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International Conference on

OIL, GAS AND PETROLEUM ENGINEERING

21-22 OCT 2022

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BOOK OF ABSTRACTS

INTERNATIONAL CONFERENCE ON

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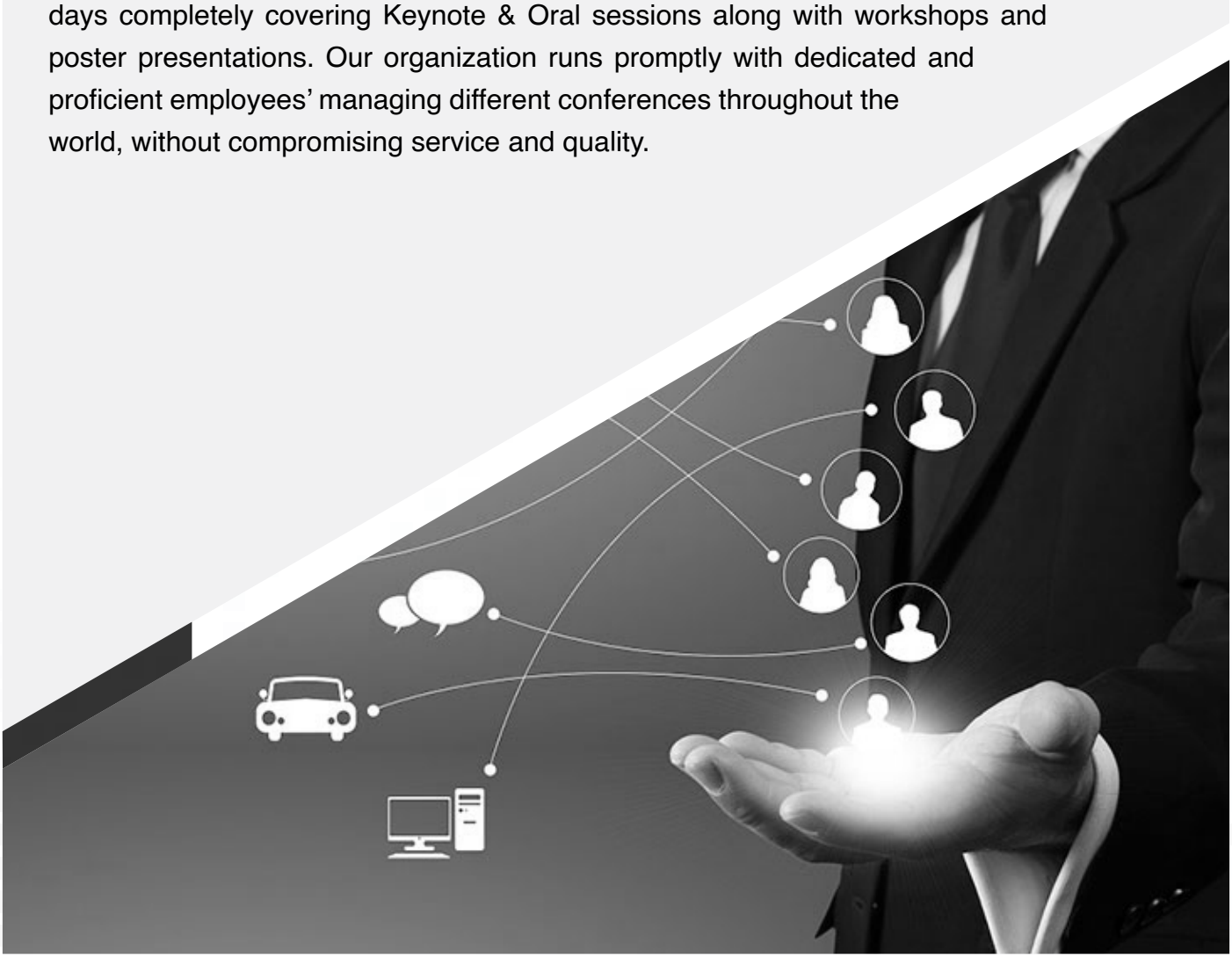
ABOUT MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.



ABOUT IOGP 2022

With an earnest objective to congregate Oil Gas professionals, researchers, industry experts and scientists Magnus Group proudly enunciates and welcomes you toits **International Conference on Oil, Gas and Petroleum Engineering (IOGP 2022)**, which was organized Virtually during **October 21-22, 2022**. This year the global summit will move forward with the theme *Shaping world's energy through latest trends in oil, gas and petroleum*.

The conference provides the oil and gas industry, researchers, professionals, petroleum engineers, oil and gas experts, scientists, and scholars the opportunity to use our global platform to help consumers navigate their changing needs by showcasing their research findings, latest trends, breakthroughs, and innovations in the field of petroleum, oil and gas.

The two-day colloquium is designed to foster collaboration and innovation, with Oil and Gas poster presentations, interactive panel discussions, and visionary keynotes sessions.

We are confident that our conference will provide you with an incredible

chance to explore new horizons in your field and we hope to see you at our upcoming IOGP 2023 conference during October 26-28, 2023

KEYNOTE FORUM

DAY 01

INTERNATIONAL CONFERENCE ON

OIL, GAS AND PETROLEUM ENGINEERING

21-22 OCT

Piotr Oskar Czechowski[1]*, Artur Badyda[2], Piotr Dąbrowiecki[3,4]

[1]Gdynia Maritime University, Faculty of Management and Quality Science, Department of Quantitative Methods and Environmental Management, Gdynia, Poland

[2]Warsaw University of Technology, Faculty of Building Services Hydro- and Environmental Engineering,-Warsaw, Poland

[3]Military Institute of Medicine, Department of Allergology and Infectious Diseases, Warsaw, Poland

[4]Polish Federation of Asthma Allergy and COPD Patients Associations, Warsaw, Poland

Improved statistical models of influence of selected air pollutants on all-cause death and pneumonia related in selected polish agglomerations

Poland has one of the worst air quality in the European Union, particularly regarding concentrations of particulate matter (PM). This study aimed to evaluate short-term effects of air pollution and weather conditions on all-cause mortality and pneumonia-related hospitalizations in three Polish agglomerations. We investigated data from 2011-2018 on a number of health outcomes, concentrations of PM2.5, PM10, nitrogen dioxide (NO_2), ozone (O_3), and selected meteorological parameters. To examine the impact of air pollutants and weather conditions on mortality and pneumonia burden, we identified optimal general regression family models for each agglomeration. GRM uses the concept of general linear models (GLM), enabling to capture the non-linearity of the impact of cause and effect relationships at the stage of nonlinear link function as well as through the interactions and lags of independent factors. The identification of interactions and lags up to 3 days is particularly important element of the presented research. The final models explained <25,3% of variability in all-cause mortality. The models with interactions, O_3 concentration in Warsaw, NO_2, O_3, and PM2.5 concentrations in Cracow and PM10 and O_3 concentrations in the Tricity explained >13% of variability in the number of deaths. Up to 48,6% of daily variability in the number of pneumonia-related hospitalizations was explained by the combination of both factors i.e. air quality and meteorological parameters. The impact of NO_2 levels on pneumonia burden was pronounced in all agglomerations. We showed that air pollution profile and its interactions with weather conditions exert a short-term effect on all-cause mortality and pneumonia-related hospitalizations. Our findings may be relevant for prioritizing strategies to improve air quality.

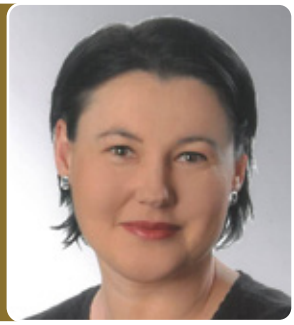
Audience Take Away:

- Audience will learn synthetically the situation of Poland and partly Europe in the area of selected air pollution.
- Audience will be able to see an outline of the stochastic data processing methodology (stochastic, exploration and author's), including diagnostics of measurement data based on air pollution automatic monitoring system
- Audience will have the opportunity to learn about the factors (air pollution and meteorology) with lags and interactions affecting selected diseases and deaths (among others pneumonia, asthma and COPD) over a long period of time (2011-2018) identified by GLM family statistical models
- The presentation is primarily aimed at expanding the knowledge about the air pollution situation in Europe and in Poland and about statistical methods and models allowing to identify in detail the causes of selected diseases. The cognitive aspect of statistical methodology, relatively rare in this scale of research, its advantages and weaknesses also seems to be important
- The key benefit from the point of view of conducting own research and job seems to be getting to know the classic and new statistical methodology of measuring data diagnostics, learning about solutions that ensure high quality of both data and the results of model works. An interesting aspect is also the approximation of the statistical models themselves, their assumptions and problems that were solved in the identification and estimation process

- Important are the conclusions in the form of identified factors influencing selected disease and long-term deaths, which allow for comparison with other regions of the world
- The presented methodology and results allow to include this component in the regional policy of sustainable development of urban and industrial agglomerations

Biography:

Studied statistics and econometrics at the University of Gdansk, Poland, from which he graduated in 1996. He studied MBA (Management) in Toronto in Canada. At the Warsaw University of Technology in 2004 he received PhD degree in the field of Environmental Engineering / Statistics (Institute of Environmental Engineering Systems, Applied Mathematical Methods). The title of prof. obtained in 2015 at the Gdynia Maritime University [GMU] in field of Quality Sciences, Environmental Engineering and Statistics. Then he worked for many years in the Information Systems team in GMU. For over four years, he has been the head of the Quantitative Methods team. He has published over 120 research articles in SCI(E) journals. Since 2006 and 2015, he has been working as a professor at the GMU and the Medical University of Gdansk (environmental toxicology).



Katarzyna Chruszcz-Lipska

Faculty of Drilling, Oil and Gas, Department of Petroleum Engineering,
AGH University of Science and Technology, Krakow, Poland

Turpentine as a biofuel

Due to the demand for the replacement of petroleum-based products, especially in transport, there is an increasing need for alternative fuels. In this context, natural terpenes from plants have been proposed as a renewable source of biofuels. Turpentine is a fluid obtained from living conifers, mainly pine. Turpentine oil consists of terpene hydrocarbons (α-pinene, β-pinene, limonene, 3-carene and camphene) and other compounds such as anethole. The proportions of turpentine's ingredients may vary depending on the natural source from which it is obtained and the production method. Currently, turpentine is mainly used in the chemical, cosmetics, pharmaceutical and varnish industries. The main driver of the turpentine market growth is the increasing use of household and personal care products where turpentine is used in the production of fragrances and flavors. The second consumption volume of turpentine is fragrance applications. Nowadays, various kinds of turpentine, such as turpentine oil, sulfate turpentine oil, gum turpentine oil (taken from the sap of pine) and pine oil have been considered as biofuel components. Research has been successfully conducted on terpenes from pine oleoresins as special fuels for jet and rocket engines as well as conventional fuel engines. The addition of natural terpenes without any special processing makes fuel more environmentally friendly. The addition of turpentine to diesel-based engines reduced smoke and toxic gases emissions. The experimental data show that even 100% pine oil can be directly used in diesel engines.

Audience Take Away:

- Chemical composition and properties of turpentine
- Production and use of various types of turpentine
- Advantages and disadvantages of using turpentine as biofuel components

Biography:

Katarzyna Chruszcz-Lipska received her MSc PhD degrees in Chemistry at the Faculty of Chemistry of the Jagiellonian University in Krakow (Poland). At present, she is working as adjunct in the Department of Petroleum Engineering at The Faculty of Drilling, Oil and Gas of the AGH University of Science and Technology (Krakow, Poland). Her present research interests focus on geochemistry of reservoir waters, crude oil and reservoir rock, environmental protection in petroleum industry, corrosion and also biofuels based on turpentine.

Marco Ludovico-Marques

Structures and Geotechnics, Polytechnic Institute of Setubal, Barreiro, Setubal, Portugal

Concept of carbon capture from natural gas wells and its storage and reuse in deep rock reservoirs

The innovative systems shown intends to carry out CCS from natural gas extracted on cement completions of gas wells by absorbent selective nanoporous materials forming conducting channels on linked pores. CO_2 fluids are transported upwards and then injected and stored in upper nonproductive Oil & Gas porous rock reservoirs by the Removal-Transport-Injection System (RTIS), assuring the mechanical safety of the wells. Several embedded and linked extraction micro devices exert capillary forces and/or suction pressures responsible for this uplift phenomenon. These are linked to compressor micro devices included on cement top levels that receive and develop carbon dioxide deeper injections into upper non-productive porous rock formations. This innovative concept also considers vertical transport tubes, advanced metallic alloys-based, with compressor devices to carry out carbon dioxide re-injection into productive Oil & Gas reservoirs. Procedures to tackle corrosion problems that arise on these manufactured materials, caused by H_2S are given to aiming to overcome this phenomenon that jeopardizes the transport of carbon dioxide, the physical and mechanical stability of completion and the support effect of casings in Oil & Gas wells.

This system of removal-transport-injection plus re-injection (RTIS+R) that links the wells into Oil & Gas reservoirs has proper sensors linked to a central unit and are machine learning guided with micro-satellites/UAV´s connections for the RTIS+R concept, being the unexpected gas leaks also monitored.This innovative system allows no further, the lifting and transport to surface Oil & Gas facilities on fields, of the extracted carbon dioxide from gas wells. The natural gas production on wells is free of CO_2, the major responsible gas for green-house effect and therefore environmentally friendly as monitored, but CO_2 helped.

Biography:

Marco Ludovico-Marques is a Geological Engineer, MSc in Soil Mechanics and Ph.D. in Geotechnical Engineering (Rock Mechanics) at the Universidade Nova de Lisboa in 2008. He is an As. Prof. at Barreiro School of Technology of Polytechnic Institute of Setubal since 2010, Head of Department of Structures and Geotechnics since 2014 till 2021 and is also Coordinator of Petroleum and Gas Technologies courses (E&P) since 2014. He teaches at Higher Education Institutions since 2005 and has been responsible for twenty subjects (different curricula units). Editorial board member of seven scientific journals and Reviewer of another twenty-seven journal. He is an expert assessor for R&D and Innovation Project applications. His research interests and practice are Geotechnics, Petroleum, and Gas Engineering, CCUS, Transition scenario of Energy, Fuels and Gas underground storage & engineering, Stone conservation.

SPEAKERS

DAY 01

INTERNATIONAL CONFERENCE ON

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Automated mineral identification and its applications in rock mechanics

Saeed Aligholi
Institute of Innovation, Science and Sustainability, Federation University Australia, Ballarat, VIC, Australia

Microstructural features of a material is determining its mechanical properties. Mechanical properties of rock materials are very important in a wide range of engineering disciplines including mining, civil and petroleum. In order to reliably model mechanical properties of rock materials quantifying their microstructural features is the first step. Rocks are formed from different minerals with different textural features. Optical microscopy is the main method in order to quantify both mineralogical and textural (size, shape, interlocking,) features of rock materials. However, manual microscopy is a time-consuming process, and a successful rock quantification requires an experienced operator. Therefore, an automated mineral identification (AMI) scheme is highly demanded. For the sake of a successful AMI both colour and textural patterns of the rock forming minerals must be taken into account. Minerals regarding their crystallographic systems are showing different colours under planned and crossed polarized lights as a function of the orientation of their optical axes with the polarizers. These colour variations are the most important colour features for the task of mineral identification. The major rock forming minerals including quartz and feldspars, however, cannot be recognised just by their colour features. These minerals are showing distinct textural features including twinning and undulatory extinction. It will be explained how developed AMI schemes can recognise and classify minerals based on colour and textural features. Moreover, it will be shown that the mechanical properties of rack materials are closely related to their petrographic features, and it is possible to successfully estimate engineering properties of rock materials by means of quantitative analysis of their photomicrographs.

Audience Take Away:

- The importance of quantitative rock microstructural analysis in rock mechanics
- Automation of optical microscopy
- Application of novel image processing methods in mineral identification

Biography:

Dr. Aligholi obtained a B.Sc. in Applied Geology from Shahrood University of Technology, and an M.Sc. in Engineering Geology from Ferdowsi University of Mashhad. His PhD awarded recently by the department of Civil Engineering, Monash University. Dr. Aligholi is currently a sessional lecturer at institute of Innovation, Science and Technology, Federation University Australia. He has worked in the field of automatic microstructural quantification of rock materials by means of image processing and machine learning techniques, and understanding the relationship between physical, mechanical and dynamical properties of rock materials, and has published his findings and contributions in high ranked journals.

Factors affecting in biomass gasification and hydrogen- rich gas production

Nezihe Ayas*, Alattin Cakan and Burcu Kiren
Chemical Engineering Department, Eskisehir Technical University, Eskisehir, Turkey

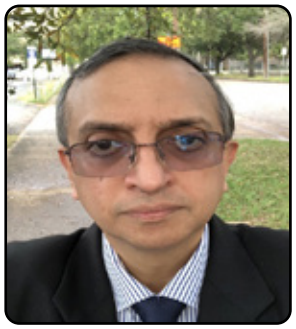
Energy is a key tool that acts as catalyst for the economic and social development of a nation, and today, the main source of the energy for global energy supplies is based on fossil fuels, i.e., oil, natural gas and coal. However, the exploitation of this primary sources of energy as the result of excessive consumption and the damage caused by greenhouse gas emissions and pollution in the environment prompted the nations to look for new permanent solutions to solve these issues. Therefore, renewable sources of energy are great option for the supply of energy in the sense of ease in the integration of different sources of renewable energy, and they have environmental benefits, such as, reduction of environmental damage and regeneration of the environment. It is possible to use biomass as an alternative fuel for the supply of power in the case of the reduction of production due to the weather conditions, but the biomass industry is still attracting attention because of its diversity of feedstocks and the way in which wastes are handled. Biomass can be utilized to generate electricity, biofuels, or chemicals by thermochemical processes such as combustion, pyrolysis, liquefaction and gasification. Gasification technique attracted the industrial practitioner, as it was a method to promote the conversion of biomass into energy from economic and environmental advantages. Specially, biomass gasification has been regarded as the best choice and has a huge potential, satisfies energy needs and could ensure fuel supply for the foreseeable future. Hydrogen has attracted much attention from many researchers because of its capacity to produce clean energy, with zero emissions, and its high energy density.

Audience Take Away:

- The audience will be able to understand the role and the importance of biomass in the global energy mix
- In the context of the basic principle of the gasification process, the presentation will be given on the transition of biomass into electricity, chemicals and biofuels resulted from the gasification process
- Parameters affecting the gasification process, e.g., raw material, gasifying agent, residence time, gasification temperature, catalyst type and so forth, will be described in detail to acquire a gas product with a high energy density
- Finally, the superior characteristics of hydrogen, and its significance in achieving global energy security, will be discussed

Biography:

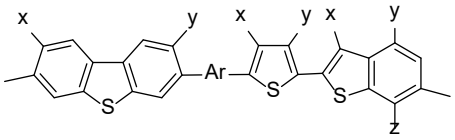
Nezihe Ayas is a full professor of Chemical Engineering at Eskisehir Technical University. Her research interests include gasification technology, energy conservation, hydrogen energy and fuel cells, bioenergy, biodiesel and catalyst preparation via different synthesis methods. She is the author of 100+ national and international journal papers along with a similar number of conference papers on the different aspects of her areas of expertise. She has been involved as a project manager in 25+ international and national funded projects. Her research team is actively working in the areas of biofuel production, hydrogen, gasification and fuel cell technologies, process modelling and simulation.



Novel hyrdogen-free low-carbon catalytic desulfurization process with value addition of sulfur compounds present in crude oil and refinery streams

Anjan Ray*, T. Senthilkumar, Umesh Kumar, Vedant Joshi, Sudip Kumar Ganguly
CSIR-Indian Institute of Petroleum, Dehradun, Uttarakhand, India

Crude oils and refinery streams such as naphtha, gasoline, kerosene, diesel, Light Cycle Oil (LCO), Vacuum Gas Oil (VGO), Heavy Residue Oil (HRO), Foots Oil, Visbreaking Tar (VisTar) streams contain Sulfur-Containing Heterocyclic Aromatic Compounds (SCHAC). These SCHACs are responsible for the corrosion of metallic assets, poor fuel quality, health issues, and environmental problems and need to be treated for sulfur reduction before its final end-use. To address this, a novel single-step hydrogen-free catalytic desulfurization process has been developed to treat SHACs present in the petroleum crude oils and refinery streams. The desulphurization results for different streams have been shown in
Table 1. The synthesized products, easily separable from the de-sulfurized crudes/other refinery streams via a simple filtration process, are structurally characterized with spectroscopic techniques and found to be aromatic in nature with aliphatic side chains, the generic structure being shown here:



x = H, R y = H, R z = H, R

Wherein R stands for aliphatic or alicyclic substituents, and Ar represents higher aromatic rings. The novel sulfur-containing materials exhibit promising results for bitumen blending and may also find applications in rubber compounding. The facile, inexpensive process offers a potentially transformative low-carbon desulfurization solution for bulk processing of petroleum streams at ambient pressures and mild temperatures.

Table 1 Desulfurization results of crude oil and various refinery streams

S.No.	Crude oil/ Refinery stream	Desulfurization		Sulfur reduction in (wt%)
		Before (wt%)	After (wt%)	
1.	Foots oil	0.31	0.03	90.3
2.	LCO	0.91	0.08	91.2
3.	VGO	0.08	0.02	75.0
4.	Crude oil API-40	0.07	0.04	42.9
5.	VisTar	0.05	0.03	40.0
6.	Fuel Oil	1.52	1.08	28.9

Audience Take Away:

- The approach adopted in this novel process has the potential to change the existing desulfurization configuration of crude oil and refinery streams in a cost-effective manner without the use of expensive hydrogen
- The products formed from this process are expected to find useful applications in the bitumen and rubber industries
- The process has the potential to offer a cost-effective solution for the processing of heavy sulfur-containing streams such as fuel oil and cutter stock, especially for marine applications

Biography:

Anjan Ray received his Doctorate in Chemistry from the University of Pennsylvania underthe guidance of Nobel Laureate Prof. Alan MacDiarmid. He then moved to the chemical industry and worked for over 25 year across functions ranging from Quality Control, Technical Service,R&D and Marketing to General Management, Mergers & Acquisitions and Corporate Strategy.His professional interests have spanned fields as diverse as surfactants, oleochemicals, paints,adhesives, textiles, cosmetics, pharmaceuticals, water treatment, energy efficiency, biofuels andrenewable energy policy. Currently, he holds the position of Director – CSIR-Indian Institute of Petroleum.Apart from his professional career in chemical technology, Dr. Ray has had an active interest in media, education, heritage and environmental conservation for over 3 decades.

Prediction of rate decline by machine learning in bakken shale oil wells

Subhrajyoti Bhattacharyya*[1], Aditya Vyas[2]
[1]Ph.D. Research Scholar, Deysarkar Centre of Excellence in Petroleum Engineering, IIT Kharagpur, Kharagpur, West Bengal, India
[2]Assistant Professor, Deysarkar Centre of Excellence in Petroleum Engineering, IIT Kharagpur, Kharagpur, West Bengal, India

Discrete mass-balance equations must be solved using commercial reservoir simulators. More grid blocks can be employed when the reservoir is heterogeneous and complex, which calls for precise reservoir data, like porosity and permeability that are usually unavailable in the field. It can consequently take hours or sometimes even days to predict the EUR (Estimated Ultimate Recovery) and rate decline for a single well, making them time-consuming and computationally expensive. In contrast, because decline curve models only need a few variables in the equation that can be easily obtained from the wells' most recent data, they are a simpler and faster choice. The publicly accessible databases of the Montana Board of Oil and Gas Conservation were used to collect the well data for this investigation. In a random oil field, well data set, the predictor parameters, and the SEDM (Stretched Exponential Decline Model) decline curve equation variables were correlated. The SEDM decline curve equation parameters were specifically created for unconventional reservoirs. The study looked at the relative weights of several well parameters. The original aspect of the study is the creation of a Cutting-Edge Machine Learning (ML) model based on a Support Vector Machine (SVM) for quick rate-decline and EUR prediction in Bakken Shale oil wells. The availability of a large, high-quality dataset is essential for the study's effective application.

Audience Take Away:

- The audience will learn how to use machine learning as an alternative to reservoir simulation and to overcome the complexities in traditional reservoir simulation problems also expand this study to the future to include more aspects and make the reservoir simulation process very computationally less expensive and rapid

Biography:

Subhrajyoti Bhattacharyya completed his Bachelor in Engineering from Jorhat Engineering College in 2017. He did his M.Tech in Petroleum Exploration and Production Technology from Dibrugarh University in 2019. He joined Doctoral Research Programme in 2019 at Deysarkar Centre of Excellence in Petroleum Engineering, IIT Kharagpur under the guidance of Prof. Aditya Vyas (co-author), Ph.D. from Petroleum Engineering, Texas A&M University, Texas, USA.

Tube wells pouring of rare gas in rocks of vindhyan super group around sagar, South Ganga Basin, Bundelkhand Region M.P. India

Arun K Shandilya*, Iyengar Bhargava
Deptt of Applied Geology, Dr.H.S.G.University SAGAR, N.I.T, Raipur

The tube wells are pouring the of the Helium gas& petroleum gas in the rocks of the Vindhyan Super Group around Sagar, South Ganga Basin, Bundel khand region, M.P. is carried out in the detail with joint collaboration of Deptt. of Applied Geology and ONGC Energy Centre, Ahmadabad. As Author has already reported the Discovery og Helium has leakages through more than 50 tube wells/e wells excavated in agriculture fields various Villages in Sagar Distt. The geochemical analysis of the soil , gas and water indicates remarkable amount of Helium gas in these tube wells, containing about 0.45 to 0.735 and methane varying from 72 % to 99%. These investigations were done in the long research work (more then 25 years)dedication carried out in this area and research finding published in the Journal of National and International repute, which has attracted the officers/ Scientists of ONGC, Dehradun, CGWB, Faridbad, Atomic Mineral Directorate Hyderabad and Bhabha Atomic Research Centre Mumbai. The Result of the stable isotopic analysis of Ethane gas in these samples δC^{13} value are ranging from -24.9 per mill w.r.t. PDB and -26.9 per mill w.r.t. PDB and the Methane gas are ranging from Isotopic Values -54.0- per mill w.r.t. PDB to -61.5 per mill w.r.t. PDB are indicative that this gas is of thermogenic origin, which must have been formed at very high temperature & pressure condition in the deeper horizon of the great Vindhyan sedimentary basin of late Proterozoic (>500m.y.) period. A reporting of leakages of above mentioned gas from 50 tubewells in the inliers of Vindhyan rocks and even in the Deccan trap rocks ensures that this area must be having a big gas reservoir within Vindhayn rocks around Sagar- Distt. in M.P.The ONGC energy Centre Ahmadabad has started the detail collaborative geophysical work on the drilling exploration upto the depth of 600 m has been carried out and to be carried out in various location from where the leakages of has been earlier reported earlier. In these 600 m deep drill holes detail geophysical logging including the gama ray logging and Neutron logging, lithological an d structural logging will be carried out to know the probable gas reserve and at what depth the, we can get the gas for the exploration and utilization of these ases for industrial purpose and other uses etc . The detail geophysical studies will be very much helpful in the gas reserve calculation and the depth of the gas pockes in the South Ganga Basin in Bundelkhand region in M.P.Tube Wells Pouring Of Rare Gas In Rocks Of Vindhyan Super Group Around Sagar, South Ganga Basin, Bundelkhand Region M.P. INDIA.

Biography:

Prof. ARUN Kumar Shandilya, worked as Professor in Dr,H.S.G University SAGAR, having 44 years of Experience in Teaching and Research and Administration. He did Doctoral research on Himalayan Tectonics . He have published more then 85 Research papers in the Journal of National and International repute. Supervised 8 students for Ph.D and more then 500 students for M.Tech / M.Sc Dessertaions on Himalayan Geology, Central India and Rajasthan Geology and Geology of Bundelkhand Tectonics, Satpura Tectonics and on Coal Geology and impact of mining on the Environment of Manganeese and coal, Iron, Marble mines, Phosphorire Mines etc. He have published a Book On- geological and environmental processes by springer nature and another book is on peninsula geology and environment .

Theory of reversible hydrogen storage in metal decorated 2D nanomaterials beyond Graphene

Vikram Mahamiya
Department of Physics, Indian Institute of Technology Bombay, Powai, Maharashtra India

By applying Density Functional Theory (DFT) and Ab-Initio Molecular Dynamics (AIMD) simulations, we predict the ultrahigh hydrogen storage capacity of alkali metal (AM), alkali-earth metal (AEM), and Transition Metal (TM) decorated single-layer carbon nanomaterials, including, Holey-Graphyne (HGY) and Biphenylene Sheet (BPS). We have observed that one unit cell of HGY can adsorb 6 Sc atoms, and each Sc atom can adsorb up to 5 H_2 molecules with an average binding energy and average desorption temperature of -0.36 eV/H_2 and 464 K, respectively

The gravimetric weight percentage of hydrogen is 9.80 %, which is considerably higher than the Department of Energy, United-States (DOE-US) requirements of 6.5 %. BPS is a recently synthesized advanced 2D carbon allotrope with four, six, and eight-membered carbon rings. We have kept various alkali and alkali-earth metals, including Na, Be, Mg, K, Ca, at different sites of BPS and found that K and Ca atoms prefer to bind individually on the BPS instead of forming clusters. It wasfound that 2×2×1 supercell of biphenylene sheet can adsorb eight K, or eight Ca atoms, and each K or Ca atom can adsorb 5 H_2, leading to 11.90 % or 11.63 % of hydrogen uptake, respectively, which is significantly higher than the DOE-US requirements.

The average adsorption energy of H_2 for K and Ca decorated BPS is -0.24 eV and -0.33 eV, respectively, in the suitable range for reversible H_2 storage. Hydrogen molecules get polarized in the vicinity of ionized metal atoms, and get attached to the metal atoms through electrostatic and van der Waals interactions. We have found that Kubas interactions also play a significant role in hydrogen binding with Ca and Sc atom. We have estimated the desorption temperatures of H_2 and found that the adsorbed H_2 can be utilized for reversible use. We have found that sufficient energy barriers exist for the movement of metal atoms that can prevent clustering, calculated using the Climbing-Image Nudged Elastic Band (CI-NEB) method. The solidity of metal decorated HGY and BPS structures were investigated using AIMD simulations.

Audience Take Away:

- Hydrogen is considered one of the most suitable alternatives to fossil fuels in present times because it is highly abundant, possess high energy density, and does not produce harmful pollutant during combustion
- In this talk, I will describe the theoretical methodology for hydrogen storage in solid state form
- I will also discuss the theory behind the adsorption of hydrogen molecules on 2D nanomaterials and the practical difficulties associated with it
- I believe that the audience will get familiar with the hydrogen storage problem and computational modeling, which will motivate them to design novel materials for hydrogen storage applications

Biography:

Vikram Mahamiya studied physics at the Indian Institute of Technology Delhi and graduated as M.Sc. in 2017. He then joined the research group of Prof. Alok Shukla at the Indian Institute of Technology Bombay, India. He has recently submitted his Ph.D. His Ph.D. research is on the electronic structure, optical, and hydrogen storage properties of clusters and 2D Nanomaterials. Vikram has published 6 firth author research articles in reputed journals and his few articles are currently under review.

Deep learning models for history matching and forecasting reservoir performance

Mayur Pal
Department Mathematical Modelling, Kaunas University of Technology (KTU), Kaunas, Lithuanian

Advances in new technologies particularly Artificial Intelligence (AI) and Machine Learning (ML) have now made it possible to use AI and ML based approaches for building reservoir models, which do not rely on conventional simulation tools for history matching and production forecasting. These new methods have the capabilities to eventually replace numerical simulator as a fast history matching and forecasting tool. Objective of this work is to use new AI and ML based deep learning algorithms for performing history matching and forecasting on a series of industrial dataset from middle east and North Sea.The results show that AL and ML based deep learning algorithm-based models are very good and gives close to 85% accuracy in history matching a few well patterns. In total model is evaluated on 3 different datasets with high accuracy. The models are also extended to generate long term forecast.

Audience Take Away:

- Use of machine learning in oil and gas application
- AI and ML based time series history matching and forecasting of oil and gas production for reservoirs
- AI and ML based forecasting can reduce the time taken for history matching and forecasting from months to days. Computationally fast and accurate approach can reduce reliance on expensive history matching and forecasting tools

Biography:

Mayur Pal received Ph.D. degree in Civil and Computational Engineering from Swansea University, Wales, UK in 2007. After finishing his Ph.D. Mayur Pal worked at Shell International Exploration and Production B.V. Research Centre in Rijswijk followed by Maersk Oil Research and Technology Centre. He also held positions as head of enhanced oil recovery team and head of asset in North Oil Company, Qatar. He has over 80 publications and over 800 citations. He is currently Prof. at Dept. of Mathematical Modelling at KTU, Kaunas, Lithuania. His research interest includes, subsurface flows, multiscale modelling, discrete fracture network modelling, enhanced oil recovery, CCUS, data science and machine learning applications to solve problems in engineering and sciences.

Solar Combined System, SCS, integrated in tunisian residential applications: Energetic and exergoeconomic investigations

Majdi Hazami
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Nowadays the cheaper and simple kinds of these converting solar energy system systems is the Solar CombiSystem (SCS) which use thermal part of solar energy to provide domestic hot water and hot water for space heating. The primary energy source of a SCS is solar energy while the auxiliary energy source can be fuel, natural gas or electricity. Many researchers have treated the SCS potential and performances to cover buildings thermal needs. The endeavor of this paper is to study the potential offered by the expenditure of a Solar Combined System, SCS, integrated in Tunisian buildings for the heating load of dwellings and domestic hot water supply. The analyses are based an experimental and simulation studies according to a typical climatic condition of Tunis. The developed system was evaluated based on the steady-state conditions at different temperatures. The study of the energetic and the economic potential given by the employ of SCS is achieved by using a TRNSYS simulation model according to a Tunisian scenario. The model includes component models for the PV/T solar collector, storage tanks, heat exchangers auxiliary heating units, heating, control units and thermostat, and makes use of the appropriate weather data files. Simulations are conducted for Tunisian houses in the four climate conditions to study energy savings possible with solar combisystems. The annual performances investigation includes: energy extracted and delivered to the user from the PV/T system, heat loss, auxiliary energy and electric and thermal efficiencies. It has been observed that the proposed SCS system can meet the daily requirement of domestic hot water as well as air heating space during great periods of the year. It has been concluded that in terms of energy saving the SSC offers a greater potential compared to other conventional systems (gas boiler, PAC…). The results showed that the maximum instantaneous thermal and electric energy efficiency in active mode are about 50 and 15 %, respectively. It was found also that the maximum thermal and electric energy efficiencies were about 50 and 14.8%, respectively. The results showed that the optimized SCS covert the major part of the hot water and the electric needs of Tunisian household's with an expected annual average gain of about 14.60 and 5.33%, respectively. An economic appraisal was also achieved to appraise the SCS feasibility compared to conventional systems by the evaluation of the savings, the financial viability, the payback times and the environmental aspects of the SCS system.

Biography:

Dr. Majdi HAZAMI received his PhD in Physic: Mechanics of Fluids, Thermal and Mass Transfer from the Faculty of sciences of Tunis, Tunisia, in 2007. He is an Associate Professor in the Research and Technology Centre of Energy the coordinator of a research team working on fundamental physics, solar energy applications, Photovoltaic/Thermal solar collectors, desalination, Applied Mechanics of Fluids and Thermal Transfer, simulation, Energy efficiency, Geothermic, Specific materials in building, Building space heating etc. From 2007, he is a Researcher in the Laboratory of Thermal Procedures in energy, environment and materials thematic. He is also teaching in the Faculty of Sciences of Tunis (Master of thermal transfer) and in the Faculty of Sciences of Bizerte (Professional master in HVAC and Energy management). He also assured the supervising of (09) doctoral thesis, (06) Master supervision (06), Research project coordination (05), (02) Patents, (32) Publications in indexed journal with impact factor, (05) Publications in specialized books and about (17) International Proceedings.

Stress-strain analysis of a tubing and packers system in 3-D wells

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During well operations such as injection and production a string of tubing with packers is used. The system usually contains multiple packers and ports. The number of packers can be up to 20. Tubing is exposed to severe loads caused by string weight, pressures inside and outside the tubing and temperature. The objective of this study is to perform stress-strain analysis of the tubing set on multiple packers of various types under the action of external loads. The prediction of tubing forces and tubing movement is based on calculations and allows to avoid damage to the tubing or packer, failure of remedial operations and prevent tubing buckling.Model is based on system of differential equations describing tubing static equilibrium. It takes into account the viscous friction acting on the tubing walls and temperature changing along the well. Pressure distributions inside and outside the tubing along the well are calculated due to a hydraulics model specially adapted for a multi-packer system. Several types of packers with different constraints are modeled by different boundary conditions. The equations are solved by numerical integration over the string length. Solution for the whole tubing presents a number boundary value problems or initially value problems for intervals of tubing concluded between packers which are fixed both on casing and on tubing. Based on the obtained distribution of axial effective load and elongation along the string length, stress-strain analysis and buckling analysis are performed. This analysis allows to determine the tubing force and length change due to piston, ballooning, temperature and buckling effects. Software was developed. The results of the study will help users to select correct initial conditions to perform successful injection and production operations.

Audience Take Away:

- A full model of well operations such as injection and production consisting of hydraulic model specially adapted for multi-packer system and a model of tubing will be presented
- The presented model allows to predict tubing forces change and its length change during well operations as well as to prevent damage to tubing and packers and to avoid tubing buckling
- Software is developed. It will help to carry out simulation of the process in 3-D well and make stress-strain analysis of a tubing. The user will be able to estimate a contribution of piston, ballooning, buckling and temperature effects to the system. It will help to select the optimal initial parameters for the system in order to perform successful operation and lower operation costs and time

Biography:

Dr.Bukashkina studied Applied Mathematics and Mechanics at St.Petersburg State University, Russia and graduated as MS in 1996. She then joined the Department of Theoretical and Applied Mechanics of St. Petersburg State University. She received her PhD degree in 2000 in Mechanics of Rigid Body.In 2007 she received MS degree in Computer Science at the same institution. She had a year of internship in the Scientific Research Laboratory of Ford Motor Company, USA; Since 2012 she worked as senior software engineer at Weatherford. She has published more than 25 research articles.

Equipment-manufacturing technology

SamMalik
P.Eng., PMP, CMC, MBA, PhD. Global Engineering Director Project Management Office at Orbia, Houston, TX

As the science is making strides towards innovative and Artificial Intelligence (AI) we have to move at the ferocious speed to adept to the new inventions and development in equipment manufacturing technology. The leaders in future manufacturing industry would need to be skilled in savvy stakeholder management, global sourcing, raw materials, low cost engineering and design centers. In addition the logistics, capital markets expertise, and an understanding of complex approval processes play key role in equipment manufacturing. Moreover the ability to source the necessary talent, navigate supply chain obstacles, and communicate a long-term vision and goals.Robotics AI, automation control and monitoring have driven efficiency, reduced cost and elevated safety ian the equipment manufacturing. We must couple the lessons learned in manufacturing with new inventions to seek the best results not only cost and time but ensure the safety.

Audience Take Away:

- Innovative strategies to manufacture industrial equipment safely incompliance to global standards
- With 3 decades of industrial equipment manufacturing practical experience the success hinges on cost effective equipment manufacturing from Asia China, India, Brazil
- To have a major impact on community by sharing the lessons learned and best practices in RFPs, RFQs, Technical and Commercial Evaluation of Bids
- Provide the society with the tools, techniques to develop equipment manufacturing, contracts, vendor management, quality assurance, quality control, handover package, and post support
- Provide the industry with the tools to be skilled in savvy stakeholder management, program management, portfolio management, capital markets expertise, and an understanding of complex approval processes, as well as the ability to source the necessary talent, navigate supply chain obstacles, and communicate a long-term vision and goals
- Modern scientific, manufacturing, and engineering approaches that aid in industrial production and diverse manufacturing processes. The platform for the functioning of unit processes is manufacturing equipment. For the manufacture of high-quality, cost-effective products, properly designed equipment is needed. Equipment design is the widest of the six enabling technologies since it is the vehicle through which all of the other enabling technologies are implemented. In a given economy, the processing equipment industries perform a distinctive function. They offer the tools for all of the economy's other manufacturing sectors
- Technology use in equipment design, operations management and advanced equipment

Biography:

Senior executive with 30 years leadership experience in oil and gas, energy, EPC, EPFCM, chemical, mines, PVC, resins, power and water industry. Strong track record of successfully managing business safe operations, equipment procurement, manufacturing, finance, and mega projects. Proven track record of Operational Excellence, business transformation, business development, Joint venture, acquisitions, new business, strategic goal accomplishment. Experienced in finance, business profitability, resources, schedule, budget, business vision; HSE, QA, QC, engineer, global procurement, fabricate, construction, and joint venture and acquisitions. Project execution, sales/marketing, stakeholder management, technical, engineering and communication aspects of business. ▪ Executive Management ▪ Focused Leadership ▪ Performance Delivery Management ▪ Strong Business Vision ▪ Project Management Excellence
Dr. Malik has presented on several national and international conference including PMI, OGC, CMC and Apegga.

Geostatistical techniques applied to the prediction of an oil production time serie

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In the analysis of a hydrocarbon production performance, empirical techniques have been applied over time; extrapolating the historical behavior of the observations under the assumption that the past, present and future continue under the same trend, not subject to interventions. In order to extract the greatest amount of information from this time serie, this work applied the Box Jenkins and Reinsel methodology, to decompose its trend, into additional elements, such as seasonality and randomness, once the stationarity condition has been achieved. A model representing the 70.22% of the information was defined as SARIMA(0,1,1) $(1,0,0)_{12}$. Its predictions were linear, unbiased, and of minimal variance, however, this model did not match the nature of the time serie, due to the fact that the regular component of the serie could not be modeled as autoregressive. In contrast, this was only modeled as a linear function of the actual and previous errors ($p = 0$ and $q = 1$), and the computed residuals were not normal. Finally, the convenience of the use of geostatistical techniques was demonstrated. A forecast step comprised from 01/01/2008 to 12/01/2008, and considering that data was observed from January to July of that same year, these served as a comparison estimating an absolute average percentage error of the estimates (MAPE) of 5%. On the same way, this technique was applied to predict missing values from the internal structure of the time serie, along two seasonal cycles. Observations between 01/01/2001 and 12/01/2002 were removed from the total oil production historical data. Results showed a MAPE of 7.15%, not only demonstrating the efficiency of the geostatistical technique but also, that the methodology honored the seasonality and trend of the time serie. Errors were normal, identically distributed, and uncorrelated.

Audience Take Away:

- Faced with the accelerated and inevitable decline in fluid production, the Oil and Gas industry is interested in modeling the productive behavior of reservoirs. Therefore, numerical models are calibrated based on historical pressure and production data and the omission of any input data generates uncertainty in the results of their predictions
- Given the absence of information in some periods of time, specifically in mature fields, the convenience of using geostatistical techniques, an area of petroleum engineering that has been little explored in the time domain, is proposed as an alternative for the prediction of missing data in the time series of the decline in production of fluids in the reservoir of an oil field
- Results showed that the geostatistical estimation reproduces the trend and the seasonal component of the data that was not evidenced in the application of the conventional analysis methodology for time series
- This research could be expanded considering new variogram types, to improve the accuracy of the predictions

Biography:

Dr. Gambus studied Petroleum Engineering at Universidad del Zulia, Venezuela and worked as reservoir engineer for the national oil company, Maraven. She got a partial fellowship that allowed her to work in an academic position while she graduated as MS in 1998. She won a full-fellowship to get her PhD degree in 2005 at the University of Texas at Austin, United States. She obtained the position of professor for the petroleum engineering department at Universidad del Zulia, and in 2016 she got the Assistant Professor position at Universidad Industrial de Santander, in Colombia. She has published 4 research articles in journals, and 30 conference proceedings.

Effect of the variation in the concentration of the catalytic agent on the physicochemical properties of a heavy colombian crude oil subjected to a steam injection process under laboratory conditions

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[2]Grupo de investigacion en Corrosion, GIC,Universidad industrial de Santander- UIS, A.A Bucaramanga, Colombia

During the last few years, heavy crude oil production in Colombia has been increasing, becoming an important part of the national hydrocarbon supply basket. Therefore, the recovery of this type of crude oil represents important challenges for the industry, mainly associated to its high viscosity and low mobility in the reservoir. As a solution to this problem, this work studied the influence of the thermal process of steam injection in the presence of iron and molybdenum catalysts (metal sulfides) in a Colombian heavy crude oil with a viscosity of 9670 cp @ 35 °C. The catalytic aquathermolysis tests were carried out in a batch reactor at 270 °C and 800 psi, during 66 hours of reaction. Iron naphthenate and molybdenum with concentrations of the active metal in the range of 0.005 to 0.03 g/l were used as precursors in the process. The aquathermolysis process in the presence of the iron and molybdenum catalysts presented significant effects on viscosity reduction around 55 and 35 %. On the other hand, the distillation curves (ASTM D7169) of the improved crudes showed a significant decrease in the complex fractions with boiling points above 525 °C+, for which conversions of more than 7 % were evidenced. In this study, it was determined that the iron naphthenate precursor with 0.01 g/l of active metal shows better results on viscosity reduction with respect to the molybdenum precursor within the established concentration range. During the application of this recovery method, it can be established that the selectivity and reactivity of each catalyst is different. Additionally, the improvement of the physicochemical properties of the crude oil in the reservoir can be consolidated as a complementary recovery mechanism to the conventional process.

Audience Take Away:

- Understand the effect over physiochemical properties of heavy oil under different catalyst concentration
- Observe the influences of different metal ions over oil properties
- Knowing about aquathermolysis reactions

Biography:

Luis Miguel Salas-Chia is a student in Hydrocarbon Engineering Master student at the Universidad Industrial de Santander (UIS), Colombia and graduated as Petroleum Engineer in 2020. He's an active member of Grupo de Investigacion Recobro Mejorado (GRM-UIS) with a research background related to enhanced recovery methods as thermal and hybrids techniques.

Data analytics for prediction of production for parent-child wells in montney formation, Canada

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The development of unconventional reservoirs has led to the generation of multitude of data which can be used efficiently to make effective decisions for reservoir management. Data-Driven techniques have lower turn-Around times and can be used efficiently for production forecasting and developing further reservoir development insights. The current study focuses on using different types of well data such as completion data, production data and, survey data to predict the average gas production per day for shale wells in Montney Formation, Canada using machine learning. Moreover, the study attempts to predict the average gas production of a child well using only the parameters of the parent well. Parent wells are the wells drilled in the reservoir initially and child wells are the infill wells drilled subsequently in further drilling campaigns. The criterion for deciding a child well is based on specific radius threshold, production gap and orientation from the parent well. The most important feature for the predictions is spatial location given by the latitude which has been used as an indicator of the geological and the petrophysical properties. Different models such as Linear Regression, Random Forest, and Xtreme Gradient Boosting were evaluated, and the effort has been to work on interpretable models to gain understanding on the effect of different parameters on average gas production. Moreover, we used dimensionality reduction techniques to reduce training time and reduce multicollinearity in the input parameters. We concluded that using only the parameters of the parent well in the Money Formation the average gas production of the child well can be predicted with an R-squared value of 0.82. The workflow can be used to guide decisions for drilling child wells and optimize the completion parameters.

Audience Take Away:

- The workflow applied to the Montney Formation shows how data from parent wells can be used to make predictions about future production from child wells. The workflow can be readily transferred to other oil and gas reservoirs
- The focus has been to make the models interpretable so that we can understand on what factors does the production depend on most. The turnaround time is less than traditional reservoir forecasting techniques so it can be used to get a robust understanding of the parameters affecting production in a specific area quickly
- The modeling workflow also shows different ways of tuning the hyperparameters of a machine learning model and its implications as well as ways to manipulate features to be used in a model

Biography:

Yashee Mathur is a first year PhD researcher at Stanford University where she works with the Stanford Centre for Earth Resources Forecasting. She has completed her Bachelors' and Masters' from IIT(ISM) Dhanbad in India. After her undergrad, she worked as a Petrophysicist for over three years at Cairn Oil and Gas, India, where she worked extensively on formation evaluation, hydro-fracturing planning and developing petrophysical models for a Gas-Condensate Volcanic reservoir.

Acoustic sensing for fuel quality assessment

Aparna Aravelli*[1], Brian Pineda[1], Lazar Bivolarsky[2]
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[2]Perceptive Sensor Technology, Tucson, AZ, USA

The scope of adding an ultrasonic sensor to analyze and monitor the behavior, characteristics, and properties of any liquid is of high importance in several industries particularly in the oil, gas, and aerospace sectors. Industries typically working with petroleum and hydrometallurgy use an ultrasonic sensor to detect any liquid-liquid interface. The usage of advanced instrumentation systems allows for estimation of the location of the interface by analyzing the speed of sound in both liquids without any manual intervention. This non-destructive system has potential to detect of any liquids without prior knowledge of their acoustic properties. The system can also be used to detect any contaminated particulate matter or emulsion in the liquid. One of the ways an ultrasonic sensor functions is by using the pulse-echo technique that allows the sound wave to travel and reflect from the interface of the fuel and or air. Current work implements a new method of acoustic sensing technology to embark in the detection of fuel quality as an indicator to quantify aging process. In literature, studies have used ultrasonic senor for a more reliable, accurate, and simple way to detect any contamination in hydrocarbon substances such as petroleum. This work uses ultrasonic technology for kerosene-based fuels. Non-destructive ultrasonic sensor technology is used to detect and classify the quality of fuel as good, marginal, and contaminated by developing correlation models based on experimental data. Results indicate good correlation between the type of fuel/liquid and the time of flight obtained. In future, the technology can be extended to detect any mixing of fuels, aging process and corrosion detection of oil and gas pipelines based on real-time acoustic sensing.

Audience Take Away:

- Experimental and modeling approach for potential material recognition using acoustic waves
- Relevant to fuel mixing in pipelines, fuel degradation and structural integrity concerns
- Benefits include use of the sensing technique applicable to oil, gas and aerospace industries

Biography:

Dr. Aravelli is a Research Scientist and a faculty at Florida International University. She received Ph.D. and M.S degrees in mechanical engineering from the University of Miami and West Virginia University respectively. Dr. Aravelli' s research and industrial experience span broad areas of engineering including sensors, robotics, building energy systems modeling, engine emissions and optimization. Dr. Aravelli has published a book titled "Real-Time Measurement of Oxides of Nitrogen from Heavy-Duty Diesel Engines" and authored several journal and conference publications. She is currently conducting research under federally funded projects on nuclear and aerospace applications.

Biosurfactant production using Egyptian oil fields indigenous bacteria for microbial enhanced oil recovery

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The US Energy Information Agency (EIA) predicts that hydrocarbons will remain the primary energy source to satisfy the surging energy demands in the near future. Microbial Enhanced Oil Recovery MEOR is a cost-effective and ecofriendly technique that exhibits many advantages comparing with the other conventional Enhanced Oil Recovery EOR techniques where it has no need of huge amounts of energy, like thermal techniques, and it does not depend on the oil price, like many chemical techniques. On other hand, MEOR could be easily applied after simple adjustments to the existing field facilities, and it is able to produce up to 50% of remaining oil. Combined analysis of morphological, and biochemical characterization was performed on the bacterial strains isolated from Egyptian crude oil sample located in Western Desert to identify its genera. To optimize the surface activity of the produced biosurfactant, bacterial strain was grown in 10 different reported nutrient media, and a new proposed nutrient medium H. The growth rate of bacterial strain was studied using the optical density method. The emulsification activity of the produced biosurfactant was examined by measuring the emulsification index E24. The produced biosurfactant was purified and extracted by acid precipitation method. Finally, stability studies of the produced biosurfactant was done under different conditions (temperature, salinity, and pH). Results showed that the isolated bacteria strain was Bacillus subtilis. Bacillus subtilis has been isolated from Egyptian oil fields located in Western Desert, in terms of producing metabolic biosurfactant from indigenous bacteria to improve the oil recovery.

It was found that Bacillus subtilis has the ability of producing a highly active biosurfactant. It was found that the maximum surface tension (25.74 mN/m), and interfacial tension against kerosene (0.38 mN/m) was observed after 24 hours of incubation in the new proposed nutrient medium H. The growth profile of Bacillus subtilis was investigated, the maximum growth rate (2.072 x 109 CFU/ml) was observed after 24 hours of incubation. The produced biosurfactant was extracted and purified from culture media, and the biosurfactant yield was about 2.853 g/l. the critical micelle concentration CMC was also determined, it was 0.04 g/l at minimal surface tension 25.74. The stability of produced biosurfactant in different conditions (temperature, salinity, and pH) was investigated. There was no notable change in surface activity over a wide range of temperature up to 120oC, which means Bacillus subtilis is thermophilic and could tolerate the harsh temperature of oil reservoirs. The surface activity of produced biosurfactant exhibited high stability against salt concentration, even at high NaCl concentration up to 20%, it retains more than 60% of its surface activity, which means it could tolerate the harsh salinity of oil reservoirs. The optimum salinity of the produced biosurfactant was in range of 0 to 2% NaCl concentration. The optimum pH value of the produced biosurfactant was observed at neutral values. The emulsification activity of the produced biosurfactant was confirmed, and it was noticed that the maximum emulsification power against kerosene was 69.52%.

Audience Take Away:

- This work concerned with investigating the capability of production of biosurfactants by indigenous bacteria isolated from Egyptian oil field, and how to optimize these produced biosurfactants
- This work Identified the indigenous bacteria that can be isolated from Egyptian crude oil sample

- This study identified the kinds of indigenous bacteria from sampled Egyptian oil fields
- The effect of some nutrients on the growth of the selected bacterial strains will be Investigated
- This work performed several experimental studies to study the stability of the produced biosurfactants at harsh reservoirs conditions (salinity, pH, and temperature), and determine the optimum conditions for the produced biosurfactants to reach maximum surface activity
- This work carried out several modelling studies in a sand-pack model to investigate the effect of produced biosurfactants on oil recovery

Biography:

Dr. Hamed Aboelkhair studied petroleum and gas technology at the British University in Egypt, Egypt and graduated as BS in 2011. He received her MSc degree in 2017 at the British University in Egypt, Egypt. He then joined the PhD research group of Prof. Pedro Diaz at the school of engineering, London South Bank University LSBU.

Utilization of carbon dioxide in some organic synthesis

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Carbon dioxide, a natural molecule, has been utilized in the synthesis of chemicals for several decades. Its innocuous chemical properties make it a favorable substance to incorporate in such synthetic processes. The conversion of carbon dioxide into profitable chemicals such as esters, aldehydes, carboxylic acids, alcohols, amides and heterocycles has received ever increasing attention in recent years, not only because it is the chief anthropogenic greenhouse gas, but also because it has been regarded as an abundant, inexpensive, nontoxic, nonflammable, and renewable C1-building block.

Audience Take Away:

- Using of CO_2 as a building block in organic synthesis
- Synthesis of oxazolidinones and another heterocycles from CO_2
- Application of the most active, selective and reusable catalytic systems in CO_2 cycloaddition reactions

Biography:

Shahab zomorodbakhshazad studied Chemistry at the Azad University, Iran and graduated as MS in 2007. He then joined the research group of Prof. Mariette Pereira at the coimbra university, portugal he started his PhD degree in 2020 at the Catalysis and sustainability, he has published more than 20 research articles in scientifically valid journals.

Techno-economic analysis of methanol and ammonia production as a sustainable fuel from green hydrogen

Kadir Aydin
Department of Automotive Engineering, Çukurova University, Adana, Türkiye.

In this study, two different power-to-fuel solutions for sustainable fuel synthesis are investigated from the energetic, environmental, and economic standpoints. Both the solutions consider a 10 MW alkaline electrolysis section, fed by renewable wind energy, where high purity green hydrogen is produced. Then, two separate processes are investigated for the synthesis of two distinct chemicals with prices in Türkiye. In the first case, the hydrogen is mixed with CO_2, sequestered by an industrial plant, and produced from a biogas plant: the two gases are sent to a pressurized reactor for methanol synthesis. In the second case, the hydrogen is mixed with N_2, obtained from an industrial air separation unit (ASU), and sent to a reactor for ammonia synthesis. Both the synthesis processes are performed at high pressures and temperatures. In both cases, the power to fuel plants is investigated in economic terms. Methanol synthesis presents a slightly higher efficiency compared to ammonia, while the two solutions are very similar from the economic standpoint. The sale of the co-produced oxygen allows for an improvement in economic terms for both cases and can be a key point in order to reach economic sustainability, together with the expected reduction in electrolysers capital cost.

Audience Take Away:

- Renewable methanol produced from captured off gas CO_2 and non-fossil hydrogen can replace fossil hydrocarbons in a huge swathe of industrial and domestic sectors bring them ever-closer to carbon neutrality. The global market for methanol as a fossil substitute is predicted to be 500mt by 2050. The applications for methanol are already widespread due to its desirable properties. It can be transported and stored easily and safely, being a liquid at room temperature. It is biodegradable and a highly efficient energy carrier, burning cleanly and producing no soot or particulates. Methanol is commonly used as a chemical feed stock for the production of plastics, glue, building materials, paints and solvents and is the most commonly used carbon source for removing contaminants from wastewater.

- Methanol has a high Octane rating (109 RON) providing better energy conversion than either gasoline or diesel. In many regions different blends of methanol with gasoline diesel are in use, with 3% and 15% already seen in Europe and China respectively. Authorities in China are also promoting M100 (100% methanol) in light vehicles, buses and trucks. Marine transport is increasingly turning to methanol as a clean replacement for bunker fuel and it continues to grow in popularity for industrial boilers and cook stoves.

- Renewable methanol is easier and safer to store and transport than hydrogen, and actually contains a higher density of hydrogen than the equivalent liquid volume of pure H_2. It has diverse fuel applications and a large demand as an existing feed stock for the chemical industry. Therefore, renewable methanol is able to technically, economically and practically reduce the greenhouse gas emissions of significant sections of the global economy.

- Ammonia is an important basic raw material for inorganic and organic chemical industries, which can be used in chemical fertilizer, pharmaceuticals, oil refining, soda ash, synthetic fibers, synthetic plastics, nitrogen-containing inorganic salts, etc. Ammonia is expected to be a zero-carbon energy carrier in the future, like being a fuel for automobiles, ships, aircraft and other engines, and replacing gas/oil as a fuel for industrial boilers or civil stoves. Ammonia is also one of the main carriers of hydrogen energy. However, 98% of the feedstock for ammonia production comes from fossil

fuels. With the intensification of global warming and environmental issues, it is inevitable to find an appropriate green alternative to achieve low energy consumption, low emission, sustainable and efficient ammonia production. Green ammonia production is where the process of producing ammonia is 100% renewable and carbon-free. One way of producing green ammonia is by using hydrogen from water electrolysis and nitrogen separated from the air.

- Renewable methanol production has an efficiency of about 52%, while renewable ammonia production presents a slightly lower value (50%) due to higher energy consumption in compressors. Ammonia shows its superiority compared to methanol as a hydrogen carrier, as it can store a considerable amount of H_2 in its structure. On the other hand, methanol production with the described process allows for the utilization of a considerable amount of CO_2, witha positive impact in environmental terms. The production costs are higher than the market values of both renewable ammonia and methanol, the option of selling the co-produced O_2, together with a reduction of hydrogen electrolysers capital costs can considerably improve the economic feasibility of both the renewable ammonia and methanol production. Electricity is the most important cost in renewable ammonia and methanol production, in both cases accounting for more than 65% of the production cost in Türkiye. Regarding synthesis units, ammonia is more expensive than methanol, mostly due to the lower single pass conversion that imposes higher operating pressure and temperature and a higher recirculation rate.

Biography:

Kadir Aydin received his B.Sc. degree in 1983 and M.Sc. degree in 1986 from the Mechanical Engineering Department of Çukurova University. He completed his Ph.D. degree in 1993 at the Department of Mechanical Engineering of Liverpool University. He became Assistant Professor in 1993, Associate Professor in 1995 and Professor in 2001 in the Mechanical Engineering Department of Çukurova University. His special research areas are Internal Combustion Engines, Vehicle Technology, Combustion, Hydrogen and Electric Vehicles, Alternative Fuels (Hydrogen, Biodiesel, Bioethanol and Biogas) and Additive Manufacturing. He already published more than 300 national and international scientific papers.

Modelling the deformation behavior of a hydraulically fractured reservoir rock under a monolayer arrangement of proppants

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Chemical and Petroleum Engineering Department, Beirut Arab University, Debbie, Lebanon

Hydraulic fracturing is a technique for increasing the productivity of Low-Permeability rocks like unconventional reservoirs. It makes extensive use of proppants to keep the fractures open. The placement of proppants within the fracture is determined by numerous characteristics such as the pad stage, slurry stage, and rock characteristics. Due to the limited fracture breadth, less proppant may be installed near to the fracture tip. As a result, only one layer of proppants may develop, either as a dense monolayer or a less dense partial monolayer. During drawdown, the interactions of rock and proppant can result in proppant embedment in ductile formations and proppant or rock crushing in brittle formations. Both scenarios result in a reduction of fracture conductivity, which has a direct influence on well performance.A greater knowledge of the interaction between proppants and rocks can lead to more effective treatment plans. This interaction is examined in this section by developing an analytical model. To determine the fracture deformation pattern, this model employs contact mechanics theories for the sphere-plane interactions. This study took into account a variety of characteristics, including proppant size and layout. The findings were compared to an existing analytical model as well as a numerical model. According to the simulation results, utilizing nonuniform proppant sizes in a fractured rock can have a considerable influence on proppant crushing and embedment. Furthermore, for the situations studied in this work, a combination of proppant sizes can give improved fracture conductivity. The maximum compressive strength of the larger-sized proppants is an important factor in the design's efficiency.

Audience Take Away:

- The finding of this research can provide insight into the best proppant arrangement by taking into consideration the impacts of proppant and rock elastic modulus, proppant arrangement and size distribution, and rock/proppant crushing resistance
- The outcomes suggest that utilizing nonuniform proppant sizes in a fractured rock can have considerable benefits on reducing proppant crushing and embedment
- The results also shed light on the possibility of combining different proppant types, such as ceramics and uncoated sand, as means of improving the fracture conductivity and reducing the cost of the hydraulic fracture treatment
- New analytical models are still needed to examine the deformation profile of fractured reservoir rocks when nonuniform proppant sizes are used or when other conditions are taken into consideration such as elastic-plastic and plastic deformations

Biography :

Dr. Kamel Bou-Hamdan is an assistant professor in the chemical and petroleum engineering department at Beirut Arab University, Lebanon. He holds a PhD degree in petroleum engineering from the University of Aberdeen (UK). His research interests include the role of hydraulic fracturing design in enhancing well productivity. Dr. Bou-Hamdan was selected as a judge for different competitions such as the SPE MENA student paper contest (PhD division) in 2022, SPE section award in 2019, SPE student chapter award in 2017, and the Switch Energy Alliance Competition in 2021 and 2022. Furthermore, he published several articles in different conferences and journals.

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