Absolut System - Introduction

Absolut System is an independent SME established in April 2010 by recognized experts

- More than 50 years of cumulated experience and expertise in cryogenic fields
- More than 15 years of experience and expertise in CFD
- More than 10 years of experience and expertise in cryogenic space propulsion
Absolut System - Introduction

Key figures:

- 1.1 M€ turn-over in 2011, 1.8 M€ turn-over foreseen in 2012
- Staff: 3 engineers in 2011, 7 engineers + 1 CAD designer in 2012
- JEI (Jeune Entreprise Innovante – Innovative Young Company) status obtained in 2011
- ESA SME registered – ESA BD code 8481
- More than 10 industrial & institutional customers

Industrial organisation:

- Long term partnership willingness with space, defense and superconductivity major actors
- Long term partnerships established with local companies for manufacturing, set-up and testing
- Structure very reactive for studies, prototype development and manufacturing
- Structure including all competencies required to develop complete integrated systems
Absolut System - Our vision

➢ Establish long term partnership with major actors developing innovative technologies

➢ Space applications
  - Cryogenics including cryorefrigerators
  - Space propulsion
  - Thermal management
  - Test Bench
  - Simulation capabilities

➢ Scientific Research
  - Cryogenic systems including cryorefrigerators and helium recondensation

➢ Energy - Superconductivity
  - Cryogenic systems for high performance smart-grid (transmission and distribution cables, energy storage devices (SMES), fault current limiters, motors and generators), magnetic levitation devices, ...

ABSOlUT
SYSTEM
Absolut System - Our capabilities

Engineering:

➤ Cryogenic engineering
  • System Designs for Extreme Temperatures and Pressures

➤ Mechanical Engineering

➤ Aerospace Engineering

➤ Fluids and Thermal Engineering
  • CFD, multi-phase CFD
  • Thermodynamic, Fluids, Heat Transfer, two-phase flow
  • Free surface evolution, Mass transfer
  • Internal and external aerodynamic
  • Combustion
Absolut System - Our capabilities

**Fabrication:**
- Design, Fabrication, Installation, and Checkout of Cryogenic and vacuum Processes
- System Thermal-Flow, Heat Transfer and Stress Analysis
- Piping and Pipe-Support Design, Fabrication, Installation
- Design of Control Systems for Hazardous Classifications
- Instrumentation for Process Systems (with our partners)
- Complex Welding, Tubing, Wiring (with our partners)
- Systems Engineering and Validation of Complex Systems
- Systems Integration Capabilities
Absolut System - Our capabilities

**Project Management**

- Estimating
- Planning
- Project engineering
- Developing work breakdown structures
- Scheduling
- Performance measuring
- Financial and status reporting

**Documentation control and internal processus**

- Configuration control of all engineering, manufacturing and testing documentation
- Equipment calibrations
- Data record of test results
- Data storage on internal server with daily backup
Absolut System - Key Personnel CV

➤ Alain Ravex - President

- Involved in cryogenic system development since 40 years
- Former Head of low temperature department at the french nuclear agency (CEA-Grenoble)
- Former Development, Technology and Innovation Director of the Air Liquide Advanced Technologies Division (10 years)
- Former Fellow Expert in Air Liquide Group

- President Association Française du Froid/Comité Cryogénie et Supraconductivité
- Member of Cryogenics Commission of International Institute of Refrigeration
- Member of CRYOGENICS International Advisory Editors
Absolut System - Key Personnel CV

➢ Thierry Trollier – Technical Director
  - Involved in cryogenic system development and cryo-coolers since 20 years
  - Former International group expert in Air Liquide Group
  - Former head of cryocooler and cryostat section of Air Liquide Advanced Technologies Division (10 years)
Absolut System - Key Personnel CV

Julien Tanchon – R&D Director

- Involved in cryogenic system development and cryo-coolers since 10 years
- Air Liquide Advanced Technologies Expert in integration of on-board systems (space)
- Former cryocooler product manager at Air Liquide Advanced Technologies Division (10 years)
  - Pulse-Tube cooler
  - JT systems
  - Thermal links
Absolut System - Key Personnel CV

> Jerome Lacapere – Scientific Director

- Involved in cryogenic space propulsion since 10 years
- Involved in CFD applied for aerospace applications since more than 15 years
- Former head of the CFD section at Air Liquide Advanced Technologies Division (10 years)
  - Comprehension, modelisation and validation of cryogenic propellant in space launcher tanks
  - Former member of the COMPERE (propellant behavior in tank) scientific committee
  - Principal Investigator and project manager of 3 test campaigns with Liquid Nitrogen in zero-g parabolic aircraft
  - Principal Investigator and Technical head of Cryofenix project (Air Liquide / CNES / SSC Space) : Sub-orbital tests with Liquid Hydrogen in Sounding Rocket
- Former head of the CFD section at Sagem Defense (SAFRAN Group)
  - Internal and External Aerodynamic, Thermal analysis dedicated to the AASM project
Our realizations: Cryogenic Test Benches for different applications

- SOFRADIR infra-red detectors qualification
  - Remote Helium circulation loop, 12W@40K / 28W@50K
  - Gifford CRYOMECH AL125 + circulation GHe

- INP Lorraine cooling of HTS components
  - Remote Helium circulation loop 30 W@30 K
  - Gifford CRYOMECHAL325 + circulation Ghe + LN2 intermediate cooling
Our realizations : Cryostats

- CEA/LETI, LN2 optical cryostat -200C/+200C
  - Wafer profile measurement (ALTIMET)
  - Clean room operation
  - Complete automation of the system

- European Synchrotron Research Facility (ESRF), Automatic cryogenic vial charge
  - Automatic cryogenic vial charger
  - 240 samples capacity based on EMBL/ESRF vial standards
  - Complete automation of the charging and discharging of the samples with robots and bare code scanner
Our realizations: Cryo-coolers development

Studies, Design, Realization, Qualification of cryo-coolers for different applications and customers, for example:

- **Space applications**
  - 2.5 W @150 K
  - Complete validation against ESA ECSS

- **Infrared detection applications:**
  - 1.6 W @ 80K / 20C / 60Wac
  - Cost vs performance optimisation

- **HTS and industrial applications:**
  - Performances from 130W@80K up to 1 kW@80K
  - Cost objectives
Our realizations: Product distribution, integration and maintenance

- Gifford Mac-Mahon 77K-10K cryorefrigerators
- Pulse Tubes 4K cryorefrigerators
- Nitrogen & Helium Liquefiers & Recondensers

**Images:**
- Thermosyphon recondensing loop using 3 AL600 GM coolers
- Recondensing unit for Fault Current Limiter
- Helium recondenseur 15 liters/day
- Liquid Helium Plant 18 liter/day
Our realizations : Projects related to Space Ground testing

ESA / APCO

➢ Study, conception and qualification of cryogenic thermal control for New Motion System (NMS) of the Large Space Simulator (LSS) at ESA/ESTEC Test Center

➢ ABSOLUT SYSTEM responsible for:

  - Full system thermal study (FEM Model)
  - Cryogenic thermal shielding design and validation: thermo hydraulic et mechanical study
  - Subcontractors selection and Procurement Specification redaction
  - Fabrication and testing coordination
Our realizations: Projects related to Space Ground testing

ESA TRP / APCO

- Cryogenic LN2 rotating sealing development, manufacturing and qualification against ESA space standards
- Structural validation, Thermomechanic analysis with FEM
- Qualification test campaign in Thermal Vacuum Chamber
- 2 recurrent units to be delivered and integrated on LSS NMS
Our realizations: Projects related to cryogenic space propulsion

ESA TRP / ALTA

ZERO BOIL-OFF PROPULSION SYSTEM FEASIBILITY DEMONSTRATION

Absolut System is subcontractor of ALTA Space for this TRP

- Define the Zero Boil-Off architectures relevant for two reference scenarios
- Support the design, manufacture and test of one subscale demonstrator of a Zero Boil-Off system
Our realizations: Projects related to cryogenic space systems

SPACE SYSTEMS, COMPONENTS AND CRYOCOOLER INTEGRATION ACTIVITIES

- Development, Manufacture and Test of high performances thermal links for European space programs
- Development of rotary compressors for on-board thermal management
- Turbo-Brayton studies for CNES & Prime
- Support to Primes for competitive programs proposal
- Contract with AL.AT for CSO & MTG cryocoolers expertise
- Other projects under discussion with US industrials
Our Customers

**SPACE and DEFENSE AGENCIES** : CNES, ESA, DGA

**MAJOR SPACE COMPANIES** : Thales Alenia Space, EADS Astrium, EADS Space Transportation, APCO, Sofradir, Thales Cryogenics, ALTA…

**MAJOR COMPANIES involved in superconducting business** : NEXANS, IRL (NZ), HTS110 (NZ), ALSTOM,…

**SCIENTIFIC RESEARCH** : CEA, CNRS, ESRF, ILL, Universities and High Schools,…

Our Partners