

Process Safety Solutions



Safe and efficient work with dangerous chemistry

TNO Process Safety Solutions (PSS) is a multidisciplinary team of experts with state-of-the-art facilities and all necessary permits. We support industry, governments and insurers with customized testing, process and incident analysis and product qualification. Our work helps you increase production, improve efficiency, extend operating windows, prevent incidents and enter new markets without high R&D costs.

About PSS

PSS is part of TNO's Energetic Materials Research Group. For over 40 years we have worked safely with energetic and toxic materials: pyrotechnics, organic peroxides, ammonium nitrate fertilizers, self-reactive and self-heating substances, and flammable gases, dusts and liquids. Our test setups, laboratories and (gas) explosion facilities are built for the synthesis, analysis and handling of energetic materials.

Testing at extreme conditions

Can your materials, equipment or processes withstand extreme temperatures, pressures or explosions? Our facilities, permits and expertise let us test from -165 °C to 1000 °C, from 0 to 600 bar, and from no hazard to high explosive. This range helps clients qualify their products and enter new markets.

Case study: long-term cryogenic exposure

For an oil and gas client, we built a dedicated setup to store flammable liquefied gas at cryogenic temperature for at least two weeks. The tank holds 200 L of liquefied gas in contact with material samples. The question was how long-term cryogenic exposure affects the material. The test showed that it keeps performing for at least two weeks. The client now has the validation to use the material in its operations.

Extending operating windows

Many plants do not use their full potential, because their process windows are based on standard tests with wide safety margins. These tests do not always reflect the real situation. We know how standard tests are designed and run, so we can adjust them to match actual conditions. You can then intensify your process and increase output without lowering safety.

Case study: is this flow detonable?

A chemical client needed to know whether a liquid flow in its plant could detonate. Standard tests cannot handle this type of mixed flow. We developed an adjusted test that reproduced the real conditions and showed that the flow was not detonable. The client increased its production capacity without investing in new hardware.

Case study: ammonium nitrate fertilizer

Before ammonium nitrate fertilizer goes on the market, it must be tested for how easily it detonates, to prevent misuse. PSS developed a standard test method that is accepted for this purpose. We initiate the fertilizer in a standard way and measure the explosive effects. Fast qualification lets clients bring their product to market quickly.

Incident and process safety analysis

What are the safety risks of your process? We combine knowledge of explosion effects with our experimental facilities. This lets us calculate in advance how safe your process is, and confirm the prediction by testing. We also analyze accidents that have already happened, such as explosions caused by fireworks or fertilizer. Our test site can reproduce explosions.

Case study: a hazardous intermediate?

An oil and gas client developed a process where two components meet that could, in theory, form a hazardous or even explosive intermediate. We reproduced the situation in a test setup at low temperature and high pressure. The intermediate did not form, which confirmed that the process is safe.

New ways to old products

Global competition pushes the chemical industry toward processes with higher margins, but R&D is costly. We help you test alternative routes, for example whether certain materials let you skip intermediate steps. A process that looks unsafe may turn out to be safe, and more efficient. We run synthesis experiments in the lab, then design and operate continuous-flow pilot plants to study hazardous chemistry at larger scale. Examples include fluorine, bromine and phosphorus chemistry, and work with hydrazine, acetylene, ammonia and hydrogen.

Product testing (dangerous goods)

PSS helped develop many test methods, criteria and guidelines for the handling, transport, classification and storage of hazardous materials (e.g. ADR, CLP). We know these tests and their background, and can run them efficiently at short notice.

Why clients choose us

SMEs and multinationals worldwide value our rapid response, broad expertise and independence. We do not only deliver data: we explain what the results mean for your business.

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