

# HOT

## SHAPING THE ENERGY FUTURE

Our Expertise – Your Solution

Trusted Advisors since 1986



HYDROGEN STORAGE  
 MENTORING OPERATIONAL SUPPORT  
 PRACTICAL KNOW-HOW  
**INSPIOR** **FLUIDICSLAB**  
 FIELD DEVELOPMENT PLANNING  
 GLOBAL ACTIVITIES QUALITY KNOWLEDGE UNDERGROUND GAS STORAGE  
**CONSULTING** EXCELLENCE  
 EXPERTISE **CCS/CCU**  
 INTEGRATION EXPERIENCE  
 EOR LABORATORY SERVICES **NEXT GENERATION LAB**  
 RESERVOIR CHARACTERISATION EXPLORATION ACREAGE EVALUATION  
**TRAINING** CARBON CAPTURE AND STORAGE  
 INTEGRATED ASSET MODELLING  
 ASSISTED HISTORY MATCHING  
 IMPROVED / ENHANCED  
 RECOVERY  
**OIL&GAS** ENERGY  
 TRANSITION  
 HYDROGEN  
 PRODUCTION TECHNOLOGY  
 GEOTHERMAL ENERGY  
 LEAD AND PROSPECT GENERATION  
 UNDERGROUND STORAGE  
**MICROFLUIDICS**  
 DEDICATION  
 AUDITING



## A MULTIDISCIPLINARY CONSULTANCY WITH GLOBAL ACTIVITIES

The HOT Energy Group (HOT) is a technology-driven, multidisciplinary, independent organisation serving the energy industry. HOT provides best-in-class consultancy, laboratory, software and training solutions in underground storage, field development, enhanced oil recovery (IOR/EOR), and deep geothermal energy utilisation.

35+ years of specialised experience in the subsurface domain make HOT the preferred partner for governmental organisations, banks and financial institutions, international and national energy corporations, underground storage operators, EPC contractors and services providers. We support our customers in the assessment, planning, development, optimisation and monitoring of:

- ▮ Underground gas storage facilities (UGS)
- ▮ CO2 sequestration, storage and utilisation (CCS/CCU)
- ▮ Underground hydrogen storage (UHS)
- ▮ (CO2 free) oil & gas field development.

Working side by side with our customers across the globe to deliver best practices and timely solutions, HOT's global footprint is supported by offices in Austria (Headquarters), Germany and Libya, and a network of alliance and representative offices.



## INTEGRATION & INNOVATION WE LIVE IT

A team of dedicated specialists who understands cross-disciplinary integration is the foundation for us to consistently deliver real results to our clients. Innovation leads us to success.

## KNOWLEDGE WE SHARE IT

Our extensive experience in training and development gives us the ability to provide competency-based training solutions to minimise the skills gap.

## ENERGY WE HAVE IT

We have the energy, the resources, the experience and the motivation to deliver sustainable and valued projects.

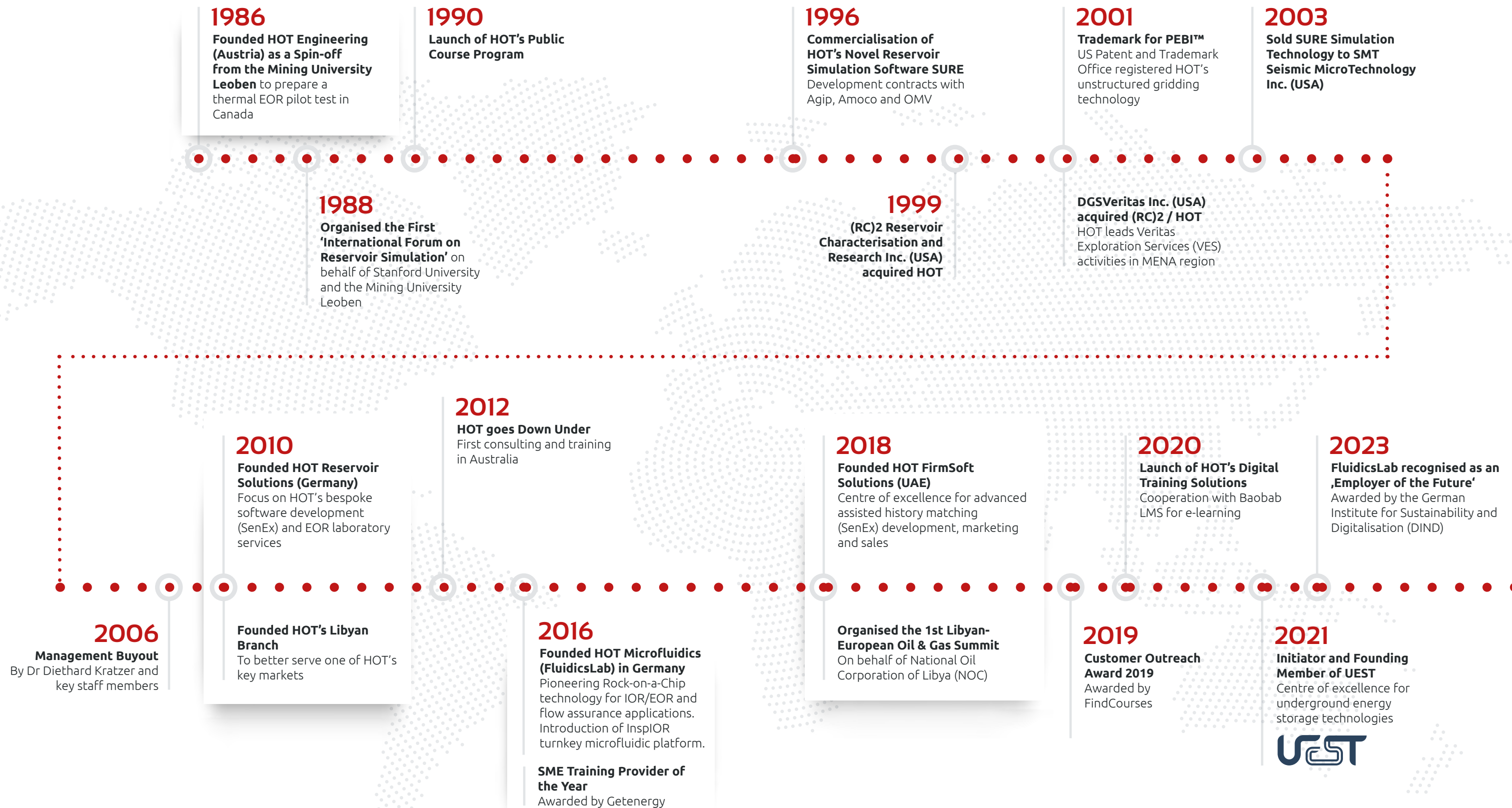
Our valued reputation is your guarantee of a total solution for your subsurface and training needs.

## QUALITY MATTERS

*„That’s why, year after year, we do our utmost for each and every project. By bringing together results-driven individuals and supporting a can-do culture, we have built a team that delivers. We have every confidence in our team, you can too.“*

– Dr Diethard Kratzer, Founder and CEO





**WE ARE WHAT WE REPEATEDLY DO.  
EXCELLENCE, THEN, IS NOT AN ACT,  
BUT A HABIT.**

– Will Durant



## SEAMLESS INTEGRATION OF EXPERTISE AND SERVICES

Our approach follows the seamless integration of expertise of all disciplines involved in every single project we undertake. This guarantees best practices, highest quality and timely project solutions.

We strive to do our best, on time and budget, and thrive on the tough jobs. Our work is supported by industry-standard software and complemented with our specialist proprietary tools.



### CONSULTING SERVICES

Integrated studies (IAM/FDP/EOR)  
Due diligence (CPR/peer review/second opinion)



### FLUIDICSLAB

(Micro)fluidics, PVT & flow assurance,  
pore scale investigations  
Turnkey systems and components



### SOFTWARE

Next-generation assisted history matching  
at well level (SenEx)



### TRAINING AND KNOWLEDGE TRANSFER

Competency-based technical training  
Business and management training

## 35+ YEARS OF EXCELLENCE

Our extensive subsurface knowledge has made us a prime partner for governmental authorities, financial institutions, energy companies and service providers.







## WE WORK TOGETHER TO ACHIEVE

– Dr Diethard Kratzer, Founder and CEO

## CUTTING-EDGE PROFICIENCY

Skills, Spirit, Dedication: The Secret of our Success

We have a globally-experienced, multidisciplinary and multicultural team of specialists that reflect the latest thinking, developments and technologies in the industry. Our highly motivated staff and associates are keen to tackle the real challenges brought to us by our clients. With the confidence to work individually and a team player's attitude, we work together to achieve.



## LEADING THE WAY IN ENERGY SOLUTIONS

Our vast subsurface experience comes from more than 35 years of characterising, modelling and simulating oil & gas reservoirs, gas storage facilities and aquifers. Our knowledge of geological principles, underground flow processes, and production, injection and storage operations has made us a prime partner for energy companies following the net-zero path.

### OIL AND GAS

Integrated asset modelling, field (re-)development and due diligence are our contributions to the global energy supply. Our FluidicsLab's PVT, SCAL, core and microfluidic flooding expertise complements our advanced fluid characterisation and enhanced recovery services.



### UNDERGROUND GAS STORAGE

We designed more than 20 billion cubic metres of storage capacity. Our reservoir models are used for day-to-day decision making and are vital for Central Europe's continued energy supply.



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### UNDERGROUND CO2 STORAGE

CCS is a key pillar for fighting climate change. We leverage our extensive storage experience for designing and planning CCS/CCU projects. Our FluidicsLab provides the lab data required for secure CO2 operations.



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### HOLISTIC ASSESSMENTS REQUIRE JOINT FORCES

That's why HOT teamed up with the ILF Group, RED Drilling & Services and CAC Engineering to form a Centre of Excellence.

This consortium fuses the individual partners' decades of project management, specialised know-how and expertise in underground storage technologies. UEST empowers energy leaders by providing strategic advice and delivering high-end and cutting-edge solutions for natural gas, carbon dioxide and hydrogen storage, and geothermal energy utilisation.

**Discover more: [www.underground.energy](http://www.underground.energy)**

### UNDERGROUND HYDROGEN STORAGE

We support storage operators to become H2-ready. Our FluidicsLab provides the measurements for our assessments of the technical and geological integrity, and performance of potential hydrogen storage sites.



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### DEEP GEOTHERMAL ENERGY

Our vast G&G and reservoir characterisation experience combined with our fluid modelling and simulation expertise make us the preferred supplier for designing and planning sustainable geothermal energy utilisation projects.







**UNLOCK THE FULL  
POTENTIAL OF  
YOUR RESERVOIR**

**WE TRUST OUR MODELS  
SO DO OUR CUSTOMERS**

## OIL AND GAS

### Profound Expertise to Support the Energy Supply

Energy transition is a global priority. While the world is moving towards the goal of net-zero carbon emission, fossil fuels will continue to play a significant role in the global energy system for many years to come.

To meet these requirements, we offer our customers a unique combination of expertise, competencies and abilities as well as track record in challenging projects. Over three decades of experience in upstream consulting, ranging from international (IOC) and national (NOC) oil corporations to private energy companies, storage operators and oilfield services providers, have sharpened our ability to deliver successful and seamlessly integrated projects and workflows with high return on investment.

#### **DUE DILIGENCE - CPR, PEER REVIEW, SECOND OPINION**

Our highly integrated workstyles apply fast-track assessments with an interdisciplinary team of experts familiar with truly cross-disciplinary and advanced workflows, enabling robust results in the shortest possible time.

#### **EXPLORATION AND DATA MANAGEMENT**

Strategically allocating finite exploration funds is crucial to replacing reserves. Our approach combines play-based analysis at basin-to-block scales, operational optimisation and comprehensive geological and geophysical (G&G) evaluation to manage exploration risk.

#### **RESERVOIR CHARACTERISATION, ASSESSMENT AND PRODUCTION OPTIMISATION**

We support you to make informed decisions on your oil and gas assets by identifying key performance drivers based on concurrent data integration with close interaction between disciplines. Complex geological settings require first to characterise, only then to model.

#### **FIELD DEVELOPMENT AND INTEGRATED ASSET MODELLING**

HOT has performed numerous integrated reservoir and asset studies, ranging from new discoveries to mature giant fields, from clastics to fractured carbonate environments, from simple structures to heavily compartmented and fractured environments.

We have completed these studies to the benefit and satisfaction of our clients.

**We get hired to build models to believe in!**





**STORAGE OPERATIONS  
ARE MORE COMPLEX  
FROM A MODELLING  
POINT OF VIEW**

**OUR MODELS ARE  
USED FOR DAY-TO-DAY  
DECISION MAKING**

## ENERGY TRANSITION

Benefit from Decades of Gas Storage Experience

**With 50+ years of successful underground gas storage (UGS) experience, Austria is a leader for underground storage technology applications and operations.**

HOT designed more than 20 billion cubic metres of storage capacity in the past twenty years. Our specialised expertise in the subsurface domain has made us the preferred partner for designing, planning, developing, optimising and monitoring underground storage of natural gas (UGS), carbon dioxide (CCS/CCU) and hydrogen (UHS), as well as for geothermal energy utilisation.

We act as a know-how provider throughout all development phases.

Pre-screening /  
Candidate Selection

Development

Optimisation

Surveillance /  
Monitoring

### PRE-SCREENING AND CANDIDATE SELECTION

Our services range from data screening and recommendations for further data acquisition requirements to full reservoir characterisation and modelling studies (dependent on data availability and prospect maturity): assess/review/QC data, develop preliminary/conceptual static reservoir model(s), perform dynamic flow simulation and assess key uncertainties.

### ASSET DEVELOPMENT

Derive the best way forward from high-resolution reservoir flow models, replicating the performance of the depletion period. Integrate new and/or reworked data, incorporate, as needed, optional special tasks (flow assurance, etc.), perform detailed well trajectory planning and optimisation, develop surveillance/monitoring concepts and quantify remaining uncertainties.

### OPTIMISATION OF OPERATIONS

Integrity assessment of the entire storage site, debottlenecking and operations' optimisation studies. Take advantage of the integrated knowledge built into a representative dynamic flow model: optimise the number, type and trajectory of storage wells; define deliverabilities and peak rates to meet contractual obligations. Minimise remaining uncertainties and maximise return on investment.

### ASSET SURVEILLANCE AND MONITORING

Refine surveillance systems, minimise operational uncertainties. Secure long-term integrity of facility and operations. Certifications.





**WE SPEED UP YOUR  
LAB ROUTINES AND  
PROJECTS**

## FLUIDICSLAB - LABWORK MATTERS

### Accelerating the Energy Transition

Our fully equipped laboratory puts us in a position to perform laboratory experiments using fluids (oil & brines) and various gas mixtures including hydrogen, carbon dioxide and hydrocarbons at reservoir conditions in compliance with highest HSE regulations.

As a leading High-Pressure High Temperature (HPHT) technology provider for PVT, IOR/EOR, CCS/CCU and H<sub>2</sub> storage applications, we serve energy companies and research organisations, streamlining lab routines while significantly reducing costs.

#### PVT & FLOW ASSURANCE: FAST & ACCURATE TESTING SERVICES

We understand the unique challenges that energy companies face in today's competitive market. Therefore, we designed innovative, reliable and HSE compliant fluid testing solutions to meet our customer's challenges with CCS/CCU, hydrogen and IOR/EOR projects.

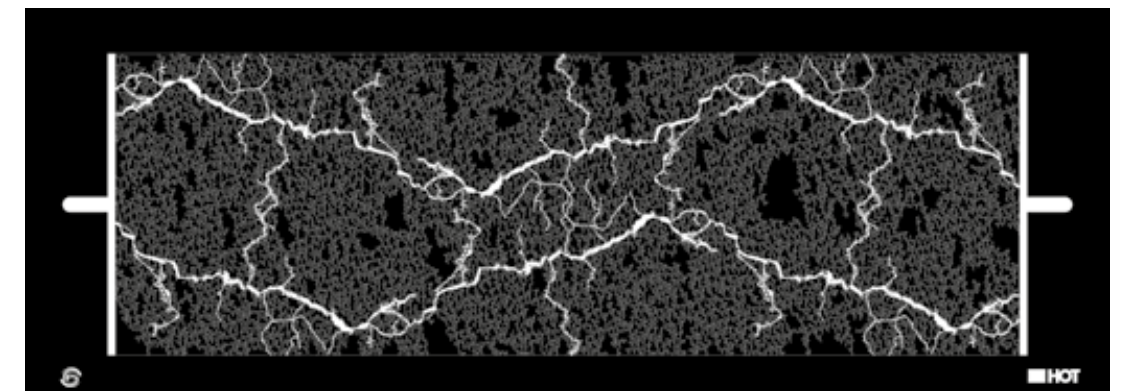
#### CORE STUDIES: ALL STATE OF THE ART

We cover all aspects of lab investigations needed for secure and optimised asset operations: from caprock integrity to multiphase flow experiments. Our state-of-the-art lab facilities and experienced team of experts provide the support you need.

#### MICROFLUIDICS: THE WINDOW INTO YOUR RESERVOIR

We integrate microfluidics to complement and/or replace conventional measurements for IOR/EOR, H<sub>2</sub> storage and CCS/CCU applications.

Microfluidics visualises what's happening inside your pore system, such as oil mobilisation and displacement, precipitation, fluid-fluid interaction, wettability modification, emulsification and foam generation, bacteria growth, and more. With fewer fluids and chemicals and less time required compared to conventional methods, we minimise environmental impact.



This is how the fractured system looks like in a Mexican oilfield



## A WINDOW INTO YOUR RESERVOIR

## INSPIOR®: THE TURNKEY MICROFLUIDIC TECHNOLOGY PLATFORM

Visualise, Digitise, Analyse and Quantify Fluid Flow

**Accurate and efficient fluid and fluid flow analysis at high pressure and high temperature (HPHT), requiring only a few millilitres of sample.**

Microfluidic fluid analysis technology is an integral part of our laboratory workflows. We integrate it to complement or replace conventional measurement methods for Improved and Enhanced Oil Recovery (IOR/EOR), Carbon Capture, Storage and Utilisation (CCS/CCU) and Hydrogen Storage applications.



### BROAD RANGE OF APPLICATIONS

From fast and accurate fluid testing to process visualisation and an all-in-one technology platform: Our InspIOR microfluidic systems are designed to enhance efficiency and convenience in your laboratory workflows:

- ✦ Oil Recovery factors and mechanisms
- ✦ Residual/initial saturation distributions
- ✦ IOR / EOR screening
- ✦ Solubility and flow assurance
- ✦ Fast phase envelopes
- ✦ Pore scale trapping mechanisms
- ✦ Minimum miscibility pressure (MMP)
- ✦ Asphaltene and wax precipitation
- ✦ Drying of CO<sub>2</sub> wells and salt precipitation
- ✦ Methanation – bacteria growth

### BESPOKE MICROMODELS COMPLEMENT OUR TURNKEY TECHNOLOGY

Our standard glass-silicon-glass (GSG) micromodels (chips) are based on high-resolution core images (micro-CT scans, etc) and are delivered either oil-, mixed- or water-wet.

An unlimited number of identical chips can be produced, and can also be re-used many times. This allows the unbiased comparison between individual flooding experiments.





## SenEx - THE ADVANCED TOOL FOR RAPID AND SUPERIOR HISTORY MATCHING

## GAME-CHANGING ASSISTED HISTORY MATCHING SOFTWARE

Fast, Focused, Flexible, Forward-Thinking

Our flagship software SenEx (Sensitivity Explorer) improves the history match quality at well-level and significantly speeds up the history matching exercise.

SenEx arrives at high-quality and geologically consistent history matched models with typically less than 20 simulation runs, **no matter how many wells to match, no matter how long the history to match, no matter how many parameters to tune.**

### SenEx - HOW IT WORKS

There is no trial-and-error in SenEx. SenEx applies advanced mathematical techniques to compute sensitivities analytically and hence efficiently. It works at the grid block level, therefore eliminates the need for box multipliers, leading to geologically sound and consistent models.

After each simulation run, SenEx generates new property arrays to be used in the next simulation run. This loop is repeated until a satisfactory match is finally reached. This advanced approach saves time and reduces the amount of human resources required.

### WHY SenEx?

- ▮ Reduces drastically the turnaround time of history matching mature fields
- ▮ Achieves superior well-level history-match quality with typically less than 20 simulation runs
- ▮ Generates geologically sound and consistent reservoir models
- ▮ Works at the grid block level eliminating the need for “box multipliers”
- ▮ Supports various black-oil reservoir simulators



## TRAINING SOLUTIONS FOR TOMORROW'S CHALLENGES

## TRAINING SOLUTIONS FOR TOMORROW'S CHALLENGES

### We Accelerate Careers and Empower People

Over three decades, we have honed our capability to design and deliver cutting-edge training solutions, enabling us to continuously incorporate the latest thinking and industry developments into our training portfolio.

With our strong commitment to further education, we have assisted thousands of oil, gas and energy industry professionals by improving their knowledge, skills and expertise. Whether you have just started your career or are an experienced professional, our comprehensive portfolio of knowledge transfer services will help you to strengthen your competencies.

## WE...

... deliver a **wide range of training solutions** in upstream oil & gas industry disciplines and energy transition topics.

...are **independent** and so are the technology and workflows we present and the software we use in our training programs.

...are the 2016 & 2017 Getenergy **'SME Training Provider of the Year'** for consistently developing and delivering industry leading training programs.

...have been awarded the **"Customer Outreach Award 2019"** by FindCourses, a global training search engine for professionals. FindCourses has recognized HOT as a trusted partner in their Customer Outreach award selection process based on prompt and excellent customer care and professionalism in handling training inquiries.

...have a genuine drive and enthusiasm for **facilitating measurable improvements** in the performance of our clients' employees. For us, it is more than just a course or training project - it is our passion and commitment to further education and capacity building.



Winner of the 2016 & 2017 SME Training  
Provider of the Year Award





## YOUR TRUSTED PARTNER FOR PROFESSIONAL DEVELOPMENT

## TRAINING & KNOWLEDGE TRANSFER

### We Deliver Excellence

The energy transition is a global priority. While the world is moving towards net-zero carbon emission, fossil fuels will continue to play a significant role in the global energy system for many years.

Our wide range of energy training solutions covers all crucial stages of oil and gas exploration, production value chain, and energy transition. From public short courses to tailored integrated development programs: With a core team of industry experts, we deliver various professional training solutions and services that help our clients ensure they meet the requirements of today's increasingly complex energy industry environment.

#### PUBLIC SHORT COURSES

We offer 100+ public courses annually in various locations worldwide. Our short courses reflect our diverse training services portfolio, including the most current topics related to the Energy Transition and E&P, Surface Facilities, Finance and Contracting and Personal Development.

#### CUSTOMISED TRAINING

We design training solutions by taking into account your company's requirements and objectives as well as your staff's background and experience. From standard to tailored and bespoke in-house programs - we will find the ideal balance between classroom, workshop and on-the-job training.

#### NEW-HIRE AND LONG-TERM TRAINING

These multidisciplinary programs focus on the practical applications required by the industry and are designed to accelerate the development of new graduates, young and experienced professionals and their integration as contributors to the workforce.

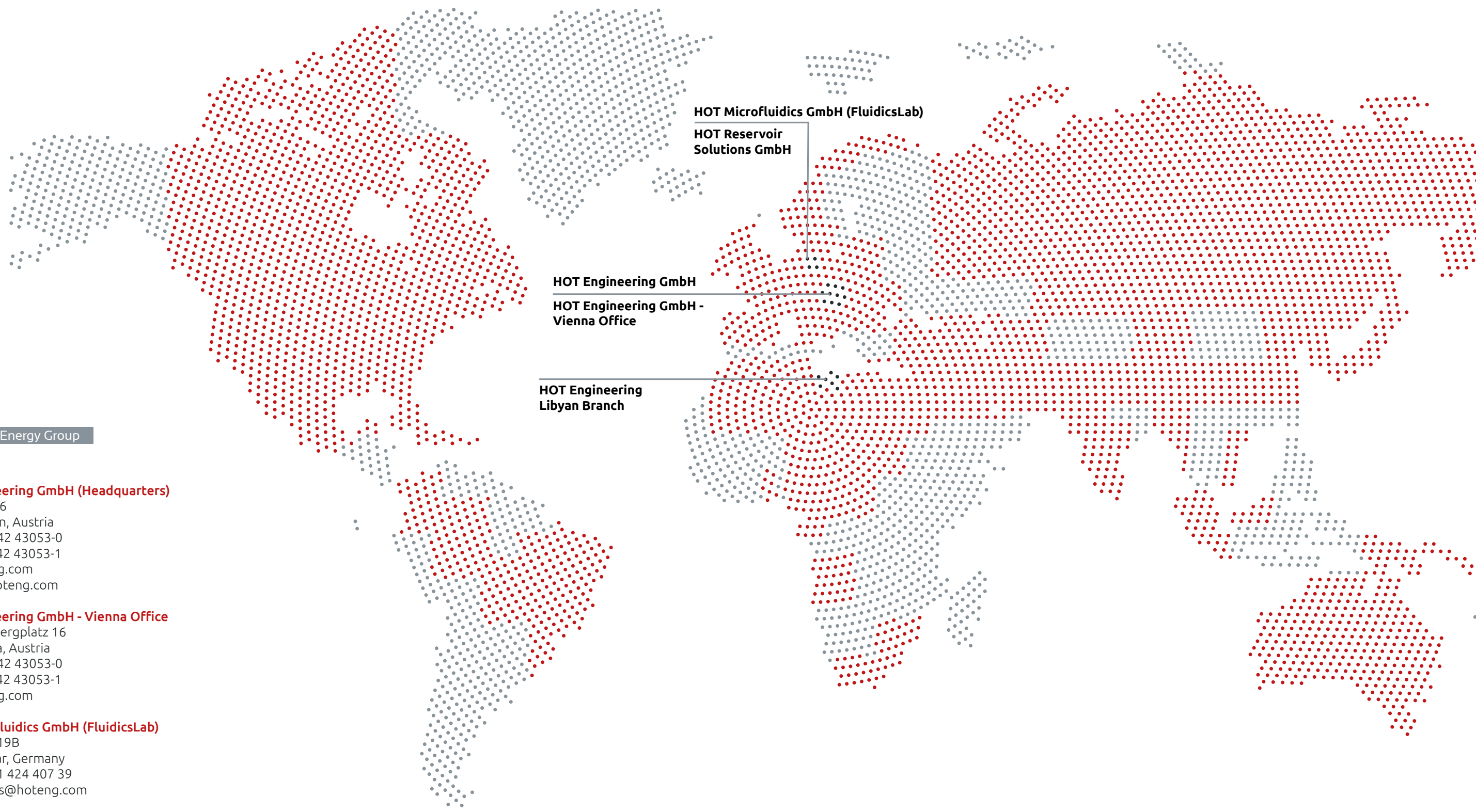
#### TEAM DEVELOPMENT

We work with your people at all stages of their development to improve performance: At the start of projects when the team is experiencing problems, when they are going through changes in priorities and personnel or when they need to develop positive relationships with key stakeholders.

#### ON-THE-JOB TRAINING, COACHING AND MENTORING

We develop the skills of individuals and small groups, help them think through and resolve their problems. Supplying our technical expertise as required enables you to make informed decisions about the most appropriate way forward.





HOT Microfluidics GmbH (FluidicsLab)  
HOT Reservoir  
Solutions GmbH

HOT Engineering GmbH  
HOT Engineering GmbH -  
Vienna Office

HOT Engineering  
Libyan Branch

#### The HOT Energy Group

##### **HOT Engineering GmbH (Headquarters)**

Parkstrasse 6  
8700 Leoben, Austria  
Tel.: +43 3842 43053-0  
Fax: +43 3842 43053-1  
hot@hoteng.com  
training@hoteng.com

##### **HOT Engineering GmbH - Vienna Office**

Schwarzenbergplatz 16  
1010 Vienna, Austria  
Tel.: +43 3842 43053-0  
Fax: +43 3842 43053-1  
hot@hoteng.com

##### **HOT Microfluidics GmbH (FluidicsLab)**

Am Stollen 19B  
38640 Goslar, Germany  
Tel.: +49 151 424 407 39  
microfluidics@hoteng.com

##### **HOT Reservoir Solutions GmbH**

Am Stollen 19B  
38640 Goslar, Germany  
Tel.: +49 151 424 407 39  
hotrs@hoteng.com

##### **HOT Engineering Libyan Branch**

Essyahia City  
Tripoli, Libya  
Tel.: +218 21 483 7278  
libya@hoteng.com

## GLOBAL ACTIVITIES


Our global footprint is supported by HOT offices in Austria, Germany and Libya, and a network of alliance and representative offices.



LOOKING FOR A PARTNER WHO'LL  
**MAKE A DIFFERENCE?**

[www.hoteng.com](http://www.hoteng.com)  
[www.fluidicslab.com](http://www.fluidicslab.com)

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