



Interview with Alexis Vignes, INERIS. INERIS is part of Work Package 2 and 4 of the PYSOLO project. The work of INERIS focusses on the technological risk assessment, ensuring that safety is a design driver, not an afterthought.

PYSOLO – Making Use of Concentrated Solar Power for Biomass Pyrolysis

PYSOLO (PYrolysis of biomass by concentrated SOLar pOwer) offers a solution for both decarbonisation and defossilisation by preparing the ground for a fully renewable process combining concentrated solar power and biomass pyrolysis. Thanks to the use of solar heat in the pyrolysis process, the production of valuable products bio-oil, biochar and pyrogas can be maximised and the associated CO₂ emission minimised. This offers both economic and environmental benefits compared to conventional pyrolysis.

Please shortly describe INERIS' role in PYSOLO

The role of INERIS within the PYSOLO project is to ensure that safety is fully integrated into the technology development process, acting as a foundation for both innovation and sustainability. Safety is embedded from the very beginning, guiding design choices and operational strategies rather than being treated as an afterthought. Through a proactive and systematic risk assessment approach, potential hazards are identified and mitigated from the early stages of project development. This includes detailed analyses for each PYSOLO technology block and the overall integrated process, addressing both substance-related risks (such as flammable gases or biomass handling) and process-related conditions (e.g. high temperatures, pressure, ...).

The risk assessment methodology is built on lessons learned from past industrial incidents, regulatory standards, partner expertise, and advanced modelling and experimental data to establish a robust and credible safety framework. This approach aligns with PYSOLO's sustainability vision, proving that safety, performance, and environmental responsibility are inseparable pillars of a mature and credible technology ready for industrial deployment.

Which specific components do you test in terms of risks and safety in the PYSOLO project and how do you go about it?

We focus testing on the materials and 'bricks' that drive fire/explosion risk. First, we perform safety profiling of selected heat carrier particles (PHC) and biomass, assessing combustion related properties and hazard potential. Second, we characterise biomass and by products for critical behaviours such as self-heating, since storage conditions and scale can significantly alter the risk profile. We also investigate system specific combined scenarios. A good example is the solar receiver's observation window: dust deposition and potential high voltage concepts introduce electrostatic hazards. We therefore study static charge build up, discharge risk, and dust explosibility to decide whether a technical option is acceptable or should be redesigned or avoided

What security-related risks have been identified so far, and what specific risk mitigation measures have been considered?

So far, we have identified three main safety topics. The first concerns biomass storage and handling, as biomass can self-heat under certain conditions and, in some cases, ignite. The second relates to the core of the process, where very high temperatures are involved. The key challenge here is maintaining system stability and preventing abnormal operating conditions.

The third topic relates to biochar handling, as it may produce very fine dust requiring careful control, especially where potential ignition sources are present, including hot surfaces, electrostatic discharges, and adjacent electrical or mechanical equipment. To deal with these issues, the project follows a step-by-step safety approach. We first try to reduce risks through smart design choices, before adding technical safeguards and clear operating rules. In practice, this means defining safe ways to operate the system, anticipating what could go wrong, and putting measures in place to keep everything under control. For electrostatic risks in particular, we rely on measurements and facts: we test how materials behave and only keep solutions that can be demonstrated to be safe. If something cannot be made safe, it is simply not used.

