Edna M. Bisso Bi Mba | Wintershall Dea TSC GmbH & Co. KG

LOCAL PLAYER, GLOBAL HEROES: EIN ORT FÜR INNOVATIONEN – DAS TECHNOLOGIE UND SERVICE CENTER VON HARBOUR ENERGY

Tailor-made laboratory solutions for the full lifecycle of energy projects. The Technology and Services Center based in Barnstorf is a highly specialized energy technology center that ensures the safety, sustainability and future development of Harbour Energy’s global operations. It promotes technology, innovation and expert advice for customers worldwide. At the TSC, we provide a multifaceted portfolio of complex laboratory and fit-for-purpose solutions which support the assessment of reservoirs and the optimisation of operations, recovery, and storage. Our subject-matter experts are also involved in technology scouting and ideation, contributing to the development of new technology.

We support Harbour Energy’s domestic and international business locations and external clients with analytical investigations and consulting services. Our Drilling Fluids & Cement Lab provides the basis for cost-effective selection of appropriate third-party products, root cause analysis of drilling problems as well as quality control of formulations and procedures. A multitude of chemistry-related aspects specific to the production of gas and oil are being addressed by our Gas & Oil Field Services. Our Materials & Corrosion Lab is equipped with a variety of characterisation and testing methods. References from material and corrosion science as well as synergies with chemistry ensure cost-effective and customised solutions.

Furthermore, we offer a broad range of consulting and analytical services from nano to basin scale. Our Reservoir Specialists Group are subject-matter experts in micropaleontology, mineralogy and reservoir quality prediction. The Advanced Core Analysis & Digital Rocks Lab provides petrophysical measurements, characterizes reservoir rock-fluid interactions, conducts core flooding experiments, and offers pore-scale analyses and simulations. The leading-edge digital rocks technology helps analyse the potential of gas and oil fields quickly, precisely and efficiently. The technology uses rock core samples acquired from exploration, appraisal and development wells that are imaged with a microcomputed tomography scanner to create 3D digital models of rock samples. Moreover, we store over 70,000 meters of rock samples and thousands of drill cuttings from our operations since 1911, which form the basis for every subsurface study carried out. The samples are the company’s geological “memory” and can even be re-evaluated decades later.

To unlock the potential of the geological subsurface, ensure safe operations, advance initiatives for the time after the fossil age and develop solutions for the decarbonisation, the TSC is continuously seeking to increase the skills of its energy transition capabilities and is keen to collaborate with a robust network that includes research institutions, external operators, academia. How do we use existing reservoir characterisation and laboratory services for the energy transition? How do we apply Digital Rocks and cement qualification analysis to carbon capture and storage (CCS)? How do we ensure safe geothermal operations by performing core flooding test at high pressure – high temperatures conditions to simulate maximum flow rates and formation damage?

Technology & Service Center (TSC)

- Local player, global heroes: Ein Ort für Innovationen
- Edna Michelle Bisso Bi Mba, Head of Reservoir Services

Technology & Service Center (TSC)

- **Competence center** for Reservoir and Production Services
- **Complex** laboratory and **fit-for-purpose** solutions
- E&P specialist technical **service on-demand** (SoD) supported by laboratory equipment
- **Optimisation** of operations, recovery and storage
- Technology scouting and development

State-of-the-art equipment for **rock**, **material**, **hydrocarbon** and **water analysis** on the Central European market

Technology & Service Center (TSC)

Fact sheet

Solution Center

combined with

Business Continuity

Diverse Portfolio

Value Generation

> **40** value creating Projects / year

12 Technical Disciplines

2000+ Samples analyzed / year

10+ Journal & Conference publications / year

Diverse client portfolio, internally and externally

Solutions for **energy transition**

Leveraging Technology, Innovation and Services since 1958

Technology & Service Center (TSC)

Modern Analysis and Consulting

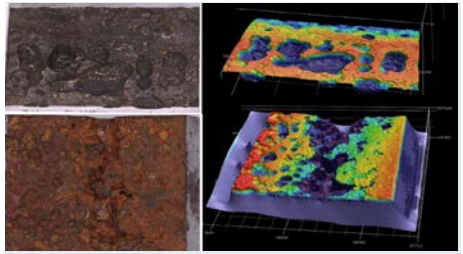
Competence center – integrated expertise & fit-for-purpose solutions

Production Services

Reservoir Services

Production Chemistry

- Water, gas & oil analytics
- Process **safety** & **monitoring**
- Flow assurance
- Production **optimization**
- **Real-time** problem solving in drilling and production



Materials & Corrosion

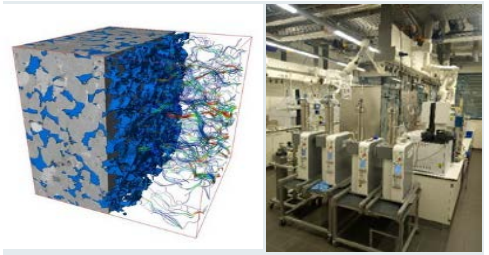
- Material selection & Testing
- **Root-cause** analysis
- Corrosion **prevention** and **management**

Drilling Fluids & Cement

- Drilling fluids and cement slurries **QA/QC**
- Mud and cement slurries **optimization**
- Fluid properties and compatibility assessment

Reservoir Specialists

- Mineralogy & Petrography
- **Micropaleontology** & **Biostratigraphy** (asset age-dating, Biosteering)
- Largest **core archive** in Germany
- Geotechnical Support

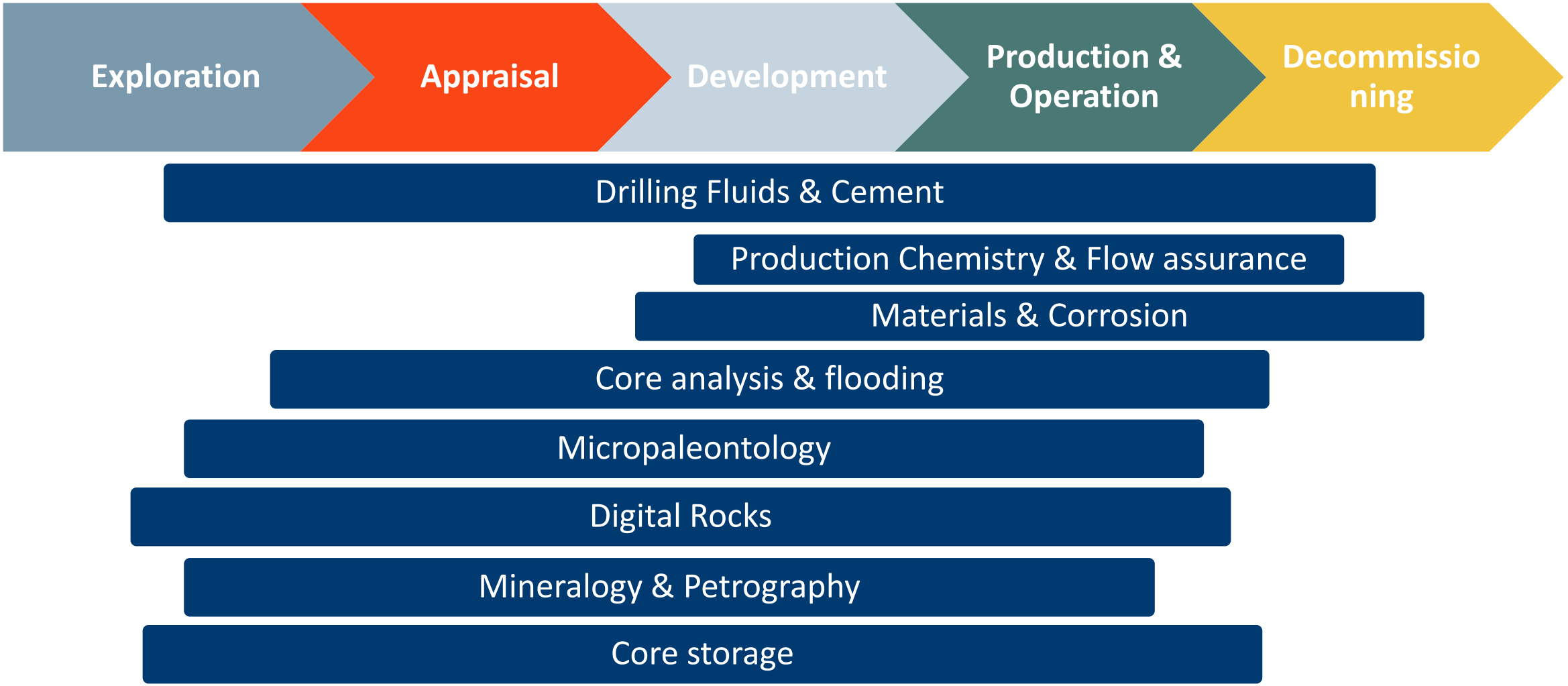


Advanced Core Analysis

- Unique combination of **Digital** (rock imaging and processing) & **Conventional Core Analysis**
- Integrated usage of HPHT for **core flooding** studies
- **Formation damage** studies
- PVT & core analysis **QA/QC**

Technology & Service Center (TSC)

Solution Center for the entire Lifecycle of Projects



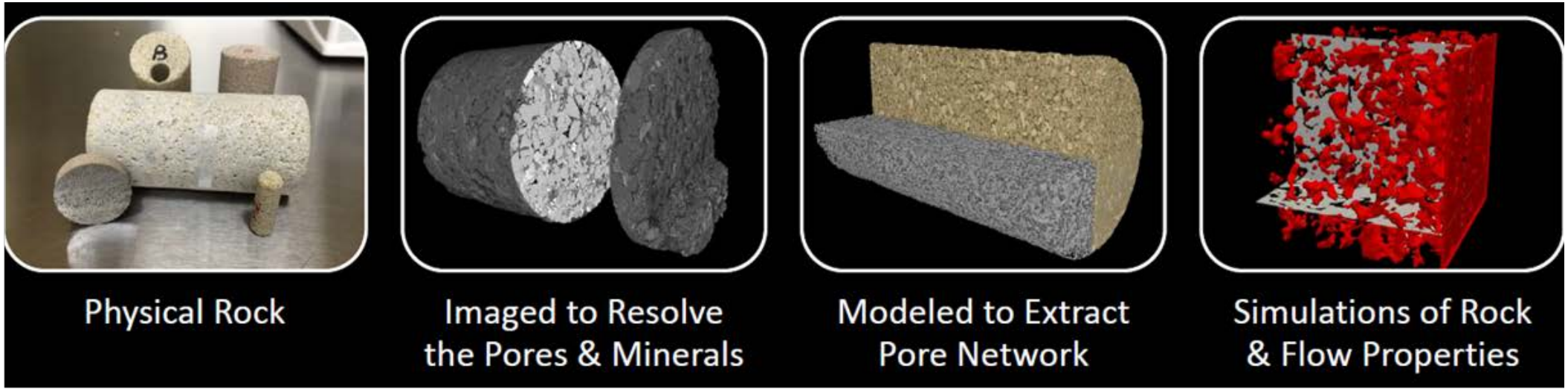
Solutions for the Energy Transition

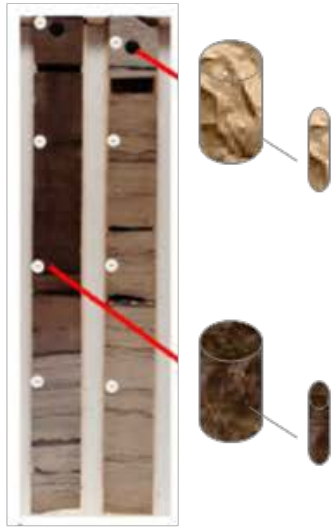
- Technology & Service Center Capabilities


Over 70,000 metres of drilled cores
Important analogue of rock materials
100+ visitors from Academia & Industry

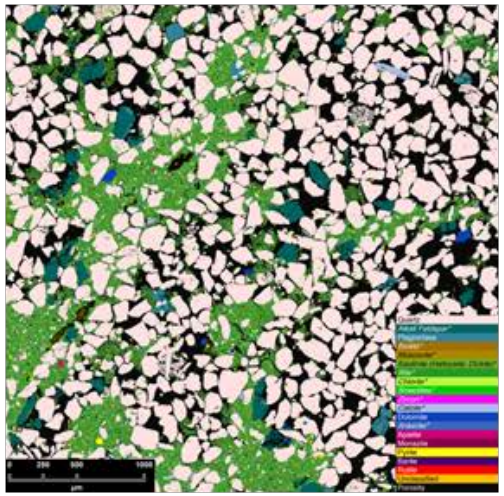
Digital Core Analysis – Technology & Service Center

Workflow overview

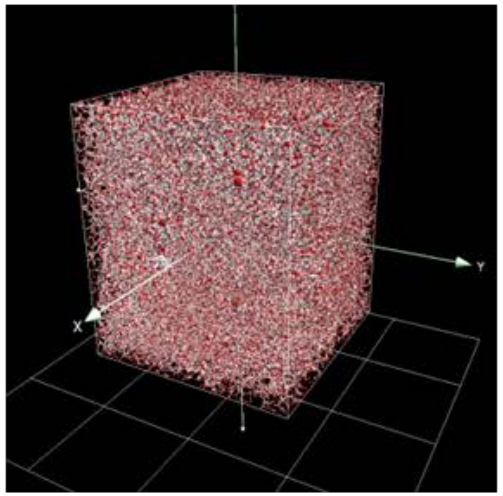




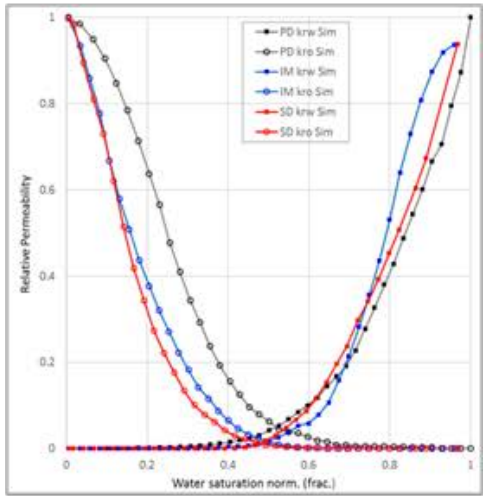
Core-Plug-Subplug



Rock characterization



Digital Rock model



Digital SCAL

Solutions for the Energy transition

Application for Carbon Storage

- **Digital Rocks Physics** - Uncertainties reduction regarding wettability state and fast-track input generation for simulation studies
- **Cement qualification study** for CCS application
  - COLLATE - **CO_2 L**iquid **LA**boratory **TE**sting
  - GREENSAND
  - INJECTWELL

Autoclaves for CO_2 exposure

Solutions for the Energy transition

Application for Geothermal operations

- Typical very high flow rates needed to achieve economic operation
- Problems well known from E&P operations:
  - Production side
    - Sand production (wellbore stability, damage to facilities)
    - Scaling (due to p,T changes)
  - Injection side
    - External/internal Filter cake formation (particles, corrosion)
    - Scaling (due to p,T changes)
    - Fines migration

Core Flooding Tests performed at high pressure / temperature to simulate maximum flow rates and formation damages

Technology & Service Center (TSC)

Clients & Partners

- The TSC is delivering its expertise to most HE Business Units and to third parties

- **We believe that technology development & innovation needs a diverse team of experts in various disciplines from industry, research and academia**

Thank you!

We look forward to working with you.
Do not hesitate to contact us.

Technology & Service Center