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AGH
AGH University of Krakow

SPE International
AGH University of Krakow
SPE Student Chapter

Message from the Organizing Committee

Dear Participants and Guests,

As the organizing committee, we are honored to welcome you to the **13th East Meets West Congress**. Over the past few months, we have worked hard to make this event happen and seeing you all here today confirms that our efforts have paid off. Your presence highlights the importance of this gathering and our shared commitment to innovation and progress. We sincerely thank our partners and sponsors for their support, which has made it possible to bring together students, young researchers, and industry professionals. It is inspiring to see the next generation of experts eager to exchange ideas and present their innovations.

This year's theme, "Tomorrow's Energy Starts Today," emphasizes the key role young minds play in shaping the future of energy. The research and ideas you present through posters and presentations will contribute to the development of new solutions. We hope this conference inspires and supports you on this journey.

This event also marks another step toward restoring the international scale of our congress, as it was before the pandemic. Compared to last year, we have more sponsors, more participants, and a stronger presence. This progress shows we are on the right path, and we are committed to growing even further.

This congress is not just about research—it is also a great opportunity to exchange knowledge between experts and students who share a passion for the oil and gas industry. We encourage you to take full advantage of this experience, engage in discussions, and build lasting connections. With that, I wish you all inspiring speeches, insightful conversations, and unforgettable moments.

Let's make this conference a success together!

Best regards,

East Meets West Organizing Committee

Agenda

01.04.2025 - Day 1

15:00 – 17:00	Registration AGH University of Krakow, building A4, room 3 (ground floor)
19:00 – 22:00	Icebreaker Party + Registration (badges only) Slow Cafe Bar .punkt, Staromostowa 1, 30-506 Kraków

02.04.2025 - Day 2

08:30 – 09:00	Registration + morning coffee AGH University of Krakow, building A4, room 3 (ground floor)
09:00 – 09:45	13th EMW Congress 2025 Opening Ceremony
09:45 – 11:00	Technical presentations – part 1
11:00 – 11:30	Coffee with CEO
11:30 – 12:20	Technical presentations – part 2
12:20 – 13:30	Lunch break
13:30 – 15:00	Student Paper Session - part 1
17:00 – 20:00	Integration field game and city visiting

Poster session (contest with prizes)

Agenda

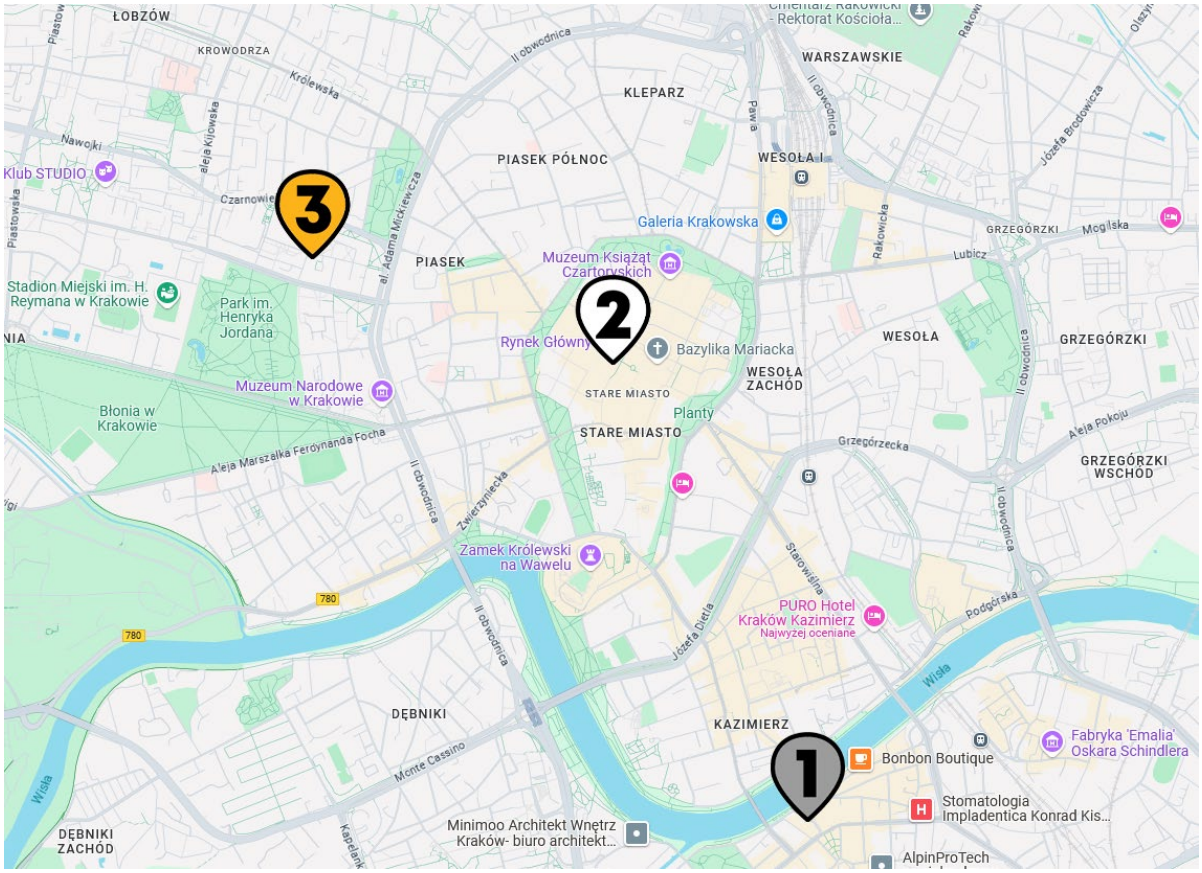
03.04.2025 - Day 3

08:30 – 09:00		Morning coffee AGH University of Krakow, building A4, room 3 (ground floor)
09:00 – 10:00		Panel Discussion: Tomorrow’s energy starts today
10:00 – 10:30		Coffee break
10:30 – 11:30	Poster session (contest with prizes)	Student Paper Session - part 2
11:30 - 12:00		Coffee break
12:00 – 13:00		Student Paper Session - part 3
13:00 – 14:00		Lunch break
14:00 – 14:30		Award Ceremony
19:00 – 23:45		Gala dinner (with congress closure) Restauracja Sukiennice, Rynek Główny 3, 31-042 Kraków

04.04.2025 - Day 4

09:00 – 16:00		Field trip - Wieliczka Salt Mine Miners’ Route (Regis Shaft) pl. Kościuszki 9, 32-020 Wieliczka

Organizational matters



1. **Bar .punkt - Icebreaking Party**

   Staromostowa 1, 30-506 Kraków

2. **Restauracja Sukiennice – Gala Dinner**

   Rynek Główny 3, 31-042 Kraków

3. **AGH University of Kraków, building A4, room 3**

   Al. Adama Mickiewicza 30, 30-059 Kraków

4. **Wieliczka Salt Mine – Field Trip**

   Daniłowicza 10, 32-020 Wieliczka (Not on the map above)

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Honorary Guest

Pierre Emmanuel d'Huart

SPE Regional Director for Europe

Pierre Emmanuel d'Huart, 40, is currently Head of Offshore Technological Development at Saipem. With over a decade of experience in various offshore projects across Europe, Egypt, Nigeria, Brazil, and the Middle East, he has made remarkable contributions that have had a significant impact on the industry.

He led a team to build the heaviest and deepest pipeline ever and contributed to establishing the first subsea drone operations contract. Additionally, Pierre Emmanuel was a visiting lecturer at IFP School for three years, where he shared his knowledge and experience with students.

He now leads the development of Saipem's offshore & subsea technology solutions, driven by his passion for learning and industry collaboration.

Pierre Emmanuel holds an MSc in Civil Engineering from ESTP in Paris and an MSc in Petroleum Engineering from IFP School. He is an accomplished author with several papers at OTC and articles about major industrial achievements in the field of Production & Facilities.

Beyond his work, Pierre Emmanuel is a proud father of 2. He has served the wider community as a reserve navy officer for the French Navy and is engaged on the Board of Directors of the Society of Petroleum Engineers as Regional Director for Europe.

Paper Session

(Undergraduate, Master Students, PhD / YP)

As always, one of the main events that takes place during the East Meets West is the Student Paper Session. It has always been a fantastic platform for sharing ideas through presentations of research, conducted by contestants split into 2 categories: undergraduate and master students and PhD candidate / Young Professionals categories.

From fresh and different approach to well-established industry standards to entirely new and surprising ideas, across a variety of specific fields such as geology, reservoir engineering and even chemistry – expect to be amazed by the quality of work presented!

The scientific committee of the Student Paper Session at East Meets West will award the best presentations.

Increase of injectivity index by applying Induced Thermal Fracturing in Waterdrive Reservoir Systems in Peru

Juan Carlos Santvañez Huarcaya
LatinTecna
Peru

The injection of a cold fluid, in this case production water after passing through the CPF (central process facility) into a reservoir with temperatures of 214 °F, generates a growing region of cooled rock around the injection well. The rock matrix within the cooled region contracts and induces a thermoelastic stress field around the well. The injection of production water into a subsoil reservoir, the horizontal stresses at the surface can be reduced by several hundred psi, this will depend on the injection pressure and its parameters. In case of high pressures or suspended solids plugging the face of the formation in the perforations (balling), a hydraulic fracture will occur. As these fractures grow, the flow system will change from a circular to a more elliptical geometrical one in a plan view.

With the development of this research, the increase in the injectivity index is identified. The drilling of injection wells is postponed, and the drilling of production wells is advanced. HPS systems are also sized smaller, reducing costs and having a lower environmental impact in their installation and operation with energy consumption.

The Marañon basin represents an opportunity for the block operators, an environmental benefit with the reduction of emissions through co-production, and an economic benefit due to the reduction in fuel consumption and a resource available at no additional cost.

Strategic Management in Energy Transition: Integrating Workforce Development and Sustainability for Long-term Industry Success

Ahmed Jaadan
University of the People
United States of America

The energy sector is undergoing profound transformations driven by the global push for sustainability, decarbonization, and the integration of renewable energy. For oil and gas companies, managing this transition effectively requires balancing the need for energy security with environmental stewardship and technological innovation. A key challenge lies in how to build a workforce capable of adapting to new technologies and sustainable practices while maintaining industry professionalism and operational efficiency.

This proposal explores the strategies necessary to manage these evolving demands, focusing on workforce development, leadership, and strategic management. It will examine how oil and gas companies can implement management frameworks that align business objectives with sustainability goals, ensuring that operations remain profitable while fostering a culture of innovation and ethics. By focusing on reskilling and upskilling, leadership development, and the adoption of sustainability practices, this research will provide a comprehensive roadmap for organizations navigating the complexities of the energy transition.

The primary objective is to provide actionable strategies for oil and gas companies to optimize their workforce, improve business sustainability, and strengthen organizational professionalism in this dynamic environment. The findings of this research will offer valuable insights for executives, managers, and policy makers looking to shape the future of energy management.

Neural Networks Application for Structural Interpretation – a case study of Miocene Formations of the Carpathian Foredeep CO2 storage

Kacper Paprota
AGH University of Krakow
Poland

Reliable reconstruction of the structural framework of geological formations provides the necessary base for further detailed seismic analysis. A crucial aspect that determines the realization of the established objective is the appropriate quality and resolution of seismic data. With increasing technological developments, modern procedures have begun to be used that allow more advanced analysis of the seismic image. For this purpose, machine learning techniques and iterative neural networks, among others, are used. In the case of using neural networks can be used supervised (by classified well data) or unsupervised in training processes. The base of the applied neural network classification is a set of calculated seismic attributes, representing the input data for the neural network. This research focused on the detailed reconstruction of the structural framework of the Miocene deposits in the Carpathian Foredeep located in the front of the Carpathian overthrust. The neural network created on the base of successive iterations provided more opportunities to follow discontinuities and configurations of individual sets of seismic reflections. Moreover, an effort was made to analyze Miocene deposits located in the basement of the edge part of the Outer Carpathians. This zone is characterized by a much worse quality of seismic data, a consequence is due to both the existence of high-angle layers within the Carpathian units and the tectonic deformation of these deposits. The conducted research made it possible to separate several seismofacies within the analyzed section of the Carpathian Foredeep basin, characterized by different seismic parameters. Due to the fact that the obtained model has a structural-seismofacial feature, it can be used for further detailed structural interpretations, and in next stages (in connection with well data) for lithofacial and reservoir analyses.

Paid from the funds of the Ministry of Science and Higher Education under the contract number DWD/8/0065/2024 dated 01.10.2024, program "Implementation PhD 2024"

Use of Marginal Abatement Cost Curves to Plan Oil and Gas Assets Decarbonization

Filip Wejzerowski
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Poland

The oil and gas sector faces increasing pressure to reduce greenhouse gas emissions while maintaining economic viability. A structured approach is needed to identify, prioritize, and implement cost-effective decarbonization measures. This study explores the application of Marginal Abatement Cost Curves (MACC) as a decision-making tool for planning decarbonization strategies across O&G assets.

The research presents a methodology for constructing asset-specific MACCs by integrating emissions baselines, abatement potential, and economic feasibility of mitigation options. A case study approach is used to evaluate a portfolio of O&G assets, assessing various emissions reduction levers, including energy efficiency improvements, electrification, carbon capture and storage (CCS), and low-carbon fuel substitution. The analysis provides insights into the cost-effectiveness and impact of each measure on overall emissions reduction.

The results demonstrate that MACCs facilitate strategic decision-making by ranking decarbonization options based on cost per ton of CO_2 abated. This approach helps asset managers balance emission reduction targets with operational and financial constraints. Additionally, the study highlights key limitations, such as uncertainties in technology costs, regulatory dynamics, and interactions between mitigation measures.

The findings support the use of MACCs as an effective framework for O&G companies to develop phased, economically viable decarbonization roadmaps. By incorporating MACCs into investment planning, firms can enhance sustainability performance while mitigating transition risks. This study contributes to the broader discourse on industrial decarbonization, emphasizing the need for data-driven, cost-efficient pathways to achieving net-zero emissions in the O&G sector.

The Current State-of-the-Art R&D of Generative AI and its Applications in Petroleum Industry

Aydin Abdulkhaleq
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Poland

With current AI boom in various domains, oil and gas industry still unmature in this regard. Despite the fourth revolution and digitalization in petroleum industry, we observed the need for surveying the current research and development of Artificial Intelligence and its occurrents in the industry. Since 2022, almost every domain witnessed Ai trend and its processing applications, but how about the petroleum industry?

To answer this questions and show the possible and the current R&D of Ai in Oil and Gas industry, we made a comprehensive review for the State-of-the-Art of current modern Artificial Intelligence including (Large Language Models, Advanced Deep Learning and Physics Informed Machine Learning) processing applications in Petroleum Industry.

Geological Hydrogen in Poland

Patrycja Wisińska
AGH University of Krakow
Poland

In recent years, the growing interest in renewable and low-emission energy sources has led to the intensification of research on hydrogen as a potential energy resource. Currently, hydrogen is mainly produced from natural gas by steam methane reforming or by water electrolysis, both of which consume a significant amount of energy. Geological hydrogen, also called natural or white hydrogen, occurs naturally in the Earth's crust and may present a promising alternative.

Natural hydrogen accumulations seem to develop in geological settings distinct from those of natural gas or oil. Since many factors influence its formation and accumulation, the global distribution of potential deposits remains largely unknown, and their exact resources and storage potential are not yet well understood.

With this in mind, Student Research Clubs 'Kiwon' (specializing in Petroleum Geology and Energy Resources) and 'Hydro' (specializing in Hydrogeology and Hydrology) of AGH University of Krakow, have decided to conduct interdisciplinary research in the Podhale Basin, located in the foreland of the Tatra Mountains in Southern Poland.

The identification of potential migration zones for natural hydrogen and other geogenic gases through surface geochemistry will be paired with the chemical analysis of surface and groundwater to determine its composition and evaluate possible correlations with hydrogen occurrences. By integrating various collected and archived data, an interdisciplinary interpretation will be conducted, allowing for a better understanding of the geological structure of the Podhale Basin.

Power to methane process with the use of flue gas captured CO2

Michał Gałan
AGH University of Krakow
Poland

The Sabatier reaction is a potential solution to the problem of storing energy from wind turbines or photovoltaic panels. Excess power generated during periods of favorable conditions is used to electrolyze water, producing hydrogen. This hydrogen, once converted into methane via the Sabatier reaction, can be stored or used directly. Large battery storage units are expensive, whereas methane (CH_4) obtained from this process is a widely used fuel that integrates well with existing infrastructure. Unlike pure hydrogen, which poses technical storage and transportation challenges, methane is easier to handle. The energy stored in the gas can be fed into existing natural gas networks or converted back into electricity, for example, in combined-cycle gas turbine (CCGT) power plants.

Beyond renewable energy storage, the Sabatier reaction also offers a promising pathway for carbon capture and utilization (CCU), particularly for reducing CO_2 emissions from industrial sources. Carbon dioxide captured from flue gas emissions—which result from burning fossil fuels in power plants, cement factories, and steel mills—can serve as a feedstock for the reaction. By utilizing CO_2 from these sources, the process helps reduce greenhouse gas emissions while producing a valuable energy carrier. This approach supports carbon neutrality goals by recycling CO_2 rather than releasing it into the atmosphere.

For future Mars exploration, the Sabatier reaction holds great promise. The Martian atmosphere consists of about 96% CO_2, providing an abundant substrate for the reaction. By combining locally sourced CO_2 with hydrogen (which could be obtained via electrolysis from subsurface water deposits), methane fuel could be produced on-site. This would significantly reduce the need to transport fuel from Earth, making long-duration Mars missions more feasible.

Influence of Pulse Rotary Speed on Drill Bit Performance

Daria Nesterenko
Dnipro University of Technology
Ukraine

This study analyzes the effect of pulse rotary speed on well drilling performance. The key trends in penetration rate changes under pulse rotary speed conditions have been identified. A near-bit shock absorber has been designed, and methods for controlling rotary speed intervals have been developed to optimize its operation. The research employed an integral approach, combining a review of scientific and patent literature with experiments and analytical studies of drill bit performance. Computer modeling and programming were used to process data and verify analytical dependencies. The analysis was conducted using Excel and Mathcad, applying mathematical statistics methods. The study examined solid body deformation and fracture under dynamic loads and drill bit–bottomhole interaction. A near-bit shock absorber was designed to generate pulse rotary speed, and methods to regulate its operation were developed. Pulse rotary speed nearly doubles the penetration rate. The optimal interval period is determined by bit blade penetration reaching the full cutter length in specific geotechnical conditions. The penetration rate increases with the rotary speed until the cutter ceiling penetration is reached, beyond which further interval extension reduces penetration efficiency.

Experimental studies were conducted on the effect of pulse rotary speed on penetration rate and energy consumption. A test rig was built, comprising a drilling machine, a frequency converter, and a pulse rotation setter. The results showed a 30–100% increase in penetration rate and a 3–17% reduction in energy consumption. For the first time, it has been demonstrated that pulse rotary speed enhances the rate of penetration (ROP). Mathematical expressions have been proposed to describe the relationship between rock-cutting element penetration per destruction cycle and penetration rate as a function of rotary speed.

Innovative technologies for equipping operational wells with systems for the mechanical purification of liquid and gaseous mineral resources

Viktoriia Razorienova
Dnipro Technical University
Ukraine

The goal is to develop technologies intended for the long-term equipping of operational wells of various purposes with systems for the mechanical purification of liquid and gaseous mineral resources in productive horizons located at any depth, represented by medium-grained, fine-grained, silty, and dusty sands. The work uses methods of analyzing innovative technologies and materials, generalizing scientific and technical achievements in various fields of economic activity, as well as synthesis and physical modeling of systems for the mechanical purification of liquid and gaseous mineral resources. The developments are presented, focusing on technologies for constructing systems for the mechanical purification of liquid and gaseous mineral resources in productive horizons located at any depth, represented by medium-grained, fine-grained, silty, and dusty sands. For the first time, the use of water-based binding materials containing organic polymers for solidifying loose gravel material into a block structure of a gravel filter for mechanical purification systems of operational wells has been justified. For the first time, the possibility of equipping the intake part of hydrogeological wells in medium-grained, fine-grained, silty, and dusty sands with mechanical purification systems featuring removable casings and sealing systems has been substantiated. It lies in the development of: recommendations for selecting parameters of technologies for equipping hydrogeological wells with systems for the mechanical purification of liquid mineral resources; at the level of inventions of fundamentally new technologies for equipping the productive part of wells with gravel filters, the implementation of which, compared to traditional technologies, reduced the cost of well equipment by 0.6 to 1.0 thousand USD for wells with a depth of up to 100 meters.

The impact of organic waste as additives to drilling muds and cement slurries for borehole heat exchangers

Sofiia Sierova
Dnipro University of Technology
Ukraine

Scope of application of the development is represented by the technologies of thermal action on oil formations. The object of the development is general patterns accompanying the phenomena of thermal action on oil and reservoir rocks with the identification of influential physicochemical factors of the processes that take place in the bottomhole zone of the well; basic theoretical and practical issues of the methods of oil recovery increase by injecting heat carriers into oil reservoirs and creating in-situ combustion; analytical studies of the integral characteristics of the influence of individual components on the efficiency of a process of thermal oil recovery increase.

The purpose of the paper is to perform analytical design and calculation as well as laboratory study of the parameters of existing and proposed thermal technologies to increase extraction of high-viscosity oils from reservoir rocks, which improvement will increase significantly the percentage of heavy oil recovery and provide the opportunity to involve shallow-depth deposits.

Originality of the obtained results is in the methodically developed general issues of the phenomena of thermal action on oil and reservoir rocks with the definition of influential physicochemical factors; a model of interphase interaction for the conditions of the process of thermal oil recovery increase is proposed.

Practical results are as follows. The value of the work is to improve technologies to increase the extraction of heavy oils from reservoir rocks, which implementation will increase significantly the percentage of oil recovery and provide the opportunity to develop heavy hydrocarbon fields with a high degree of productivity and efficiency.

Practical significance of work is in the fact that the developed technological solutions can be implemented at the main objects of heavy hydrocarbon production both in Ukraine and abroad.

Student Poster Session

(Undergraduate, Master Students, PhD / YP)

Similarly to the paper session, the 13th East Meets West Student Poster Session is also focused on exploring the results of the contestants' research projects.

In this competition, presentations are a bit different. Students need to create a poster that clearly and attractively showcases the key points of their work.

The posters should be easy to understand and visually appealing. If anything is unclear, don't worry – the authors will be right next to their posters, ready to chat and answer any questions. It's a great opportunity to learn more and have direct conversations with the creators.

Real-Time Modeling of Physical Effects and Failure Impact – Digital Twin in CO2 Systems

Paweł Bielka
AGH University of Krakow
Poland

The growing interest in machine learning (ML) has led to its application in various fields, including time series analysis, which is essential for modeling complex and evolving systems. Sensor data on equipment parameters (e.g., pressure, temperature, flow) and environmental conditions (e.g., wind speed, temperature, humidity) serve as a foundation for detecting anomalies and identifying emergency events, such as pipeline leaks, tank ruptures, toxic releases, or explosion hazard zones. Time series analysis enables real-time monitoring and prediction of potential threats. Traditional statistical methods and linear regression often prove insufficient, particularly when dealing with complex nonlinear and long-term dependencies in sequential measurement data. In such cases, Recurrent Neural Networks (RNN), particularly Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) models, offer effective tools for forecasting and real-time anomaly detection.

In gas transmission systems and other industrial applications, early failure detection allows for the implementation of Predictive Maintenance (PdM) strategies, which are significantly more effective than reactive repair approaches. Risk analyses (PHA/HAZOP/LOPA) are equally important for newly designed and modernized infrastructure, especially when the consequences of failures in CO_2 or hydrogen applications are not entirely predictable. Consequence analysis—including the modeling of discharge, dispersion, fires, explosions, and toxic effects—is performed using specialized software such as DNV Phast, ALOHA, or EXDAM. The results of these analyses, combined with real-time sensor data, serve as a foundation for training and tuning ML models that operate in real time.

This study presents the concept of integrating process data and simulation analyses within a Digital Twin, which supports optimization, risk management, and predictive assessment of failure impacts. The application of LSTM networks instead of traditional ARMA/ARIMA models is introduced to capture complex long-term dependencies and better handle noise and incomplete data. Particular emphasis is placed on CO_2 transport, pipeline leaks, and other industrial hazards, highlighting the tangible benefits of comprehensive monitoring systems and advanced time series analysis.

Acknowledgments: The work was carried out within the 'CarbonPipelineFlow Digital Twin' project, grant no. 10688, supported by IDUB AGH Programme.

Predicting Key Geothermal Reservoir Properties Using AI/ML: A Case Study from Northern Croatia

Jakub Cebula
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Wojciech Panek
AGH w Krakowie, Shell Polska Sp. z o.o. O. w Krakowie
Aleksander Pyzik
Shell Polska Sp. z o.o. Oddział w Krakowie
Michał Fedor
Independent Researcher

The development of cost-effective and accurate methods for estimating key geothermal reservoir parameters can be an important enabler of the energy transition. This study presents a machine learning (ML) approach to predict temperature, porosity, and permeability in a geothermal reservoir located in northern Croatia, using real-world well log data. The dataset includes acoustic (AC), gamma ray (GR), density (DEN), spontaneous potential (SP), and neutron (CN) logs from multiple wells, with additional reservoir property measurements available for a subset of them.

In the study a geological assessment and 3D modelling of the reservoir using LeapFrog software to identify data patterns and inform the modelling strategy was conducted. Multiple ML models were trained and evaluated to predict reservoir properties in wells lacking direct measurements. The best-performing model achieved an R^2 score of 0.97 and a Mean Absolute Percentage Error (MAPE) of 0.15 on validation data from wells with known properties. The results obtained this way were as follows: Well 1: Porosity: Avg. 1.19% , Max.4%, Permeability: Avg. 0.09 mD, Max. 0.118 mD, Max. Temperature: 111 *C, Well 2: Porosity: Avg. 0.67% Max. 4.57%, Permeability: Avg. 0.05 mD Max. 0.125 mD, Max. Temperature: 131 *C.

Although the exact reference values for two of the evaluation wells remain undisclosed by the dataset providers, our model's performance was independently verified through a blind test as part of a SPE Geoenergy Hackathon, where it secured 2nd place among over 50 international teams.

These results highlight the potential of AI/ML to provide reliable reservoir property estimates, potentially reducing the need for costly measurements and facilitating the wider adoption of geothermal energy technologies.

Simulation of Drilling Parameters for Borehole Heat Exchangers

Piotr Buliński
AGH University of Krakow
Poland

The borehole heat exchangers play an increasingly important role in the energy mix. However, their high installation costs often discourage potential investors, making the optimization of drilling expenses essential. This can be achieved by properly adjusting drilling parameters.

The simulation results presented in the report are based on research conducted by the AGH Laboratory of Geoenergetics in Młoszowa. Rotary percussion drilling was used during the drilling process, and both drilling time and energy (fuel) consumption were monitored under specific mechanical and technological parameters. The tests covered different pressure values (20, 22, and 24 bar) as well as rotational speeds (20, 40, and 60 rpm). The study was carried out at two depth ranges: 65–68 meters and 68–71 meters, with each of these sections corresponding to the length of a single drill rod. As part of the experiment, the parameters of 18 borehole heat exchangers were analyzed.

Evaluating CO2 Column Heights and Caprock Sealing Capacity in Polish Gas Fields Using Mercury Intrusion Porosimetry (MIP)

Ahsan Nabi Soomro
AGH University of Krakow
Poland

This study evaluates the CO_2 sealing capacity of Polish depleted gas reservoirs using mercury intrusion porosimetry (MIP), focusing on nine caprock samples. Key findings include calculated CO_2 threshold pressures and corresponding column heights: Sample 1 showed a CO_2 threshold of 0.495 bar, translating to a 12.6 m column height, while Sample 2 had a threshold of 0.215 bar, resulting in a 5.5 m column height. Samples 5 and 6 exhibited higher thresholds of 1.75–1.85 bar, yielding 44.6–47.1 m column heights , Samples 3, 4, 7, and 9 demonstrated negligible mercury intrusion, indicating ultra-tight caprocks likely capable of supporting CO_2 column heights exceeding 100 m. While MIP provides rapid pore-throat characterization, direct gas-water experiments under confining pressure are recommended to validate these findings, as MIP tends to underestimate entry pressures by 4–5×.

These results highlight these depleted gas reservoirs as prime candidates for CO_2 storage, particularly informing initiatives like GO4ECOPLANET (1 $MtCO_2$/year by 2027), and emphasize the need for multi-method validation to optimize site selection.

Estimation of the CO2 Saturation Distribution During CO2 Injection into Deep Aquifers at the Grid Block Level Using Artificial Neural Network

Jan Kowalski
AGH University of Krakow
Poland

Carbon dioxide sequestration is the process during which CO2 is injected into underground geological formations. Storing CO2 in water bearing formations is one of the potential options. During the injection and during the post-injection period, the distribution of CO2 saturation and the pressure in the layer are very important because they determine the safety of the entire project. These parameters are analyzed during the storage site planning phase, using reservoir simulators. Reservoir simulators solve complex systems of equations, as a result calculating fluid saturations and pressures in each model block for each time step.

Due to the complexity of the calculations, the simulation time for large, complex models can be long and significantly complicate the process of analyzing or optimizing a CO2 storage site. To overcome these limitations, artificial neural networks (ANN), which are gaining increasing attention in the industry, can be used. One of the interesting applications of ANN is the creation of a Grid-Based Surrogate Reservoir Model (SRM). The goal of Grid-Based SRM is to reproduce the results of numerical simulations, i. e. pressure and saturations for successive time stamps at the grid block level. Depending on the complexity, the training time of the ANN can also be very time-consuming, but the computations of the trained network are practically instantaneous.

The purpose of the poster is to present the results of research on the creation of a Grid-Based ANN reservoir model to predict the distribution of CO2 during the injection process into a deep aquifer. CMG's GEM simulator was used to generate database for ANN training, validation and testing. The model was a “shoes-box” and consisted of 50x50 blocks in the I and J directions and 3 layers. However, only a 9x9x3 element of the model, where changes in saturation occurred, was used for the creation of ANN. The samples, i.e. models that were used to generate data sets, differed in permeability, porosity and injection rate.

Using Artificial Intelligence to Optimize Drilling Processes in the Oil Industry

Yelizavieta Hrebeniuk
Dnipro University of Technology
Ukraine

The oil and gas industry faces rising costs, efficiency demands, and environmental pressures, making innovative solutions like artificial intelligence (AI) vital. This study explores how AI can enhance drilling processes by analyzing large datasets from operations to predict problems and optimize settings in real time.

The goal is to lower expenses, boost safety, and minimize ecological impact. Data is collected from drilling rig sensors tracking pressure, temperature, speed, and vibrations, creating a comprehensive dataset. AI, using machine learning tools like regression and neural networks, is trained on historical records to identify patterns and anomalies. It forecasts issues such as tool jams or circulation loss and adjusts parameters like rotation speed or weight on bit instantly. Python-based tools, including TensorFlow and Scikit-learn, process the data, with outcomes tested against industry benchmarks. Results show AI cuts downtime by 20–40% through early problem detection, improving operational uptime. Drilling efficiency rises 15–25% as optimized settings enhance penetration rates. This leads to cost savings of 10–20%, driven by reduced delays and higher productivity. Safety improves as AI quickly spots hazards, lowering risks to workers and equipment. Simulated drilling scenarios validate AI's accuracy, showing strong alignment between predictions and real results.

This research marks a new step in applying AI for real-time drilling optimization. It introduces a system that integrates sensor data to predict issues effectively and links drilling adjustments to performance gains. Beyond efficiency, AI reduces energy use by 3–17% through adaptive control, offering a sustainable approach. The findings suggest AI could transform the oil industry, providing a scalable tool for companies to refine strategies and for regulators to shape innovation policies. Further development could amplify these benefits, positioning AI as a cornerstone of modern drilling practices.

Preparation of Natural Gas Using Refrigerating Machines Operating on Solar Energy

Anastasiia Molodocha
Poltava National Technical University
Ukraine

The article considers the possibility of using absorption refrigeration machines powered by solar energy in the preparation of natural gas. It has been established that for most regions of Ukraine, the total annual potential of solar energy is quite high, so the use of such refrigeration machines is possible. For the analysis, a complex gas treatment unit was selected from one of the fields in the Poltava region.

The technical re-equipment of the unit was carried out by reconstructing the low-temperature separation line and the booster compressor station. In the compressor station block, it is proposed to install an absorption chiller operating on the principle of "solar cooling". This cooling method is based on a lithium bromide absorption chiller, the generator of which, instead of steam, is supplied with hot water from a solar collector.

Continuous operation of the refrigeration unit during the day is ensured by the installation of a solar energy storage device. The required refrigeration capacity of the refrigeration machine and the required area of solar collectors for the less sunny month of the summer period are calculated.

Changes in the Quality Parameters of Natural Gas in the Gas Network after Doping with Renewable Gasses

Wiktor Humeniuk
AGH University of Krakow
Poland

Currently, one of the most significant research directions in natural gas transportation involves analyzing how the quality parameters of gas fuel change in transmission networks when enriched with renewable gases, such as hydrogen and/or biomethane. This pursuit is driven by the need for sustainable development and the reduction of greenhouse gas emissions. The choice of these gases is far from arbitrary—hydrogen, presented as the fuel of the future, emits no carbon dioxide during combustion, while biomethane, produced from biogas derived from organic waste, markedly reduces emissions compared to fossil fuels. Furthermore, hydrogen helps to decrease linear pressure losses within the network, which in turn reduces the velocity of gas transport. In contrast, biomethane promotes more stable operational parameters, a factor that is crucial for maintaining the integrity of the transmission infrastructure.

The study involved simulations on a hypothetical natural gas network to assess the impact of renewable gas admixtures on natural gas quality, employing the SIMONE computer program for the analysis.

Analysis of the Effectiveness and Potential of Carbon Capture and Storage (CSS) Technology in Reducing CO2 Emissions

Klara Bienias
AGH University of Krakow
Poland

Climate change requires modern solutions to reduce CO_2 emissions. This poster presents carbon capture and storage (CCS) technology, discussing its key aspects – from CO_2 capture in industrial and energy processes to its transportation and permanent storage in geological formations. The potential implementation of CCS in Poland is analyzed, highlighting its benefits for the energy sector and challenges such as costs, infrastructure, and legal barriers.

The research section includes a simulation conducted in ProMax to evaluate the efficiency of acid gas removal using amines in a natural gas processing facility. This study assessed current system performance, parameter adjustments for gas from a new reservoir, and opportunities to enhance purification efficiency. The findings underscore CCS's potential to complement renewable energy sources in achieving climate neutrality, provided further technological development and financial support.

Exploring Freezing Desalination in Oil and Gas Operations

Oskar Dunaszewski
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Poland

Access to clean water is even more essential than the resources that power our world. As freshwater supplies dwindle, unconventional desalination methods—often requiring high energy inputs—are being explored. This research focuses on identifying and evaluating energy-efficient approaches to producing clean or low-salinity water.

One promising method leverages the low temperatures of Liquefied Natural Gas by integrating its regasification process—such as open rack vaporization—with simultaneous desalination. Another approach involves designing cooling systems that consume less energy than conventional distillation or offer greater reliability than reverse osmosis, while also addressing the challenge of brine disposal.

The goal is to develop comprehensive solutions that balance environmental concerns with energy efficiency, enabling sustainable desalination. Additionally, this study will analyze potential technical limitations and challenges, providing insights for future improvements.

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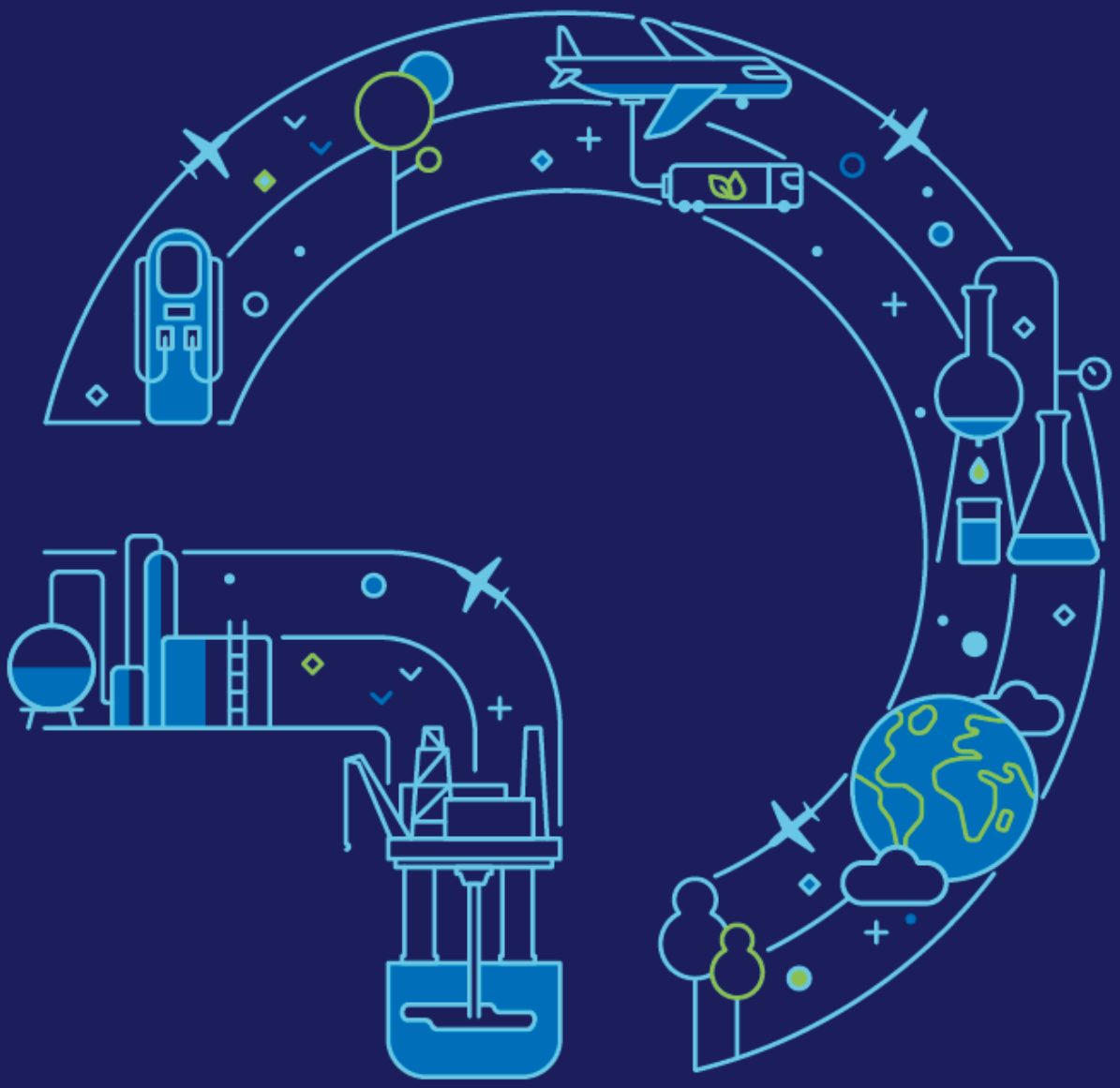

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The **ORLEN Foundation** is the largest corporate foundation in Poland. It was established in 2001. Its founder is ORLEN SA, the largest industrial company in Central and Eastern Europe. The ORLEN Foundation runs grant and scholarship programs. It works to improve safety and donates for important social causes. The Foundation also runs an employee volunteer program within the ORLEN Group.

ORLEN is an integrated, multi-utility corporation primarily active in Central Europe. We supply energy and fuel to over 100 million Europeans, and our advanced products are sold in over 100 countries across six continents.

The company's activities include both oil and gas production and the processing and sale of petroleum products, as well as energy generation and distribution. One of the key elements of ORLEN's mission is to act as a leader in the energy transformation process in the region. ORLEN's strategy aims, among other things, to increase gas production, build four offshore wind farms, large-scale energy storage facilities and at least two small-scale nuclear power plants. By the end of 2035, ORLEN plans to spend between PLN 350bn and PLN 380bn on strategic goals.

NATURAL GAS EXTRACTION IN THE FOUNDATION OF **POLAND'S ENERGY SECURITY**

Exploitation of resources and expansion of underground gas storage facilities to supplement the basic uninterrupted supply of blue fuel to millions of Polish recipients. Domestic extraction for the key area of the **ORLEN Group's** operations on the domestic market, financial access for Polish municipalities and fuel for transformation and economic development.

CHEMFOR is a young, energetic and flexible company operating in the field of drilling fluids, which provides ready-made and "tailor-made" comprehensive services to customers.

We serve mainly companies from the following industries: oil and gas, geothermal energy. Our experience has also proven valuable in other areas such as HDD, Microtunneling, construction works and wastewater treatment.

CHEMFOR is a highly professional and solution-oriented technology company. Thanks to our extensive network of suppliers and strategic partnerships, we can offer our customers a full range of top-quality services at very competitive prices, practically all over the world.

GAZ-SYSTEM is a strategic company for the Polish economy. It is responsible for the transmission of natural gas, manages the most important gas pipelines in Poland and the Baltic Pipe offshore gas pipeline. It is the owner and operator of the LNG Terminal in Świnoujście, as well as the owner of Gas Storage Poland – a company acting as an operator of natural gas storage facilities.

GAZ-SYSTEM is currently implementing the construction of a floating gas terminal FSRU in the Gulf of Gdańsk, the aim of which is to ensure the diversification, stability and security of gas supplies. The company also wants to play an active role in the process of transformation and decarbonization of the Polish economy, conducting projects concerning the possibility of transmitting biomethane and hydrogen.

Brenntag is the global leader in chemical and ingredient distribution, connecting customers and suppliers across a wide range of industries. With over 17,700 employees and operations in 72 countries, Brenntag offers a complete portfolio of industrial and specialty chemicals, technical support, regulatory expertise, and digital solutions.

As part of the Brenntag Group, our Energy Services division provides innovative solutions for the oil, gas, refinery, petrochemical, and renewable energy sectors. With over 50 years of industry experience, we deliver sustainable products, services, and renewable energy solutions to meet the evolving demands of the energy market.

We offer comprehensive support, from project development to logistics, with a focus on enhancing efficiency, reducing carbon emissions, and ensuring energy security. Our expert team provides outstanding technical support, value-added services, and a broad range of products, all designed to meet the unique needs of the energy industry.

Welcome Evening – Icebreaking Party

The Icebreaking Party is a cherished tradition and the perfect way to kick off EMW in a relaxed and welcoming atmosphere. This year, we invite you to Bar .punkt in the heart of Kraków's Kazimierz District, where you'll have the chance to connect with fellow participants over snacks and beer. It's a great opportunity to meet new people, start conversations, and set the tone for the days ahead. Join us for an evening of good company and a laid-back start to the event.

Integration field game and city visiting

This year Organizing Committee is organizing a beautiful sightseeing trip around majestic city of Krakow. The field trip through Kraków takes you on a fascinating journey from AGH University of Krakow to some of the city's most iconic landmarks. You'll encounter the legendary Wawel Dragon before visiting the Jewish heritage at the Old Synagogue and Ghetto Heroes Square. The route continues across the scenic Vistula river and ends at the lively "Okrąglak", known for its vibrant atmosphere and delicious "Zapiekanki". A perfect mix of history, culture, and local flavor!

Gala Dinner

The Gala Dinner is one of the highlights of EMW, offering an elegant evening in a unique setting. This year, we invite you to "Sukiennice Restaurant", located in the heart of Krakow's historic Main Square. Surrounded by rich history and stunning architecture, you will enjoy exquisite Polish cuisine. It's the perfect occasion to unwind, connect with fellow participants, and celebrate together in a refined yet welcoming atmosphere. We look forward to sharing this special evening with you.

Wieliczka Salt Mine – Field Trip

As part of our conference program, we invite you to explore one of Poland's most extraordinary landmarks - the Wieliczka Salt Mine. This UNESCO-listed site offers a fascinating journey through underground chambers, stunning salt sculptures, and breathtaking chapels carved entirely from salt.

During the guided tour via Mining Route, you will discover the rich history of this 700-year-old mine, walk along impressive corridors, and admire the spectacular St. Kinga's Chapel. The visit is a perfect blend of history, culture, and adventure, making it a must-see attraction.

Join us for this unforgettable experience and uncover the hidden wonders of the underground world!

Kraków – The Heart of Polish Heritage

Kraków, one of Poland’s most beautiful and historic cities, offers a unique blend of rich history, stunning architecture, and a vibrant cultural scene. As a former royal capital, it captivates visitors with its charm and atmosphere.

Among the city’s highlights are the UNESCO-listed Old Town, home to the impressive Main Market Square and St. Mary's Basilica, the magnificent Wawel Castle, and the historic Jewish Quarter of Kazimierz. Those interested in history can explore Schindler’s Factory or visit the Auschwitz-Birkenau Memorial, located nearby.

For a different experience, the underground wonders of the Wieliczka Salt Mine are well worth discovering. Kraków also delights with its diverse culinary scene, lively nightlife, and warm hospitality, making every visit truly memorable.

English-Polish Dictionary

English	Polish
1. Hi / Bye	1. Cześć / cheshch /
2. Good Morning	2. Dzień dobry / dsyeni doh-bry /
3. Good Night	3. Dobranoc / do-bra-notz /
4. Good	4. Dobrze / do-bsheh /
5. Yes	5. Tak / tahk /
6. No	6. Nie / nyeh /
7. Thank you	7. Dziękuję / dye-coo-yeh /
8. Please	8. Proszę /prosheh /
9. Excuse me / I am sorry	9. Przepraszam / pshe-pra-sham /
10. Cheers!	10. Na Zdrowie! / na zdro-vye /
11. How are you?	11. Jak się masz? / jak she mash /
12. I don't understand	12. Nie rozumiem / nye roh-zoo-myem /
13. I don't speak Polish	13. Nie mówię po polsku / nye mo-vyeh po pol-skoo /
14. Do you speak English?	14. Czy mówisz po angielsku? / che moo-veesh po an-gyell-skoo /
15. My name is…	15. Mam na imię…/ mam nah eem-yeh/
16. I like you	16. Lubię Cię / loob-yeh cye/
17. How much is it?	17. Ile to kosztuje? / ee-leh toh kosh-too-yeh /
18. Can I have the bill, please?	18. Rachunek, proszę / pro-she o ra-hoo-neck /
19. Can I pay with a credit card?	19. Czy mogę zapłacić kartą kredytową? / chi mo-ghe za-pla-tsits car-tom /
20. I am lost	20. Zabłądziłem / zah-bwon-tzee-wehm /
21. Excuse me, how can I get to...?	21. Przepraszam, jak dojść do...?/ pshe-prash-am, yahk doysh doh /
22. Excuse me, where is the toilet?	22. Przepraszam, gdzie jest toaleta? / g-jeh yest twa-leh-tah /
23. I'm not well. / I'm sick	23. Jestem chory / yeh-stem ho-ree
24. I have to see a doctor	24. Potrzebuję lekarza / poh-tscheh-boo-yeh leh-cka-shah /
25. Could you take a picture of us, please?	25. Przepraszam, czy możesz nam zrobić zdjęcie? / pshe-prash-am, tshy moh-gheh zho-bich zdye-che /

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