NUCLEAR Valley
FEDERER LES ENERGIES

CLUB H

CATALOG

French tritium offer 2025

Nuclear Valley Nuclear Valley has launched the Club 3H in spring 2023: the club associates the expertise of its members around Tritium, to propose a “French” offer on the various markets in France and abroad.

To date, the 3H Club - steering committee members are the following companies in the nuclear industry:

CURIUM
Management of critical environmental (chemical, radiological, biological) risks,

DG Skid
Process engineering, pressure vessels, piping systems, automation, and process equipment,

ECM Technologies
Key player in the market of equipment for the heat treatment and transformation of materials,

EGIS
Consulting, engineering, construction supervision and operation of large infrastructure projects,

GONZALES Groupe,
Conception, manufacturing and integration of mechanical equipment’s,

JACOMEX
Design and manufacture of glove boxes and gas purifiers,

KEP Technologies
Solutions to meet radioactivity measurement challenges, whilst respecting all constraints of the nuclear field,

TECHNETICS
Leader in customized high-performance sealing solutions for critical applications,

ALSYMEX, Bouygues Construction Expertises Nucléaire (BCEN), E2S, EKIUM (SNEF Group), Gasne Group, ROTAREX SMT have also joined the initiative and are strengthening a coherent offer of expertise in order to address the most ambitious projects.

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Preface - by the General Delegate of the Nuclear CSF, Mrs. Maria FAURY, the Director General of Nuclear Valley, Mrs. Sophie ROUZAUD and the president of the 3H Club, Mr L. JANOT, CEA.



Among its missions, Nuclear Valley supports the economic development of companies and their internationalization which is a priority. It also focuses on innovation as a means of boosting competitiveness.

Within Nuclear Valley, the 3H club aims to bring together the entire chain of skills required to meet the needs of operators and projects in two areas:

- Detritiation of waste and heavy water in order to reduce emissions into the environment and recycle heavy water for reuse;
- Tritium production in fusion facilities (tritigenic devices) and tritium recycling in a context of increasing fusion reactor projects.

As part of its efforts to improve knowledge of these areas and the needs to be met, the Club has forged close links with Agence ITER France (AIF), with whom it maintains regular exchanges in an excellent spirit of collaboration.

By pooling their skills and expertise in the design and construction of such facilities, club members will be able to respond more quickly and effectively to the challenges raised by the use of tritium.

We wish the 3H Club every success !

Part of the 3H Club at a strategy seminar at the Château de Cadarache on December 6, 2024.

MATRICE

Legend :
● Main know-how (sold alone)
○ Complementary know-how (included in solutions)
BIG Large dimenssion unit capabilities

	CURIUM	DG SKID	ECM	EGIS	GONZALES Groupe	JACOMEX	KEP Technologies	Technetics	ALSYMEX	BCEN - Bouygues Construction Expertises Nucléaires	E2S	EKIUM	GASNE GROUP	ROTAREX SMT
H3 PROCESS														
Electrolysis	○	○	○					○	○					
Purification : Detritation Gas	○	○				○			●	●	○		○	●
Purification : Detritation Liquid	○	○							●	●				●
Purification : Cryogenic distillation (concentration)	○	○	○						●				○	
Purification : Distillation desorption	○	○	●			○			●					○
Solid waste treatment	●		●						●	○				
Effluents treatment (gas & liquid)	●	○	○			○		○	●		○		○	○
Storage	●	○						●	●					●
Disposal	●	○				○		●	●					●
Separation / Traping	●	○	○			○			●				○	
SKILLS														
ENGINEERING & MANUFACTURING														
Fluid Process Engineering : P&ID Design, Line calculations, Process Equipement definition	○	●	●						●			●	●	●
Design	○	●	●	●	●	●	●	●	●	○	●	●	●	●
Measure & instrumentation	●	●	●		○	○	●		●	○	●	●	○	●
Digital (Modelization, AI…)		○		●				○	●	○	●	●	●	○
Robotics		○	○		●			○	○	●	○			○
EPC		●	●	●	●	○	○		○	○	○		○	
Site management and coordination		●		●	●				●	○		●		
Overall project management		●	○	●	●	○	○	○	●	○		●		●
Safety	●		○	●	○		○	○	○	○		●	○	○
HVAC	○		○	●		●			○	●		●	○	○
Radion protection	●		○		○	○	●	○		○	●	○		
Regulatory	●	○		●	○		○		●				○	
Environment surveys	●			●					○		●			
Geological analysis		○		●										
Metal Work		●	●		●	●		●					●	●
Piping engineering		●	○					●	○			●	●	●
Automation : Design, Programming, HMI Developpment, Communication, Architecture,		●	●		●		○		○		●	○		
Mechancial Engineering		●	●	○	●	●	○	●	●		○	●	●	●
Modular Construction		●	●	○	●					●				
Carpentry / Metal Structure		●	●	●	○								●	
Electricity LV		●	●	○					○	●	○	●		
Electricity HV				●	●					●		●		
Machining			○		●			○	●				●	●
Welding			○		●	●			●				●	○
Civil Works				●						●		●		
Decontamination	●								○	○			●	
Mechanicam Simulation		○	●	●	●		○	●	●	○		●		●
Thermal Simulation			●	○	○		●		○	○		●	○	●

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	CURIUM	DG SKID	ECM	EGIS	GONZALES Groupe	JACOMEX	KEP Technologies	Technetics	ALSYMEX	BCEN - Bouygues Construction Expertises Nucléaires	E2S	EKIUM	GASNE GROUP	ROTAREX SMT
EQUIPEMENTS														
Capacities : Tanks, Vessels, Reactors	○	○	●					○	○				●	
Process Equipments : Pumps, Heat Exchangers, Filters, Columms, Compressor, Cyclone/Separator, Agitators/Mixing…	○	○	●			○		○	○			●	●	●
Furnaces (Induction, Resistor)	○	○	●					○	○					●
Glove Boxes	○	○	○			●		○	●			●	●	
Containment solutions (confinement)	○	○	○			●			●	○			●	
Valves		○	●			○		○	●			●		●
Instrumentations : Flowmeters, temperature transmitters, …	○	○	●			○		○	○		●	●		●
Gas Analyzers	○	○	○			○		○	○		●			●
Hndling solutions	○	○	○	○				○	○	○			●	○
Cloche de dégazage - Degassing Solutions	●	○				○			○				○	
PACKAGES :														
Process Skids : Injection, Treatment, Compression, Filtration…	○	●	○			○			○			●	●	○
Process Units	○	●	●						●			●	●	●
Plant pilot	○	●	●						●			●		●
Gas Panel	○	●	●			●			○				●	●
Test Benches	○	●	○		●				●			○	●	●
Prototypes	○	●	○		●	●		●	●		●	○	●	●
SERVICES (Operations)														
Dismentelment	●			○				○		●				
Installation :		●	○	○		●		●	○	●		●		○
Piping		●	○					○	○			●	●	○
Electrical		●	○		●				○	●		●		○
Automation		●	○		●	●			●			●	●	○
Assembly/Erection/Handling		●	○	○	●			●	○	●		○		●
Commissionning		●	○	○	●				○					
Regulatory compliance	●			●					○			●		○
Risk Management	○			●					○			○		
Chemical/Radiologial characterization	●	○										●		○
Essais laboratoire	●	○					●	●	○			●		●
Transportation (ADR / EURATOM)	○	○												○
Operation	○								○			○		
CERTIFICATIONS														
ISO 45001		●		●						●				
ISO 9001		●	●	●	●	●	●	●	●	●			●	●
ISO 14001			●	●				●		●		●		
MASE	●	●								●		●		
CEFRI	●				●	●	●	●	●	●		○	●	
ISO 19443				●				●	●			●	●	
ISO 50001 : Energy management												●		
ISO 37001 : Anti-Corruption				●								○		
Qualification EN 1090 Exc4					●									

TRITIUM
Its sources and uses

Tritium is a radioactive isotope of hydrogen that disintegrates into the stable helium 3, with a 12.33 years half-life.

THE MAIN TRITIUM SOURCES

Tritium is produced naturally by cosmic ray actions and is also a by-product of the nuclear industry (military nuclear tests, thermonuclear arms manufacturing, NPP and nuclear fuel re-treatment release). It exists in its gaseous form, but can also be found in oxidized form (tritiated water or water vapor) or organic form (bound to carbon). The action of cosmic rays (neutrons) on certain elements in the air (nitrogen 14) leads to a natural production of atmospheric tritium of between 0.15 to 0.20 kg per year. It is also produced in the earth's crust, but in very small quantities [1].

Most nuclear reactor technologies produce tritium. Some generate such small quantities that it is neither worth recovering nor dangerous to be released into the environment.
This is true for direct releases in gaseous or liquid form, or through fuel processing plants. On the other hand, tritium is produced in large quantities in pressurized heavy water reactors (PHWRs), the majority of which are of the CANDU type (for CANadian Deuterium natural Uranium) [3]. It is mainly in the form of tritiated water (HTO) and can be extracted for industrial use.

This process is applied in Tritium Removal Facility (TRF) in two stages: catalytic extraction in vapor phase, then cryogenic distillation for an approximate production of a few hundred grams per year and per facility [2] [3] [4].

It allows to store tritium and to manage it per radiological decrease or to consider a reuse in industrial applications.

The release of Tritium is expected to increase with the implementation of new reactors and the development of experimental nuclear fusion reactors.

ENVIRONMENTAL PROTECTION AND RISK MANAGEMENT

Compared to other radionuclides, tritium is released in the environment by nuclear sectors due to its mobility. The tritium limit of discharge in the environment is calculated by radiological impact studies that consider the receiving environment and its low radiotoxicity.

Measurement of tritium in its different forms is key in the process of risk assessment (radioprotection, exposure, modelization,...modelization...).

Detritiation facilities and storage are solutions to limit the release of tritium into the environment.

All tritium-related operations and activities must follow local and international directives and regulations.

THE MAIN USES

The thermonuclear fusion reaction between deuterium and tritium is the basis of the nuclear deterrence arsenal of some countries [5]. But this reaction will also be exploited in nuclear fusion reactors.

This is in particular the purpose of the research undertaken on an international scale with the ITER project.

Tritium needs are significant in this sector, with an initial estimated 25 kg to start the ITER experimental device. For the next step, the DEMO reactor, which should bring fusion to the threshold of industrial operation, tritium requirements will be of the order of 300 g per day to produce 800 MW of electricity [6].

More peripheral applications use tritium's properties to make phosphorescent ma terials glow for light signaling, or use it as a radiochemical product or as a tracer for research or oil and gas exploitation.

TRITIUM
Challenges and opportunities

TRITIUM ACCOUNTING AND INVENTORIES, TRITIUM WASTE MANAGEMENT

The monitoring needs in the context of radioactive material and waste disposal are detailed in this document's introduction. But the challenges faced by tritiated material and waste characterization are numerous.

On the one hand, its storage and disposal are made difficult because of its tendency to outgas.

On the other hand, the concentration of tritium is very variable within the same component. Destructive measurements by sampling are therefore not very representative.

Apart from liquid scintillation dedicated to low concentrations, conventional nuclear measurement techniques are not fully adapted to tritium measurement and only chemical analysis techniques meet this need [7]. However, they remain sampling- based techniques, with the above-mentioned problems of representativeness.

TRITIUM QUANTIFICATION FOR COMMERCIAL EXCHANGE

Since tritium is produced worldwide in very small quantities (as a reminder, a CANDU reactor produces a few hundred grams of tritium per year), and since its extraction process is complex and therefore expensive, a gram of tritium is traded at a high price, from about $30,000 to about $35,000 [8] [9]. Therefore, a facility produces the equivalent of a few million to a few tens of millions of US dollars a year.

The measurement accuracy of the tritium quantities exchanged between the producer and the user is therefore critical because it has a direct economic impact. The slightest measurement uncertainty would result in an under- or over-estimation that would strongly disadvantage one party or the other.

TRITIUM QUANTIFICATION FOR ITS TRANSPORTATION

Compared to storage, the transport of radioactive materials presents increased risks, particularly in terms of loss, theft or misappropriation. Thus, international regulations govern the transport of these materials and require the measurement of their quantity (or activity).

IAEA indicates for example that « the material to be transported should be characterized to identify the radionuclides, the form and activities of the material in order to assign a transport security level. In some cases, a shipment might consist of a single radionuclide, either in a single package or multiple packages. In other cases, there might be multiple radionuclides within a single package or multiple packages containing multiple radionuclides within a single shipment. The identity and activity level of each of the radionuclides should be identified » [10]

A shipment containing tritium must therefore be quantified in order to assign the appropriate level of transport security.
Tritium storage, today highly centralized on specific sites, combined with increasing commercial exchanges, will thus impose the need for accurate measurements on all shipping sites and all recipient sites

TRITIUM PRODUCTION

The growing number of fusion reactor projects highlights the need for high-performance tritigenic devices to equip these reactors. These are complex systems requiring studies, developments and special skills for the construction and commissioning phases.

TRITIUM REMOVAL

Countries who are producing Tritium can take the opportunity of Tritium high value to extract it and store it for future use.

A removal Tritium facility include several high-technology areas: liquid phase isotopic separation, cryogenic distillation and high-vacuum operation.

WHY A NUCLEAR VALLEY H3 GROUP ?

France has a long relationship with nuclear from innovation to operation through project management, construction, maintenance, confinement, dismantling, waste/water treatment and storage, measurement, monitoring, ... We cumulate strong knowledge and know-how in nuclear field thanks to decades of nuclear deployment.
State owned research centres provide a high capacity for innovation including in tritium. France has also laboratory capabilities to handle tritium (characterization, experimentation)
Whatever the project around Tritium, from characterization, storage, production, recycling to detritiation plant, it requires many specific competences that cannot be found in a single company. Nuclear Valley, with 440 members, covers all required skills and experiences to address projects. H3 group has been created by dynamic Nuclear Valley members who have solutions for all tritium management needs.
Members of the group are working altogether in a team spirit to propose global solutions with high expertise for French and international industries.

Purpose of this catalog is to provides an overview of each member and their multicompetence for project including tritium management.

[1] Le tritium et l'environnement – Société Française de radioprotection

[2] Richard J. Pearson, Armando B. Antoniazzi, William J. Nuttall, Tritium supply and use: a key issue for the development of nuclear fusion energy, Fusion Engineering and Design, Volume 136, Part B, 2018, Pages 1140-1148, ISSN 0920-3796, https://doi.org/10.1016/j.fusengdes.2018.04.090.

[3] Livre blanc du tritium, Autorité de Sureté du Nucléaire, page 132, https://www.asn.fr/sites/tritium/132/

[4] Soon-Hwan Son, Sook-Kyung Lee, Kwang-Sin Kim, Tritium production, recovery and application in Korea, Applied Radiation and Isotopes, Volume 67, Issues 7–8, 2009, Pages 1336-1340

[5] https://laradioactivite.com/le-phenomene/letritium

[6] https://www.iter.org/fr/mach/tritiumbreeding

[7] F. Bachelet et al, Calorimétrie : une méthode non destructive pour la mesure du tritium et son inventaire, revue « CHOCS AVANCEES » du commissariat à l'énergie atomique et aux énergies alternatives, numéro 15 d'octobre 2021, page 40 https://www-physique-chimie.cea.fr/science-en- ligne/chocs-avancees.html

[8] Daniel Clery, Out of Gas, Science, Vol 376, Issue 6600, doi: 10.1126/science.add5489

[9] Pearson, THE TRITIUM WINDOW: AN OPPORTUNITY FOR ACCELERATED FUSION DEVELOPMENT, Tritium 2022, Book of Abstracts

CURIUM

FOCUS 3H EXPERIENCES

- Characterization and measurment
- Radioprotection
- Water and gaz treatment
- Waste treatment
- Liquid Waste Assembly and packaging
- Experimentation
- R&D (PATCH 3 project in partnership with CEA).

CERTIFICATIONS

Nuclear Activity authorization:

Members of:

WHO WE ARE

Since 1994, CURIUM has been dedicated to the **management of critical environmental (chemical, radiological, biological) risks**. Our team of experienced chemical and radiological engineers conducts technical studies and performs **in-situ operations** for all sectors working with hazardous substances.

KEY INFORMATION

Scope of activity:
CURIUM experts are involved in the **management of chemical and radioactive risks, as well as combined risks** associated with hazardous products: toxic, flammable, corrosive, carcinogenic, mutagenic and toxic to reproduction (CMR), explosive, infectious, radioactive, water-reactive, self-reactive.

CURIUM's areas of expertise:

- Hazardous waste management
- Chemical and radiological characterization, measurement, decontamination
- Works on site
- Experimentation, R&D and engineering
- Environmental studies and projects.

CUSTOMER REFERENCES

CONTACT

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OUR ADDED VALUE

- Multi risk expertise
- Safety certifications
- Our own laboratory
- Reactivity and innovation
- Circular economy culture
- Turnkey approach/solutions
- International perspective
- Knowledge of regulatory frameworks.

DG SKID

DG SKID SUPPORT

- Automated Process Unit Engineering & Construction
- Piping &Tubing 3D Integration
- Cryogenic, PED, ATEX, High Temperature expertise
- Process Unit, Demonstrator, Pilot, Prototype
- Skids, Test Bench/Loop, Treatment Unit, Measurement Unit & Equipment integrator

CERTIFICATIONS

MASE
AMÉLIORER LA PERFORMANCE SSE

afaq ISO 45001 Santé Sécurité au Travail AFNOR CERTIFICATION

afaq ISO 9001 Qualité AFNOR CERTIFICATION

CONTACT

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WHO WE ARE

DG SKID is a reliable partner for the Nuclear industry, offering specialized expertise in process engineering, pressure vessels, piping systems, automation, and process equipment. We supply fluids process packages or treatment units specifically tailored to the nuclear industry needs.
Thanks to our engineering & workshop capabilities, we successfully execute turnkey projects end to end while ensuring strict conformity to all regulatory or contractual constrains.

KEY INFORMATION

- **Project Management (EPC, EPCM, PMCS) Performance guarantee**
- **Process equipment**
- **Automation and Control including safety systems**
- **Electricity**
- **Temperature, Flow & Pressure Control**
- **Instrumentation**
- **Mechanical & Steel Structure**
- **Piping, Vessels, Reactors**
- **Management of CEFRI certified contractors**
- **Process Engineering including Equipment technology selection and related sizing**
- **Focused on fluid process applications featuring hazard.**

CUSTOMER REFERENCES

framatome · NAVAL GROUP · GONZALES GROUPE · Westinghouse · orano

OUR ADDED VALUE

- Pressure Vessels & equipment
- Cryogenic application
- Gas, Liquids and Powders expertise
- EX Proof area (ATEX, IECEx, NEC)
- Complex rheology
- Wide range of fluids application.

ECM TECHNOLOGIES

NUCLEAR APPLICATIONS

Fuel Cycle:

- Zirconium Tube Annealing
- MOX & UO2 Pellets Sintering
- Powder reduction & calcination

Waste Treatment:

- Calcination furnaces
- Vitrification furnaces
- MOX & UO2 Pellets Sintering furnace
- Metallic Waste Melting installations
- Tritium Degasing

Other Heat Treatment & Robotics Solution

CERTIFICATIONS

- ISO 9001: Quality management system
- ISO 14001: Environmental Management Systems
- European Pressure Equipment Directive DESP
- CEFRI.

CONTACT

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WHO WE ARE

Our Mission: to design and manufacture high-tech solutions to improve the performance of industry and support it in its ecological transition.

ECM Technologies is indeed a key player in the equipment market for the heat treatment and transformation of materials.
We provide turnkey solutions for various industries around the world and we have a dedicated Business Unit answering to the specific requirements of the nuclear, industry with leading edge skills and know how.

KEY INFORMATION

- **Family-owned** company / **French** Capital
- Based in Grenoble, France
- **Over 700 Employees**
- **Dedicated Business Unit to Nuclear and Special Projects**
- ECM operations abroad: ECM USA, ECM China, ECM Furnace India, ECM Kazakhstan, ECM Gmbh (Germany), ECM Singapore.

CUSTOMER REFERENCES

cea framatome orano

TA TechnicAtome cavendish nuclear iter

Members of Bpi nuclear Accelerator
bpifrance

OUR ADDED VALUE

- Expertise in Heating Technologies up to 3000°C under Vacuum and Gas Atmosphere
- Strong expertise in confined environments integration: gloveboxes or remote controlled hot cells.
- As a true skills-hub, ECM Technologies offers tailor made solutions and intervenes in the fuel cycle and in the waste management & recycling
- Solutions for Tritium desorption from metallic waste
- Project management in highly restrictive and normative environment.

EGIS

OUR CAPABILITIES

- Project and Program management
- Digital strategy, integration, PLM, BIM
- EPCM
- Site characterization, geotechnics, siting, seismology
- Environmental Impact Assessment
- Nuclear infrastructure design
- Site logistics, preparation, site management
- Nuclear safety support
- Water and maritime interface
- Waste management strategies and studies of tritium contaminated wastes (Gas, liquid and solid).

CERTIFICATIONS

- ISO 45001: Occupational Health and Safety
- ISO 9001: Quality management system
- ISO 19443: Quality Management Systems in Nuclear
- ISO 37001: Anti-Bribery Management Systems
- ISO 14001: Environmental Management Systems.

WHO WE ARE

Egis is a global company specialised in consulting, engineering, construction supervision and operation of large infrastructure projects.

Egis offers Owners Engineer, Architect Engineer as well as niche expertise for all nuclear facilities including power plants, SMR's, Research & Fusion Reactors, Fuel Fabrication facilities, Waste and Storage Facilities. We also provide radioactive waste management consultancy services through our subsidiary Galson Sciences Ltd.

Egis supports its customer along the lifecycle of nuclear infrastructures, from feasibility and design, construction management to operation, dismantling and up to soil remediation with our crosscutting and multidiscipline expertise.

KEY INFORMATION

Egis is a global company with 17,000 employees in over 120 countries with a turnover of €1.5 billion. We have supported 20 countries with their nuclear programmes over the course of our 70 years in the nuclear industry.

CUSTOMER REFERENCES

CONTACT

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OUR ADDED VALUE

- Provides upstream siting and EIA studies
- Acts as the project integrator to design the adequate building and utilities to host the process
- Takes over the position of Architect Engineer including all phases of the design and construction supervision
- Proposes integrated tritium waste management strategy.

GONZALES GROUP

Founded in 1971, Gonzales Group is an international company.

- 450 employees
- 70 M€ turnover
- 8 operational subsidiaries around the world

- France – Roumanie – Vietnam – USA –

OUR CAPABILITIES

- Project Management
- Supply chain
- Project quality
- Design and Conception
- Machining
- Mechanical welding: (Steel, Stainless steel, Aluminium)
- Power cabinets manufacturing
- Electrical wiring
- Automation
- Robotics
- Assembly Integration
- Commissioning and Training.

KEY INFORMATION

Conception, manufacturing and integration of mechanical equipment's:

- Special machines
- Prototypes
- Tooling
- Production line assemblies

Integration of automated mechanical assemblies.

CERTIFICATIONS

- ISO 9001: Quality management system
- Qualification 15085 CL1 (Welding)
- Qualification EN 1090 EXC4 (Welding)
- Qualifications RCC-MRx / RCCM / ASME / EN.

CUSTOMER REFERENCES

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OUR ADDED VALUE

Quality, reliability and timeliness are the three key concepts for each of our actions in order to satisfy our customers.

JACOMEX

NUCLEAR APPLICATIONS

Nuclear Gloveboxes for:

- R&D for the manufacture of fuel assemblies
- Gas purification (H2O, O2, tritium gas)
- Online sampling of radioactive gases and liquids materials.
- Gen IV & V nuclear reactors R&D,
- Management and reprocessing of radioactive waste
- Radiochemistry and Radioprotection
- Nuclear medicine and production of radioisotopes.

CERTIFICATIONS

- ISO 9001: Quality management system
- ISO 3834: Quality requirements for fusion welding of metallic materials
- ISO 10648: Classification of containments/ gloveboxes according to tightness.

WHO WE ARE

Born from Nuclear Research and partner of innovation, Jacomex is developing its containment and controlled atmosphere expertise for over 80 years. We design and manufacture technical solutions to protect products and humans allowing for tomorrow's breakthroughs to emerge.

KEY INFORMATION

Jacomex vertically integrates its design and manufacturing capacity on one site close to Lyon in France. Being present internationally and on several industry markets, the company is strongly investing in innovation, offering standardized or fully bespoke containments solutions, using the latest fabrication technologies, mastering the fabrication of gloveboxes at an industrial level at the highest nuclear quality grade standards.

CUSTOMER REFERENCES

NRG Nuclear. For life. · cea · EDF · TerraPower · SEABORG

And many more...

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OUR ADDED VALUE

Successful recent experience in delivering tritium gloveboxes, ventilation safety fixtures and gas purifications systems, with integrated process and analysis equipment in North America and Europe.

KEP TECHNOLOGIES

WHO WE ARE

KEP Technologies, through its Setsafe brand, partner with you to provide standard or customized solutions to meet your radioactivity measurement challenges, whilst respecting all constraints of the nuclear field.
Our skilled team of engineers and academic doctors lead projects from solution conception right through to installation, training, and maintenance, or however you require.
KEP group's expertise also allows us to intervene on diverse and broader operations, along the life cycle of the nuclear fuel: extraction, enrichment, fuel manufacturing, use, sorting, recycling and storage.

CORE COMPETENCES

- Characterization of conditioned nuclear waste
- Characterization stations for low to high-level waste
- Nuclear waste management
- Tritium measurement.

KEY INFORMATION

KEP Group is a French group with a turnover of 75m€ and 450 employees.
KEP Measurement Business Unit is 20m€ with 100 employees (Nuclear Activity 25%).
For 40 years, we have been supporting nuclear professionals in projects such as characterization of nuclear materials, decommissioning, waste management and storage.

CERTIFICATIONS

CEFRI

afaq ISO 9001 Qualité AFNOR CERTIFICATION

CUSTOMER REFERENCES

cea · BARC · AWE · icepco · ICSI · Los Alamos NATIONAL LABORATORY · orano · SCK·CEN · KIT · ANDRA

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OUR ADDED VALUE

We are combining manufacturing of standard measurement solutions and Engineering capabilities for customized solutions:

- Engineering, studies & design
- Project Management
- Measurement & instrumentation
- Mounting & Assembly.

TECHNICS GROUP FRANCE

NUCLEAR APPLICATIONS

- Gen III, IV & Fusion nuclear reactors
- Fuel Cycle management, reprocessing and storage.
- Nuclear medicine and production of Radioisotope
- Hydrogen production
- Tritium confinement
- Tritium process
- R&D:
  - PACH3 project with CEA
  - ITER TBM / DMS

Capabilities of development for Remote Handling assemblies.

CERTIFICATIONS

- ISO 9001: Quality management system
- ISO 19443: Quality management systems in Nuclear
- ISO 14001: Environmental management systems
- CERFI
- EN9100: Quality management systems for aerospace production.

CONTACT

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WHO WE ARE

Technetics is the leader in customized high-performance sealing solutions for critical applications in nuclear power, flow control, semiconductors and aerospace.

Technetics offers a wide range of customized materials. They perform in the most extreme temperature, pressure and corrosive environments and also provide benefits of high purity, sound absorption, noise reduction and structural enhancement.

MAESTRAL®, Technetics-CEA's joint R&D laboratory, has been dedicated to the design and testing of high-performance sealing systems for over 50 years. Technetics works with the major players in the nuclear industry worldwide.

KEY INFORMATION

Technetics Group is made up of some of the world's best-known sealing and critical component design and manufacture businesses delivering highly engineered seal designs and critical component solutions:

- 6 primary manufacturing locations
- More than 500 employees
- For more than 50 years we support the nuclear development across the world

CUSTOMER REFERENCES

And many more...

OUR ADDED VALUE

Based on our expertise and capabilities we propose a unique value proposition around sealing technologies. We can support our customers from R&D, design, manufacturing, prototyping and installation.

ALSYMEX

OUR CAPABILITIES

- Design and Sizing
- High precision large dimension machining
- Welding development & qualification (laser, EB, TIG)
- Special process development & qualification (HIP, ...)
- Nuclear grade and high performance material
- Assembly and integration, incl. clean rooms
- On site installation, commissioning and maintenance
- Project Management
- Piping / skids / Glove Boxes / Fuel cells
- Safety parts & assemblies
- Cryogenics
- Prototypes / Test benchs.

CERTIFICATIONS

- ISO 9001: Quality management system
- ISO 19443: Quality management system (Nuclear)
- IWE, IWT, IWS qualifications (Welding)
- EN ISO 9712 qualifications (NDT)
- Codes RCC- M / ASME / ESPN / CODAP
- CEFRI qualification.

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WHO WE ARE

Subsidiary of the ALCEN Group, ALSYMEX is a mid size industrial company specialized in design, engineering, manufacturing, assembly, on site installation, commissioning and maintenance of mechanical sub-assemblies and complex systems.

- 500+ employees
- 100 M€ turnover
- 6 premises in France – 1 subsidiary in Tunisia

- Nuclear – Defense – Big Science -

KEY INFORMATION

High level expertise in Tritium processes:

- Sizing, industrialization, monitoring, nuclearization
- Tritium – material interaction
- Process simulation management
- Operation, Maintenance and Dismantling considerations

Design and manufacturing of systems suited for nuclear processes:

- Nuclear Glove boxes and fuel cells
- Skids
- Control command
- Tooling (Handling, Control...)
- Integration of mechanical assemblies
- Piping / Fluids
- Machining / welding

CUSTOMER REFERENCES

OUR ADDED VALUE

ISO 19443 certified, ALSYMEX benefits from a long experience in the nuclear domain, both in fission and fusion.
Capability to design and manufacture of safety parts and assemblies (process sub-assemblies, glove boxes, ...).
Expertise & strong experience in tritium.

Bouygues Construction Expertises Nucléaires

OUR KNOW-HOW

- Tritium Gas Purification
- Tritium Liquid Purification
- Robotics
- HVAC (Heating, Ventilation, and Air Conditioning)
- Modular Construction
- Low Voltage (LV) Electrical Expertise
- High Voltage (HV) Electrical Expertise
- Civil Works
- Nuclear Waste Management
- Dismantling
- Installation/Erection
- Electrical Services
- Assembly/Erection/Handling.

CERTIFICATIONS

WHO WE ARE

Bouygues Construction Expertises Nucléaires, and its affiliate Kraftanlagen Heidelberg offers an integrated, innovative and high value-added service all over the world, based on a range of solutions covering all technical fields and the entire life cycle of nuclear infrastructures.

KEY INFORMATION

To summarize our many years of experience in the handling and processing of tritium, the following projects should be mentioned:

- Conceptual Design Tritium Confinement Systems for an European NPP
- Detailed Design for the ITER WDS (Water Detritiation System)
- Conceptual & Detail Design for the ITER Tokamak Complex – ADS (Atmosphere Detritiation System)
- Detailed Design for ADS at the ITER Hot-Cell Facility
- Pre-Conceptual Design Studies for the DEMO Fuel Cycle Architecture.

CUSTOMER REFERENCES

And many more...

CONTACT

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OUR ADDED VALUE

Specifically for Tritium, our offer covers the whole EPC package value from basic design to project execution: installation and commissioning.

E2S-INNOVATION

WHO WE ARE

E2S-Innovation is a company specializing in the development of measurement solutions and innovative instruments capable of responding to field problems, in order to protect people and the environment from the risks of atmospheric pollution.

We bring expertise and know-how for the sizing and complete development of multi-measurement systems, specific to the needs of our customers in the fields of chemical measurement, detection of industrial emissions, quality monitoring air, and nuclear measurement.

NUCLEAR APPLICATIONS

- Tritium sampling by passive trap
- Tritium sampling by active trap
- Tritium environmental analysis & measurements
- Tritium sampling in ventilation ducts, chimneys glove boxes.

KEY INFORMATION

E2S-Innovation have developed and industrialized the PA3 innovative technology, answering to the continuous and passive radioactive atmospheric tritium sampling (HTO).
PA3 solution, based on a method patented by IRSN, is a full solution, self-contained and easy to deploy, also well suited to routine surveillance only in emergency situations or to the radiation protection of workers.

CUSTOMER REFERENCES

CONTACTS

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OUR ADDED VALUE

E2S-Innovation develops and offers innovative solutions in radiation protection & nuclear instrumentation as our air-sense.tech technology. We devote 30% of our time to R&D development. Our R&D team masters the entire value chain: from the choice of measurement technology to the development of embedded and user software, including electronics and mechanics.

EKIUM

NUCLEAR APPLICATIONS

Scope of work:

- Feasibility studies,
- Pre-FEED, FEED,
- EPCm, EPC,
- Site Surveys, Construction Supervision,
- Testing,
- PMO,
- Technical Assistance, …

Fields covered:

- Mechanical,
- Calculation,
- Electricity, I&C,
- Civil Work,
- General Installation & Process
- Nuclear safety, …

CERTIFICATIONS

MASE – CEFRI – Qualifoudre

afaq ISO 14001 Environnement – AFNOR CERTIFICATION
afaq ISO 45001 Santé Sécurité au Travail – AFNOR CERTIFICATION
afaq ISO 9001 Qualité – AFNOR CERTIFICATION

CONTACT

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WHO WE ARE

Ekium is the engineering subsidiary of the French group SNEF – turnover of €2.2billion and 14,800 employees –. Ekium is the French leader engineering for industrial facilities, buildings, utilities and automation for process industries. Thanks to a proximity network in France and abroad offices, our Engineers and Technicians manage industrial's structuring projects from feasibility to maintenance. Since 1990, Ekium has been accompanying its clients with a common goal: to place industry at the heart of the new challenges faced by our society.
Ekium is involved at all levels of the nuclear life cycle alongside the mains key players all around the world in this industry: upstream and downstream phases of the fuel cycle, reactors, dismantling, storage, but also research and testing programs and laboratory projects.

KEY INFORMATION

- **+30 years old company**
- Based in **Lyon**, France
- **+2500 employees, +300M€ turnover**
- Presence in **14 countries**.

CUSTOMER REFERENCES

cea – orano – framatome – iter – TA TechnicAtome – ENEC الإمارات للطاقة النووية – NUCLEARELECTRICA – EDF

OUR ADDED VALUE

- Expertise on operating as well as new generation nuclear power plant
- Support wide range of NPP technologies EPR & EPR2, AP1000, APR1400, CANDU, PHWR, VVER, …
- Multi-skilled design office,
- Capability to operate on all project lifecycle: from feasibility studies to site survey & testing.

GASNE INDUSTRIES

OUR CAPABILITIES

- Design and Conception
- Manufacturing & repair
- Project Management
- Supply chain
- Project quality
- High alloy steels, stainless steels…
- Machining
- Welding & Orbital welding
- Sheet metal & Boiler making
- Assembly Integration
- Piping / skids / Glove Boxes
- Safety parts & assemblies
- Prototypes / toolings.

CERTIFICATIONS

- ISO 19443: Quality management system (Nuclear)
- IWS qualification (Welding)
- Codes RCC- M / ASME / ESPN / CODAP
- CEFRI qualification.

WHO WE ARE

Founded in 1949, GASNE Industries has a strong experience in the nuclear sector, both in studies and manufacturing.

- 35 employees
- 5 M€ turnover
- 4 operational subsidiaries in France

Nuclear – Medical – Aeronautical – Defense

KEY INFORMATION

Conception & production of mechanical equipments

- Glove boxes / Skids
- Tooling (Handling, Control…)
- Parts & sub-assemblies used in large components of nuclear reactors
- Integration of mechanical assemblies
- Piping / Fluids
- Machining / welding / grinding
- sheet metal boiler making.

CUSTOMER REFERENCES

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OUR ADDED VALUE

Long experience in Nuclear – ISO19443 certified. Study & Manufacturing of safety parts & assemblies (Glove boxes & several process equipments). Expertise & strong experience in Tritium (For CEA…).

ROTAREX - SMT

OUR CAPABILITIES

- Design and Conception Bellows Valve
- Methods
- Machining & Manufacturing
- High alloy steels, stainless steels
- Welding & Orbital, Laser, Tig
- Project Management
- Supply Chain
- Project Quality
- Assembly Integration
- Integrated Functional & Leak testing
- Integrated testing laboratory
- Spares Kits
- Prototypes.

CERTIFICATIONS

Codes RCC- M / ASME / ESPN.

WHO WE ARE

ROTAREX SMT benefits from this important REX which has since this day guaranteed compliance with the safety, security and sealing rules necessary for its very demanding sectors. The bellows valve activity for the Nuclear market was created in 1950,.

- 2000 Employees
- 300M€ Annual turnover
- 4 R&D centers
- 10 Factories and Logistics Centers
- 32 Sales / Service offices

- Nuclear Civil and Military – Nuclear Fundamental Research – Defense – Aerospace – Fire Extinguishing – Medical – Automotive – Laboratory – Industrial - ...

KEY INFORMATION

Conception & production of mechanical equipments:

- Bellows valves, non-return
- LP and HP gas regulators
- Gas reversal plant
- Anti-return by flame AD
- LP and HP hoses for gas and liquid fluids.

CUSTOMER REFERENCES

CONTACT

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www.rotarex.com

OUR ADDED VALUE

Long experience in Nuclear:

- Study & Manufacturing of safety parts & assemblies
- Expertise & Strong experience in tritium for CEA Civil & CEA Military,
- Nuclear propulsion & Fundamental Research.

MEMBERS OF THE TRITIUM CLUB


NUCLEAR
Valley
FEDERER LES ENERGIES


CLUBH