

Description of the infrastructure	
Name(s) of the infrastructure(s)*:	IR INERIS – SAFETY platform Large scale experimental platform for industrial safety
Location (town, country):	Verneuil en Halatte, France
Website:	www.ineris.fr
Legal name of organisation operating the infrastructure:	INERIS
Location of organisation (town, country):	Verneuil en Halatte, France
Infrastructure Contact <i>(i.e. name, email of <u>primary</u> contact)</i>	Stephane Duplantier, stephane.duplantier@ineris.fr
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<p><i>*Infrastructure (s): means a facility, a resource (or a coherent set of them) together with the related services that are used by the scientific community to conduct research.</i></p> <p><i>**Installation: is a part of an infrastructure that could be used independently from the rest.</i></p>	

Description of the facilities
<p>Give a brief general description of the infrastructure to which access is offered. Illustrate, in particular, its state-of-the-art equipment and services offered to users that make it rare or unique in Europe. Outline the areas of research normally supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations**, describe these including their specific features. If parts of the infrastructure are still under construction, specify the starting date of construction and indicate the date when access can realistically be made available.</p>
<p>FACILITY NAME SAFETY PLATFORM (Large scale experimental platform for industrial safety)</p> <p>Purpose and brief technical description, including figures as appropriate</p> <p><i>Purpose</i> Reference site allowing trials on various types of pipes and gases (namely CO₂), including massive gas leakages and the measurement of their thermodynamic behaviour.</p> <p><i>Brief technical description with picture and/or diagram</i> The site enables to manage gases under high pressures (between 100 and 200 bars) and to simulate gas leakages or breaches on industrial equipment on pipes with diameters of 1 to 3 inches, to study:</p> <ul style="list-style-type: none"> - the flow upstream the breach and the various possible flow regimes, - the characteristics of the jet formed after the breach (diameter, speed and concentration for example), - the dispersion of the cloud in the atmospheric environment as well as the possible changes of state (liquid formation and, even, carbonic ice in the case of CO₂).



State of the Art, uniqueness (if applicable), and any specific advantages (e.g. technical, economic etc)

This permanent equipment on the site of Montlerville are widely recognized for safety purposes in the industry. It is possible to adapt the equipment to answer specific problems connected to the industrial safety for toxic and flammable gases – either to study the gas behavior, to improve modeling tools or to test risk prevention barriers. It is of course possible to bring answers to emergent questions and to carry out experiments in close collaboration between several partners or industrialists.

This reference site is unique in France and well-known in Europe, allowing experiments on various types of pipes and gases.

Scientific environment (related and potentially available scientific and technical services at RI's location e.g. analysis, material preparation etc.)

located 3 km from INERIS, the site can easily be operated and monitored. A careful preparation of experiments is necessary, including the pipes and vessels, the measurement devices, the gas preparation (in case of mixture), the safety measures.

The site contains several trial pipes and storage capacities between 1 and 5 m³, with related recirculation equipment (pumps, flow-meters, gauges, etc). Dedicated measurement devices are also available on-site for concentrations, velocity, pressure and for thermodynamic parameters, as well as advanced visualization techniques (camera HD, fast-camera, infrared camera).

QUALITY CONTROL / QUALITY ASSURANCE (QA):

Activities / tests / data are:

accredited to Standard ISO 9001

while not specifically accredited, data quality is controlled in accordance with institute's accreditation to Standard _____

If none, please specify associated risks:

Link to your institution QA webpages if available:

CCS PROJECTS:
EU-funded CCS projects:

FP7-CO2-PIPEHAZ (2010-2014), H2020-CO2QUEST

Other CCS projects:
Main/major non-CCS projects:

Simulation of NO₃ releases, H₂ releases and research on thermodynamic properties of gas mixtures (ANR-HyPE-HyDROMEL, UE- FP7-CO2QUEST), Research on flame arrestors, Simulation of leakages on underground pipes (JIP-CRATER)

Patents:
Selected publications:

Hébrard J., Jamois D., Proust C., Spruijt M.b, Hulsbosch-Dam C.E.C., Molag M. and Messina E., Medium scale CO₂ releases, Energy procedia, under press

Jamois D., Proust C., Hébrard J., “Hardware and instrumentation to investigate massive releases of dense phase CO₂”, The Canadian Journal of Chemical Engineering, vol. 93, issue 2, 2014.

Woolley R.M., Fairweather M., Wareing C.J., Falle S., Mahgerefteh H., Martynov S., Brown S., Narasimhamurthy V., Storvik I., Sælend L., Skjold T., Economou I., Tsangaris D., Boulougouris G., Diamantonis N., Cusco L., Wardman M., Gant S., Wilday J., Zhang C.Y., Cheng S., Proust C., Hébrard J. and Jamois D. CO₂PipeHaz: quantitative hazard assessment for next generation CO₂ pipelines. Energy Procedia 63 (2014) 2510 – 2529.

Woolley R.M., Fairweather M., Wareing C.J., Falle S.A.E.G., Proust C., Hébrard J., Jamois D. Experimental easurement and Reynolds-averaged Navier–Stokes modelling of the near-field structure of multi-phase CO₂ jet leases. Int. J. Greenhouse Gas Control 18, 2013, 139–149.

FACILITY AVAILABILITY:

Unit of access: month

Availability per year:

6 months

Expected duration of single experiment:

3 to 6 months (including design, setup and a “campaign”, i.e. a series of tests)

OPERATIONAL OR OTHER CONSTRAINTS:

Specific risks:

Safety risks due to handling of CO₂ and the handling other substances on the same platform (toxic or flammable)

Legal issues: