



THERMAL-HYDRAULIC INSTRUMENTATION

PRESSURE and VELOCITY MEASUREMENTS, TWO-PHASE MEASUREMENTS

Challenges & Markets

The determination of the thermodynamic properties, necessary in understanding the behavior of materials at high temperature relies in a complementary manner on experimental measurements and calculations. These studies are conducted to meet the needs of safety or for the purpose of selecting and justifying the choice of materials in using systems such as future nuclear reactors or even in attempting to enhance productivity in nuclear plants. All this is achieved by reducing the duration of reactor inspection phases while optimizing their availability.

The different thermal-hydraulic technologies can also be used in the chemical / chemical engineering industries, in steelmaking and in the automobile and oil industries.

Value added offer

The Sodium Platform of the DEN offers industrialists the necessary equipment and the technical competence required in using sodium or even other liquid metals for any scientific or industrial project. The personnel provide assistance and training in teaching users how to operate the thermal-hydraulic instrumentation and how to analyze and interpret the results.

Users benefit from practical training in the actual manipulation of the equipment.

Consulting and guidance are offered to optimize the feedback and analysis of the samples.

The objective of the CEA/DEN is to meet the needs expressed by industrialists whether they concern:

- the use of a test means available on the Sodium platform and the competence of the DEN, particularly on the Cadarache site,
- the licensing of a specific technology (Patents & Know-how)
- the creation of new collaborations,
- consulting and expertise,
- network sharing,
- the development of instrumentation, of facilities or instrumental techniques

HYDRAULIC INSTRUMENTATION THERMAL

PATENTS

CEA – Cadarache has 14 families of transferable patents in the particular area of research:

- FR2940452B1, FR2940434B1, FR2940434B1 (expires in 2028)
 - FR2946757B1 (expires in 2029)
 - FR2964456A1, FR2960061A1 (possible patent protection until 2030)
 - EP0706188B1 (expires in 2014)
 - EP0723270B1 (expires in 2015)
 - EP0798469B1, EP0820067B1 (expires in 2016)
 - FR2801648B1 (expires in 2019)
 - FR2925144A1 (possible patent protection until 2027)
- as well as 2 patents pending during 2012

Design, Development, Qualification of instrumentations (sensors, algorithm, acquisition, IHM) Design Basis / Facility Design
Availability of test means to validate the instrumentation or the devices of our clients

Expertise

Sodium Technology

- Work in a hostile environment (heat, noise, close quarters...)
- Specific instrumentation that can be used at high temperature,
- The construction, Installation and Operation of sodium facilities,
- Material endurance tests
- The mastery of specific sodium risks.

Simulation / CAD

Advisory activity

Equipment

The CEA/DEN has important test and development means at its disposal:

- Test means in liquid metals adapted to the implementation of liquid sodium (600°C max)
Instrumentation / Metrological chain adapted to liquid metals
Rapid Sodium Leak Detection System (a patented technology)
- Monitoring in an opaque medium
- Furnaces (600°C)

Our strong points:

The DEN has:

- more than 30 years of expertise,
- a network of experts enabling us, among our other activities, to produce sensors to specification,
- and a universally recognized know how in the manipulation of sodium and materials that have come into contact with it.

Working in partnership with the INSTN at the School of Sodium and Metal Liquids, the DEN conducts a series of varied training courses specifically adapted to the practical manipulation of sodium and liquid metals. These courses are designed either from a safety point of view or from a purely technical standpoint.

Key figures:

- Manpower

Instrumentation / Equipment Sodium:

- 20 study engineers
- 10 technicians
- 4 apprentices
- 4 PHD students

Design laboratory

- 16 study engineers

- Accreditations

Licensed facility for the Protection of the Environment (ICPE)

- Many "families" of patents protect this platform

They have entrusted us with their work:

SOMAXIS, ACOEM,
MS Métaux spéciaux SA