GEOCHEM

SRL® - Smart Reservoir Laboratory

a new concept of global petrophysical laboratory service



Ferenc Fedor, PhD, MBA

Owner, CEO

Libya, 26.11.2024

Challenges in our new World

- Climate change – carbon footprint reduction
- Pandemic & war – limitation of traveling & transport, disruption of supply chains
- Energy crisis – significant fluctuations of prices, limitation of transport
- Raw materials – critical resources in remote areas

So the new words:
Automation, process management, QAM, home office, Industry 4.0, VR/AR/MR, etc.

Role of the Geology in the World life

- Raw materials and energy exploration anywhere in the World, under any conditions (seafloor, outbacks, deserts, montains, underground, etc)
- Conquering space, preparing for space mining (Moon, Mars, other planets, moons)
- Research on climate change, understanding and predicting processes on Earth
- Underground facilities for different purposes (HLW, ILW/LLW disposal, etc), geotechnical tasks

Hot topics in geosciences

H2 production and underground storage, Carbon Capture and Storage (CCS), geothermal research (HS, EGS, ATES, BTES, DBHE), unconventional fossil fuel production (tight gas, shale oil, UGC, etc), critical elements

Needs for exploration/research

Surface techologies (geophysical survey, sampling), boreholes and well logging, laboratory works, modelling

Problems with traditonal laboratory service and future activities

Given a sample from anywhere …

Transportation (permits, physical and chemical changes, dustiness, dilapidation, carbon footprint, time, costs)
Technology (high spectrum of instruments and softwares, difficult, maintenance, expensive, data management problems, qualified staff needed, capacity)
Qualified staff (education and experience, time, maintenance, carbon footprint, salary and insurance, work attitude, capacity)
Data management (security, redundance, errors, interpretation)

From sample to results/reports: time-consuming (3-6 months), expensive

New directions in exploration and exploitation require changes

Unconventional and renewable resources (H_2, CO_2, petroleum, geothermal)
Automation (cobots, machine learning, AI, big data)
Principles: Industry 4.0, „Design as you go”
Environmental protection (using renewable energy, less chemicals)
Social distance (pandemic)
Change of attitude (new generation, VR/AR, less lexical more practical)

Lack of real data, which need for calibration, upscaling!

The SmartLab concept

On-site laboratory service anywhere

Highly automated (a technician need for maintenance using expended reality tool, next step robotization and AI)

VR/AR tools for education and service

Sustainability

- Energetically independent (solar, wind, accumulator)
- Chemicals not need (water, air, nitrogen from surroundings)

Data transportation via secure satellite internet to the Headquarters

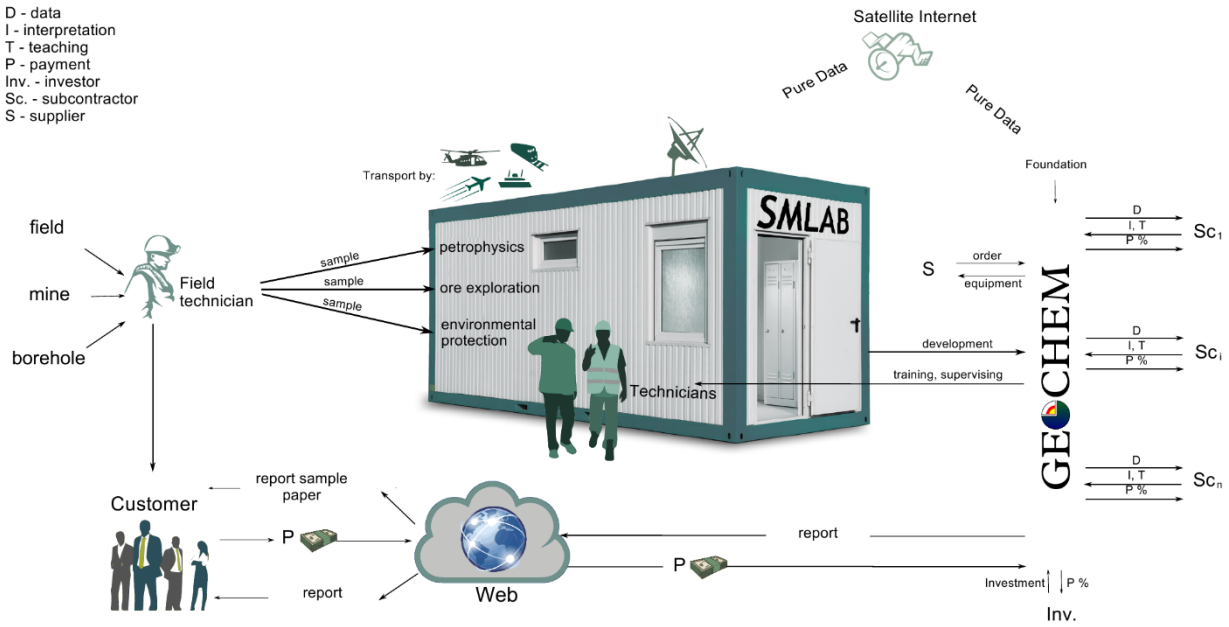
Interpretation by experts living anywhere in the world

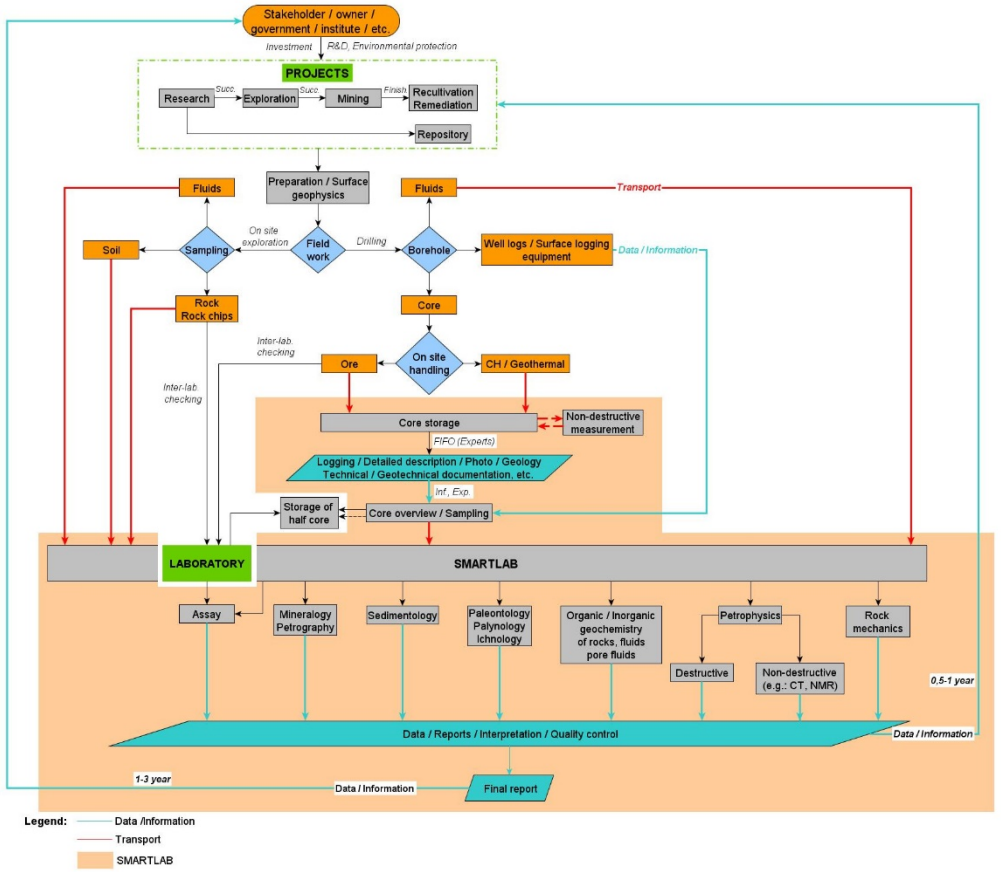
Payment via internet

Complement geophysical and remote sensing activity (calibration, upscaling)

Goal: time-saving service (1-5 days), cost effective, less carbon footprint

Smart Reservoir Laboratory (SRL®) Concept





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Smart Reservoir Lab - The Solution, all-in-one

Reservoir state measurements in one automized step – porosity, permeability (PPD, pressure fall-off, steady-state), acoustic velocity, critical flow velocity, invers-reverse permeability, relative permability using different fluids.

SRL needs only 10 m^2 area, a technician instead of 200 m^2 reservoir laboratory and 2-3 high qualified expert.

First and second realizations



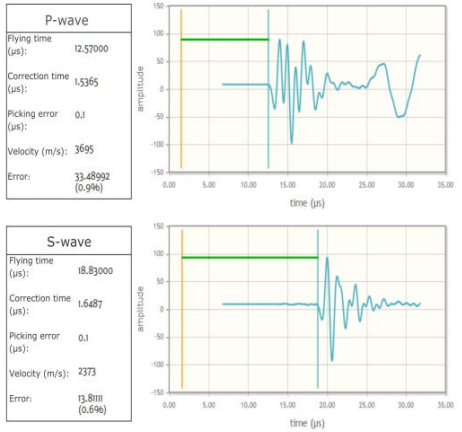
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SRL-A1000 Ultrasonic Wave Velocity Test System

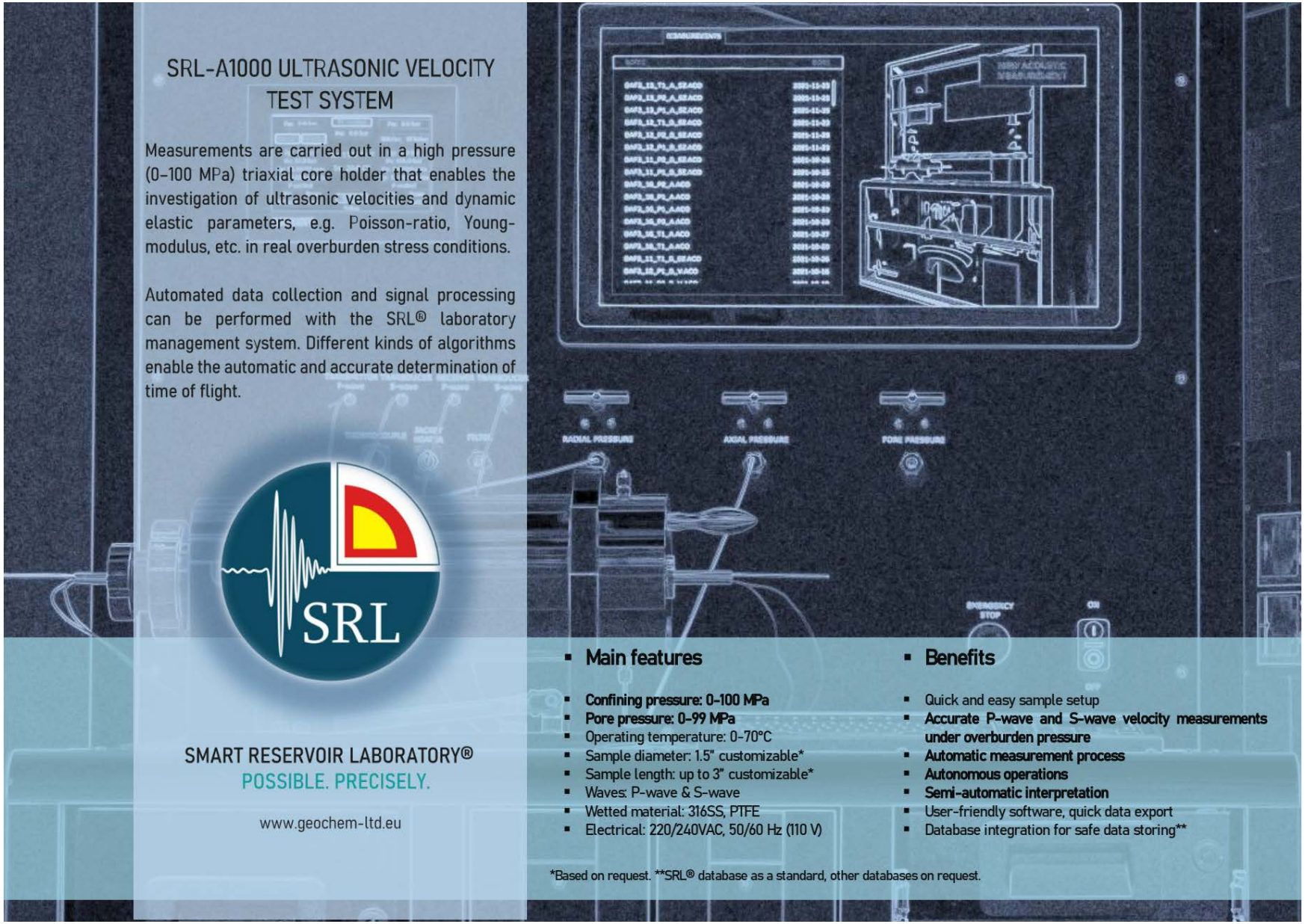
- Quick and easy sample setup
- Accurate P- and S-wave velocity measurements under overburden pressure
- Automatic computer-controlled measurement process
- Autonomous operations
- Easy-to-use software with quick data reporting functions (pdf, xlsx)
- Integration with Smart Reservoir Lab database in order to safe data storing (integration with other databases is upon request)







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SRL-A1000 ULTRASONIC VELOCITY TEST SYSTEM
Measurements are carried out in a high pressure (0–100 MPa) triaxial core holder that enables the investigation of ultrasonic velocities and dynamic elastic parameters, e.g. Poisson-ratio, Young-modulus, etc. in real overburden stress conditions.
Automated data collection and signal processing can be performed with the SRL® laboratory management system. Different kinds of algorithms enable the automatic and accurate determination of time of flight.
SRL
SMART RESERVOIR LABORATORY®
POSSIBLE. PRECISELY.
www.geochem-ltd.eu
RADIAL PRESSURE
AXIAL PRESSURE
PORE PRESSURE
EMERGENCY STOP
Main features
Confining pressure: 0-100 MPa
Pore pressure: 0-99 MPa
Operating temperature: 0-70°C
Sample diameter: 1.5" customizable*
Sample length: up to 3" customizable*
Waves: P-wave & S-wave
Wetted material: 316SS, PTFE
Electrical: 220/240VAC, 50/60 Hz (110 V)
Benefits
Quick and easy sample setup
Accurate P-wave and S-wave velocity measurements under overburden pressure
Automatic measurement process
Autonomous operations
Semi-automatic interpretation
User-friendly software, quick data export
Database integration for safe data storing**
*Based on request. **SRL® database as a standard, other databases on request.

Differences between qualities – Acoustic systems









	SRL-A1000	AVS-700 (Vinci)	AWMS-350 HT (CoreLab)	AVS-0 (Vinci)
Price	200 000 EUR	~ 195 000 EUR	~ 200 000 USD	91 100 EUR
Confining pressure	15000 psi	10000 psi	10000 psi	10000 psi
Pore pressure	15000 psi	10000 psi	9500 psi	10000 psi
Temperature	75 °C	120 °C	150 °C	ambient
Pressure control	automatic, software based	manual	manual	manual
Controll	automatic, software based	manual	manual	manual
Operation	automatic, software based	software controlled	software controlled	software controlled
Personal requirement	technician	professional	professional	professional
Software	Smartlab - integrated	Unique - data copy demand	Unique - data copy demand	Unique - data copy demand

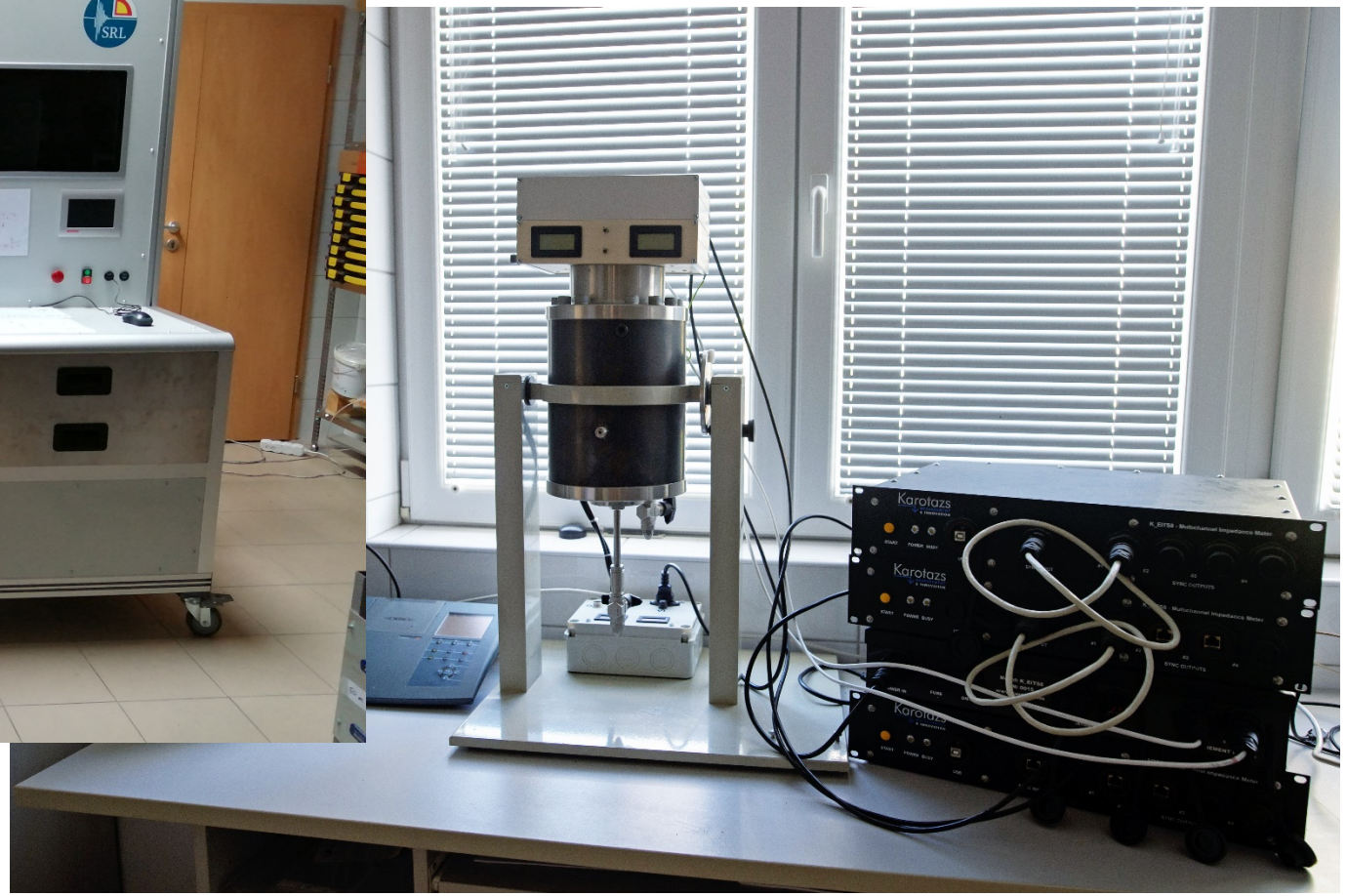
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Smart Reservoir Lab – SRL®



SRL-AP1000 in progress

MEIT3D



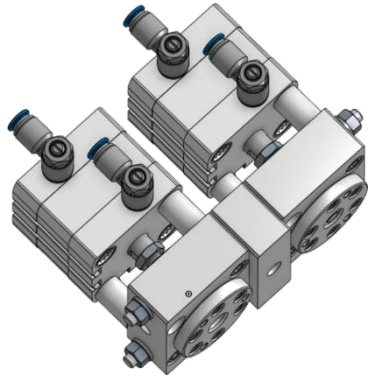
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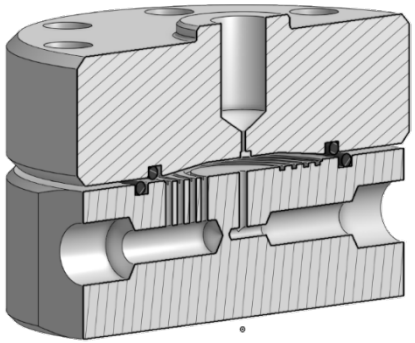
Automated Universal Permameter – SRL-AP1000

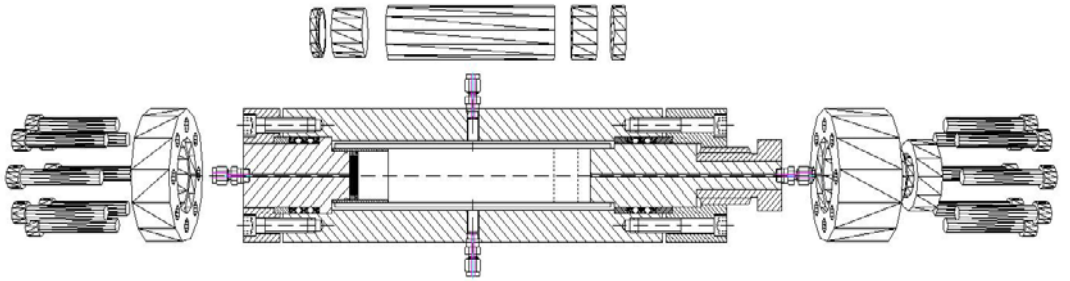
Main Technical Features

Medium:	Liquid & Gas
Range of Permeability	**10 D – 0.1nD (12 order of magnitude!)**
Confining Pressure:	max. 1000 bar
Pore Pressure:	max. 400 bar
Max. Temperature:	max. 150 °C
Sample Dimension:	∅1-1,5”, L = 0.5”–3”
Differential Pressure:	+/- 16 bar
Flow:	two way
Wetted materials:	Stainless Steel, PTFE









Challenges: There is no a universal test method!

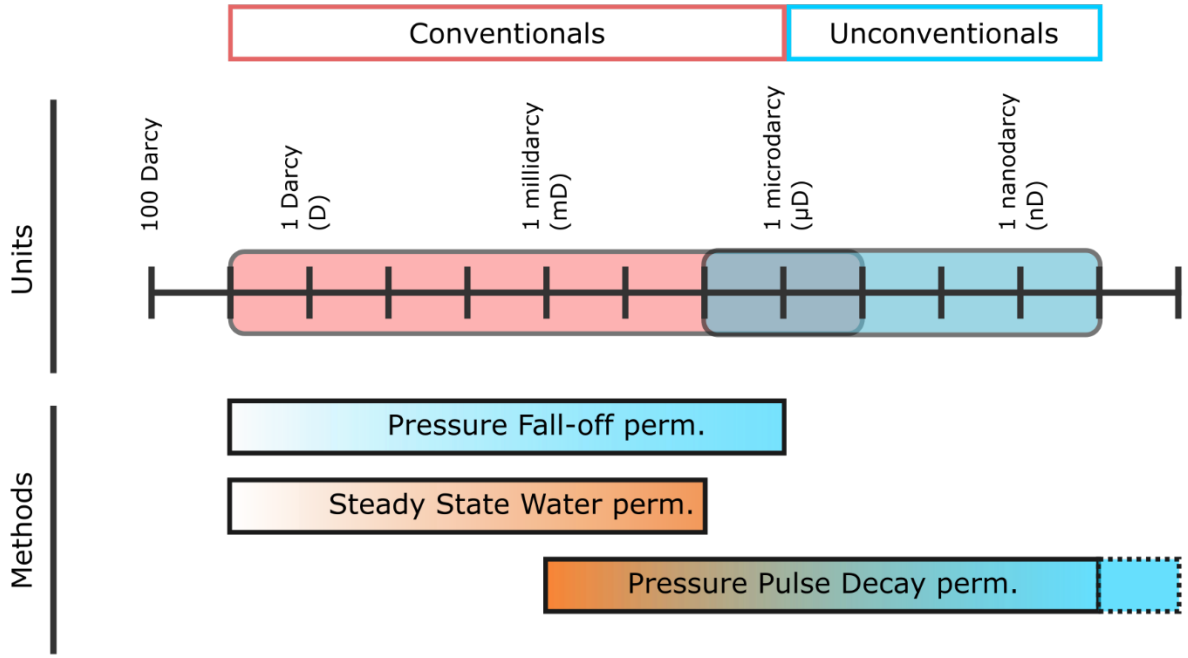
Selected test method mainly depends on the range of permeability & sample geometry

Integration of different permeability test methods:

- **Pressure-falloff gas permeability**
- **Steady state water permeability**
- **PPD water & gas permeability**

Other test methods:

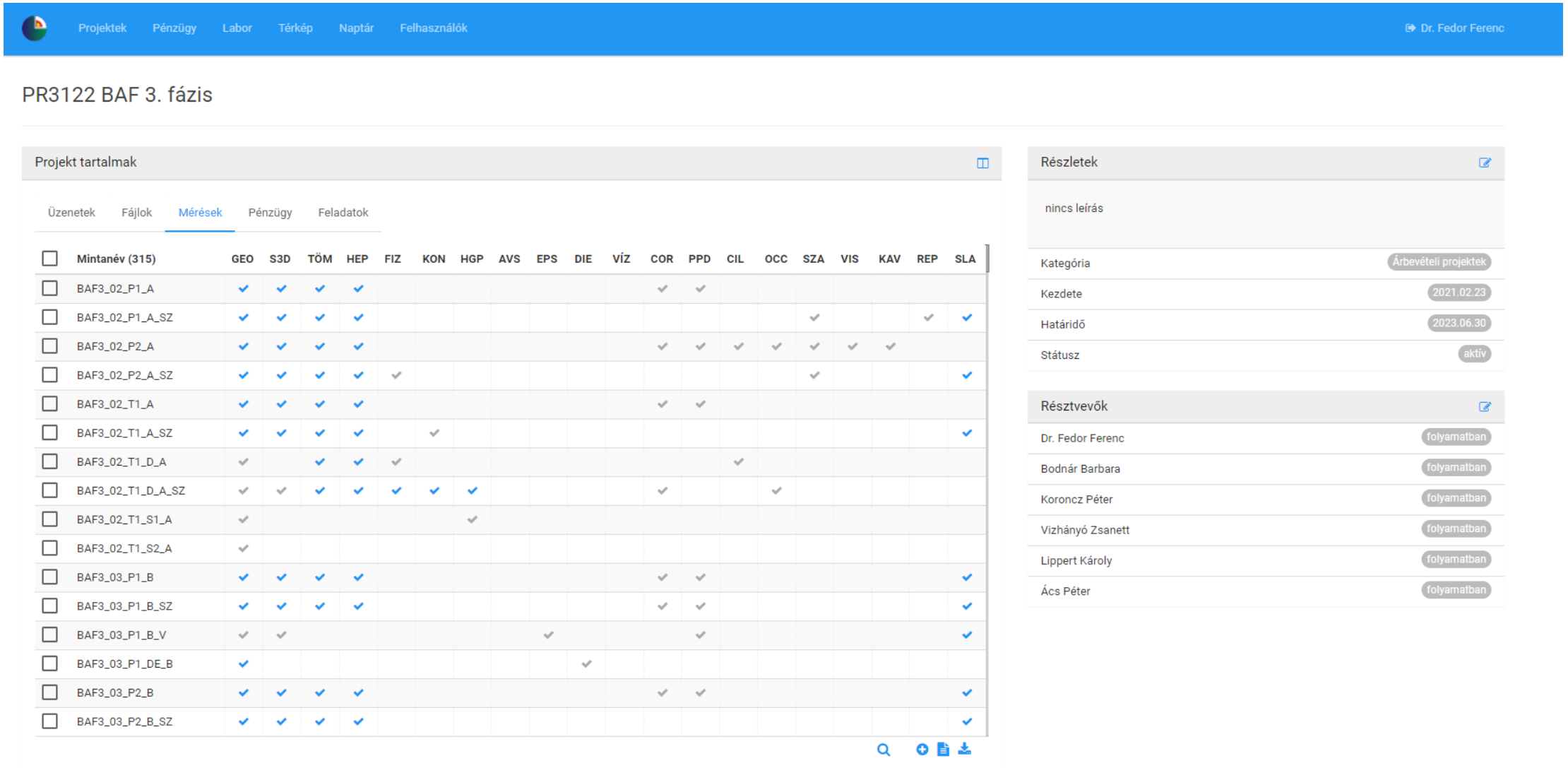
- **He-gas porosity**
- **Core Flooding Tests (Reservoir stimulation)**
- **Ultrasonic velocity measurements**
- **Critical flow velocity**
- **Invers-reverse permeability**
- **Relative permeability**
- **Multifrequance electric impedance tomography (under development)**
- **Thermal conductivity (under development)**



Automized pressure, temperature steps, in one step many different parameter could be measured.

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Smart Reservoir Lab - software background



Smartlab/GEOCHEM – other info



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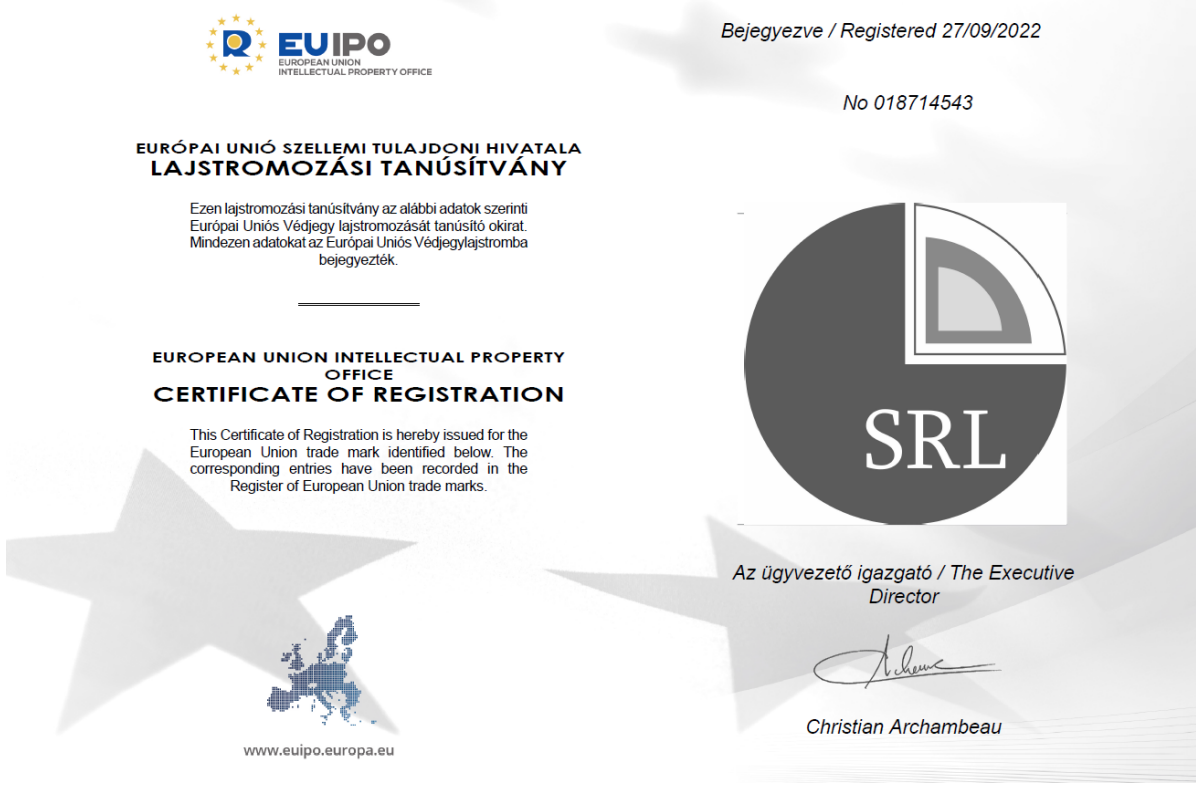
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Az ügyvezető igazgató / The Executive Director

Christian Archambeau

WIPO registration: EU, UK, Turkey, Australia

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Contact:

Ferenc Fedor, PhD., MBA
fedor.ferenc@geochem-ltd.eu

GEOCHEM Geological and Environmental Research, Consultancy and Service Ltd. (HUNGARY)
www.geochem-ltd.eu