



Technology
& Corporate
Venturing

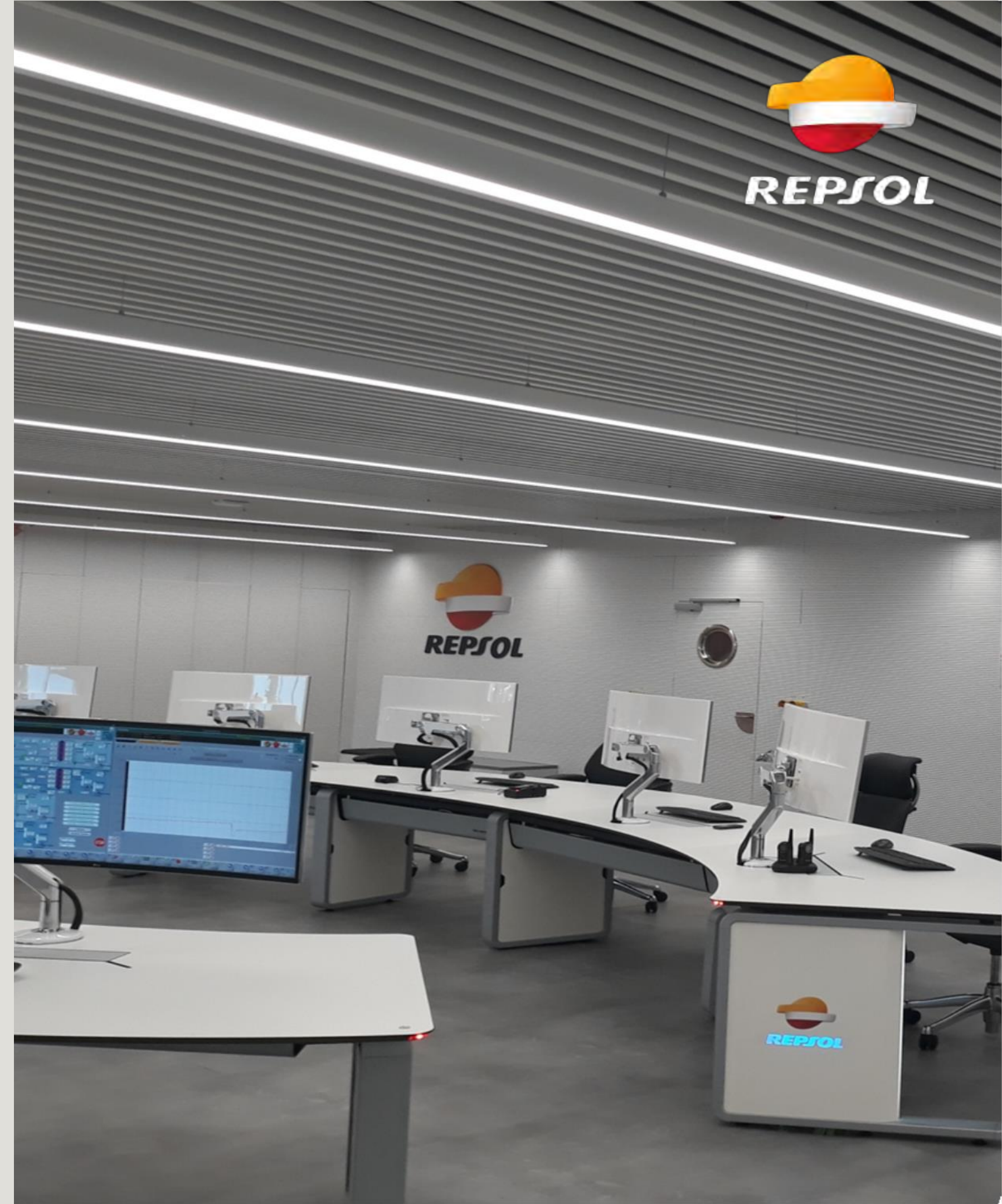
Experimentation in Repsol



EXPERIMENTATION

Technical Capabilities

- Analytics & Biotechnology
- Fluids
- Formulation
- Industrial
- Rocks & catalysis



ANALYTICS & BIOTECHNOLOGY TECHNICAL CAPABILITIES

Repsol Technology Lab





REPSOL

ANALYTICS & BIOTECHNOLOGY

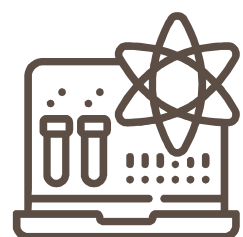
Technical Capabilities

COMPOSITION ANALYSIS



Chemical, elemental and isotopic composition of petrochemical and industrial samples.

CHEMICAL STRUCTURE DETERMINATION



Determination of molecular geometry and electronic structure of target molecules.

POLYMERS RESEARCH



Lab scale polymer synthesis, functionalization and characterization

BIOTECHNOLOGY RESEARCH



Biotechnology research and applications to the O&G and New Energy businesses





ANALYTICS & BIOTECHNOLOGY

In Figures



Tests	More than 150 tests
Standardized test methods	Following standardized methods such as ASTM, UNE, IP, UOP, Standard method.
	Participation in intercomparison trials (ILS)
Activity	Analysis of 20,000 annual tests in the area
Equipment	More than 200 laboratory equipment
Analytic & Research studies	State of the art Instrumentation for complex analysis studies and polymers & biotechnology research

ANALYTICS

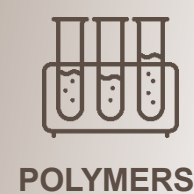
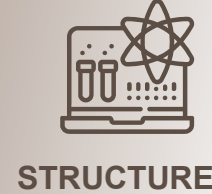


Composition Analysis

**Chemical structure
determination**

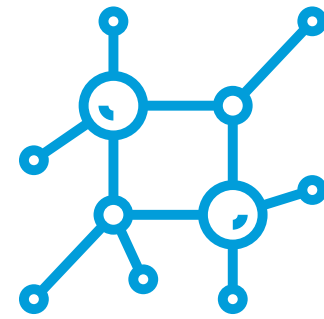
**Polymer Synthesis &
functionalization
Processess**

ANALYTICS

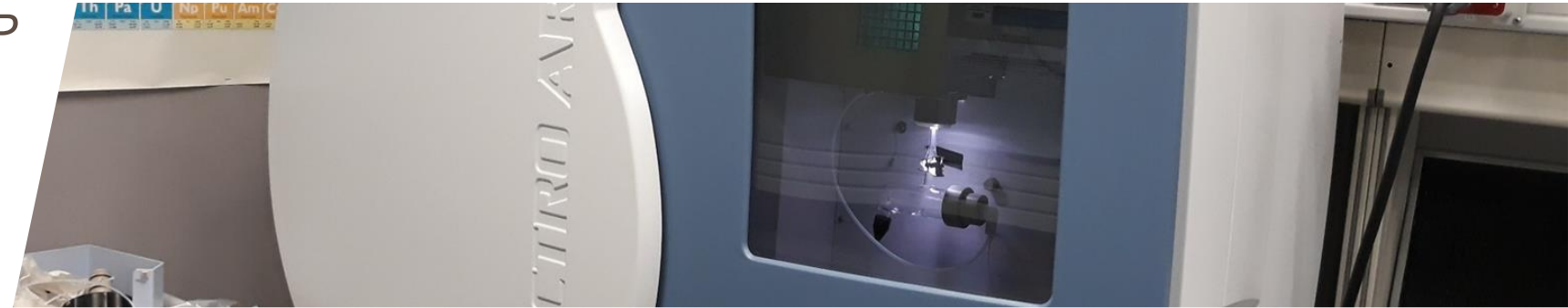


Composition Analysis

- / Thermal Analysis (TGA, DSC, TGA-IR)
- / X Ray Fluorescence
- / Isotopic Analysis
- / Inductively Coupled Plasma (ICP-OES, ICP-MS)
- / Elemental Analysis
- / Ionic Chromatography
- / Electroanalytical Techniques (Voltamperometry, Potenciometry, Coulombimetry)



ICP



XRF



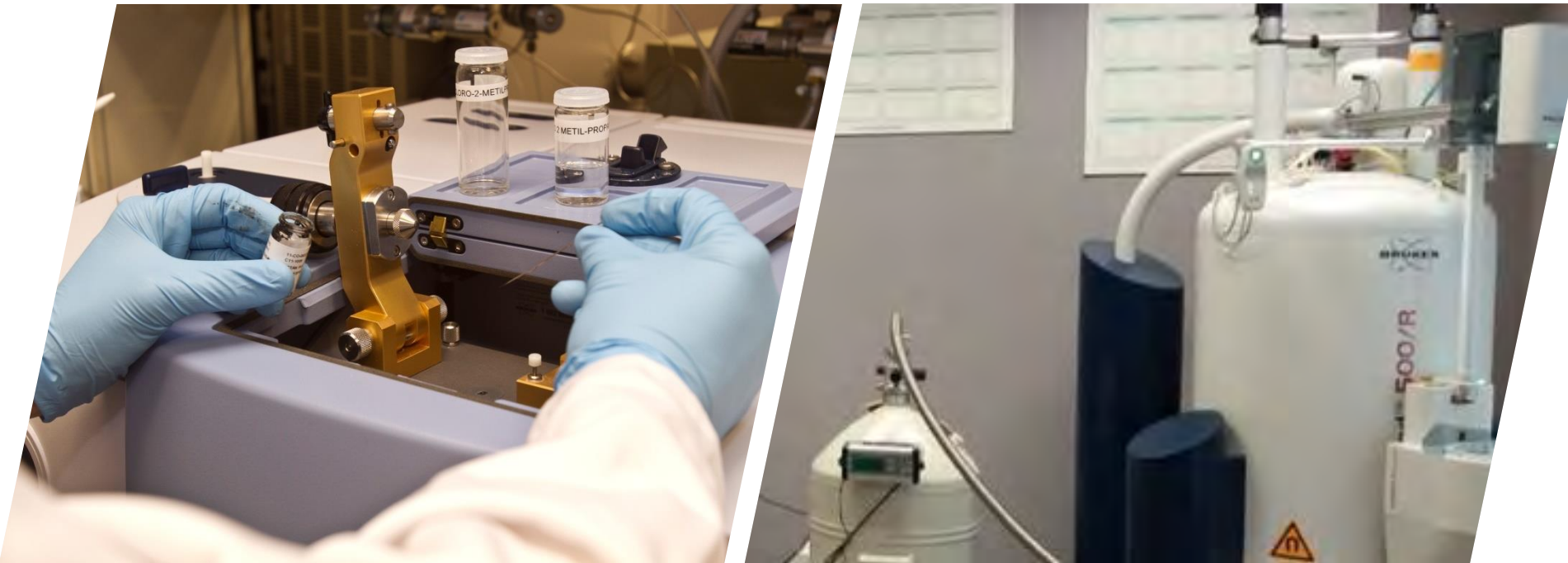
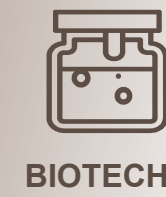
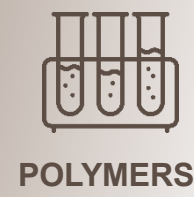
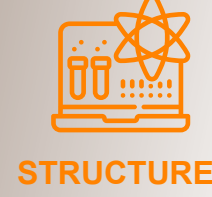
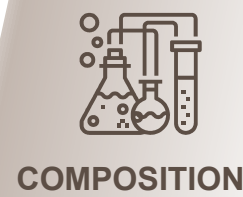
TGA



IRMS

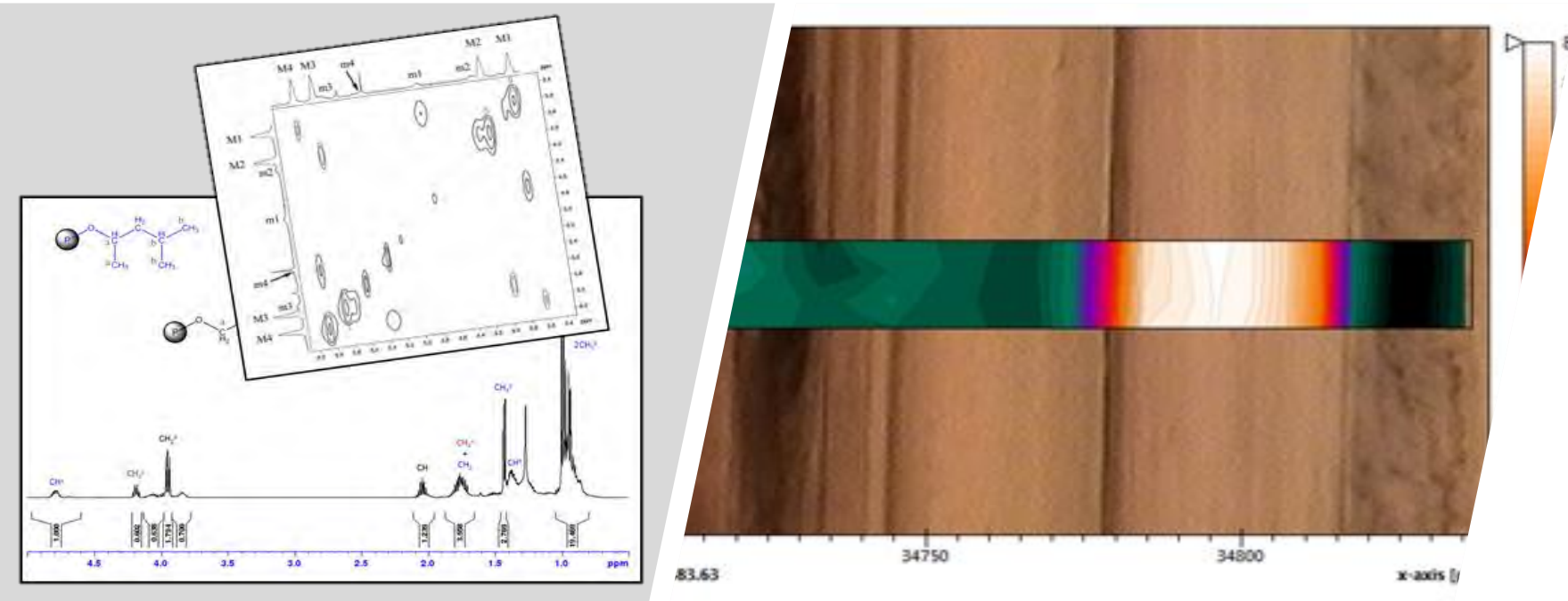
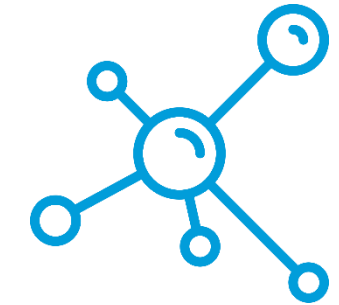


ANALYTICS

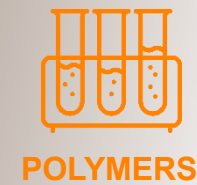
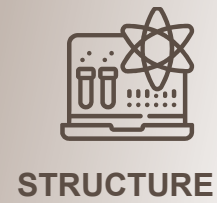
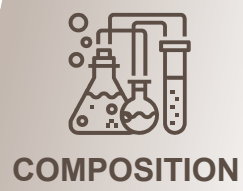


Chemical Structure Determination

- / FT-Infrared Spectroscopy
- / Raman Spectroscopy
- / Ultraviolet-visible Spectroscopy
- / Vibrational Microscopy (IR, Raman)
- / NMR Spectroscopy (1D, 2D, VT, HR-NMR, DOSY)
- / Polymer characterization

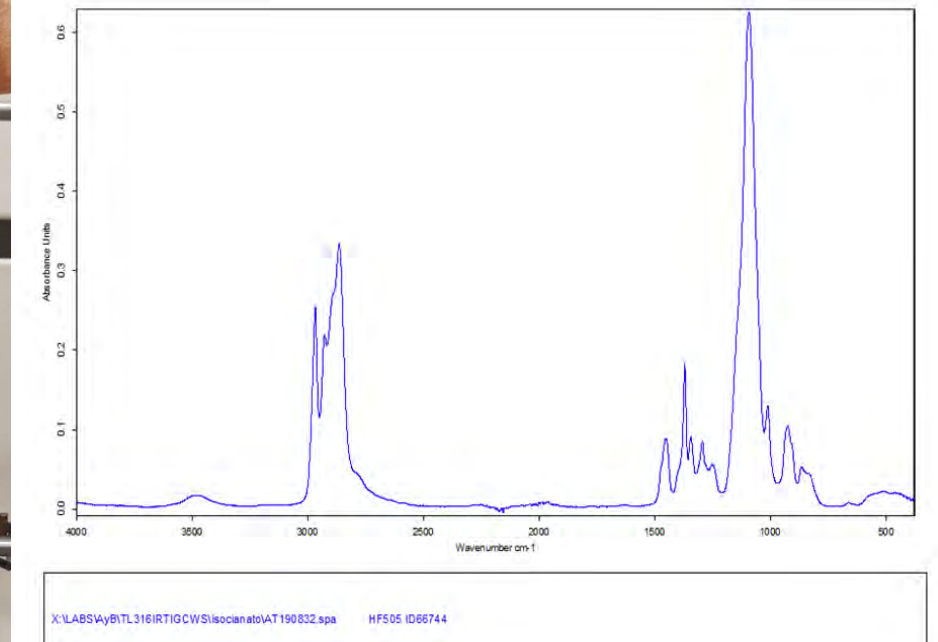


ANALYTICS



Lab Scale Polymer Research

- / Polyol Synthesis
- / Polyol Functionalization
- / Epoxidation
- / Lab Scale reactions



BIOTECHNOLOGY



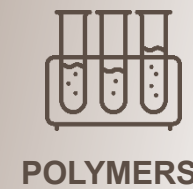
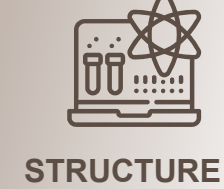
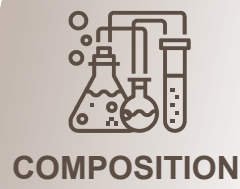
**State of the art Instrumentation
for Biotechnology research and
development.**

**Biotechnology services applied
to the Oil&Gas Industry.**

**High Throughput Screening
automatization methods**



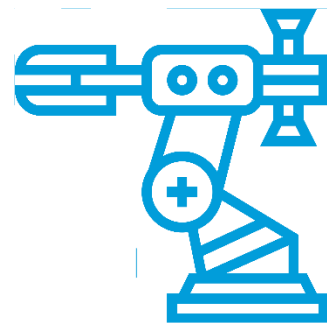
BIOTECHNOLOGY



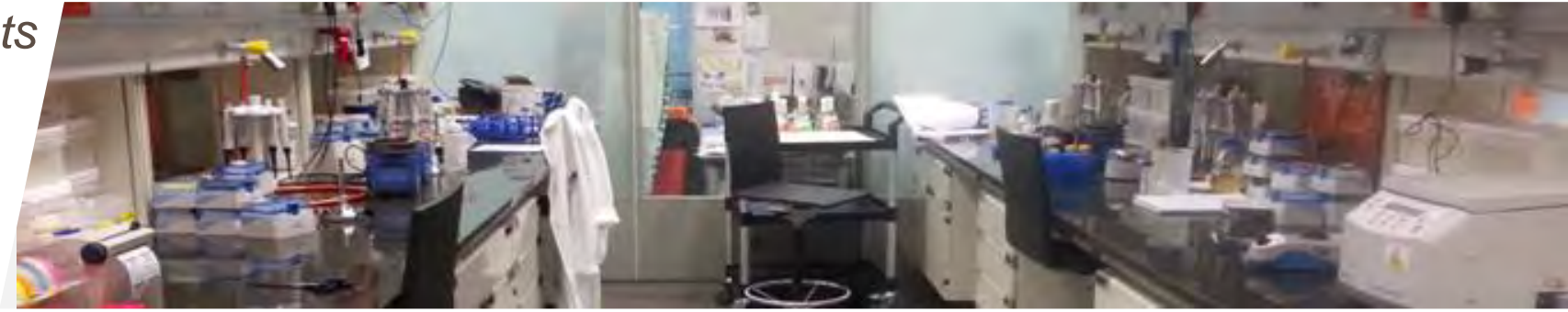
Biotechnology Research

- / Molecular biology
- / Microbiology isolation, characterization and culture optimization
- / Biocatalyst design, production and activity characterization

- / Fermentation development from bench lab to lab scale
- / High Throughput Screening (HTS) methods development



Lab experiments



Molecular Biology



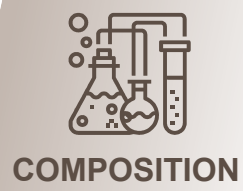
Microbiology



High Throughput



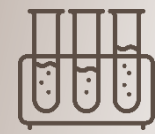
BIOTECHNOLOGY



COMPOSITION



STRUCTURE



POLYMERS



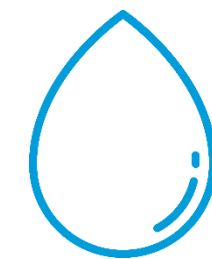
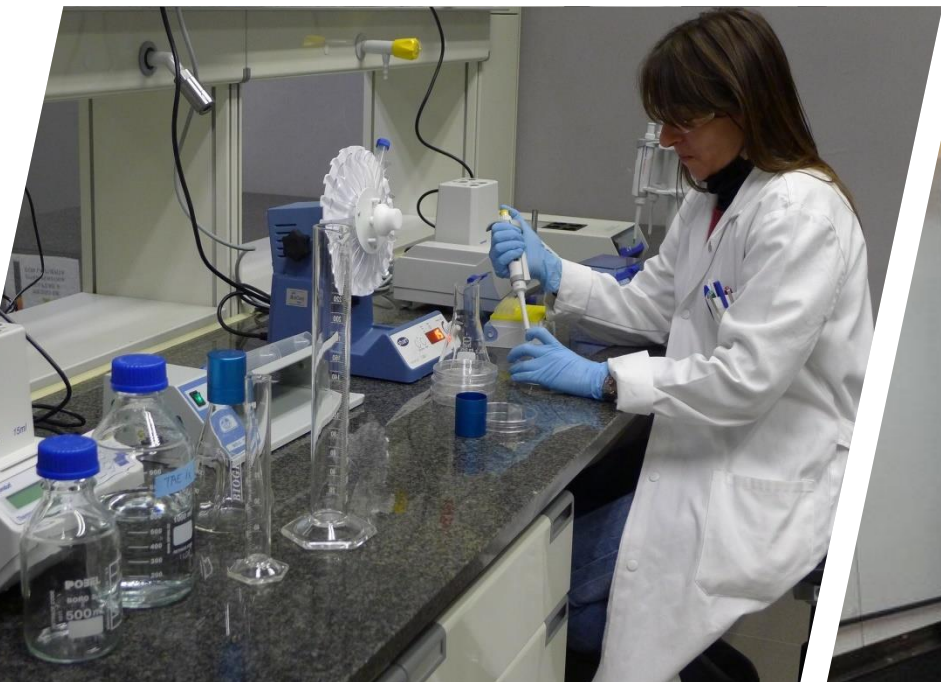
BIOTECH



Biotechnology Services



- / Microbial contamination determination (ATP-based, culture and PCR assays)
- / Ecotoxicity analysis (Microtox: EC50-15')
- / In house polymers degradation tests (BacTrac 4300 biodegradation CO₂ monitoring)
- / Waste water treatment process evaluation



FLUIDS TECHNICAL CAPABILITIES

Repsol Technology Lab



FLUIDS

Technical Capabilities



REPSOL

CHROMATOGRAPHY



Different gas and liquid chromatography techniques

PVT LAB



Reservoir fluids analysis and advance studies (rheology, flow assurance, characterization...)



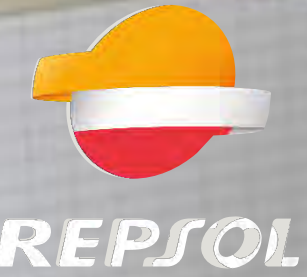


FLUIDS In Figures



Tests	More than 80 standardized and in-house developed methods
Activity	<ul style="list-style-type: none">❑ Analysis of different type of samples: Biofuels, Oils, Crude Oils and Distillates, Polymers, Additives, Residues,...❑ Development of new analytical methods❑ Surveillance new analytical techniques❑ Specialized analytical support❑ Specialized consultancy in Analytics❑ RRT performances for the Company and European Work groups.❑ Technological prospective studies
Equipment	More than 50 laboratory equipments

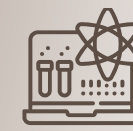
CHROMATOGRAPHY



CHROMATOGRAPHY



CHROMATOGRAPHY



PVT



GC X GC TOF, FID, NCD & SCD

/ Two-dimensional gas chromatography coupled with TOF, FID, NCD and SCD detectors.

HPLC - HPLC

/ Two-dimensional liquid chromatography

GC-MS

/ Gas chromatography with single and triple quadrupole mass spectrometry detectors



CHROMATOGRAPHY



CHROMATOGRAPHY



PVT



MULTIDIMENSIONAL GC

/ Reformulyzer and heat-cut.

HS/ DT/PYRO-GC-MS

/ Thermal desorption, pyrolysis and head space coupled to GC-MS

GC-FID/ ECD/ SCD/ FPD

/ Gas chromatography with different detectors



CHROMATOGRAPHY



CHROMATOGRAPHY



PVT



UPLC (PDA & RID)

/ Ultra Performance Liquid Chromatography

GPC (DAD & RID)

/ Gel Permeation Chromatography with Diode Array and Refraction Index Detectors



CHROMATOGRAPHY



CHROMATOGRAPHY

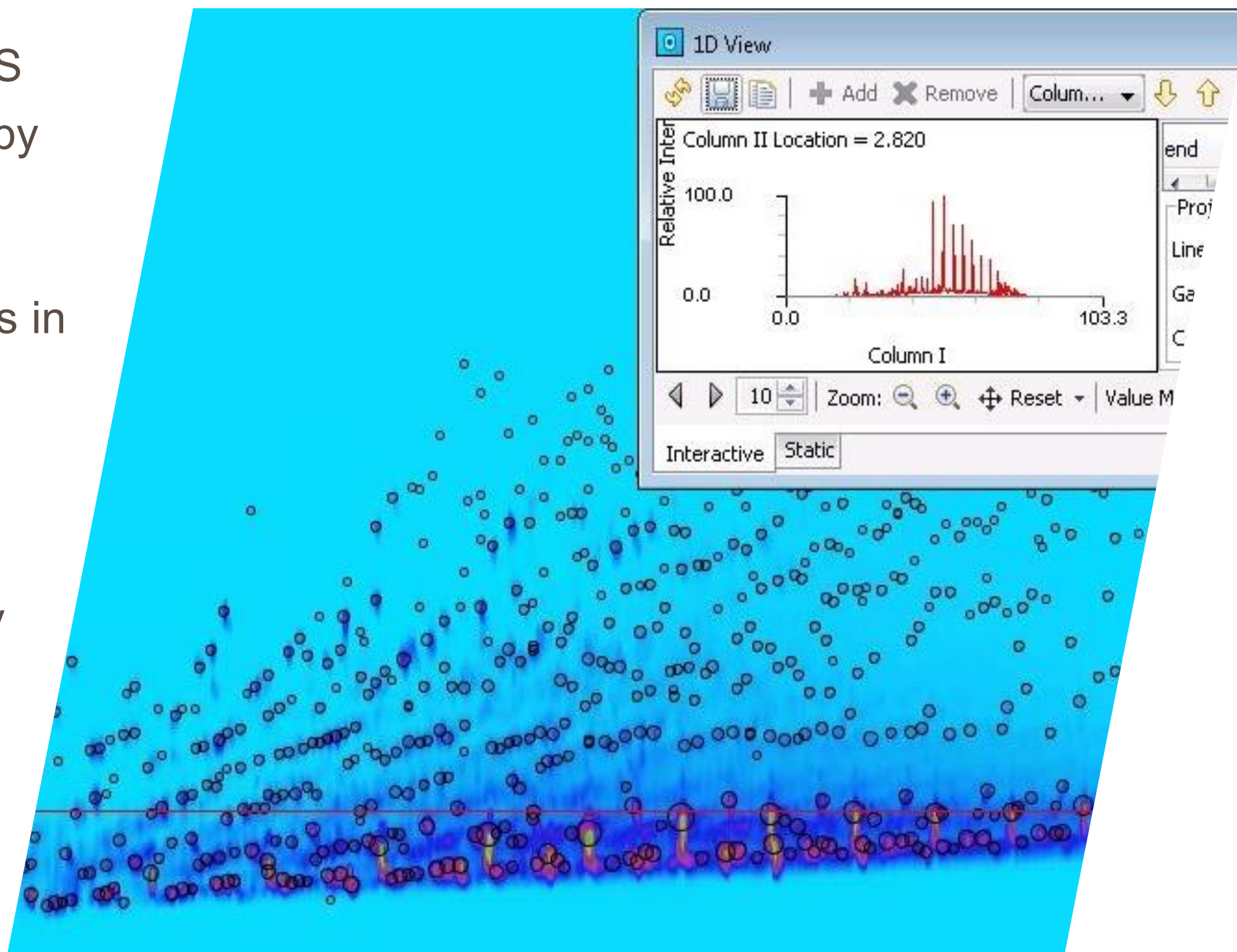


PVT



REPSOL

- / Determination of FAME in kerosene by GC-MS
- / Determination of organic volatile compounds by Thermal Desorption-GC-MS
- / Hydrocarbons detailed characterization
- / Speciation of sulphur and nitrogen compounds in petroleum distillates
- / Speciation of nitrogen compounds in medium distillates by GCxGC-NCD
- / MOSH-MOAH Analysis in Polymers
- / Determination of antioxidants in polyolefins by HPLC
- / Simulated distillation of petroleum products
- / Oil spill identification and forensic analysis



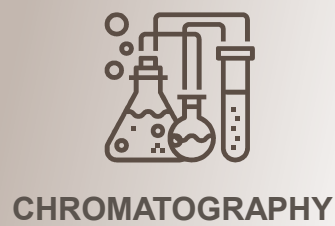
PVT LAB



REPSOL



PVT LABORATORY

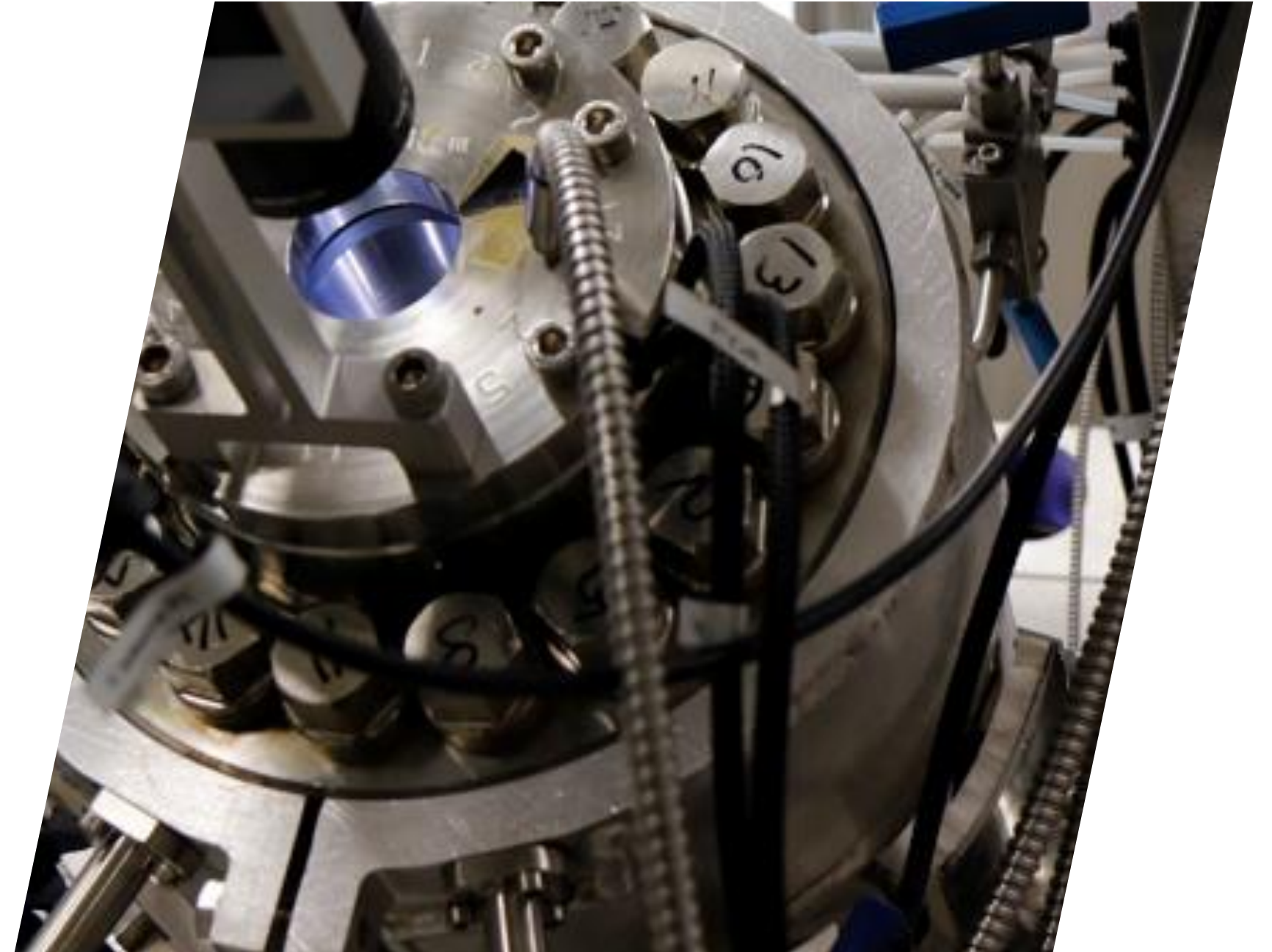


RESERVOIR FLUIDS ANALYSIS

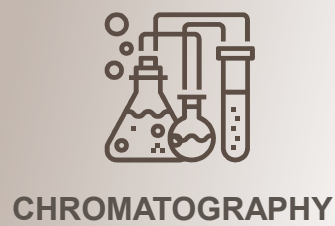
- / Quality Checks (Oil and Gas)
- / Reservoir Fluid Composition (C36+)
- / Physical Recombination (for Surface Samples)
- / Constant Composition Expansion (CCE)
- / Constant Volume Depletion (CVD) with Retrograde Liquid Volume
- / Differential Liberation (DL)
- / Viscosity
- / Separator tests (Single Flash & Multi-stage)
- / Swelling Studies

ADVANCED STUDIES

- / PVT Simulation (PVTsim, PVTp)

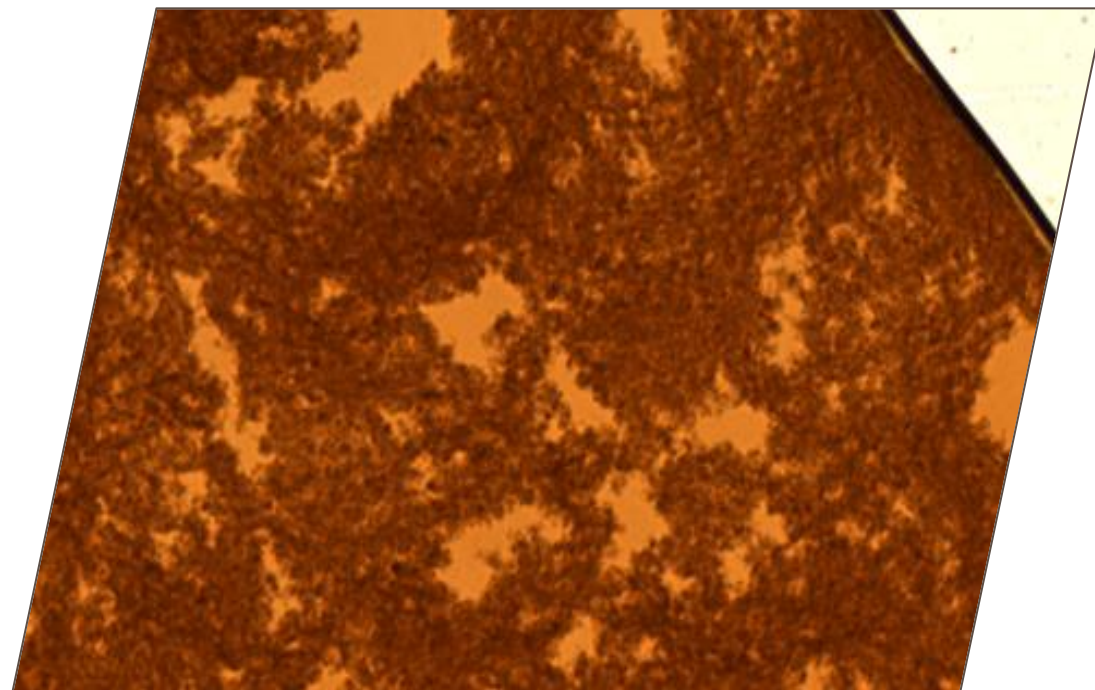


PVT LABORATORY



FLOW ASSURANCE TESTS

- / Wax Appearance Temperature (WAT) of Live Oil & Dead Oil
- / Asphaltene Onset Pressure (AOP) at Reservoir Temperature
- / Cold Finger Test
- / Dynamic Scale Loop test
- / Hydrate Formation Study

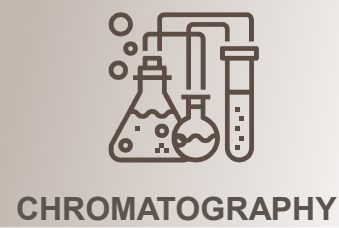


RHEOLOGY STUDIES

- / Viscosity of dead oil as a function of temperature and shear
- / Wax Oil Gels strength (Yield Stress Analysis)
- / Emulsion Rheology study
- / Oil Rheology Analysis Under Pressure (Pmax 400bar)



PVT LABORATORY



FLUID CHARACTERIZATION

- / Liquid Composition (C1 to C36+) by GC/FID
- / Gas Composition (CO₂, H₂S, N₂, C1 to C11+) by GC/FID+TCD
- / SARA Analysis
- / Crude Assay with TBP Curve & Crude Properties
- / Molar mass by freezing point depression



FORMULATION TECHNICAL CAPABILITIES

Repsol Technology Lab





REPSOL

FORMULATION

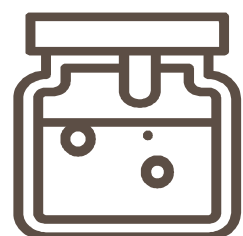
Technical Capabilities

BLENDING



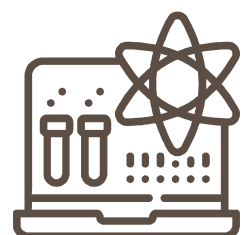
Blending of lubricants or fuels, polymer compounding, adhesives and reactive extrusion.

RHEOLOGY



Dynamic and Rotational Rheological Studies in a wide range of shear and temperature on samples of diverse nature.

PHYSICOCHEMICAL PROPERTIES



Standardized physicochemical tests and internal product characterization methods.





FORMULATION

In Figures

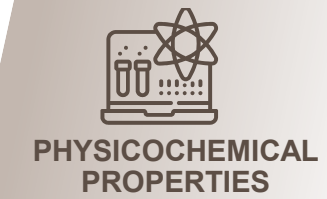


Tests	More than 200 tests
Standardized test methods	7 tests accredited by ENAC based on UNE-EN-ISO 17025 Participation in 10 annual intercomparison trials (INTA, ASTM,)
Activity	Analysis of more than 20,000 annual tests in the area
Equipment	More than 100 laboratory equipment
Blending	Capacity to manufacture lubricating oils up to 1,000 liters/batch and 20,000 liters of fuel/batch. Polymer compounding equipment at pilot scale (Haake, Eurolab, Randcastle, mini equipment, adhesives, etc.)

BLENDING



BLENDING



Formulation-Properties Design

- / Influence of the type and concentration of additive
- / Effect of matrix components on the improvement of properties

Production

- / Lubricants up to 1,000 L/batch
- / Fuels up to 20,000 L/batch
- / Polymers up to 5Kg/h

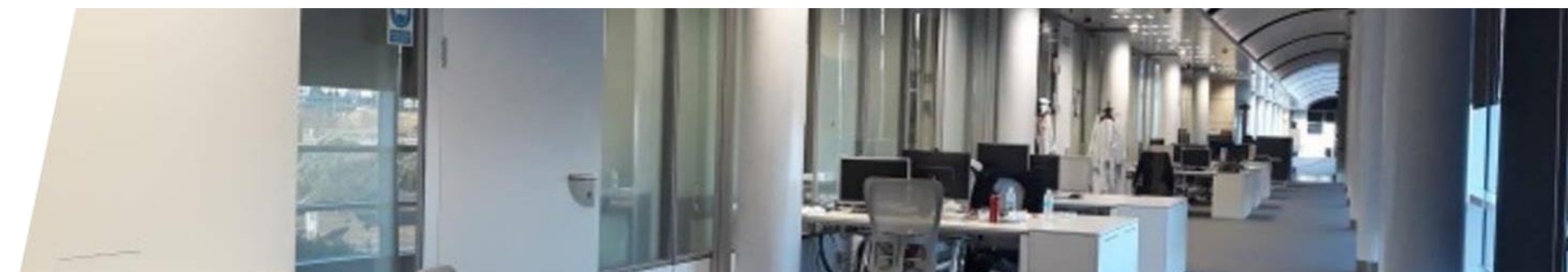
Blending of Fuels



Blending of Lubricants

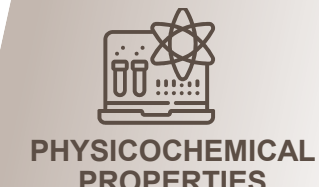


Blending of Polymers



BLENDING

Blending of fuels



Blending of Fuels

- / Development of formulation
- / Product selection
- / Blends
- / Chemical laboratory tests to quality control
- / Homologation/Certification
- / Fuel Drums

BLENDING

Blending of Lubricants



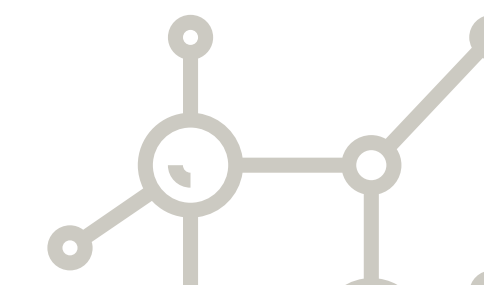
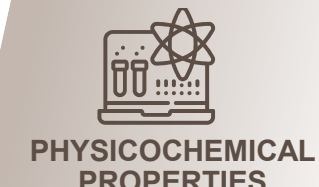
Automated & Robotized

- / Development of formulation
- / Product selection
- / Blends
- / Chemical laboratory tests to quality control
- / Homologation/ Certification
- / Lubricant Packaging



BLENDING

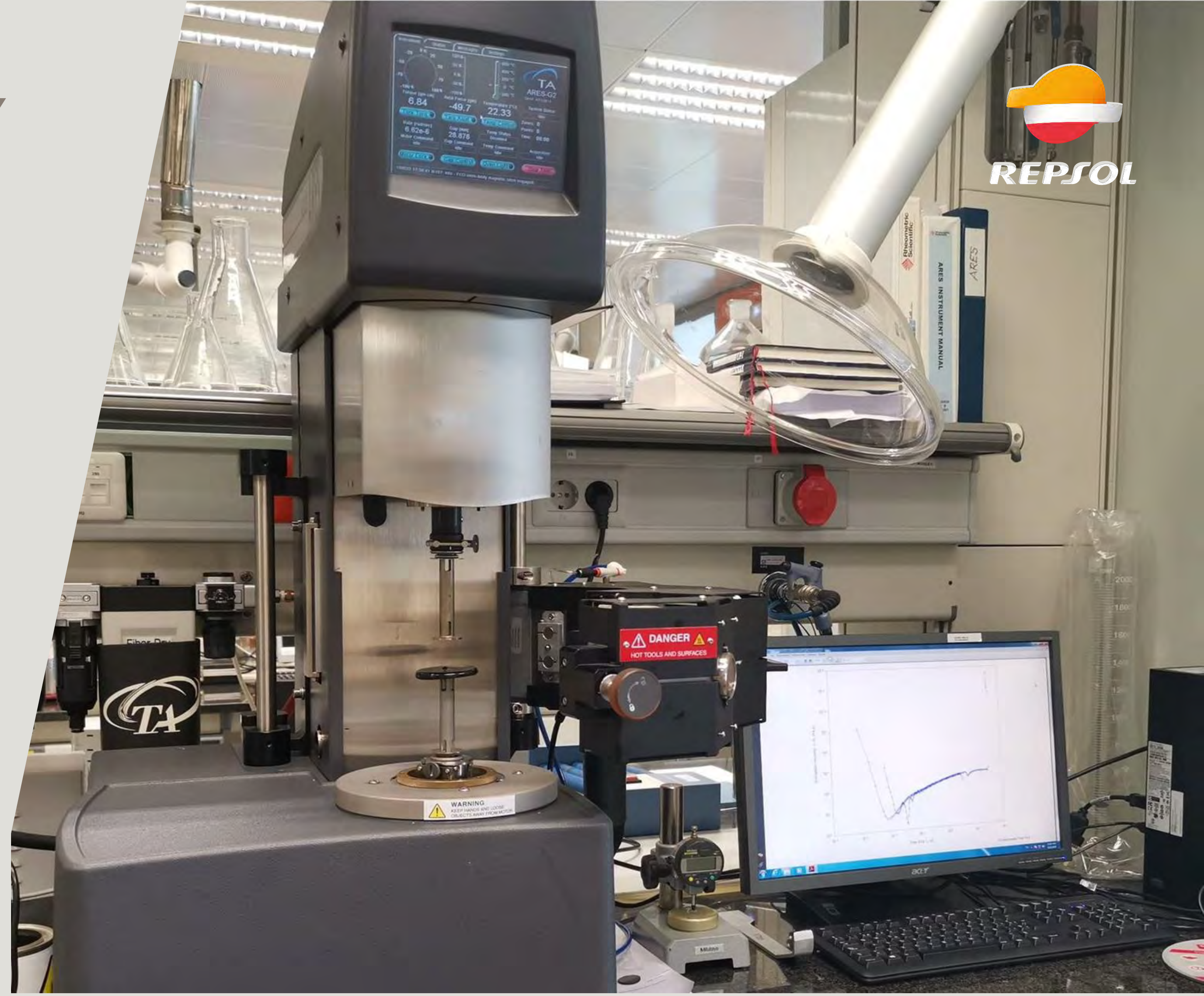
Blending of Polymers



Blending of Polymers

- / Extrusion & Compounding
 - / Eurolab Extruder
 - / Internal Mixer: Haake
- / Injection Molding
 - / Miniinjection Machine: DSM Xplore
- / 3D Printing
 - / FDM Technology: SigmaX R19
 - / SLS Technology: Sharebot

RHEOLOGY





BLENDING



RHEOLOGY



PHYSICO-CHEMICAL
PROPERTIES



RHEOLOGY

Rheology of Lubricants

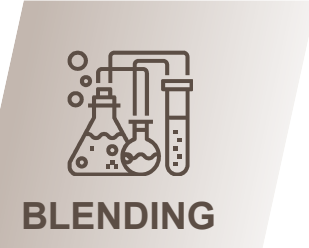


Lubricants Oils



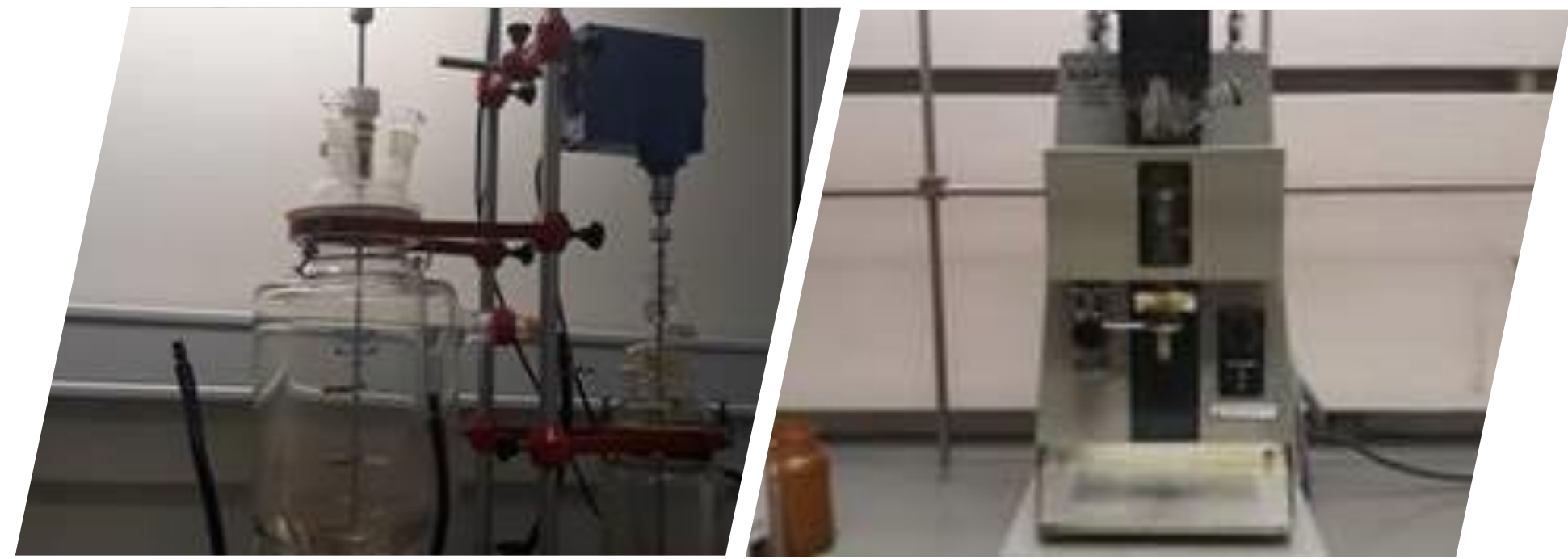
- / Kinematic viscosity
- / HTHS
- / Cold Cranking
- / Mini Rotary
- / Scanning Brookfield

- / SAE grade
- / Flow Curves



RHEOLOGY

Rheology of Specialties Base Oils



Characterization of crude oils and derivatives

- / High and low temperature kinematic viscosity
- / Dynamic Viscosity

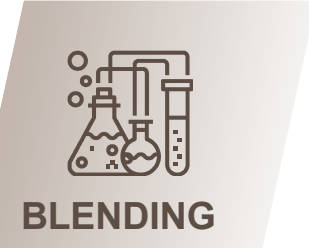
Characterization of Fuels

- / Kinematic Viscosity

Characterization of Specialties

- / Aromatic Extracts
- / Base Oils
- / Paraffins
- / Inks and varnishes





BLENDING



RHEOLOGY

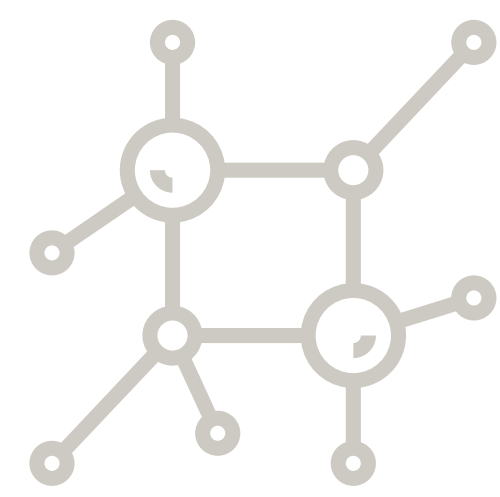


PHYSICOCHEMICAL
PROPERTIES



RHEOLOGY

Rheology of Polymers



Polymers (Polyolefins & Rubbers)

- / Capillary Rheology
- / Dynamic Rheology
- / Extensional Rheology: EVF & Haul-Off

PHYSICOCHEMICAL PROPERTIES



PHYSICOCHEMICAL PROPERTIES

Lubricants



/ Tribology tests

- / Mini Traction Machine
- / HFRR
- / Wear 4 Balls

/ Oxidation tests

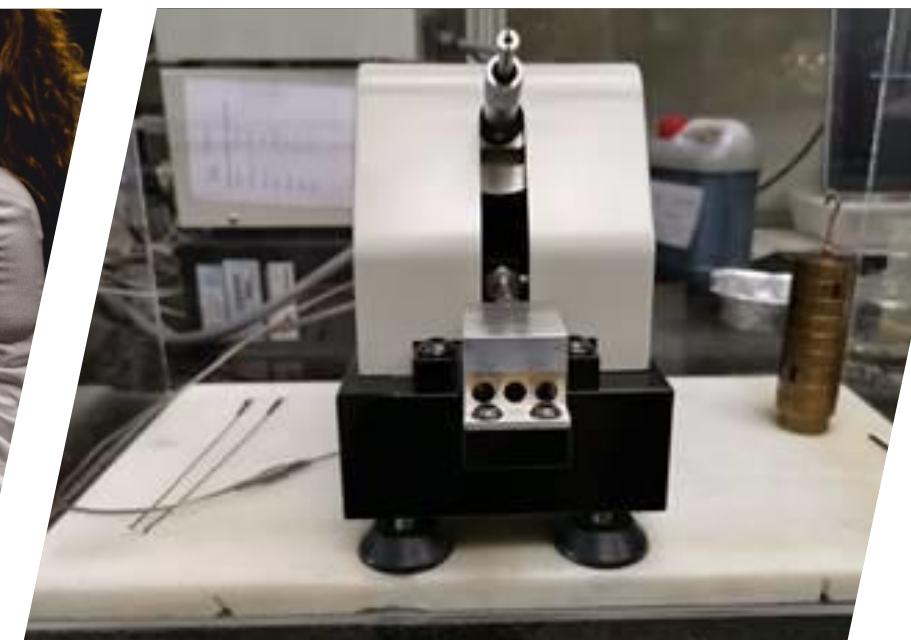
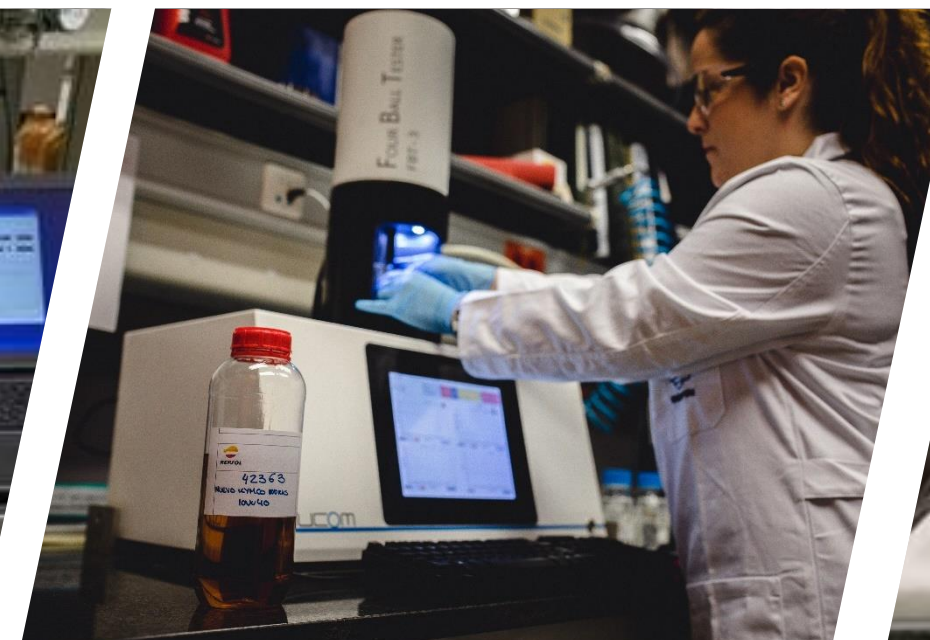
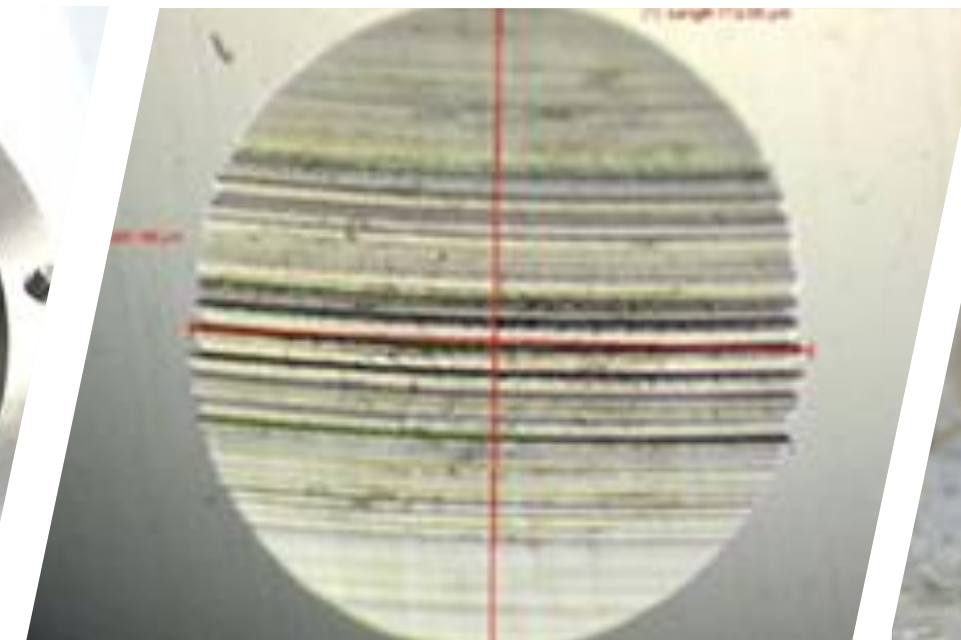
- / TOST
- / RPVOT
- / TEOST-MHT/33C
- / TFOUT
- / PDSC

/ Chemical characterization

- / Corrosion
- / PAI (by FTIR)

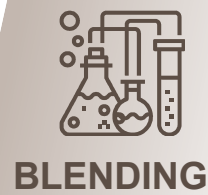
/ Physical characterization

- / Discharge Point
- / Foaming test
- / Cold Properties



PHYSICOCHEMICAL PROPERTIES

Fuels & Polymers



/ Characterization of Fuels

- / Product development Tool (Thermal stability and aging)
- / Specification compliance
- / Evaluation of new components

/ Physical characterization

- / Discharge Point
- / Cetane number
- / Cold Properties
- / Density

/ Characterization of Polymers

- / Physical tests at different temperatures:
TREF&CRYSTAF, CRYSTEX,
- / Characterization of adhesives: Tack, Peel..
- / Specification compliance/Quality Control



INDUSTRIAL TECHNICAL CAPABILITIES

Repsol Technology Lab



INDUSTRIAL

Technical Capabilities



REPSOL

PILOT PLANTS



Petrochemical pilot plants to evaluate new raw materials, new processes and new catalysts in Refinery or Chemistry industry

DISTILLERS



A range of distillers to evaluate all types of raw materials like crude, oil-fractions, bios-products, etc.).

ENGINE LABORATORY



Standardized physicochemical tests and internal product characterization methods.





INDUSTRIAL AREA

In Figures



Pilot plants	More than 35 Pilot Plants scale 1 /1 M
Refining and petrochemicals process	Desulfurizers, Coker, FCC, sulfur plants, synthesis of Polyols, SM/OP process(Oxidation, Epoxidation & Hydrogenation),etc.
Activity	30 Catalyst test per year, More than 60 experimental plants per year
Distillers	5 Distillation Pilot Plant
Process /Activity	Distillation of petroleum products, crude evaluations, 120 Distillers per year, 25 evaluated crudes/year
Engine Laboratory	The 6 engine test cells from 40kW to 350 kW, Climatic Chamber and CFR engines
Process/Activity	Evaluate fuels and lubricants performance in engines

PILOT PLANTS





PILOT PLANTS



DISTILLERS



ENGINE LAB



PILOT PLANTS

Hydrotreatment

Plants Descriptions

- / Units: 22
- / Scale 100 ml – 30 l/day max
- / Automation 24/7

Catalyst testing

- / Continuous evaluation of catalysts for HDS and MHC process
- / Ad-hoc evaluation of catalysts for HCK process
- / Metal and poisons traps
- / Pygas process
- / CO shift, pre-reforming
- / Reforming, Oligomerization

Feed evaluation

- / Alternative feeds to units
- / Bios processing (100% and coprocessed)





PILOT PLANTS



DISTILLERS



ENGINE LAB



REPSOL

PILOT PLANTS

Coke

Plants Descriptions

- / Units: 1
- / Scale 1 y 1,5 "
- / Automation 24/7

Process Development Delayed Coker

- / Condition Test
- / Characterization and test of new additives
- / Alternative feeds to units





PILOT PLANTS



DISTILLERS



ENGINE LAB



PILOT PLANTS FCC

Plants Descriptions

/ Units:

- DCR: Pilot Plant
- ACE: Advance Cracking Evaluation
- 3 Deactivation units
- Metaliltation unit

/ Scale: 6 g- 5000 g

/ Automation: 24/5 and batch

Catalyst and new Aditives testing

/ Condition Test

/ Catalyst deactivation

/ Yields Evaluation

Process Development FCC

/ Alternative feeds to units

/ Multiple injection points



PILOT PLANTS

Chemistry



PILOT PLANTS



DISTILLERS



ENGINE LAB



Plants Descriptions

- / Units 10
- / Scale 350 ml – 7 L
- / Automation 24/7 y batch

Evaluation of Heterogeneous Epoxidation Catalysts in Fixed Bed Reactor

- / Lifetime Studies
- / Condition Test



Evaluation of Batch Catalysts

- / Homogeneous & Heterogeneous Catalysts
- / Oxidation, Epoxidation & Hydrogenation
- / Neutralization Treatment of organic acid phases

Synthesis of Polyols

- / Synthesis of Polyols in Semibatch process
(Flexible/ Rigid/ CASE/ DMC/ PCPO)
- / Synthesis Polymer Polyols Semibatch & Continuous



DISTILLERS





PILOT PLANTS



DISTILLERS



ENGINE LAB



DISTILLERS

Distillers Descriptions

- / 5 Distillation Pilot Plant
- / Scale: 200 ml – 20 l
- / Automation: in progress

Characterization of Crudes, ...

- / Continuous evaluation of crudes
- / Vacuum distillation
- / Atmospheric distillation
- / Fast Evaluation
- / Complete Evaluation
- / Distillation of any experimental product

Results /precision

- / ASTM D4006
- / ASTM D1160
- / ASTM D2892
- / ASTM D5236



ENGINE LABORATORY





PILOT PLANTS



DISTILLERS



ENGINE LAB



ENGINE LABORATORY

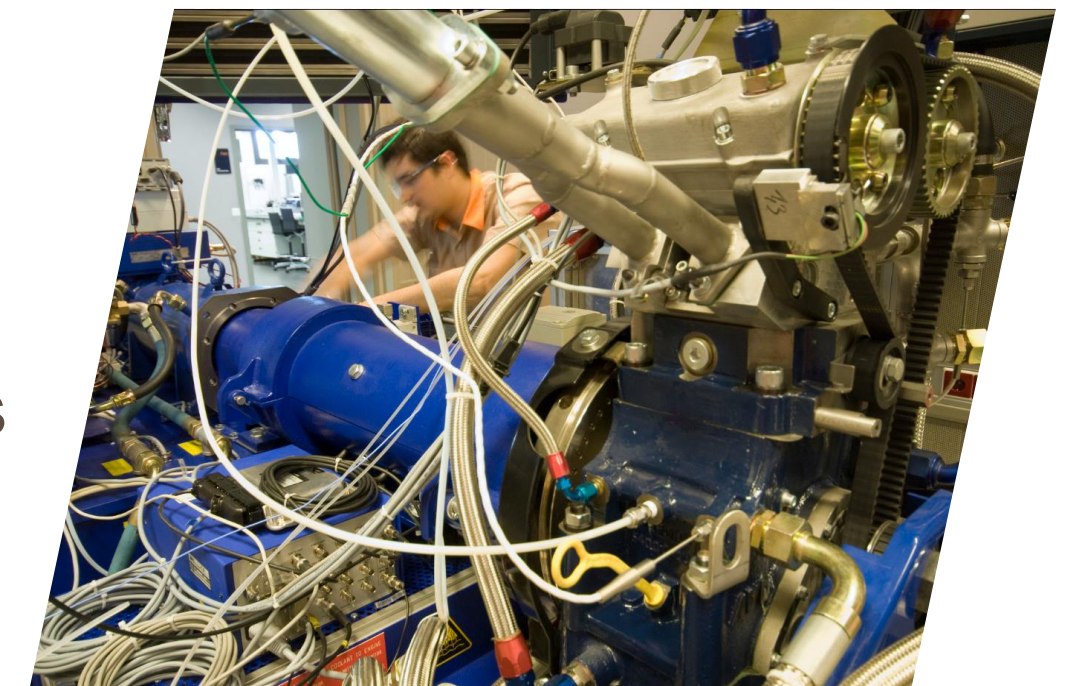
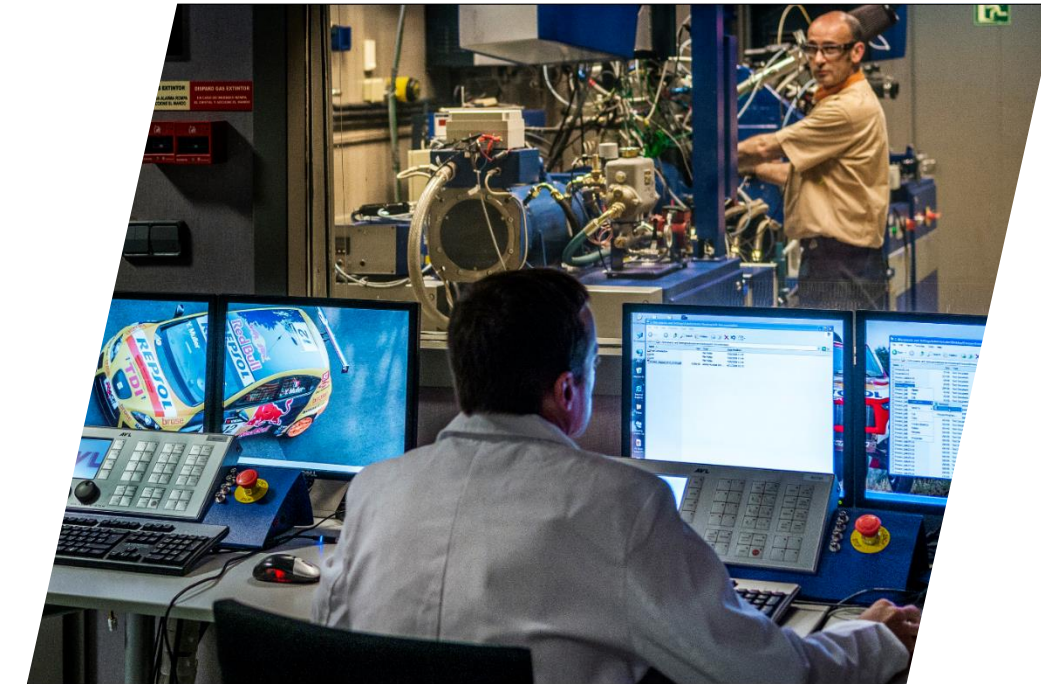
Engine test Cells

Characteristics equipment

- / The 6 engine test cells have different characteristics, with capacities from 40kW to 350 kW
- / Ambient temperatures: 10°C to 40°C
- / Fuel meters
- / Emission / particle measurement equipment
- / Chamber pressure measurement and combustion analysis
- / Vehicle diagnostic equipment / engines
- / Battery emulator

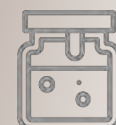
Activity to evaluate fuels and lubricants performance

- / Performance test and duration of oil and gasoline for racing engines
- / Evaluation gasoline and diesel additives in engine
- / Performance test and duration of Scooter oil
- / Evaluation of diesel in heavy duty engine.





PILOT PLANTS



DISTILLERS



ENGINE LAB



REPSOL

ENGINE LABORATORY

Climatic Chamber.

Characteristics equipment

- / Two-wheel drive (both front & rear-wheel drive)
- / Maximum axial load: 4500 kg
- / Power: 150 kW
- / Max. Speed: 200 km / hour
- / Temperature: -18°C to 50°C
- / Humidity: 40 to 60% RH
- / Conditioning pre-chamber (2 vehicles)

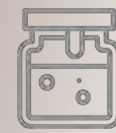
Activity to evaluate fuels and lubricants performance

- / NEDC or WLTC test
- / Oil/Fuel performance test
- / Mileage test





PILOT PLANTS



DISTILLERS



ENGINE LAB



ENGINE LABORATORY

CFR engines and injector tester

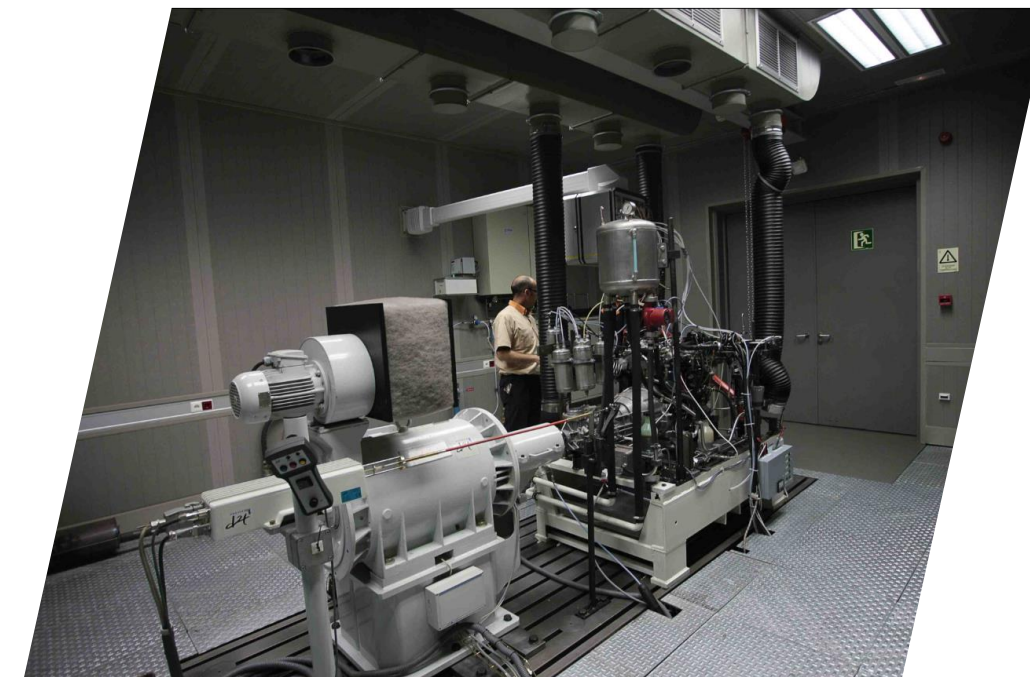
Characteristics equipment

- / RON engine
- / MON engine
- / Bosch EPS 200 tester



Activity to evaluate fuels performance

- / RON and MON test number
- / Diesel common-rail injectors tester



ROCK & CATALYSIS TECHNICAL CAPABILITIES

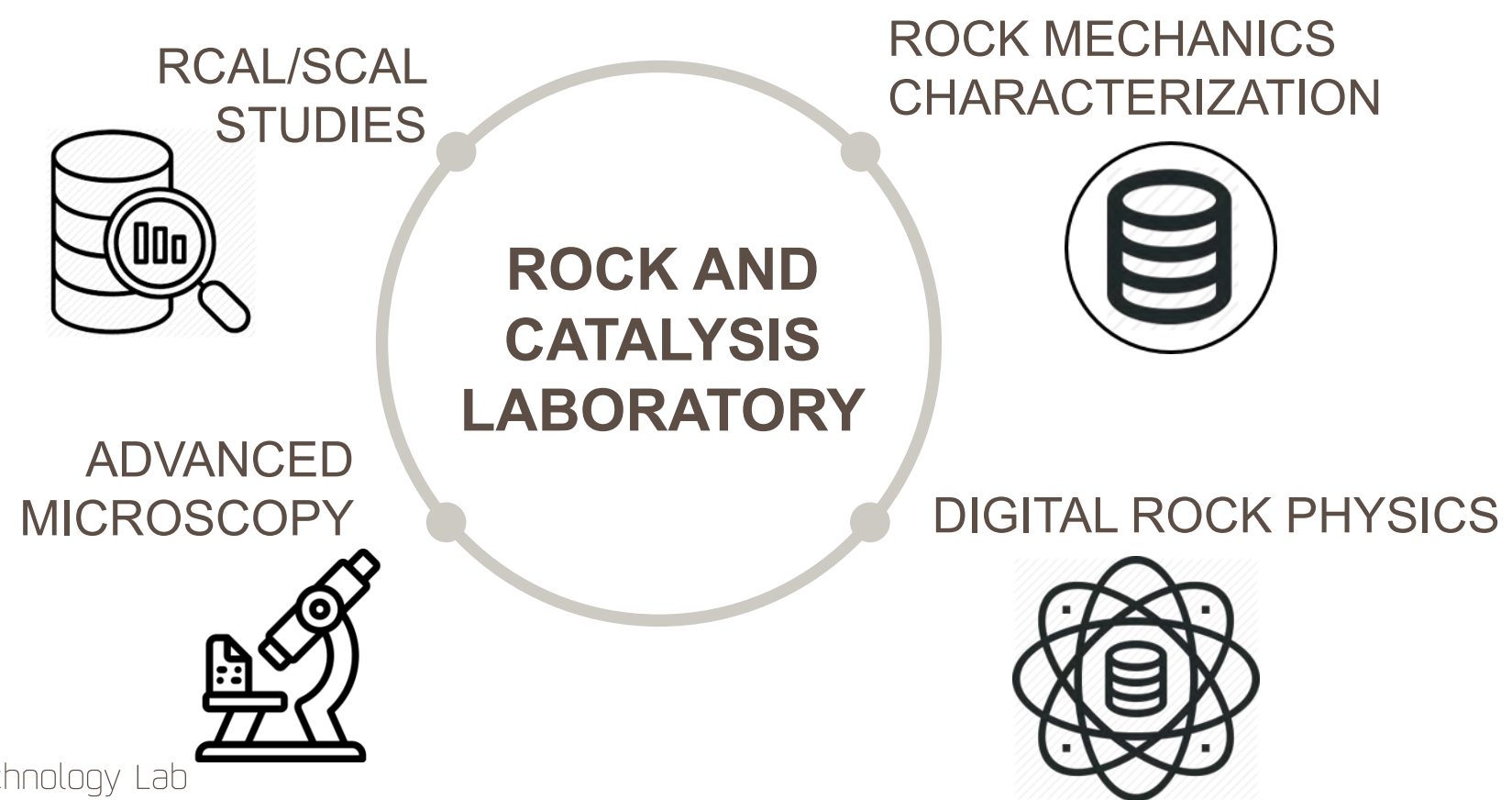
Repsol Technology Lab



ROCK & CATALYSIS

Technical Capabilities

- 1 State of the art instrumentation for Conventional and Digital material characterization
- 2 Specialized Reservoir Characterization workflows
- 3 In house developed workflows for detailed information at several scales, from pore to core characterization
- 4 Tailored solutions
- 5 Cost - time effective products



ROCK & CATALYSIS

Technical Capabilities

ROCK MECHANICS CHARACTERIZATION



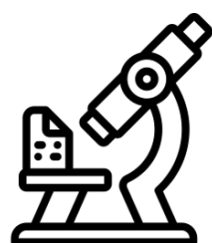
Static and dynamic properties. High Resolution continuous profile of mechanical properties

RCAL/SCAL STUDIES



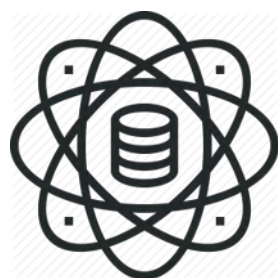
Storage and transport properties core material characterization. Rock-fluid interaction studies

ADVANCED MICROSCOPY



Advance material characterization. Fluid inclusion and catodoluminescence studies, elemental and mineralogical characterization...

DIGITAL ROCK PHYSICS



Leading edge physicochemical material characterization technologies, based on image analyses, at different scales (from nanometer to meter)



ROCK & CATALYSIS

In Figures



Leading Technology

Leading edge technologies for Conventional and Digital material characterization

State of the art instrumentations at the same facilities to integrate in the overall workflow

Multi scale characterization

Capability to obtain and integrate material information at different scales, from nanometer to meter scale material characterization

Taylored solutions

In house developed workflows for detailed material characterization at several scales

Cost – time effective products

Focused on products

ROCK MECHANICS





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY

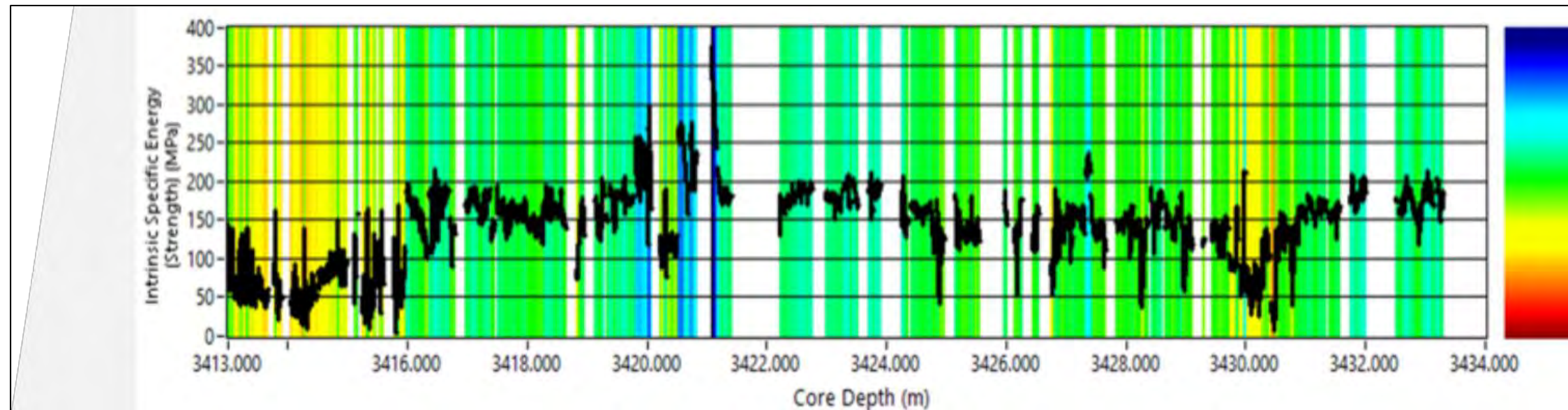


DIGITAL ROCK PHYSICS



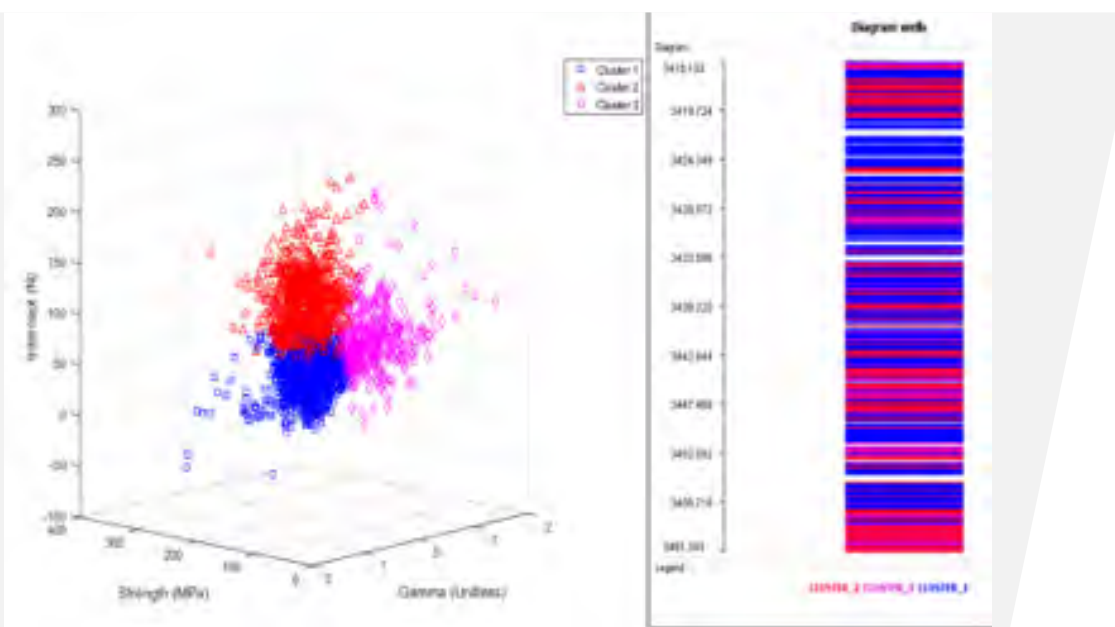
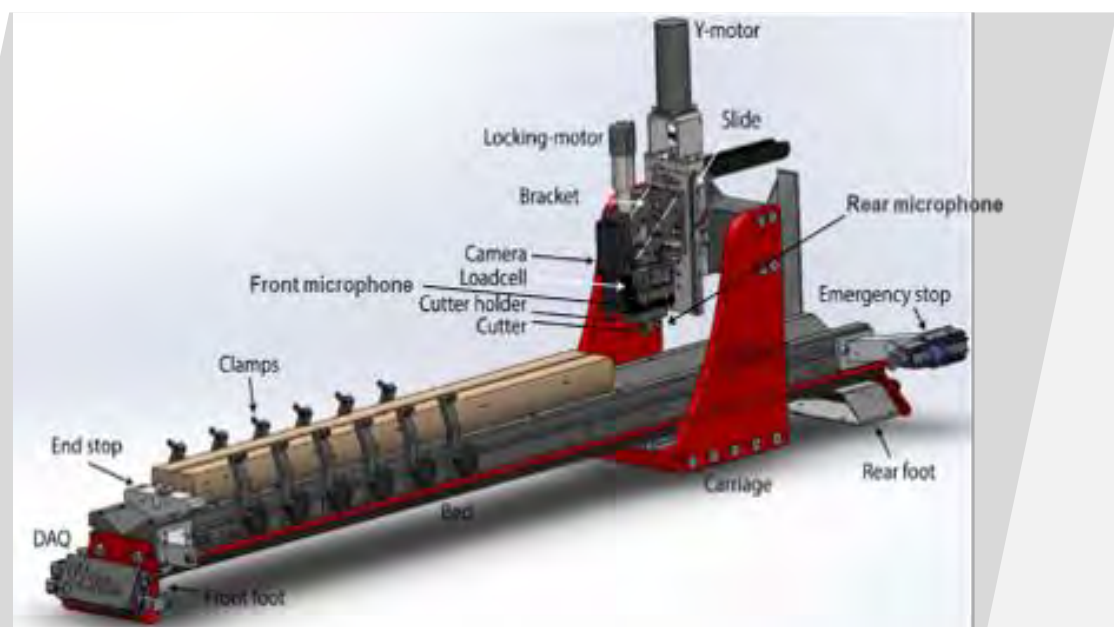
ROCK & CATALYSIS

Rock Mechanics Characterization (High Resolution profiles)



High resolution profiles on full or slabbed core

- / Strength
- / Young's modulus
- / Compressional & Shear velocities
- / Gas Permeability



Mechanical Facies identification based on categorical analysis



ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY

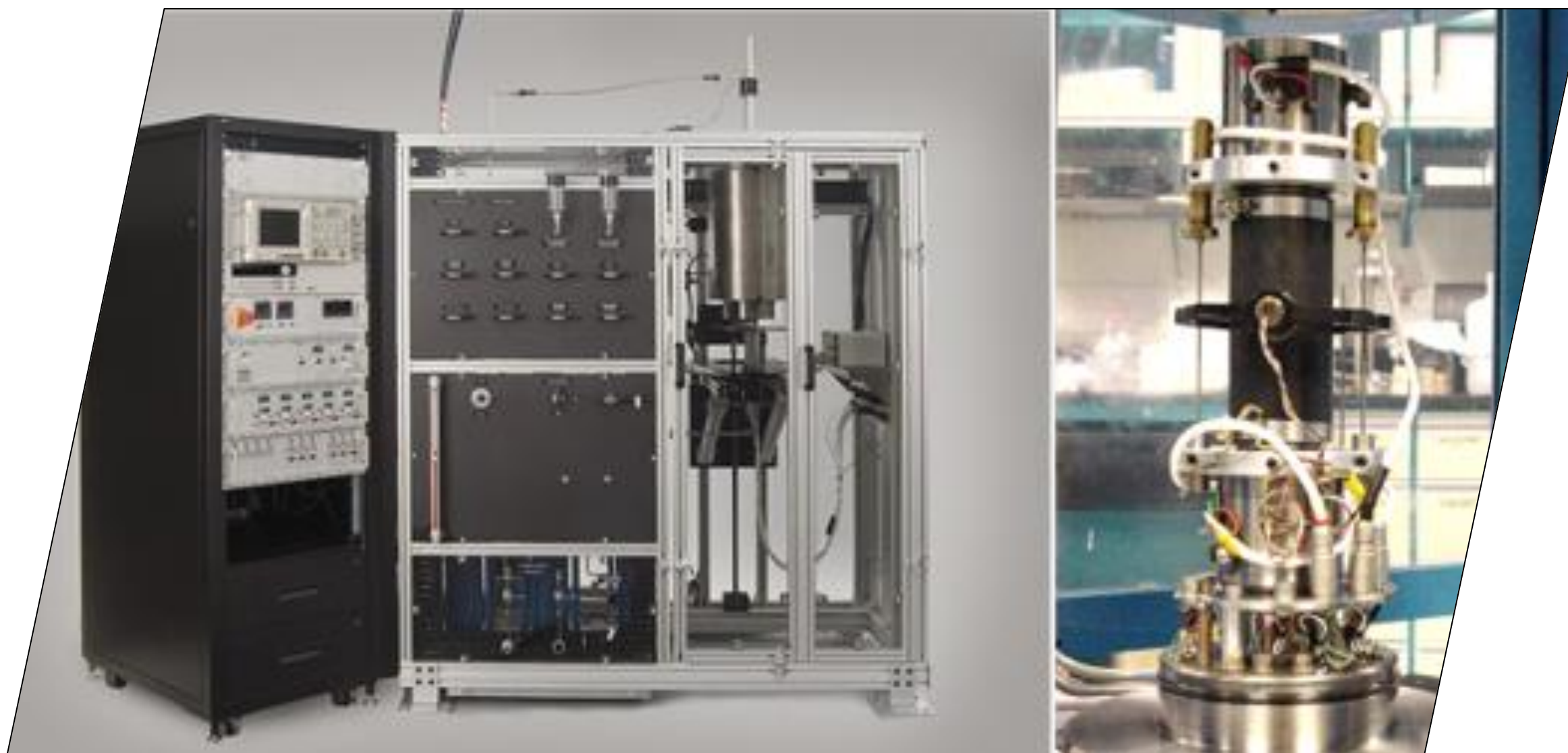


DIGITAL ROCK PHYSICS



ROCK & CATALYSIS

Rock Mechanics Characterization



Rock's constitutive Model and Failure Envelope calibration

- / Conventional rock material
- / Unconventional rock material

Complex Stress path test procedures

- / Combined with ultrasonic and permeability

Complex Stress path test procedures

- / Combined with ultrasonic and permeability
- / In-situ and temperature conditions

RCAL/SCAL STUDIES





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY

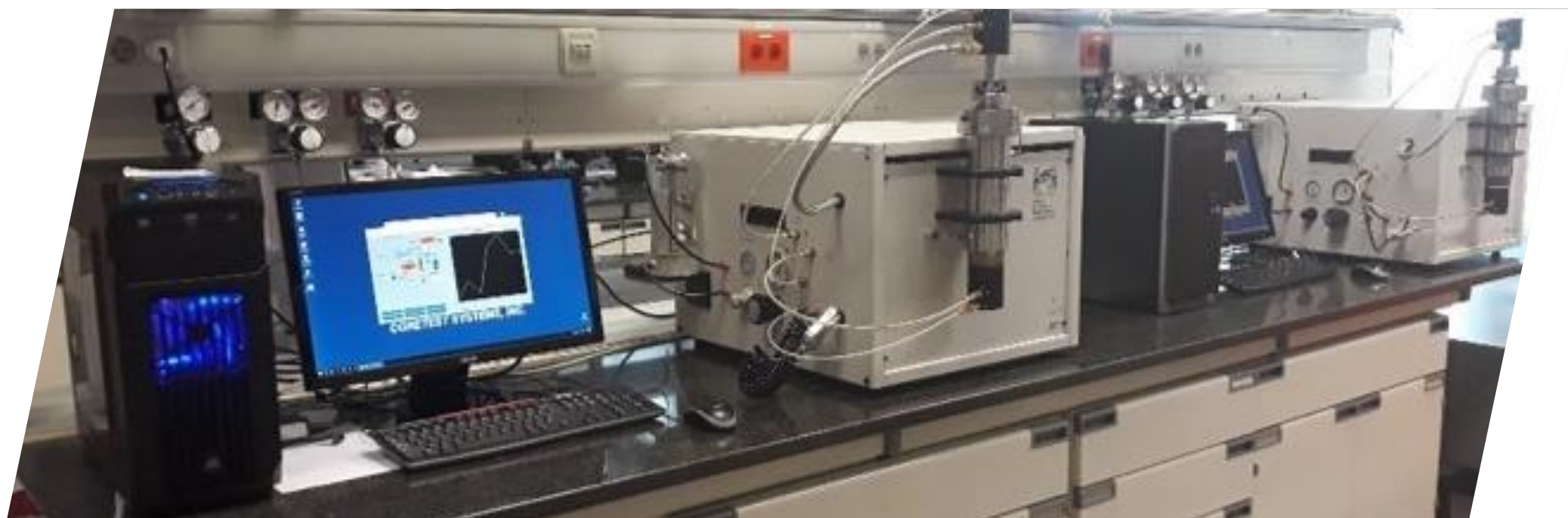


DIGITAL ROCK PHYSICS



ROCK & CATALYSIS

RCAL/SCAL STUDIES (RCAL)



Core Handling

- / Slabbing
- / Sample acquisition
- / Trimming

Cleaning

- / Dean Stack
- / Soxhel (hot & trimming)

Routine Core Analyses

- / Grain Density
- / Porosity
- / Gas Permeability





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY

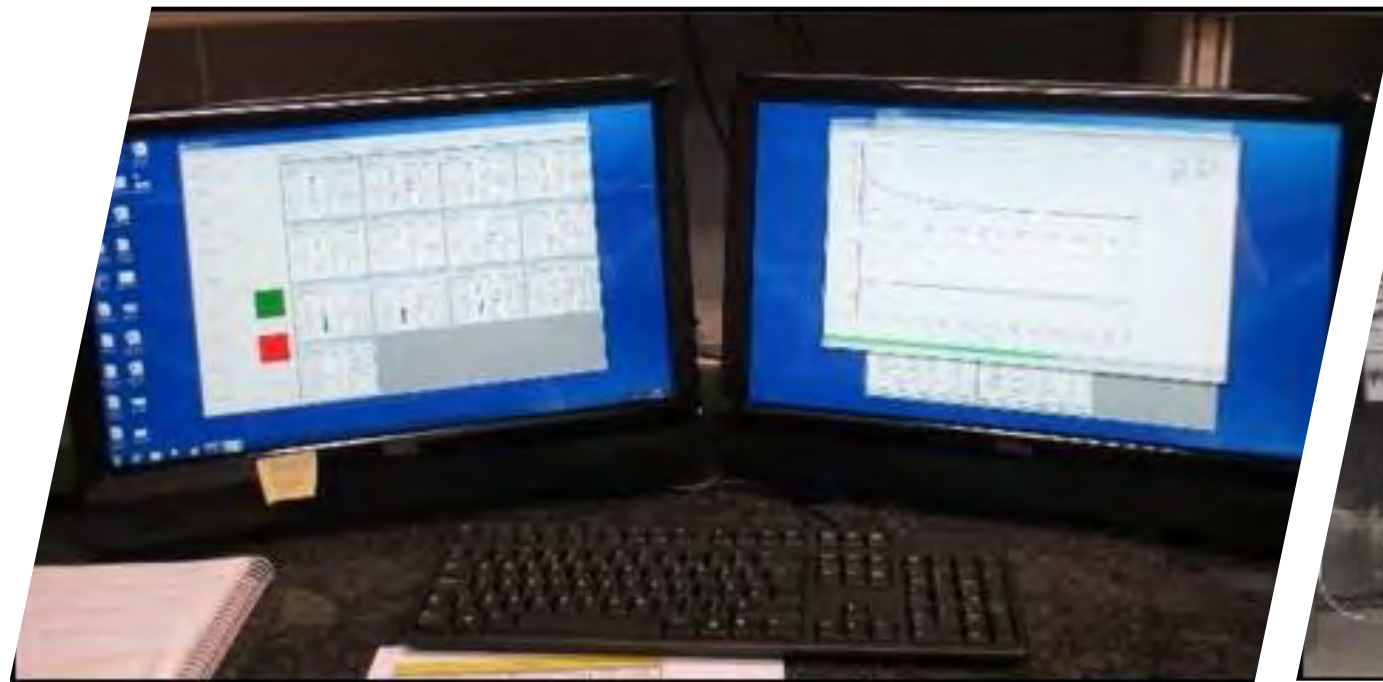


DIGITAL ROCK PHYSICS



ROCK & CATALYSIS

RCAL/SCAL STUDIES (SCAL)



Electrical Properties

- / Formation Factor (FRF)
- / Resistivity Index (RI)

Capillary Pressure Curve

- / Ultracentrifuge
- / Porous Plate
- / MICP

Nuclear Magnetic Resonance

- / Ambient & reservoir conditions

Rock-Fluid interaction

- / Wettability
- / Core Aging
- / Core flooding





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY

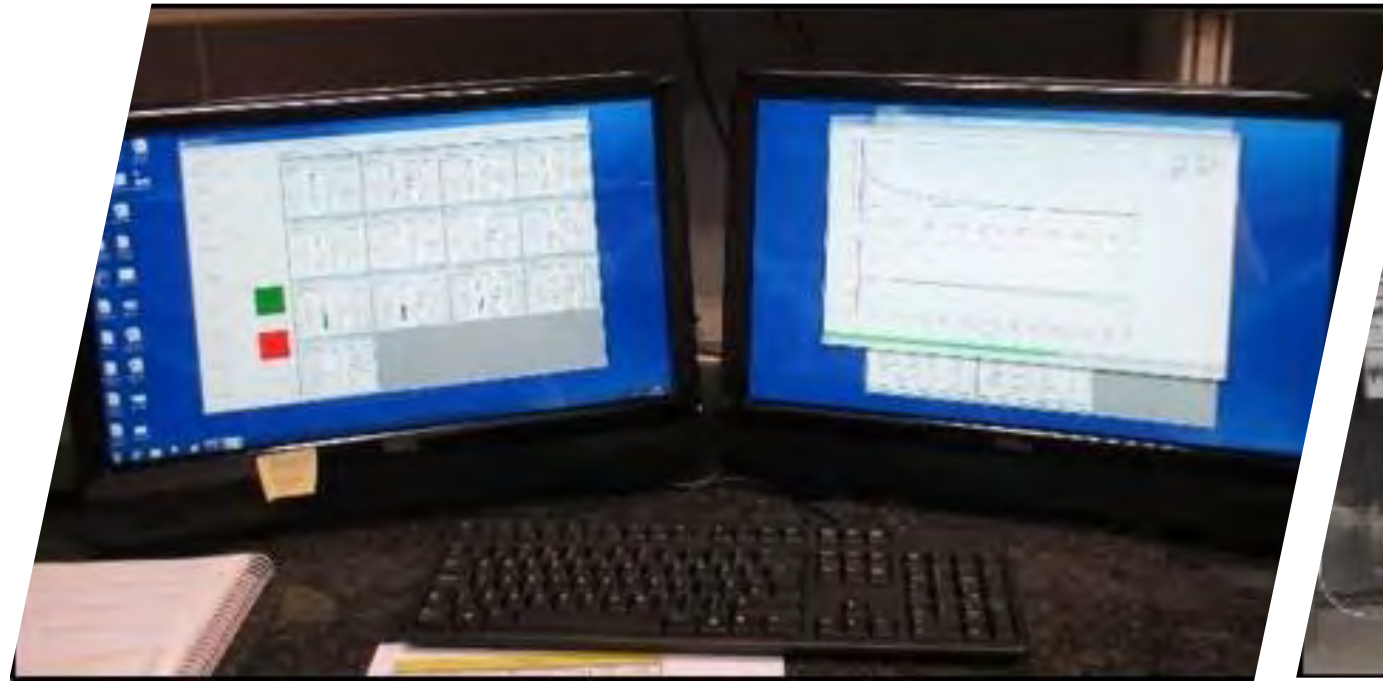


DIGITAL ROCK PHYSICS



ROCK & CATALYSIS

RCAL/SCAL STUDIES (SCAL)



Rock-Fluid interaction

/ Wettability

- Contact angle
- Ammott
- USBM

/ Core Aging

/ Core flooding

- Waterflooding and chemical injection
- Relative permeability
- Permeability modifiers (surfactants)



ADVANCED MICROSCOPY



REPSOL





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY



DIGITAL ROCK PHYSICS



ROCK & CATALYSIS

ADVANCE MICROSCOPY



Sample preparation

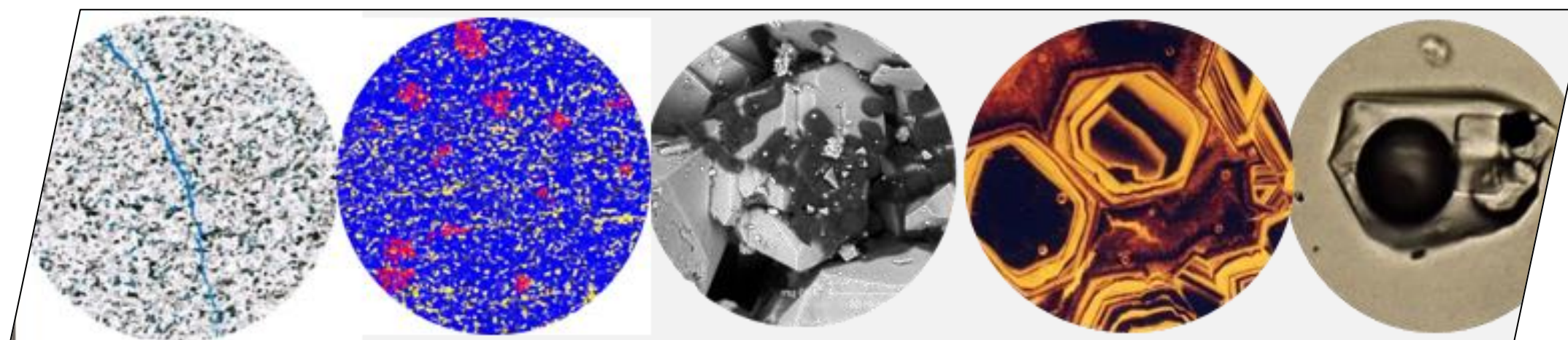
- / Thins section preparation
- / Specific sample preparation (puks, blocks, etc)

Fluid inclusions studies

- / Micro thermometry
- / UV spectrophotometry

Backscatter studies

- / SEM
- / BSE
- / FIBSEM





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY



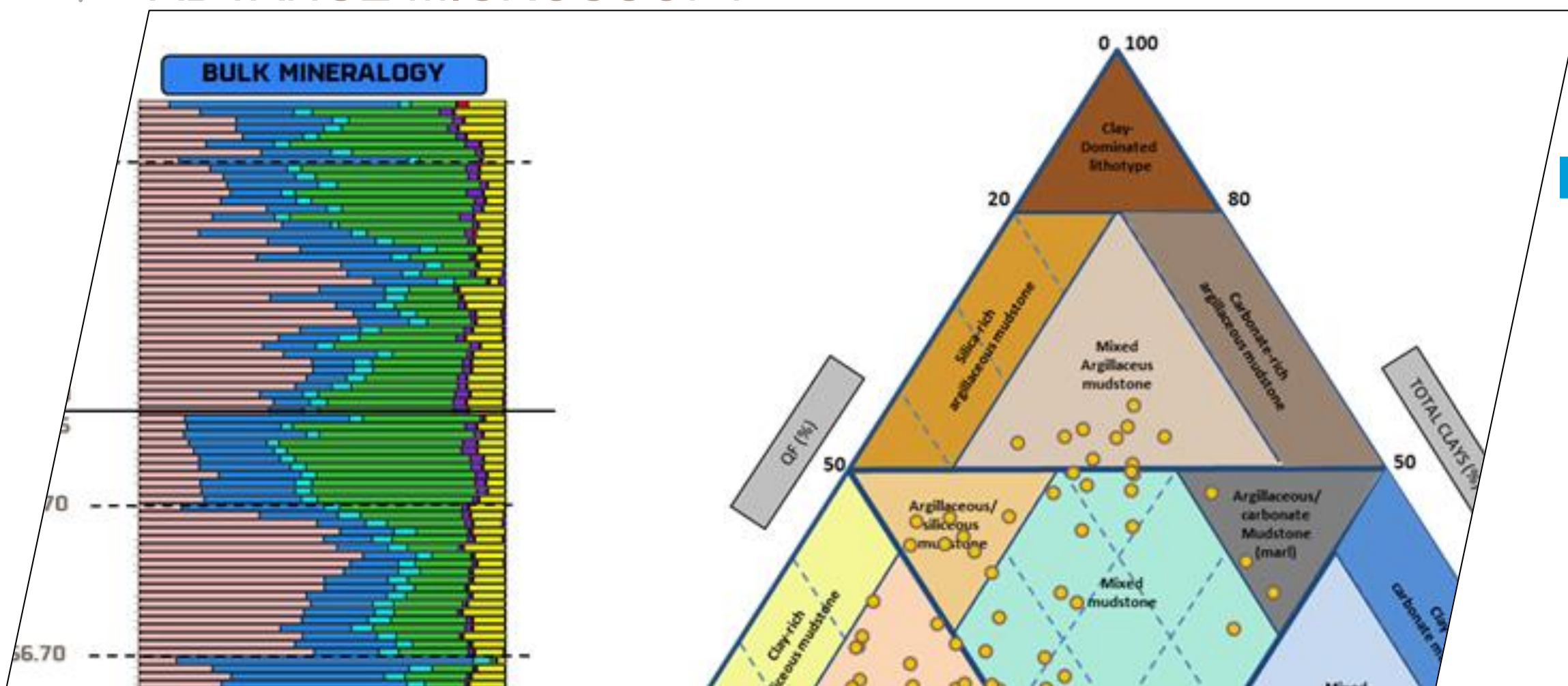
DIGITAL ROCK PHYSICS



REPSOL

ROCK & CATALYSIS

ADVANCE MICROSCOPY

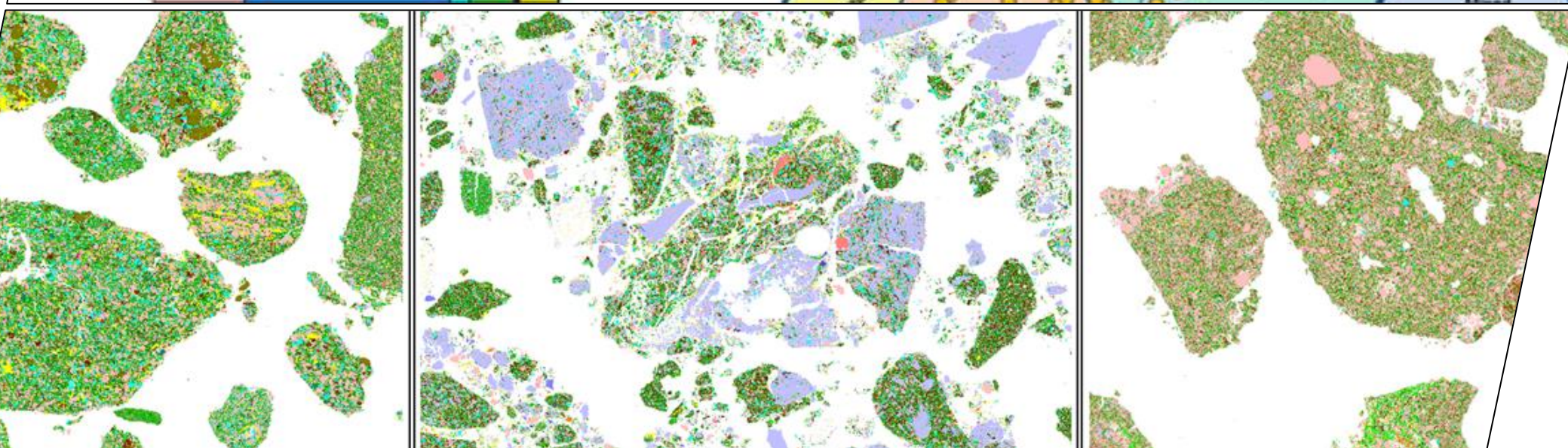


Elemental & Mineralogical studies

- / Micro X-ray Fluoresce elemental mapping
- / Petrography
- / Automatic mineralogy mapping (QEMSCAN)
- / Discrete mineralogy study (EDS)
- / Backscatter techniques (SEM / BSE)
- / Mechanical properties estimation
- / Rock Typing

Organic and inorganic geochemistry

- / TOC and Organic matter studied
- / Stable and radiogenic isotopes



DIGITAL CORE ANALYSIS





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY



DIGITAL ROCK PHYSICS



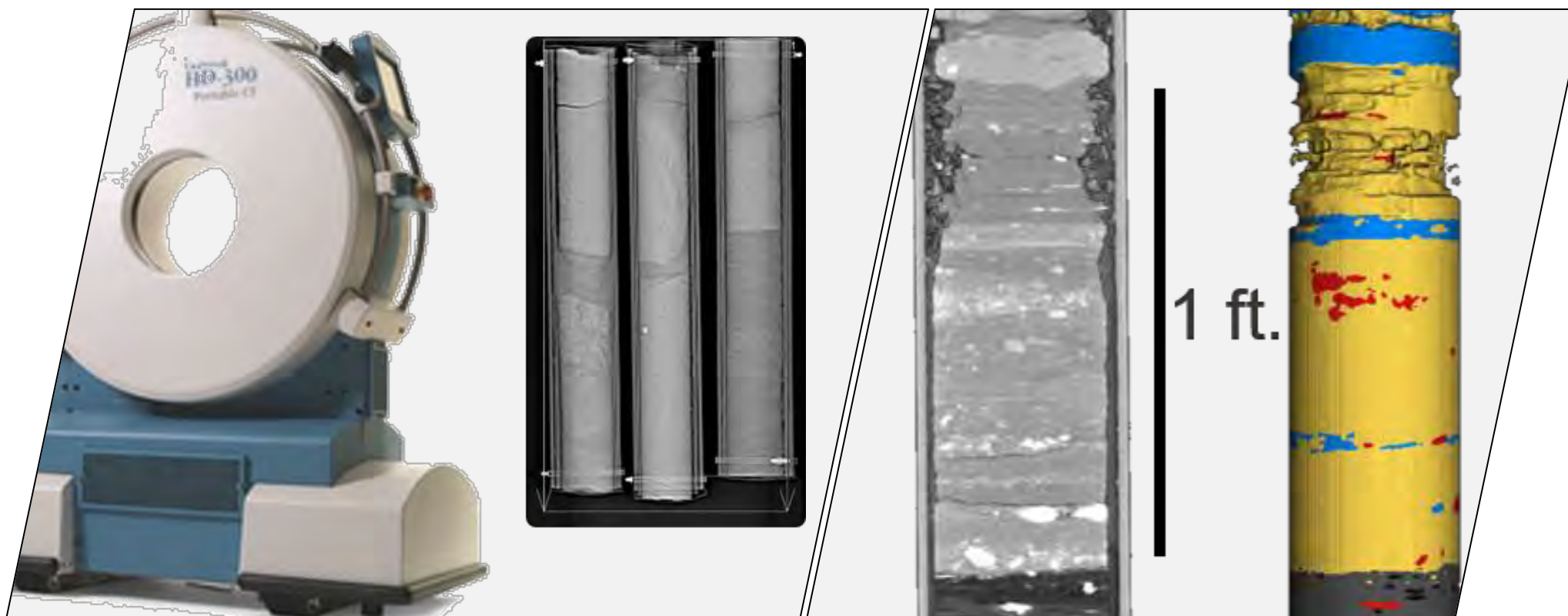
REPSOL

ROCK & CATALYSIS

Digital Rock Physics (meso scale)

Computed Tomography (CT) studies

- / 3D, non destructive imaging technique
- / Fast material characterization
- / Millimeter(mm) image resolution

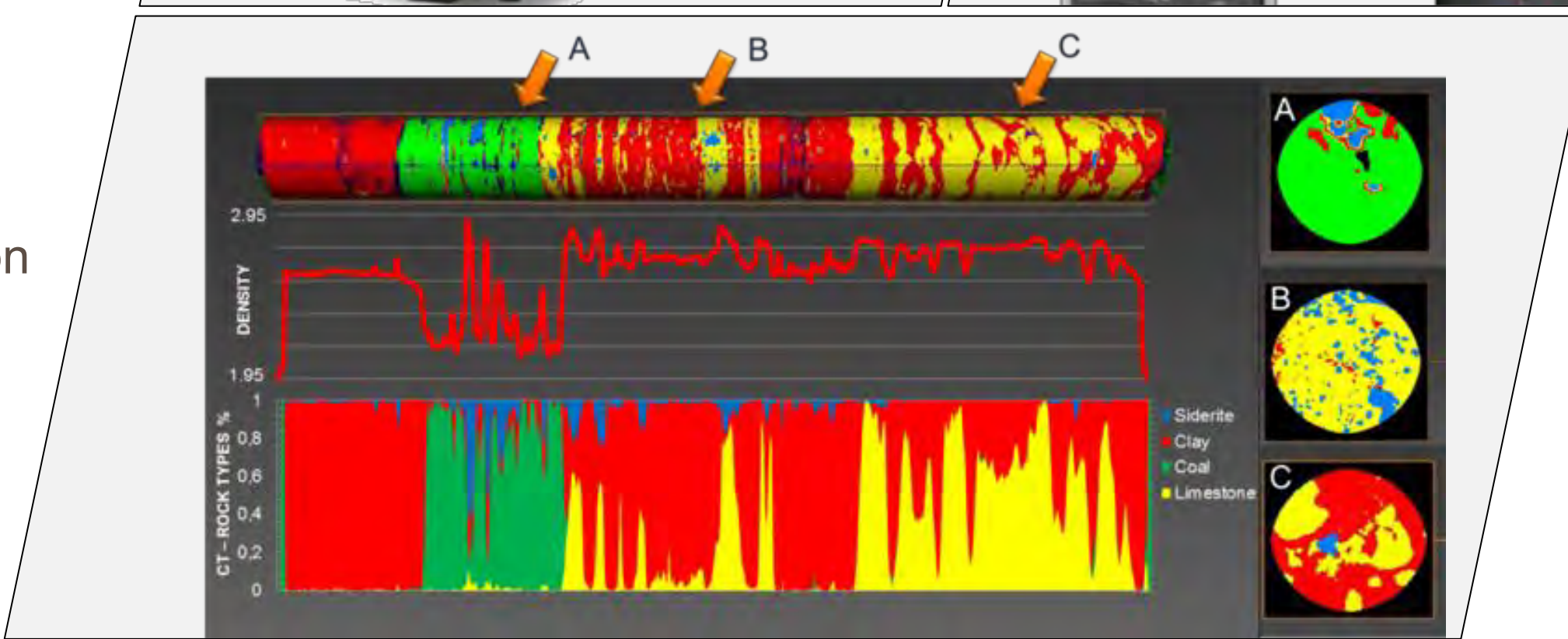


Rock characterization

- / Core description
- / Fracture studies
- / Heterogeneity evaluation
- / High Resolution Petrophysical log estimation

Material Inspection

- / Quality check





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY



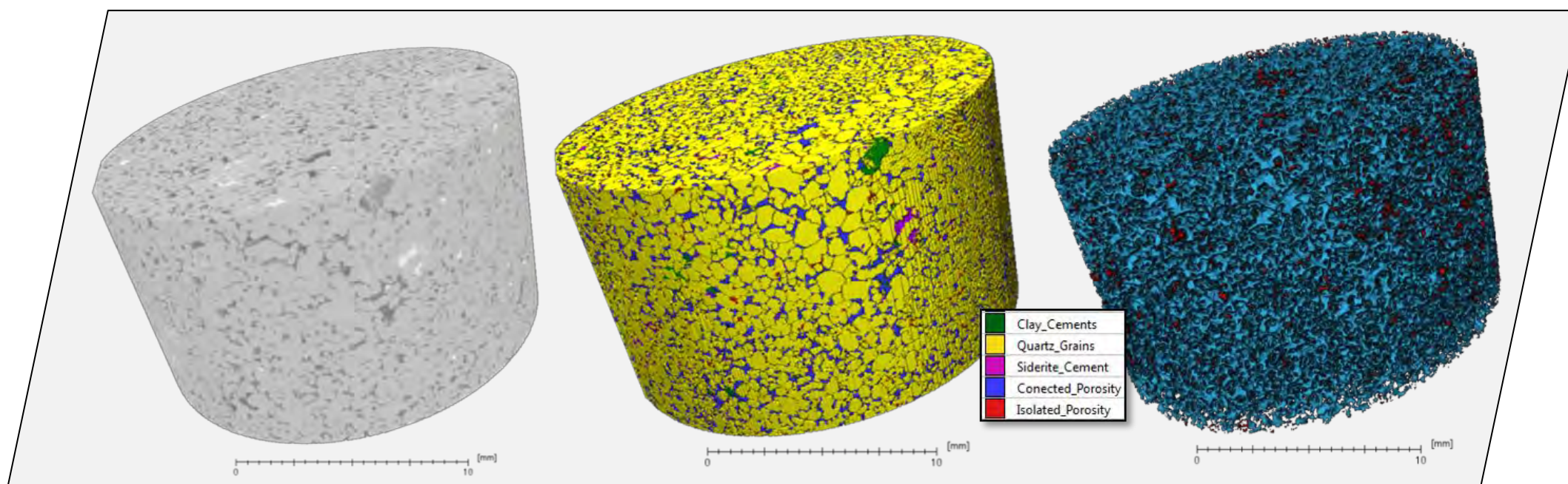
DIGITAL ROCK PHYSICS



REPSOL

ROCK & CATALYSIS

Digital Rock Physics (micrometer scale)



Micro computed Tomography (mCT) studies

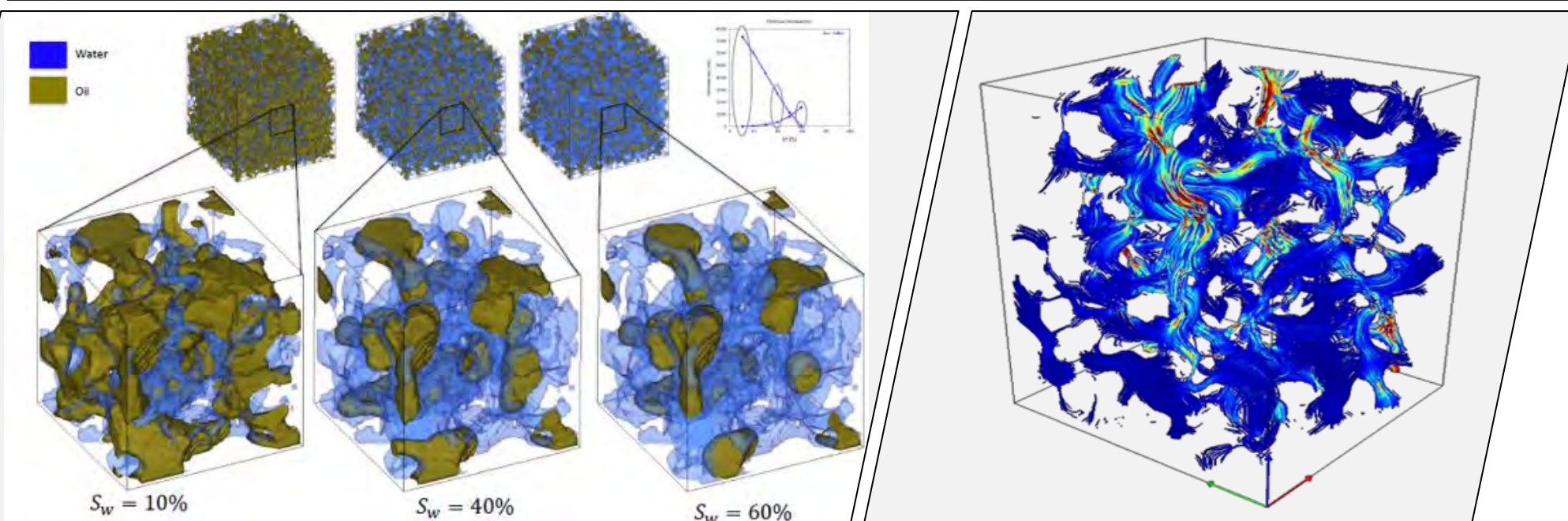
- / 3D, non destructive image technique
- / Cost-effective Material characterization
- / Micrometer (um) image resolution

Rock characterization

- / Storage & transport properties
- / Capillary pressure
- / Relative permeability
- / Multiphase flow simulations (FEM, LB, etc)

Material characterization

- / Quality control on industrial products
- / Fatigue material evaluation
- / etc





ROCK MECHANICS



RCAL / SCAL STUDIES



ADVANCE MICROSCOPY



DIGITAL ROCK PHYSICS



REPSOL

ROCK & CATALYSIS

Digital Rock Physics (nanometer scale)

SEM and EDS studies

- / 2D, non destructive image technique
- / Up to nanometer (nm) image resolution

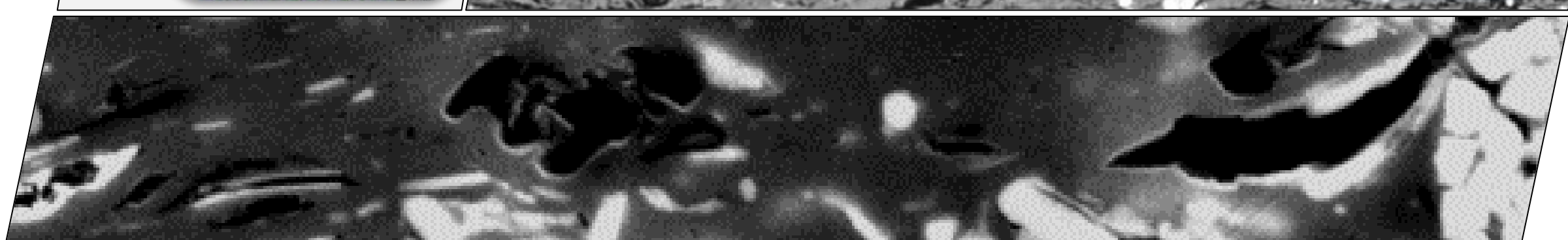
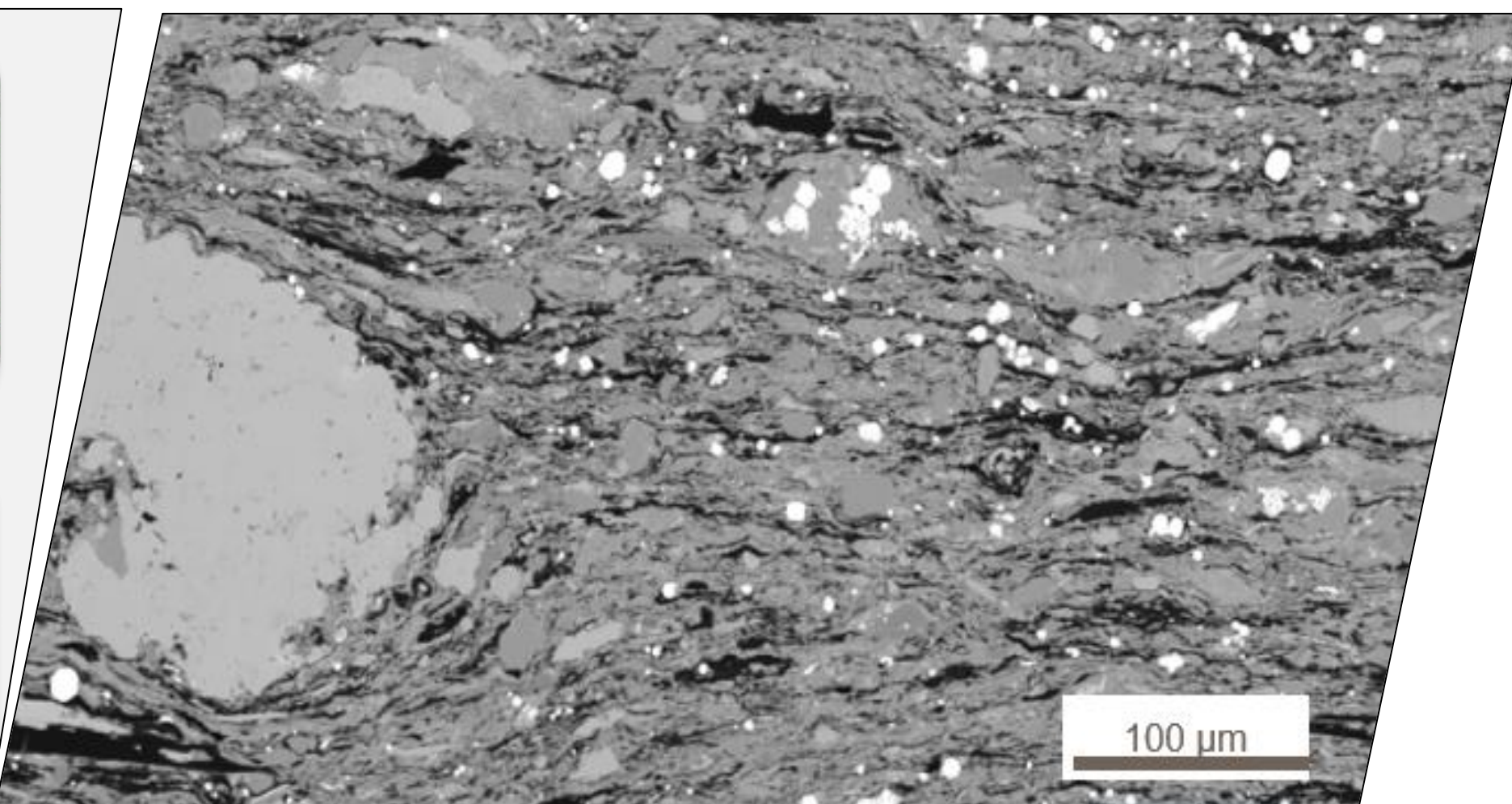
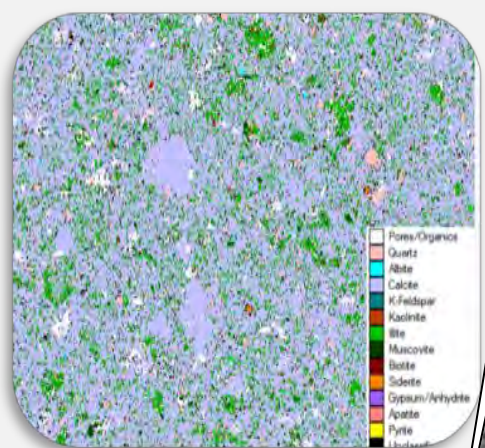
Rock characterization

- / Storage & transport properties
- / Capillary pressure curves
- / Organic Matter quantification

Mechanical properties estimation

Material Characterization

- / Polymers
- / Catalysts
- / ...





Technology Lab
from ideation to real business

REPSOL