- Filter Materials
- PPE – Personal Protective Equipment

Refrigerant Flammability per ASHRAE 34

- Fractionation Validation Analysis & Tests
- Flammability & Burning Velocity Measurement
- ASHRAE SSPC-34 Application - Preparation and Submission

Thermal Stability

- Differential scanning calorimetry (DSC)
- Carius tube (with measurement of gases evolved)
- Accelerating rate calorimetry (ARC)
  - 1. Calvet Difference Scanning Calorimetry
- Adiabatic dewar & VSP calorimeter tests
- Specific tests for drying processes: fluid bed, spray, bulk storage
- Powder basket test

Chemical Reactions

- Reaction calorimetry using Mettler RC1
- Option of testing up to 10 barg
- Measurement of gas evolved

- Mass spectrometry analysis of gases
- Reaction calorimetry using THT-micro reaction
- Calorimeter (µRC)
- Rapid results
- Small sample size (1-100 milligrams, µl)
- Heat capacity measurement
- Adiabatic ARC calorimetry for advanced stability analyses
- Adiabatic dewar & VSP calorimetry for runaway reaction simulation
- Batch or semibatch processes
- Closed-cell calorimetry to measure runaway kinetics and thermal stability
- Viscosity tests on fluid vented
- Tests to characterise fluid during venting (whether or not reaction tempering occurs)

Regulatory UN Tests / Transport

- UN Class 1 - explosives
- Test series 1 – to determine if a substance has explosive properties
- Test series 2 – to determine if a substance is too insensitive for inclusion in class 1
- Test series 3 – to determine if a substance is not too dangerous for transport in the form tested
- Test series 4 – to determine if an article, packages article, or packaged substance is too dangerous for transport
- Test series 5 – to determine if a substance may be assigned to division 5
- Test series 6 – to assign a substance or article to division 1.1, 1.2, 1.3 or 1.4 or exclusion from class 1
- Test series 7 – to determine if an article may be assigned to division 1.6
- Test series 8 – to determine insensitivity of ammonium nitrate emulsion (ANE) and blasting explosiveFire and Flammability Tests
- Ignition sensitivity including BAM fall hammer, BAM friction and Koenen tube, etc
- Explosion severity: time / pressure, gap tests fire analysis, etc
- UN Class 2, aerosols
- Chemical heat of combustion, ignition distance, enclosed space ignition, mist flammability, etc
- UN Class 3 - flammable liquids
- Flash point, fire point and sustained combustion
- UN Class 4
- Division 4.1: self-reactive substances and highly-flammable solids
- Division 4.2: self-heating solids, pyrophoric solids and liquids
- Division 4.3: substances evolving flammable gases when in contact with water
- UN class 5
- Division 5.1: solid and liquid oxidising substances
- Division 5.2 Organic Peroxides
- UN class 8
- Corrosive substances, including dermal irritation and metal corrosion
- Class 9, Miscellaneous dangerous substances and articles
- UN2211 Substances that emit flammable vapours

Physico-Chemical Properties

- Freezing/Melting point
- Boiling Point
- Relative density
- Vapour pressure
- Surface tension
- Water solubility
- Partition coefficient
- Flash point
- Flammability of solids
- Flammability of gases
- Flammability in contact with water
- Flammability in contact with air
- Explosive properties (including waiver statements)
- Liquid autoflammability
- Solid autoflammability (relative autoignition temperature)

- Oxidizing properties (including waiver statements)
- Viscosity
- Dissociation constants in water
- Granulometry & particle size analysis
- Karl Fischer Analysis
- UV-VIS Absorption Spectra

Custom/Specialised Testing

Apart from custom flammability and explosives testing, other specialised tests, both small and large-scale, can be conducted at our small scale research facility or large scale test site depending on the nature of testing. Some of the special / custom tests conducted by DEKRA Process Safety under exotic conditions include but are not limited to:

- Thermal stability tests
- Electrostatic test
- Explosibility tests
- Corrosion tests
- Mechanical integrity test
- Department of transportation tests
- Chemical reactor safety testing
- Pilot plant safety validation
- Large scale dust explosion tests
- Bon fire testing
- High temperature and high pressure flammability
- Tests to REACH protocol for SDS
- Safety datasheet (SDS) preparation
- Battery performance and safety

Specialist Capabilities

- Handling of toxic / active materials
- High-temperature / pressure equipment and testing
- Testing to REACH protocol
- Battery performance and safety testing
- Remote large-scale testing facility
- Large cement firing bunker with remote-fire system
- Small scale research facility with high pressure cells
- Energetic materials: testing on explosives, propellants, pyrotechnics to DOT, UN etc. protocols
- Safe Handling of explosive, energetic, pyrophoric, propellents, pyrotechnics or potentially-hazardous materials
- Innovative engineering solutions and test design services
- Explosives process hazards and characterisation
- Facility siting requirements

Delivering the **DEKRA difference**

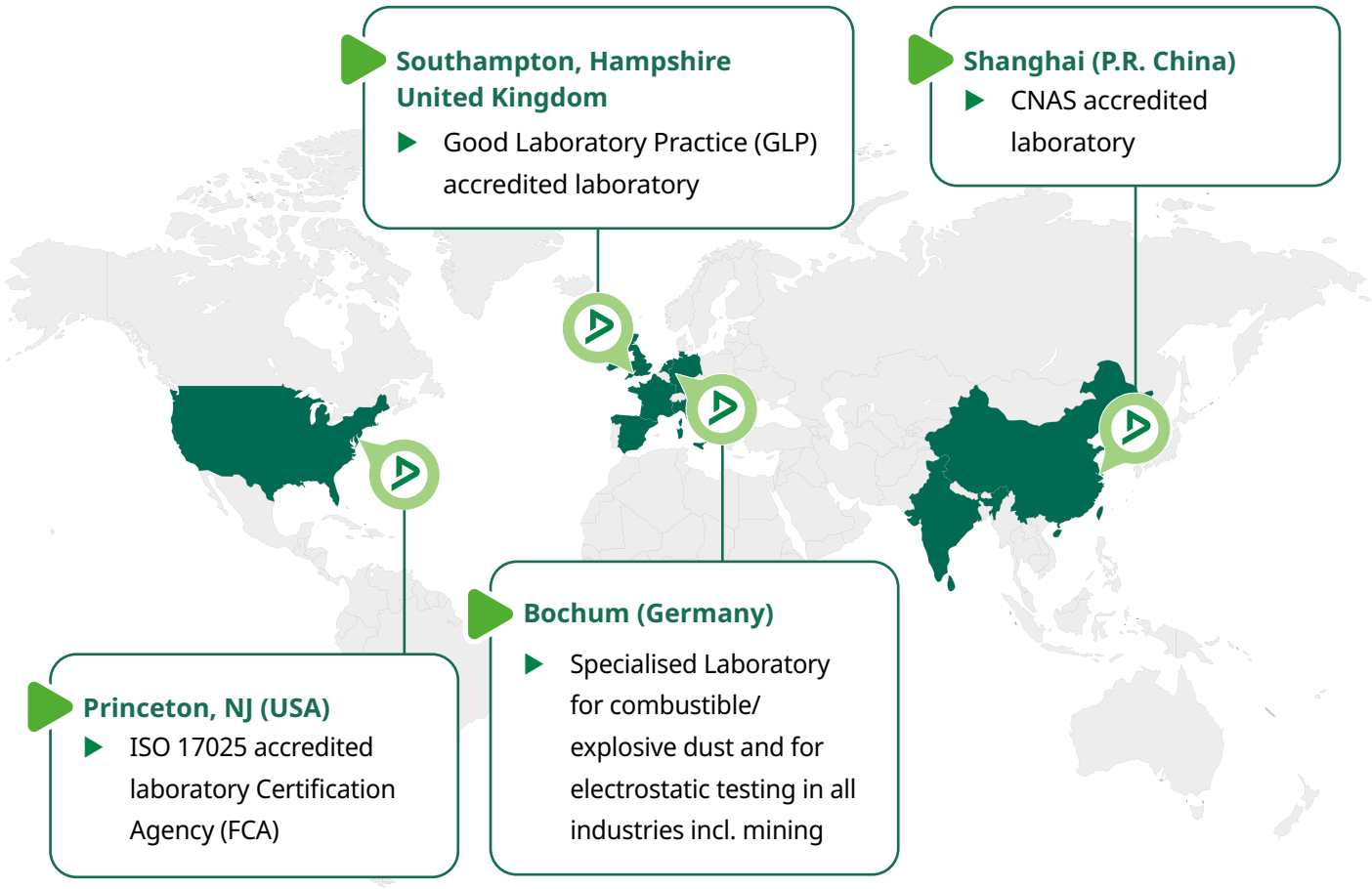
Trusted Advisors
with a passion for process safety and dedicated to quality

Global
part of a thriving, respected multinational company

Client-Focused
aiming to add value and build strong relationships through reliability

Pragmatic Solution Providers
integrating process safety management, engineering & testing

Proven Experts
in process safety and testing techniques with a strong track record



Would you like to get more information?

CONTACT US!

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