

RAAL[®]
complete cooling solutions



Cooling solutions for
RAILWAY EQUIPMENT

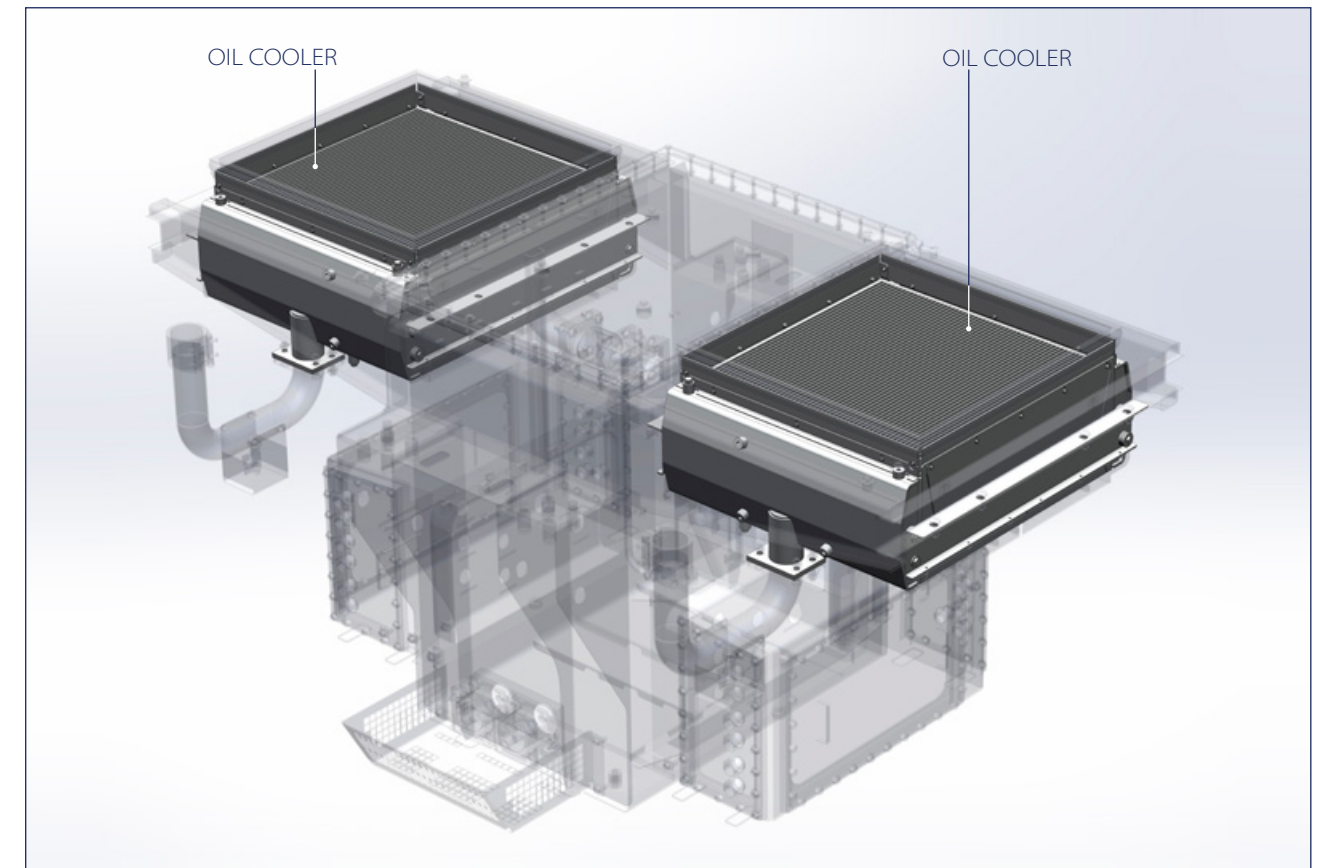
Starting from a simple cooler to a complete cooling system, RAAL always offers the best solution in terms of performance, profitability and compliance with environmental standards and it adds value to the products of its partners.

A permanent challenge for RAAL is to provide the OEMs dealing with railway equipment, reliable cooling solutions, standing out through high quality and low maintenance costs.

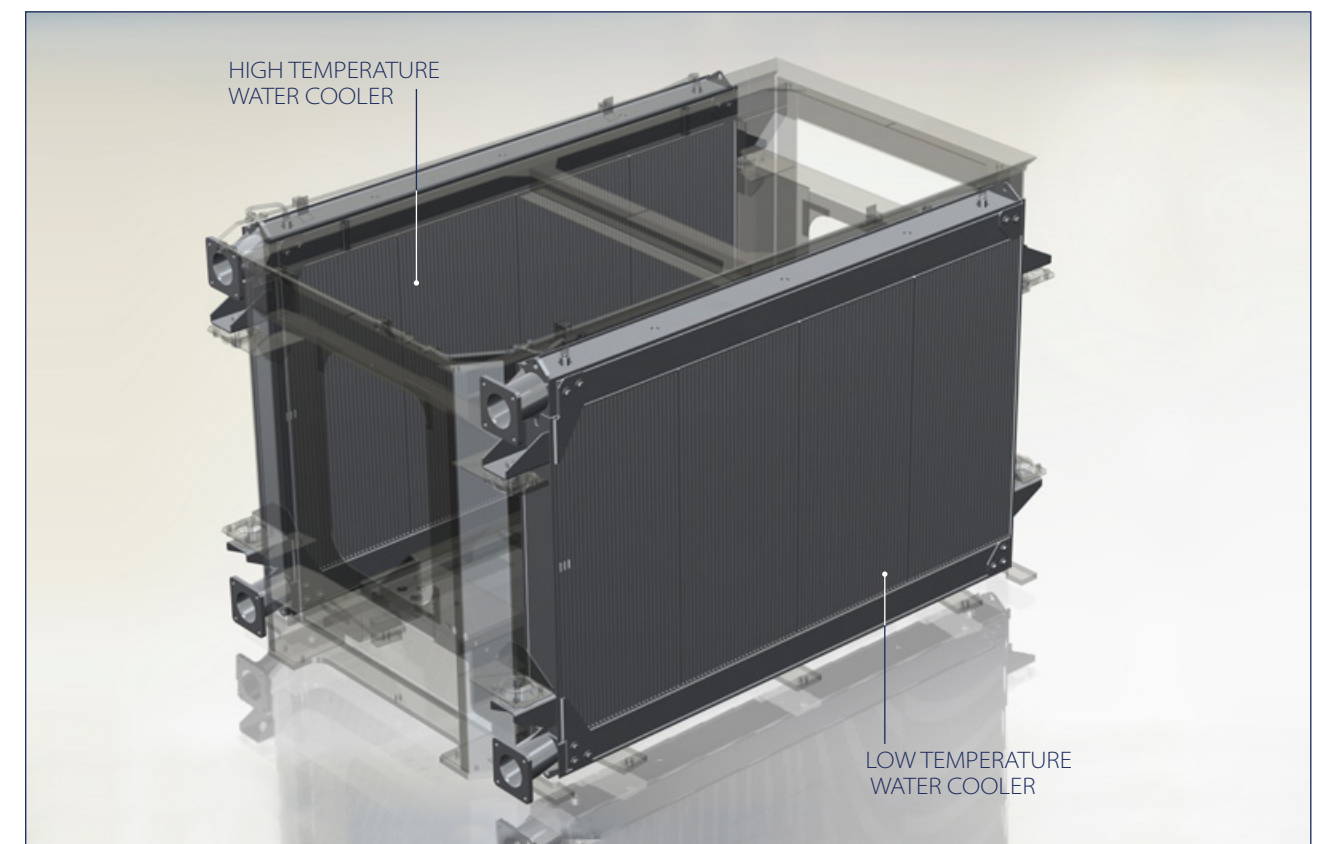
Flexibility, experience and innovation, as reflected in the RAAL products, satisfy the highest demands.



COOLING SYSTEM FOR TRACTION TRANSFORMER



COOLING SYSTEM FOR LOCOMOTIVE ENGINE



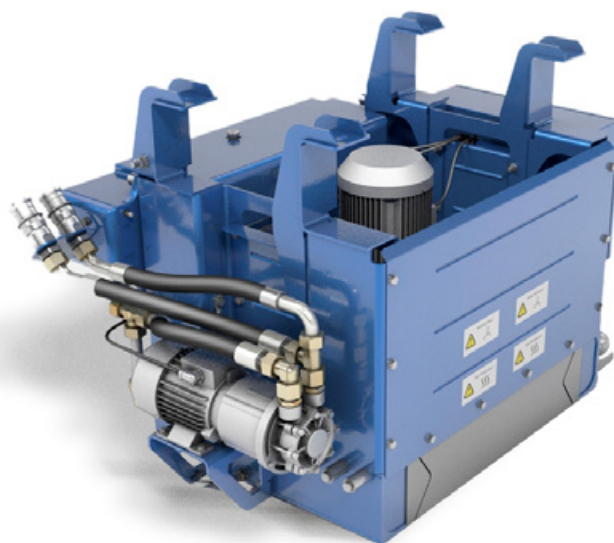
RAILWAY EQUIPMENT AND APPLICATIONS



- Locomotives**
- Railcars**
- Subway trains**
- Trams**
- Traction transformers**
- Special vehicles**

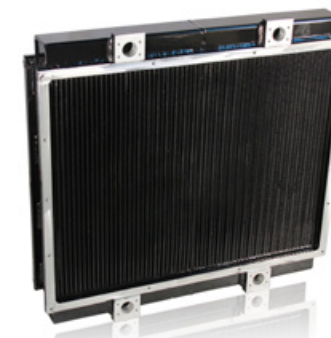
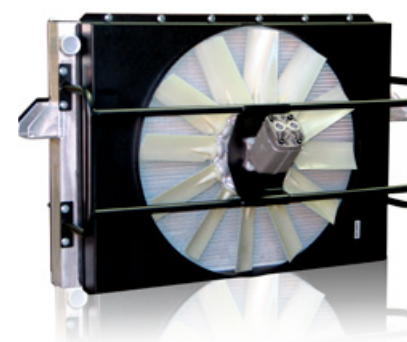
ADVANTAGES AND BENEFITS OF RAAL'S CUSTOMERS

- Flexibility and customized solutions
- Innovation, technology and performance
- Experience and expertise
- Short terms, competitive prices
- Quality and reliability
- Environment protection
- Long-term partnership



COMPLETE COOLING SYSTEMS and individual brazed aluminium **heat exchangers** in Plate&Bar construction:

- High temperature (HT) circuit **RADIATORS** for engine cooling
- Low temperature (LT) circuit **RADIATORS** for secondary circuit
- Double block **RADIATORS** for high and low temperature circuits
- **COOLERS** for converter circuit
- **COOLERS** for transformer cooling
- **CHARGE AIR COOLERS**
- **OIL COOLERS** for electrical system
- **OTHER COMPONENTS:** Metallic structures, including fan guards, fan shrouds, protection grids, fans, motors



Features of the RAAL aluminum cooling systems for railway equipment:

- high cooling performance
- compact construction
- various available constructive solutions & configurations
- low maintenance costs
- reliability

ENGINEERING

RAAL is an integrated company, all activities (manufacturing, design, testing, etc.) being carried out "in house". This competitive advantage provides both a very short development and assimilation cycle in production of new products as well as short term manufacturing and supply of series production.

• Design, calculation and simulation

RAAL uses its own dimensioning software for heat exchangers, software developed in-house based on theoretical studies and thousands of tests performed.

RAAL uses FEA (Finite Element Analysis) to simulate the structural, flow and vibration stress conditions.

• Product design

RAAL has vast experience in designing heat exchangers and cooling systems. Starting from the specifications, dimensions or CAD data of the application, **RAAL** designers are able to find the best solutions for the most efficient use of the available space.

RAAL designers have the ability to continuously optimize the products, so as to fully meet the requirements of the application.

• Testing and validation

RAAL Testing Center is the facility where the validation of new products is performed. Based on technical specifications or on the parameters obtained by means of DAQ performed on customer equipment, the heat exchangers are tested for performance and strength.

RAAL Testing Center capabilities:

- thermal and fluid-dynamic performance tests on the wind tunnel
- durability tests: thermal cycle, pressure cycle, burst pressure, performed at ambient or at high temperatures in the climate chamber
- durability tests: shock and vibration
- internal cleanliness tests
- chemical and accelerated corrosion tests
- metallographic studies

• Tools and equipment

RAAL engineers have a vast experience in tool and die design, and in designing the specific equipment necessary for the manufacturing process.

RAAL places special importance on the design, manufacturing and optimization of the new generation of fin forming machines, which provide a wide range of fins and turbulators.

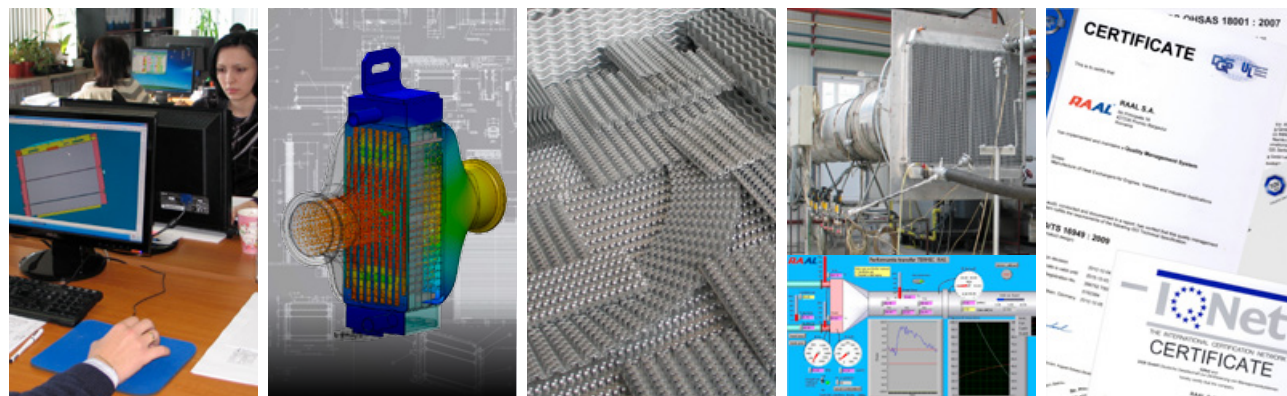
QUALITY

All **RAAL** products are manufactured in compliance with the following standards:

ISO 9001:2008 and **ISO/TS 16949:2009** - Quality Management System.

EN ISO 14001:2004 - Environmental Management System

OHSAS 18001:2007 - Occupational Health and Safety Management System



Main Factories



Headquarters and manufacturing facilities: RAAL SA, ROMANIA
Str. Industriei, nr.7, 420063, **Bistrița**
Phone: +40 263 234379,
Fax: +40 263 234507,
E-mail: raal@raal.ro



Cooling Systems Factory
Prundu Birgaului, ROMANIA
nr. 25, 427230, **Prundu Birgaului**
jud.Bistrița-Năsăud,
Phone: +40 263 203315, Fax: +40 263 203317,
E-mail: productie@raal.ro

Subsidiaries



RAAL ITALIA, ITALY
Via G. Finati 53, 44100 **Ferrara**
Phone: +39 0532773637, Fax: +39 0532776476,
Mobile: +39 3487900168, E-mail: info@raal.it



RAAL-Deutschland GmbH, GERMANY
Bauhofstraße 4 D-90571 **Schwaig**,
Phone: +49 (0)911 650 90 66-5, Fax: +49 (0)911 650 90 66-10
Mobile: +49 (0)162 294 27 19, E-mail: oana.ecedi@raal-gmbh.de



Atlas Engineering LLC, USA
30440 Industrial Rd, **Livonia, Michigan** 48150,
Phone / Fax: +1.734.427-2926, Mobile: +1.734.657.8262
E-mail: septimiu.n.puscas@atlasengllc.com



RAAL Holland B.V., HOLLAND
Dirk Dronkersweg 4462, GA, **Goes**
Phone: +31 113348933, Fax: +31 113348937
Mobile: +31 613308061, E-mail: ja@raal.nl



www.raal.ro

