

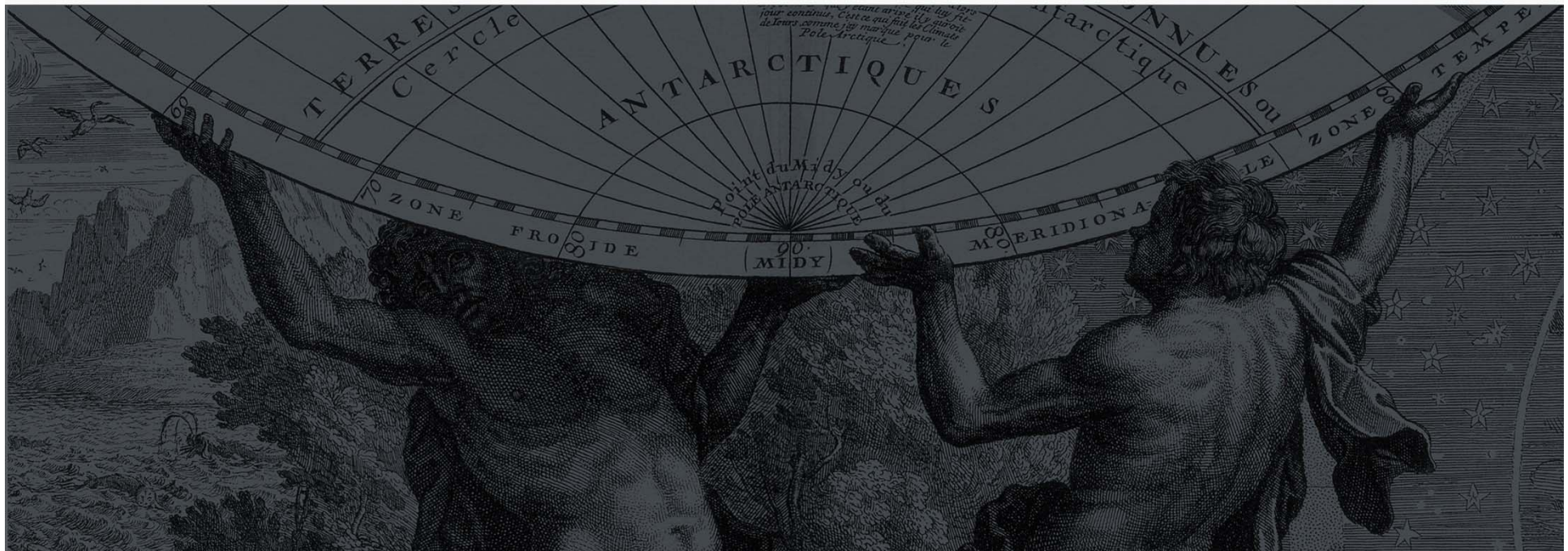


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Centro Sviluppo Materiali

CentroSviluppoMateriali.com



Partnership RINA e CSM



RINA



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Centro Sviluppo Materiali

Partnership RINA e CSM

Acquisito dal RINA il 50,5% di CSM

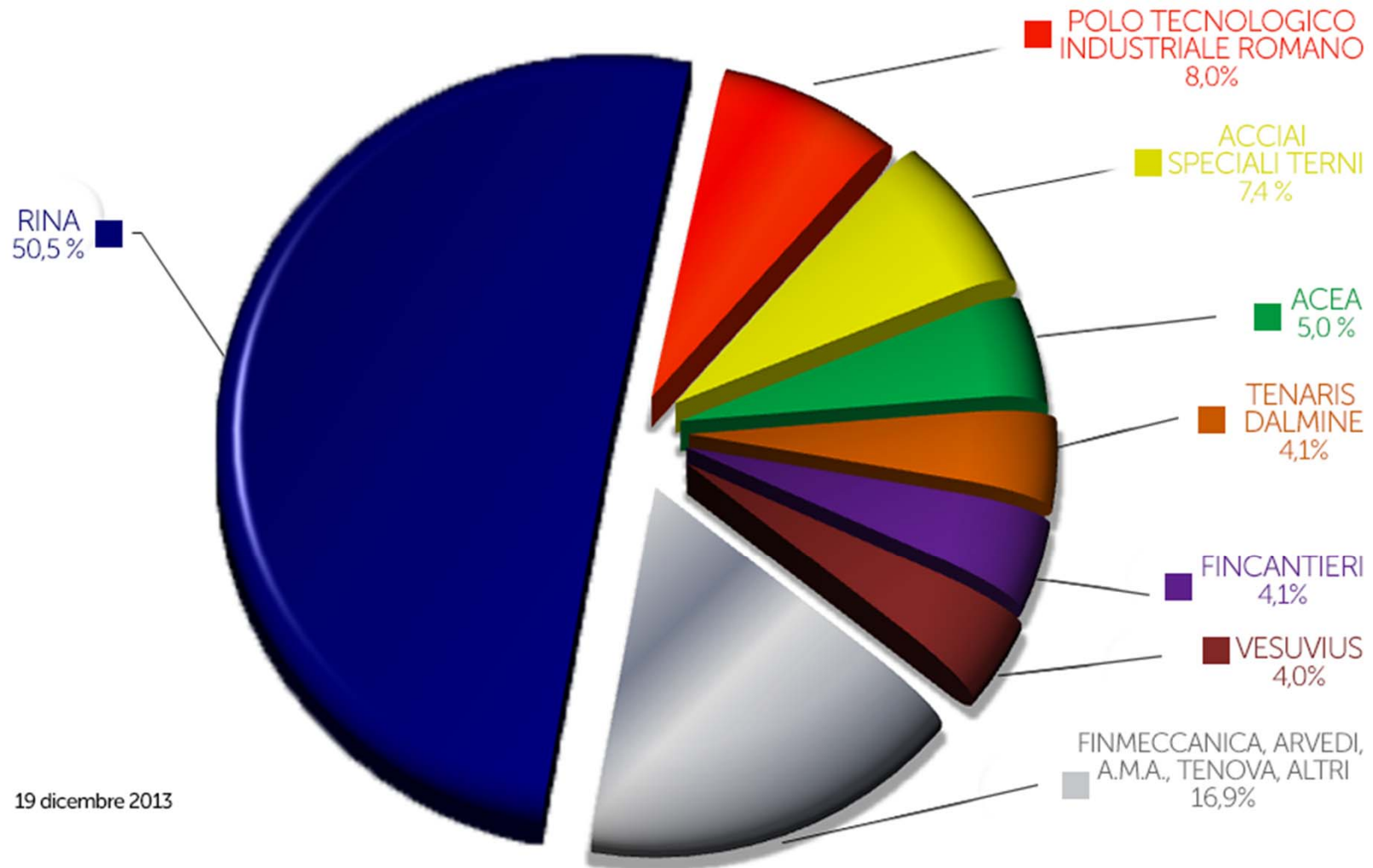
Ampliamento competenze specialistiche e presenza nei mercati internazionali settori energy, oil & gas

Tra i principali azionisti:

Per il settore siderurgico: Acciai Speciali Terni, Tenaris Dalmine, Gruppo Arvedi, Gruppo Tenova

Per altri settori industriali: Finmeccanica, Fincantieri, Saipem, Vesuvius.

CSM Shareholders



19 dicembre 2013



RINA



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Centro Sviluppo Materiali



I servizi RINA

per fatturato

Engineering

Test Inspection Certification

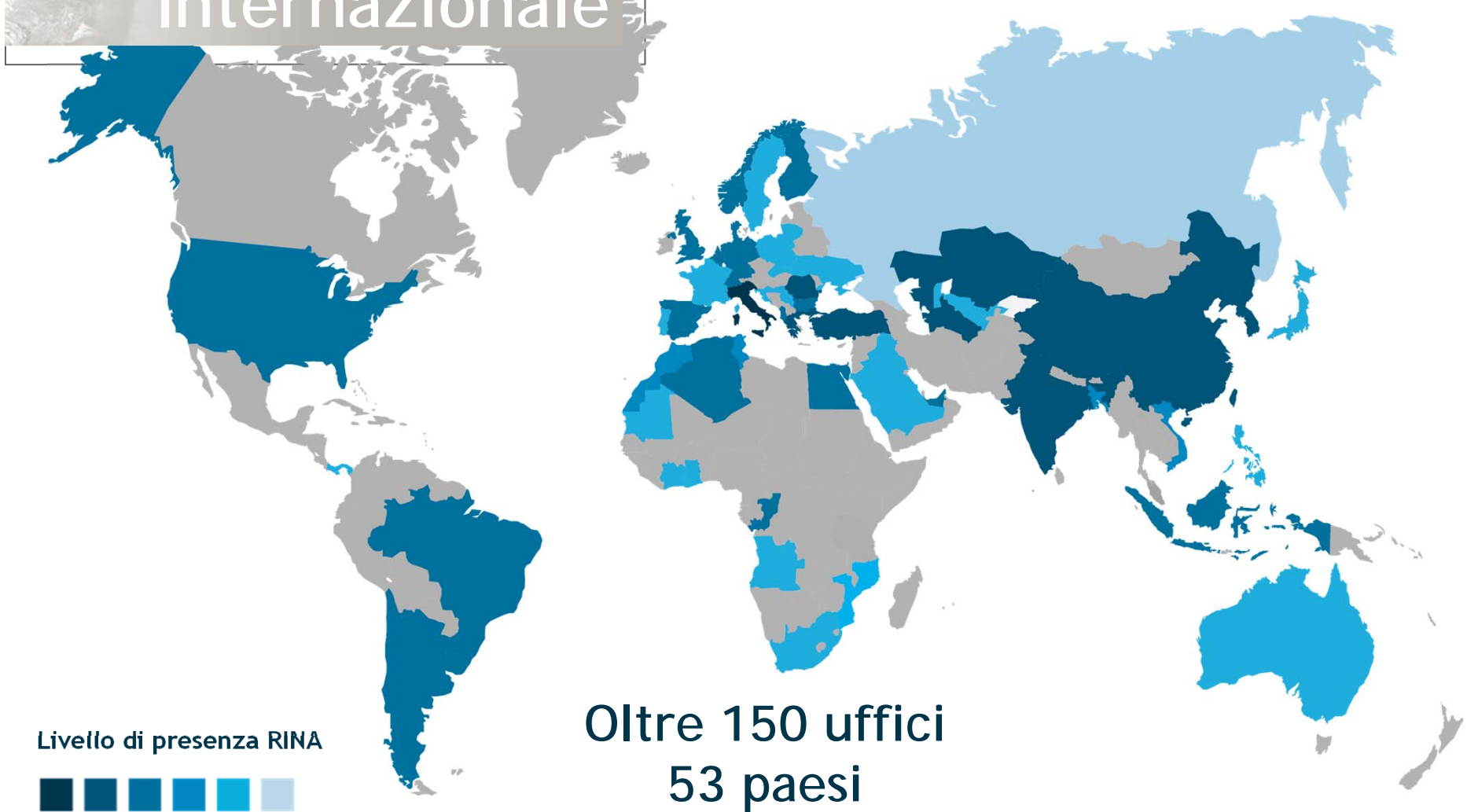
Consulenza d'Ingegneria	Classificazione
Project Management	Certificazione
Siting	Collaudi
Progettazione	Ispezioni
	Formazione



RINA
GROUP

—making the best together—

Rete RINA Internazionale



Oltre 150 uffici
53 paesi



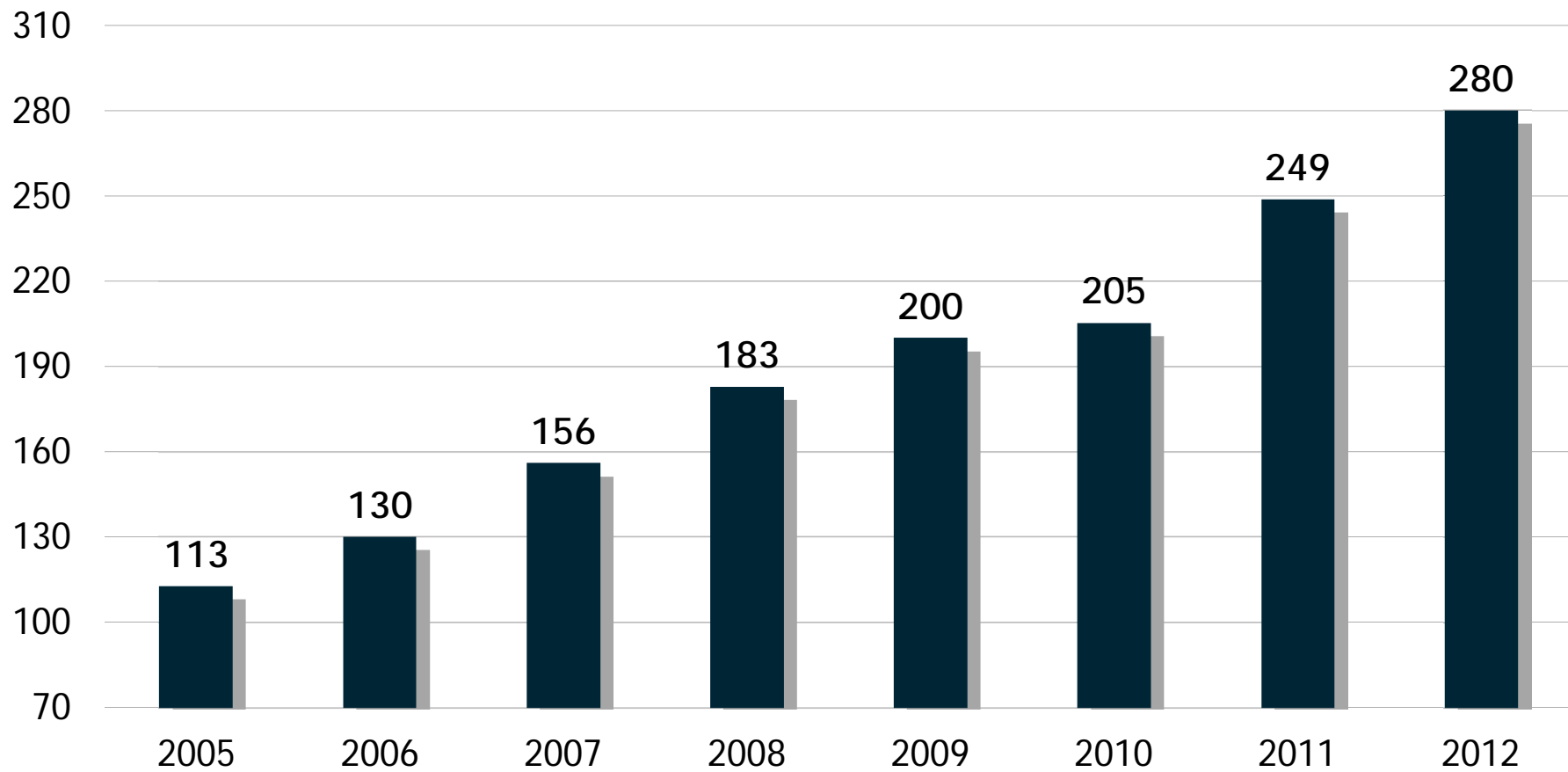
RINA
GROUP

—making the best together—



Fatturato

(milioni di euro)



RINA
GROUP

—making the best together—



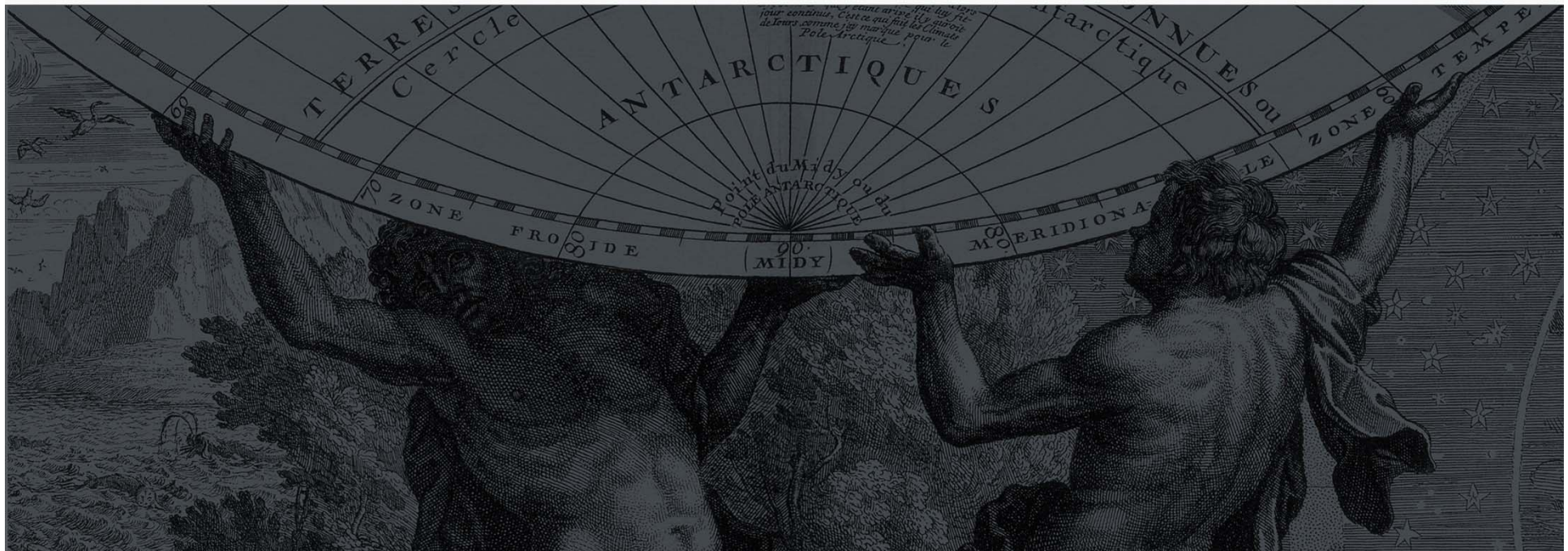
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Boundless Innovation



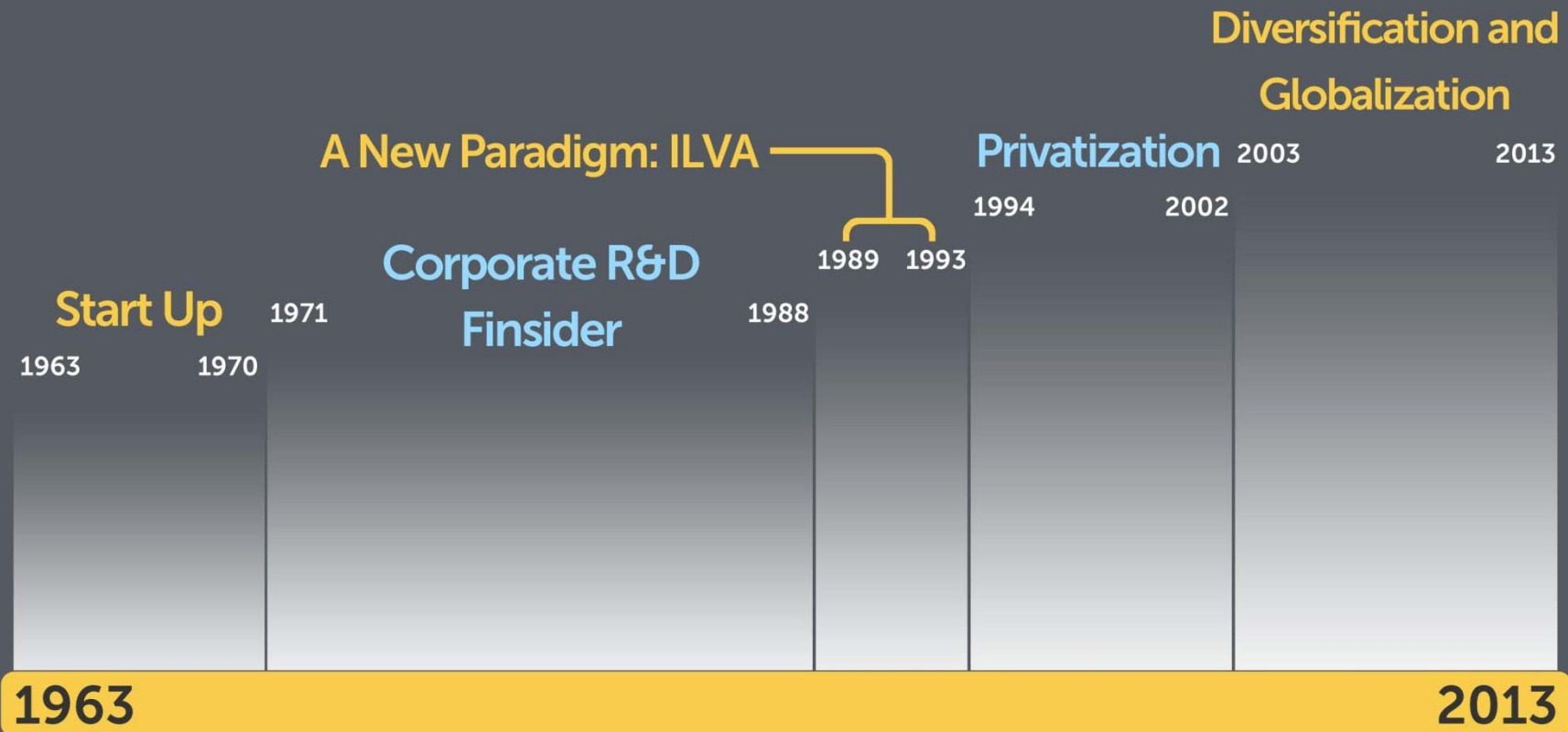
RINA



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Stages in our 50-year history



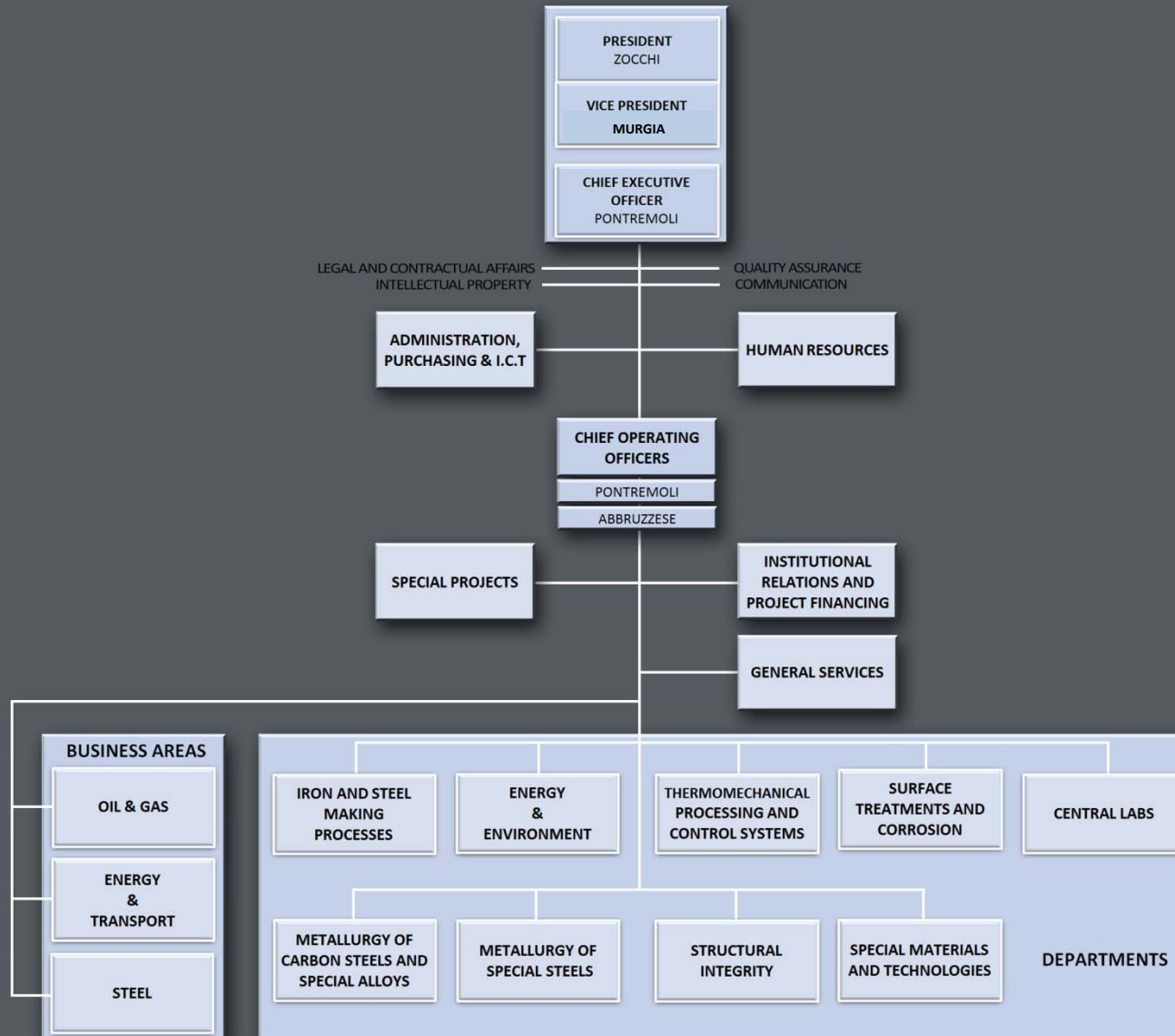


CSM AT A GLANCE

CSM is a private, global market oriented RTO
(Research Technology Organization) aiming at converting research
and technological achievements into industrial applications

- RINA and 19 qualified Shareholders operating in complementary sectors in domestic and international markets (Tenaris, Acciai Speciali Terni, Arvedi, Tenova, Vesuvius, Finmeccanica, Fincantieri, Polo Tecnologico Romano, ACEA, AMA, etc.)
- TURNOVER (2012): 31 M€
- EBITDA (2012): 3.9 M€
- WORKFORCE: 300 employees
(68% with University Degree)
- POLICENTRIC STRUCTURE:
Headquarters in Rome, 5 sites in Italy
- PATENT PORTFOLIO:
200 patents in Italy and abroad

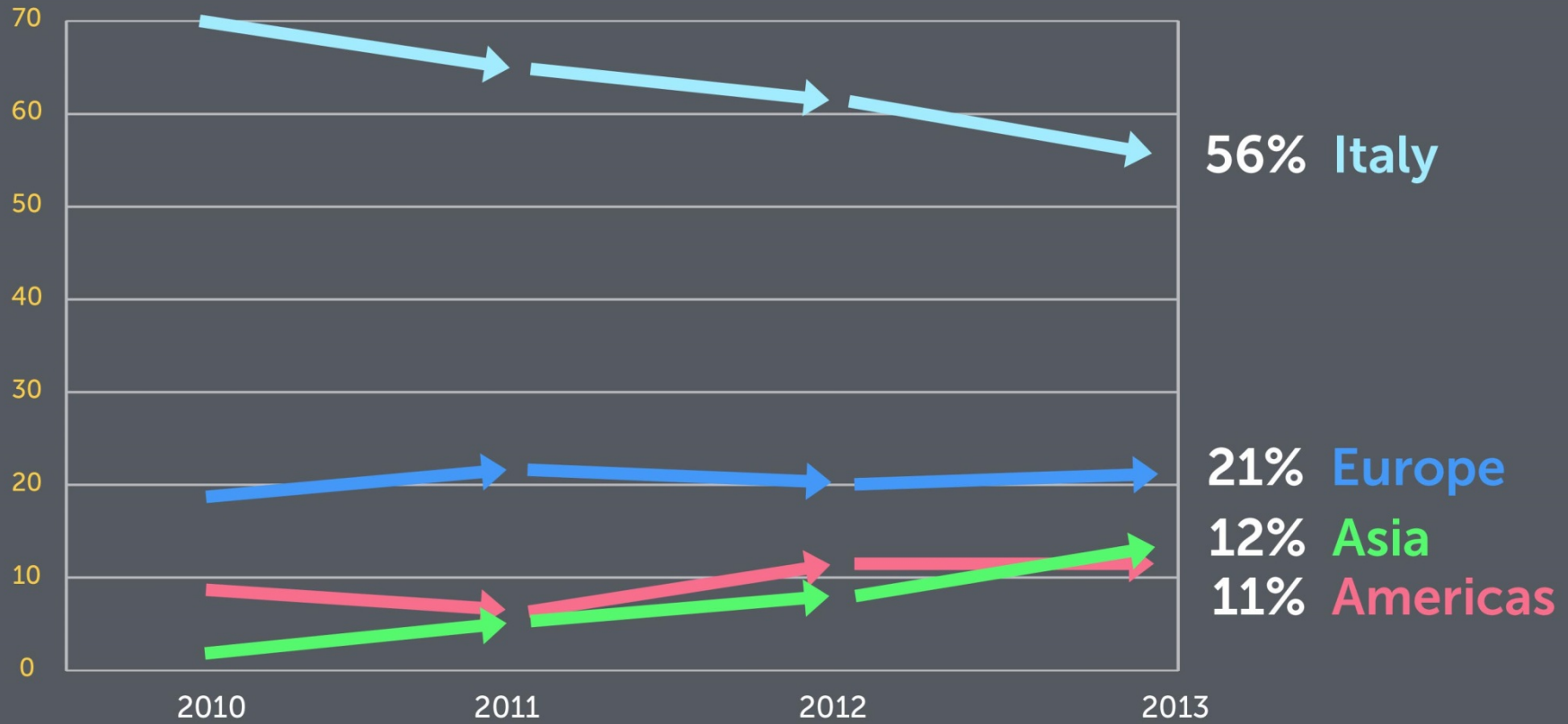






REVENUES BY GEOGRAPHICAL AREA

(% revenues)





2012 MARKET & CUSTOMER PORTFOLIO



Business Sectors

Steel

Oil & Gas

Energy

Aerospace and Defence

Trasportation

Waste Valorization



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Special projects for the environment

Oil & Gas

Energy &
Transport

Steel

Environment & Sustainability

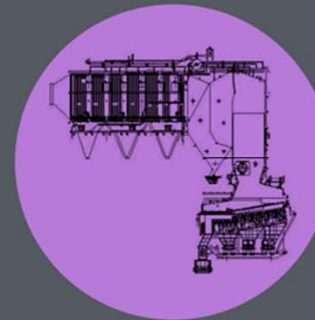
Solutions



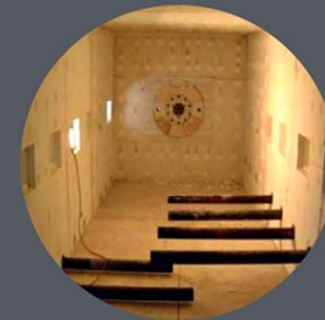
Inertization by
Plasma Torches



Pyrogasification for
Waste to Energy



Hot Corrosion
prevention



Low emission
Flameless Burners



PRINCIPAL CLIENTS

AMERICAS

ARCELOR-ACESITA
BAKER
CBMM
CHEVRON
CONOCO
EXXON
NUCOR
TENARIS CONFAB
TENARIS CONNECTIONS
TENARIS HYDRILL
TENARIS SIDERCA
TENARIS TAMSA
TERNIUM
TRANSCANADA

EUROPE

APERAM
ARCELOR MITTAL
BP
DNV
DONG ENERGY
DUFERCO
E.ON
EPRG
FLUXYS
HITACHI POWER EUROPE
METINVEST
SALZGITTER MANNESMANN
SHELL
STATOIL
TATA STEEL
TENARIS SILCOTUB
TOTAL
TUBACEX
VGB
VOESTALPINE
YARA

ITALY

EMA
ANSALDO BREDI
ANSALDO ENERGIA
ANSALDO NUCLEARE
ARCHIMEDE SOLAR ENERGY
ASO
AVIO
COGNE ACCIAI SPECIALI
CONAI
DANIELI
ENEA
ENEL
ENI
FERALPI
INAIL
LUCCHINI
MARCEGAGLIA
MICROCAST
NUOVO PIGNONE (GE-OIL&GAS)
ORI MARTIN
PAULWURTH
SAIPEM
SIEMENS-VAI
SNAM rete gas
SYNDIAL
TENARIS DALMINE
TETRAPACK
THALES ALENIA SPACE
VALBRUNA

ASIA

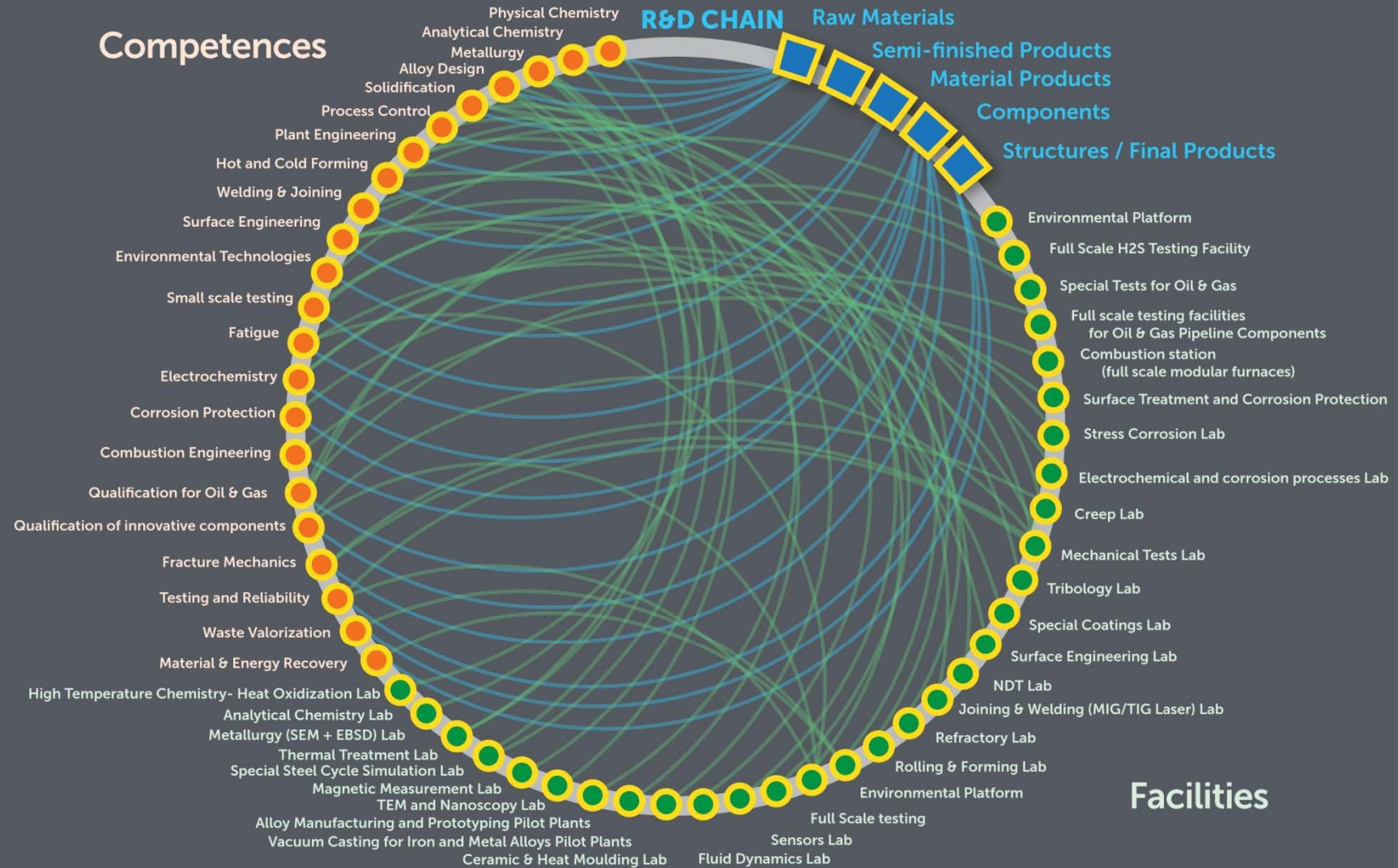
CNPC-TGRC
COLAKOGLU
BAOSTEEL
BORUSAN
BHEL
ERDEMIR
ESSAR
HANDAN
HITACHI
Nippon Steel SUMITOMO
POSCO
SAIL
SIEMENS-VAI
TENARIS NKK



Basic Approach: Covering the Whole Innovation Chain

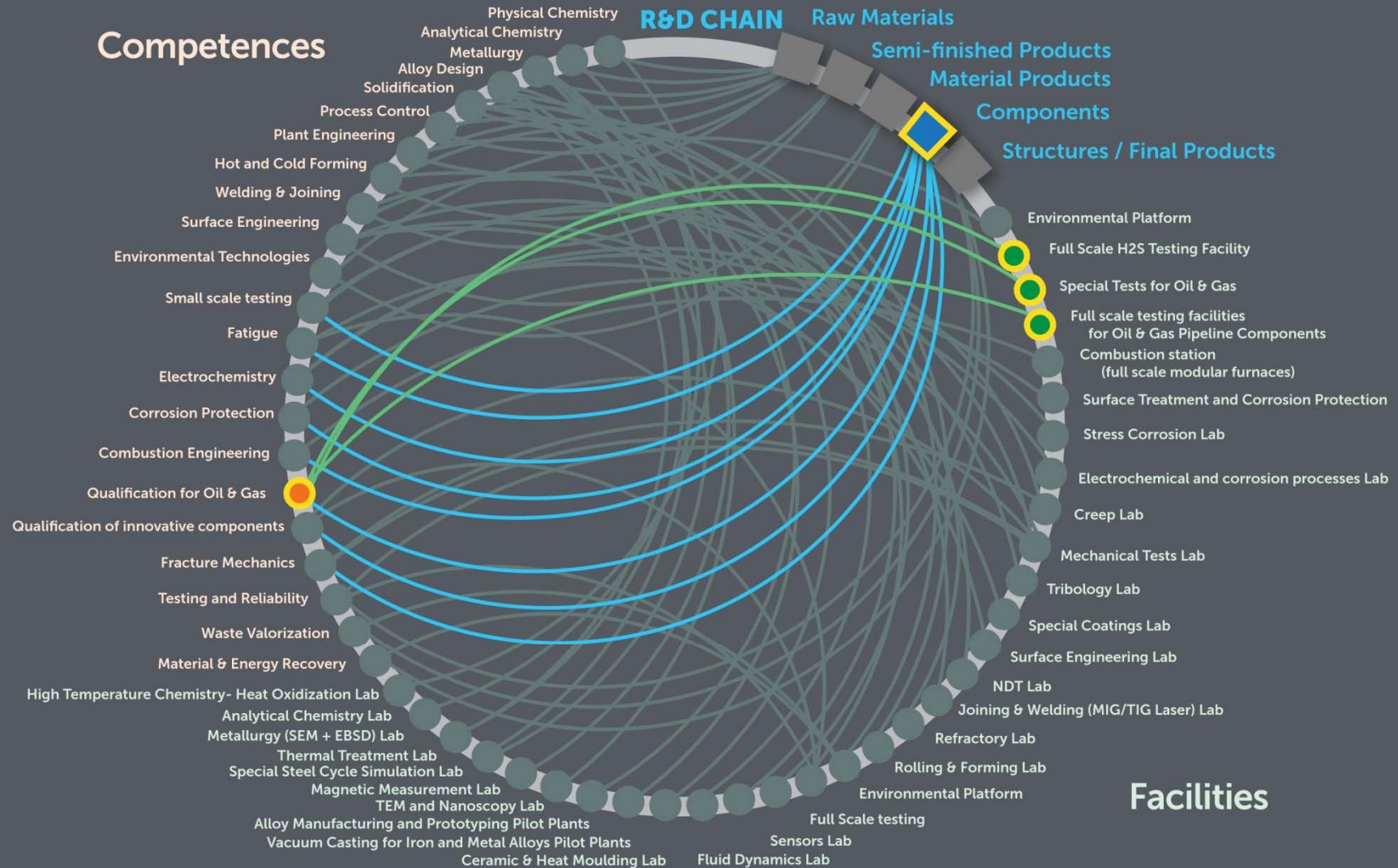


ALONG THE INNOVATION CHAIN





ALONG THE INNOVATION CHAIN





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**Innovation
Domains**

Competences and CSM know how

1/2

Production of steels and alloys and related processing technologies

Physical metallurgy (steels and special alloys)

Surface engineering and coating technologies

Steels, special alloys and ceramics for high temperature components

Advanced forging technologies: fusion, casting, rolling and moulding



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Competences and CSM know how

2/2

Structural integrity and reliability of components and systems under critical operating conditions

Traditional and innovative joining technologies

Process simulation, automation and control

Combustion technologies

Environmental technologies for the industrial assessment of by-products and energy recovery



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Material manufacturing processes

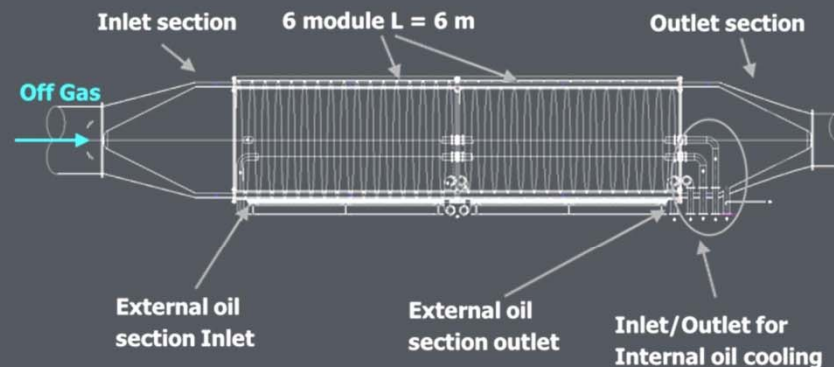
Liquid/solid cycles.

Hot/cold transformation processes. Finishing.

Process/automation control systems.

Design of innovative components.

Super-cooler



Innovative counter current gas diathermic oil heat exchanger:

- recovery of heat from off-gas with high content of dust in the temperature range 600-200°C
- fast-cooling rate ($\geq 300^\circ\text{C/s}$)

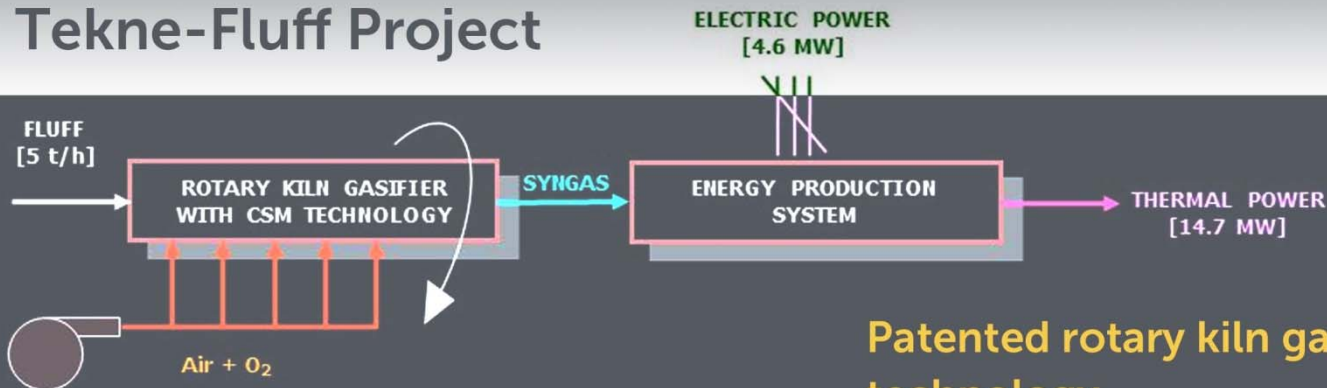
Replacement of quenching tower in gas treatment plant:

- energy recovery from off-gas with low dioxin emission both in fume ($< 0.1 \text{ ng ITEQ/Nm}^3$) and in the dust
- water saving

Recovery processes/technologies and valorization of by-products

Including hazardous waste from the production cycle.
Tailor-made processes/technologies up to pilot plant scale.

Tekne-Fluff Project



Advanced gasification technology with high energy efficiency and low environmental impact for production of electric and thermal energy from fluff

Patented rotary kiln gasification technology

validated by on purpose developed 100 kg/h pilot plant and experimental campaigns

Basic design & economic analysis for a 40.000 t/y industrial plant

Based on scaling up of pilot plant data integrated by commercial survey



New products Product quality improvement

C-Mn and micro-alloyed steels, special steels, super alloys, lightweight Al/Ti alloys, inter-metallic products – from alloy design to industrialization/qualification.
Innovation in metallurgical design and production process.

Ceramic Mould Project for turbine blades



This project has allowed us to:

- Quantitative assessment of the segregation phenomena during the ceramic shell forming
- Improved control and optimization of the ceramic shell forming process
- Rapid implementation in production of the outcomes

The benefit was a substantial reduction in the percentage of production waste due to inclusion content control



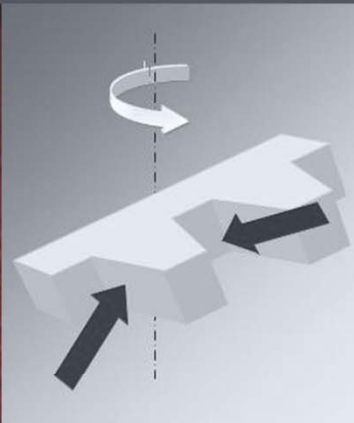
Surfaces engineering

Hot dip and electrolytic coatings, dry coatings by physical and chemical deposition, ceramics.

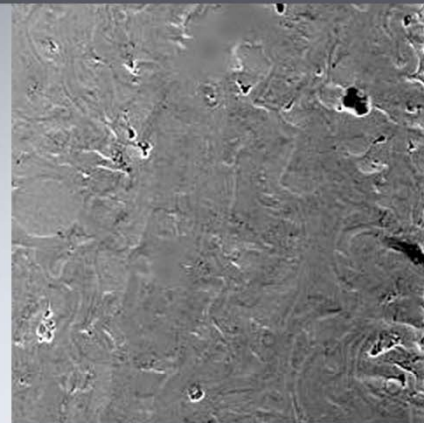
Functional coating of light alloy kinematic couples



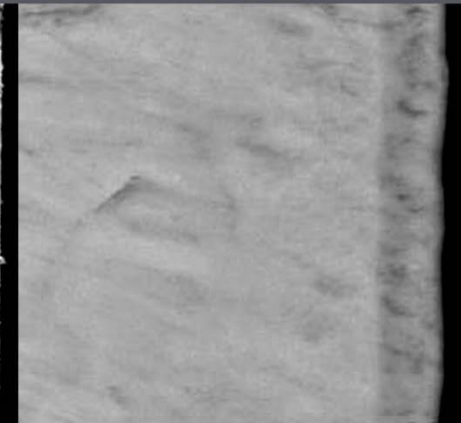
The technical problem:
excessive wear of the gear.



Design of duplex
coating solutions,
process optimisation
and testing



Plasma spray of Ti-TiN
on the titanium substrate

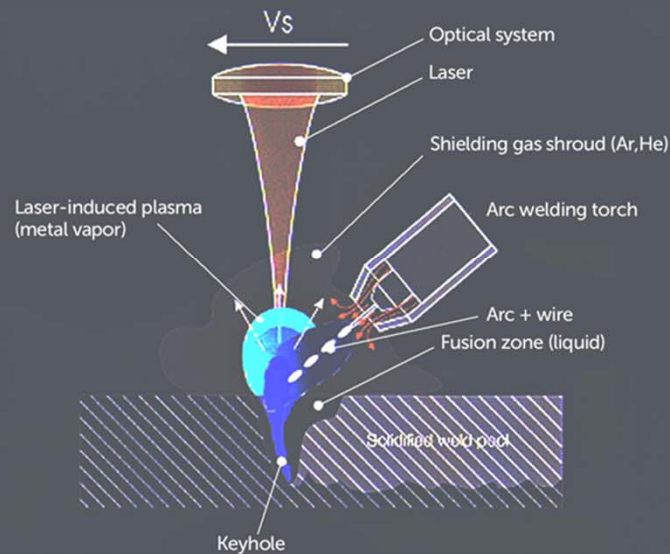


Top layer:
TiN by PVD technology

Product-to-component transformation processes/technologies

Welding/joining, hot/cold forming, cold drawing.

Laser hybrid welding



Nd: YAG fiber laser

- high welding speed
- low heat input
- deep, narrow weld
- low distortions



- Increased gap bridging
- Increased welding speed
- Reduced residual stresses and distortions
- Less severe thermal cycles

Arc (GMAW)

- low cost conventional source
- filler material fusion
- good gap tolerance
- metallurgical flexibility

In service performance of structural components

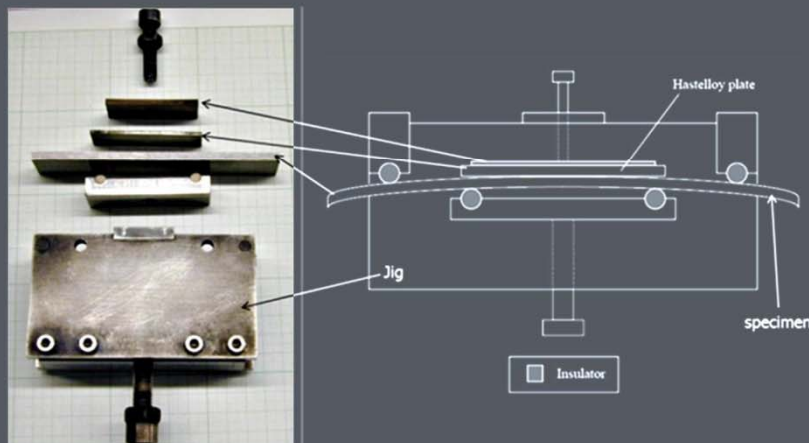
Small and full scale corrosion testing,
creep and creep-fatigue testing, provisional modeling.

HTHP Stress Corrosion Cracking

Aim of the project: Qualification of corrosion resistant alloys (CRAs) for use in Oil & Gas production by an innovative accelerated testing procedure (Crevice Four Point Bend Test)

Test conditions:

- $T = 205\text{ }^{\circ}\text{C}$
- Partial pressure $\text{CO}_2 = 3.5\text{ MPa}$
- Partial pressure $\text{H}_2\text{S} = 3.5\text{ MPa}$
- Concentration $[\text{Cl}^-] = 180000\text{ mg/l}$
- Stress level = 100% of Actual Yield Strength



Results: reliable ranking of Ni alloys in much shorter testing time (90 days) compared to standard techniques (one year)

Poor crevice performance for 36% Ni alloy revealed by the new procedure

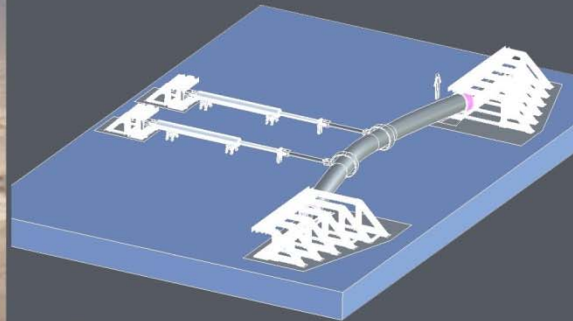
Structural reliability for risk analysis

Quantitative modeling of the damaging mechanisms
and residual life prediction by fit-for-purpose
small and full scale testing.

Strain-based Design: Buckling Assessment



Problem: Onshore pipeline through harsh areas subjected to ground movement (landslide, subsidence, earthquake, etc)



Approach:

- Innovative modelling of material plasticity and anisotropy
- Non-conventional lab test and non-linear FEA
- Full-scale bending test on pressurized pipe up to 56" OD



Results:

- Advanced pipeline application promoted by filling technology gaps
- Database for safe and reliable "in the trench" applications
- Sound assessment of buckling and post-buckling behaviour
- Predictive numerical models for strain based design



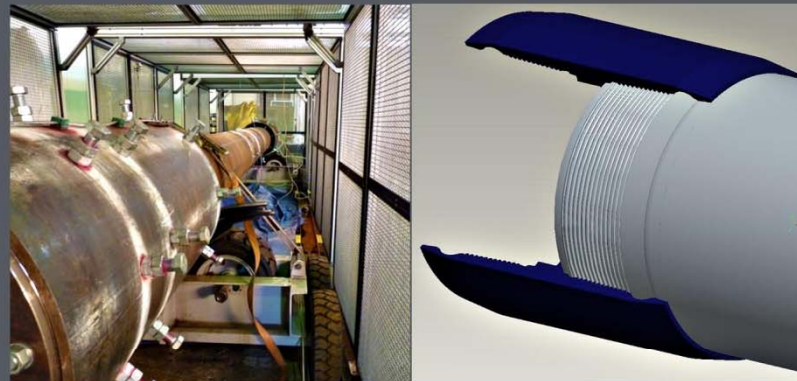
Qualification of critical components

Premium threaded connections for OCTG and risers,
critical structural components,
multi-material components.

Fatigue resistant Premium Connection

Problem:

- Riser lines are exposed to severe cyclic loading (wave loading, Vortex Induced Vibrations etc.)
- Threaded connections were not designed for fatigue resistance



Results:

Very high fatigue resistant
Premium Connection now
available on the market
(Tenaris)

Approach:

- Numerical simulation of the effect of cyclic loading to the thread
- Optimization of the geometry for different concepts of threads
- Full scale fatigue validation of performance of the best-in-class solutions



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CSM in the EU R&D Scenario

FRAC FP7

Leading position in RFCS (30 running projects)
Increasing presence in FP7 (8 running projects)

European R&D policies

Active contribution to European R&D policies at European level (presence in EU Commission Groups, Eurofer, EARTO, EDA, etc.)

European Platforms

High profile role in several European Technological Platforms, especially ESTEP (Steel) and EuMaT (Advanced Materials)

Horizon 2020 Initiatives

Horizon 2020 Initiatives. Involved in SPIRE, EMIRI, A4M (Alliance for Materials), KIC (Key Innovative Community on Raw Materials)

RIES

CSM is a founding partners of RIES (Research Initiative European Steel) an alliance of major RTO's for Steel (BFI - Germany, CRM Group - Belgium, MEFOS - Sweden, CSM)



Main european RTO's in steel R&D





Main european RTO's in steel R&D





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CSM 50 YEARS OF BOUNDLESS INNOVATION

50th Anniversary Centro Sviluppo Materiali
Rome 24th September 2013