CONFERENCE PROGRAM

ICOGCT 2021

2021 2nd International Conference on Oil, Gas and Coal Technology

Virtual | July 15, 2021

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Welcome Message from Conference Chair

London Time GMT+1

It is a great honor to welcome you to this 2nd International Conference on Oil, Gas and Coal Technology (ICOGCT 2021 Virtual). The history of this conference goes few years back when I was invited by the organizer CBEES (cbees.org) to chair ICCFE2018 held in Colombo during April 4-6, 2018. I was impressed by the way the conference was organized that I suggested to launch a new conference covering all aspects of oil, gas and coal technology as well as biofuel production and processing similar to the scope and areas of International Journal of Oil, Gas and Coal Technology (IJOGCT) which I had founded with the Inderscience Publishing Group (UK) in 2007. Most of the conference committee members are among the IJOGCT authors and board members in which I had a working relation for many years. The main objective for both ICOGCT and IJOGCT is to present ideas and research outcome with direct applications in the industry and with minimum math or theory. Over the last year we have seen at least one fake conference with the same name, so it is important for the participants to examine the committee members research areas and possibly contact the chair(s) for legitimacy of the conference before abstract submission.

The first conference (ICOGCT 2019) was successfully held in Bangkok, Thailand during May 1-3, 2019. The second conference (ICOGCT2020) was planned for July 13-15, 2020 at Cambridge University, UK. However, outbreak of Covid-19 forced the organizer to postpone the conference by one year to July 13-15, 2021. Continuation of travel restrictions and requests by most speakers it was decided to hold the

Welcome Message from Conference Chair

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conference online rather than another postponement. Therefore, this year conference is the 2nd ICOGCT that is held fully virtual on Thursday July 15th 2021. Generally an in-person conference is planned for 3 days in which the first date is for registration, 2nd day for presentations and third day is reserved for city tour. We hope to resume in-person and normal conferences from next year.

I would like to thank all the speakers and committee members in which I have had the privilege of fruitful collaboration with nearly all of them (except few) during the past few decades. I hope your support will continue and any suggestions for hosting next year conference will be most welcome. Finally and most importantly I would like to thank the Inderscience Publishing Group (Inderscience Publishers - linking academia, business and industry through research) who generously sponsored this event with the Platinum Sponsorship. On behalf of the conference organizer and all speakers I greatly appreciate their contribution and sponsorship.

Prof. M. R. Riazi
Montreal, Canada

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Conference Committee

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Conference Chairs

- Prof. M. R. Riazi, Kuwait University, Kuwait
- Prof. David Chiaramonti, Polytechnic of Turin, Italy

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- Prof. Ville Alopaeus, Aalto University, Finland
- Dr. Vural Sander Suicmez, Quantum Reservoir Impact LLC, USA
- Prof. Kevin van Geem, University of Ghent, Belgium
- Prof. Rajender Gupta, University of Alberta, Canada
- Prof. J. Richard Elliott Jr, University of Akron, USA
- Prof. Francesco Longo, University of Calabria, Italy
- Prof. Semih Eser, Pennsylvania State University, USA

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- Prof. Francisco Vargas, Rice University, USA
- Prof. Herman Potgieter, University of the Witwatersrand, South Africa/University of Manchester, UK
- Prof. Hilal Ezgi Toraman, Pennsylvania State University, USA
- Dr. Heikki Jutila, Phoenix-RDS, UK
- Dr. Nan Zhang, University of Manchester, UK
- Dr. Zhongwei Chen, The University of Queensland, Australia
- Dr. Vermeire, Florence, Massachusetts Institute of Technology (MIT), USA
- Dr. Hui Pu, University of North Dakota, USA

Conference Committee

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- Dr. Changhyup Park, Kangwon National University, South Korea
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- Dr. Anand Nagoo, Nagoo & Associates, Houston, USA
- Dr. Marko Djokic, University of Ghent, Belgium
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- Dr. Ray (Zhenhua) Rui, Massachusetts Institute of Technology, USA
- Dr. Petri Uusi-Kyyny, Aalto University, Finland
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- Dr. Fred (Fengde) Zhou, Arrow Energy, Brisbane, Australia
- Dr. S Bruce Fry,Halliburton, Houston, USA
- Dr. Prashant Jadhawar, University of Aberdeen, UK
- Dr. Yanhui Han, Aramco, Houston, USA

Presentation Guideline

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Zoom Skill Learning

1. The instructions about Zoom, please visit:
   https://support.zoom.us/hc/en-us/articles/201362033-Getting-Started-on-Windows-and-Mac
2. To get the Zoom Video Tutorials, please go to: http://www.ogct.org/zoom/guidelines.html

Join Zoom Meeting Room

Main Meeting ID: 924 8819 7241

Meeting Link: https://zoom.us/j/92488197241

Meeting ID: 923 7884 2444

Meeting Link: https://zoom.us/j/92378842444

How to Access the Zoom Meeting Room

1. Open Zoom app and create account firstly, then log in with your account.
2. Choose “JOIN A MEETING”, and copy the Meeting ID directly and then click “JOIN” button.
3. Rename your name with this format (**Paper ID + Name**) entering the Zoom meeting room.

Environment Requirement

- Quiet Location
- Stable Internet Connection
- Proper lighting

Equipment Needed

- A computer with an internet connection (wired connection recommended)
- USB plug-in headset with a microphone (recommended for optimal audio quality)
- Webcam: built-in or USB plug-in

Presentation Guideline

London Time GMT+1

London Time on Thursday July 15th (Reference Time as Time of the Conference)	9:00 AM	1:00 PM	5:00 PM
Time in New York (Eastern Time)	4:00 AM	8:00 AM	12:00 Noon
San Francisco Time (Pacific Time)	1:00 AM	5:00 AM	9:00 AM
Europe Time (France, Norway, Italy)	10:00 AM	2:00 PM	6:00 PM
Beijing (China Time)	4:00 PM	8:00 PM	12:00 Midnight
Tokyo (Japan Time)	5:00 PM	9:00 PM	1:00 AM
Seoul (S Korea Time)	5:00 PM	9:00 PM	1:00 AM
Sydney (Australia Time)	6:00 PM	10:00 PM	2:00 AM

*1. The above table time is for reference only, please pay attention to your corresponding local time and enter the room at least 10 minutes earlier.

2. In order to make the conference go smoothly, if you are not familiar with ZOOM, please enter the room 30 minutes in advance, the staff will assist you with it. Thank you for your understanding and support.

Speakers Introduction

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Keynote Speaker 1
Prof. David Chiaramonti, Polytechnic of Turin, Italy

- 10 : 40 – 11 : 10
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: David Chiaramonti, PhD, is a full professor at Polytechnic of Turin, Torino, Piedmont, Italy where teaches Bioenergy Conversion Technologies. Previously he was a member of CREAR and chairman of the Renewable Energy COnsortium for R&D (RE-CORD), University of Florence. His main scientific interest is on the production and use in engines/turbines of biofuels, either liquid, gaseous or solid, and on bioproducts, mainly focusing on thermochemical biomass conversion and process development. Recent activities cover aviation biofuel, catalytic pyrolysis and gasification of biomass in pilot/demo reactors, hydrothermal liquefaction and carbonization, methanation, and algae cultivation systems and downstream processing. He is author of more than 180 publications on International Journals and Conferences, and participated to more than 25 EU R&D and dissemination projects, in particular in the field of Biomass. He is member of the International Organising Committee, Scientific Committee and Topic Organiser of major conferences in the field, such as the European Biomass Conference and Exhibition (EUBCE), the International Symposium on Alcohol Fuels (ISAF), and the International Conference on Applied Energy (ICAE). David Chiaramonti has been member and Country Representative of IEA-Bioenergy, Task 34 - Biomass Pyrolysis and IEA Task 39 (Liquid Biofuel), and today Country Representative at UN-ICAO CAEP AFTF (ICAO task force on Alternative Fuels for aviation). He was a member of the Italian and the European Biofuel Technology Platforms, and technical secretary of the Leaders for Sustainable Biofuels: he is now technically coordinating the Alternative and Renewable Transport Fuel Forum (ART Fuel Forum, AFF), a DG Energy tender on market and policy for Advanced Biofuels, and the new H2020 project on Aviation Biofuels BIO4A (starting May2018). David Chiaramonti is member and has been chairing the International Research Advisory Council (RAC) of DBFZ (German Biomass Research Center). David Chiaramonti has been awarded the Linneborn Prize for outstanding merits in biomass at EUBCE 2017 in Stockhlom.

Speakers Introduction

London Time GMT+1

Renewable and Recycled Carbon Fuels: policy, perspectives and challenges

Abstract:
The use of sustainable alternative fuels is expected to grow worlwide, as decarbonisation of transport is a major goal for all economies, in particular after the COP21 Paris Agreement, and the attention is growing to shifting to cleaner fuels. Different regulations however exist at International and Regional level (i.e. Europe, US, etc), and for different end-use sectors, which impacts on process, feedstocks and economics of these agroindustrial industrial value chains. Some areas, as Aviation, Maritime of Heavy Duty, have been identified as priority areas by policy makers, as the transition to electrical transport or hydrogen is more complex in the short to medium term.

The presentation will address the current status of technology and perspectives at 2030 and 2050, framed within the EU regulation and considering also some International incoming regulations (e.g. UN ICAO CORSIA). The different chains will then be shortly analyzed considering the market development and deployment, with a focus on feedstock chaacteristics and sustainability vs process types/requirements.

Speakers Introduction

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Keynote Speaker 2
Prof. Curtis H. Whitson, Norwegian University of Science and Technology, Norway

- 11 : 10 – 11 : 40
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Curtis Hays Whitson is professor of petroleum engineering at the Norwegian University of Science and Technology (NTNU), Dept. of Petroleum Engineering & Applied Geophysics; he founded the international consulting company PERA in 1988, as well as Petrostreamz in 2006, a petroleum software company dealing with optimized IAM (Integrated Asset Modeling). Whitson researches and teaches both university and industry courses on petroleum phase behavior (PVT), gas-based EOR, gas condensate reservoirs, integrated-model optimization, petroleum-streams management, liquid-loading gas well performance, and liquids-rich shale well optimization. He has co-authored two books: Well Performance (Golan and Whitson) and the SPE monograph Phase Behavior (Whitson and Brulé), co-authored more than 100 papers, and has written three chapters of edited books. Whitson has a B.Sc. degree in petroleum engineering from Stanford University and a PhD degree from the Norwegian Institute of Technology (now NTNU). He is a 25-year member of the Society of Petroleum Engineers, and has twice received the Cedric K. Fergusson award (as co-author with Øivind Fevang, 1997 and Lars Høier, 2001).

Speakers Introduction

London Time GMT+1

Petroleum Thermodynamics – Our Common Equations

Abstract:
The topic covered will be the common equations and computational methods that are used to describe multi-disciplinary petroleum thermodynamics describing phase and volumetric behavior of systems containing hydrocarbons. The three main topics include: equations of state, pure compound properties, and quantification of the heavier compounds (e.g. heptanes-plus) that are too complex to describe individually.
Some of the importance achievements of three recently-passed pioneers in computational thermodynamics, Keith H. Coats, Kenneth E. Starling and Michael L. Michelsen will be highlighted in the context of this topic. Keith Coats was a pioneer in the field of petroleum engineering reservoir processes; Ken Starling was a pioneer in the early applications of EOS models for upstream and downstream applications; and Michael Michelsen's computation methods are used throughout the petroleum industry, from reservoir to refining.

Speakers Introduction

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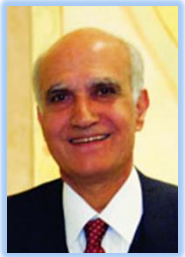

Keynote Speaker 3

Prof. M. R. Riazi, Kuwait University, Kuwait/Petrogas, Montreal, Canada

- 11 : 50 – 12 : 20
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: M. R. Riazi received a doctorate degree in Chemical Engineering from Pennsylvania State University (Penn State) and is the author of 150 publications including 6 books in the areas of oil, gas, coal and biofuel characterization, production and processing. In addition he has over 100 conference presentations and about 100 invited lectures and workshops for the petroleum industry in more than 40 countries. He has served as an Assistant Professor at Penn State as well as Visiting Professor / Scholar in the Departments of Chemical and Petroleum Engineering at the following universities: Illinois/Chicago, Texas/Austin, Norwegian University of Science and Technology (Trondheim), McGill (Montreal), Waterloo, and some other universities in US, India and Middle East. He is a professor and former chairman of Chemical Engineering at Kuwait University and is the Editor-in-Chief of IJOGCT. As a result of his work, Dr. Riazi has been honored as the recipient the following awards: Diploma of Honor from United States National Petroleum Engineering Society for the Outstanding Contributions to the Petroleum Industry, KU Outstanding Research and Teaching Awards (received from former Amir of Kuwait) and was an elected Fellow of American Institute of Chemical Engineers. He is a registered and licensed professional engineer in Ontario, Canada.

Speakers Introduction

London Time GMT+1

Characteristics of Asphaltenic Oils - Modeling and Simulation of Asphaltene Deposition in Production Wells

Abstract:
Asphaltene and wax in crude oils may precipitate under certain conditions of temperature, pressure and composition causing major problems during both production and processing of oil. General characteristics and properties of these heavy components of crude oils and problems caused during production and processing are discussed in previous publications. Over the last few years studies were conducted on several crude oils from production fields in Kuwait exhibiting asphaltene deposition in production wells.
A comprehensive and unique model has been developed to predict asphaltene phase diagram, pressure-temperature profile along production wells, amount of deposition and thickness of asphaltene deposited on the wall of a wellbore.
Laboratory tests were conducted on general properties of few reservoir fluid samples including SARA analysis, flash experiments, constant mass expansion, asphaltene onset pressure, bubble point, density and viscosity. These data are needed as input for the proposed model in addition of wellbore depth, radius, water cut and oil flow rate. Caliper data on asphaltene thickness was used to obtain deposition rate constants. In the proposed model, thermodynamic phase behavior was predicted through PC-SAFT equation of state while a 2-dimension numerical model was developed to calculate asphaltene concentration in both radial and axial directions. Furthermore, the Population Balance Modeling (PBM) approach was used to find asphaltene particle size distribution. Computer softwares in both Excel and Matlab codes have been developed based on the suggested model and results were favorably compared with both literature and field data. The presentation will end with software demonstration and its capabilities.

Speakers Introduction

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Keynote Speaker 4

Prof. Rajender Gupta, University of Alberta, Canada

- 12 : 20 – 12 : 50
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Dr Rajender Gupta is a professor in Chemical and Materials Engineering at the University of Alberta. He is a 1972 graduate from IIT Kharagpur and PhD from the University of Newcastle. He has been researching in the general area of clean coal technologies for well over last 35 years. He has published more than 150 technical and research publications including more than 80 research papers in International journals and is member of the editorial board of a number of international journals and of the technical committee of several international conferences.

Dr Gupta, before coming to University of Alberta, led several research projects at Co-operative Research Centre for Coal in Sustainable Development in Australia at the University of Newcastle on advanced coal characterization, mineral to ash transformation and Performance Prediction of Coal Fired Boilers.

Dr Gupta, currently, has been leading coal research in Canadian Centre of Clean Coal Carbon and Mineral Processing (C5MPT) at the University of Alberta. His current research interests include upgrading of low grade coals by reducing minerals and moisture, coal to liquid, coal/biomass/petcoke/asphaltene utilization, gasification and hot gas clean up, oxy-firing, post-combustion capture and underground coal gasification.

Speakers Introduction

London Time GMT+1

Sustainable Future of Coal in Power Generation

Abstract:
The coal consumption in developed countries is going down fast in recent years, however, there is not much dent in the global coal consumption due to increased demand for power in developing countries and coal being the cheapest or domestic fuel available in these countries. Coal will still dominate globally for electricity production and, therefore, there is a need for developing cleaner technologies with high efficiency and low emission for producing electricity.
Some of the high efficiency and low emission technologies (HELE) include improving the coal quality such as reducing moisture in lignite and reducing minerals in coal preferably by dry beneficiation. Other technologies such as replacing sub[critical boilers with super-critical and ultra-super-critical boilers with much higher efficiency in converting coal to power.
The sustainable future also involves a number of carbon capture technologies such as post combustion capture and gasification. The gasification technology converts coal to syngas either directly or indirectly via ash free coal/liquid using catalyst. The power from syngas has two routes: integrated gasification combined cycle (IGCC) and integrated gasification fuel cell (IGFC). The fuel cell produces an effluent stream of CO_2 and H_2O resulting in an easy carbon capture.
A low temperature catalytic gasification of low ash or ash free coals with subsequent utilization of this in fuel cell. This effluent stream can be separated easily for producing pure water and pure CO_2 for utilization. There has been significant research conducted in different elements of this process scheme such as production of ash free coal or pitch from coal and catalytic gasification of ash free coal. Catalytic gasification of ash free coal avoids contamination of catalyst by ash components. Heat integration will utilize heat from the fuel cell for endothermic steam gasification or production of supercritical CO_2 or super critical water if needed for an energy complex.
This presentation discusses these and other HELE options.

Conference Agenda

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July 15, 2021 / Thursday

Meeting ID: 924 8819 7241 **Meeting Link:** https://zoom.us/j/92488197241	
10 : 30 – 10 : 35	**Opening Remarks:** Prof. M. R. Riazi, Kuwait University, Kuwait/Petrogas, Montreal, Canada
10 : 35 – 10 : 40	**Welcome Address:** Prof. David Chiaramonti, Polytechnic of Turin, Italy
Chaired by: Prof. M. R. Riazi	
10 : 40 – 11 : 10	**Speech 1:** Prof. David Chiaramonti, Polytechnic of Turin, Italy
11 : 10 – 11 : 40	**Speech 2:** Prof. Curtis H. Whitson, Norwegian University of Science and Technology, Norway
11 : 40 – 11 : 50	Break
11 : 50 – 12 : 20	**Speech 3:** Prof. M. R. Riazi, Kuwait University, Kuwait/Petrogas, Montreal, Canada
12 : 20 – 12 : 50	**Speech 4:** Prof. Rajender Gupta, University of Alberta, Canada
12 : 50 – 13 : 30	Break

Meeting ID: 924 8819 7241 **Meeting Link:** https://zoom.us/j/92488197241		**Meeting ID: 923 7884 2444** **Meeting Link:** https://zoom.us/j/92378842444	
13 : 30 – 16 : 35	**Session 1** IS-101, IS-102, IS-103, IS-104, IS-105, IS-106, IS-107, G21-304-A, G21-305E, G21-406,	13 : 30 – 16 : 45	**Session 2** IS-201, IS-202, IS-203, IS-204, IS-205, IS-206, IS-207, IS-208, IS-209, G21-302-A
		16 : 45 – 16 : 50	**Closing Remarks:** Prof. M. R. Riazi

Detailed Overview

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July 15, 2021 / Thursday

Session 1 | **Session Chair: Prof. David Chiaramonti, Polytechnic of Turin, Italy** **Meeting ID: 924 8819 7241** Meeting Link: https://zoom.us/j/92488197241	
13 : 30 – 13 : 50 IS-101	Coal Geomechanics and Its Implication to Coal Seam Gas Well Drilling Design **Dr. Zhongwei Chen**, University of Queensland, Australia
13 : 50 – 14 : 10 IS-102	Comparison of Conditioned Radial Basis Function and Kriging: Estimation of Calorific Value Distribution in a Coal Deposit **Prof.Dr. Bahtiyar Ünver**, Hacettepe University, Turkey
14 : 10 – 14 : 30 IS-103	How Suitable are Unmined Coal Seams for CCS? A South African Case study **Prof. Herman Potgieter**, University of the Witwatersrand, South Africa
14 : 30 – 14 : 50 IS-104	Systematic Hydrogen Integration in Oil Refineries **Dr. Nan Zhang**, University of Manchester, UK
14 : 50 – 15 : 10 IS-105	MCOR Strategy for the Effective and Efficient Downstream Refining Operations **Dr. Suresh S. Agrawal**, Offsite Management Systems LLC (OMS), Houston, Texas, USA
15 : 10 – 15 : 30 IS-106	Recent Advances in Thermophysical Property Prediction **Prof. J. Richard Elliott Jr**, The University of Akron, USA
15 : 30 – 15 : 50 IS-107	Direct Conversion of Methane to Fuels and Chemicals **Prof. Hilal Ezgi Toraman**, Pennsylvania State University, USA

Detailed Overview

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16 : 05 – 16 : 20 G21-305E	Numerical Simulation Research and Analysis of Main Controlling Factors of Water Inrush from Concealed Subsidence Columns **Fu-Wei** China Coal Technology and Engineering Group Shenyang Research Institute, China
16 : 20 – 16 : 35 G21-406	Evaluating Spatial Variability of Subsurface Carbon Stock and Free-phase Gas Using Ground-penetrating Radar and Direct Measurements in Coastal Landforms of South-west Indian Peatlands Devi K, **Shashank Sharma** and Rajesh Nair Indian Institute of Technology, Madras, India

Detailed Overview

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Session 2 | **Session Chair: Prof. M. R. Riazi, Kuwait University, Kuwait/Petrogas, Montreal, Canada** **Meeting ID: 923 7884 2444** Meeting Link: https://zoom.us/j/92378842444	
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13 : 50 – 14 : 10 IS-202	Development of New Horizontal Rotary Kiln with Internal Transport Mechanism **Prof. Takuya ITO**, National Institute of Technology, Japan
14 : 10 – 14 : 30 IS-203	CCUS Contributes to Carbon Neutrality —The research and practice of CCUS of Yanchang Petroleum（Group）CO., Ltd **Dr. Xiangzeng Wang**, Shaanxi Yanchang Petroleum Group Co., Ltd, China
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14 : 50 – 15 : 10 IS-205	Artificial Intelligence and Automation in Chemical Kinetic Modeling **Dr. Florence Vermeire**, Massachusetts Institute of Technology, USA
15 : 10 – 15 : 30 IS-206	Applying Data Driven Models in Cuttings Transport Problem **Prof. Evren M. Ozbayoglu**, University of Tulsa, USA

Detailed Overview

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Session 2 | **Meeting ID: 923 7884 2444** Meeting Link: https://zoom.us/j/92378842444	
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15 : 50 – 16 : 10 IS-208	Advancements in Characterization and Modeling of Viscoelastic Polymers for Successful Chemical EOR **Assoc. Prof. Japan Trivedi,** University of Alberta, Canada
16 : 10 – 16 : 30 IS-209	Petroleum Data Analytics (PDA); Engineering Application of Artificial Intelligence & Machine Learning in The Petroleum Industry **Prof. Shahab D. Mohaghegh**, West Virginia University, USA
16 : 30 – 16 : 45 G21-302-A	Electronic Platform Rakan Albader and **Asrar J. Al-Enezi**, Ministry of Oil, Kuwait

Session 1

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IS-101

Dr. Zhongwei Chen, University of Queensland, Australia

- 13 : 30 – 13 : 50
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Dr Zhongwei Chen is a senior lecturer in reservoir geomechanics at the University of Queensland (UQ). He received his PhD degree in petroleum engineering from the University of Western Australia in 2012 and joined UQ as an associate lecturer in early 2013.

His research interests focus on key technical challenges associated with the efficient and responsible extraction of geo-energy and geo-resources, including unconventional geomechanics (e.g., CBM borehole stability), the characterisation of coal and shale mechanical and petrophysical properties, fluid flow in fractured porous media, carbon geological sequestration, and the coupled computational modelling etc.

Since 2013, he has successfully secured more than 20 projects from various funding sources, such as the Australia Research Council (ARC), ACARP, Mining Education Australia, and a number of resource companies. He has received several research awards, such as the 2011 American Rock Mechanics Association Research Award for his work related to CO2 enhanced CBM recovery.

By June 2021, he has published 120 peer-reviewed publications and with >2,900 citations. Dr Chen is currently leading an unconventional geomechanics research team at UQ consists of three full-time postdocs and four PhD students.

Session 1

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Coal Geomechanics and Its Implication to Coal Seam Gas Well Drilling Design

Abstract:
Australia has overtaken Qatar and become the world's largest exporter of liquefied natural gas. Coal seam gas (CSG), or Coal bed methane (CBM), is the dominant gas source. The talk aims to focus o the following three things: (1) an update on the recent CSG development in Australia, (2) a comparison of coal mechanical properties across key CSG production countries, and (3) new testing techniques developed by my group related to coal characterisation and properties testing.

Session 1

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IS-102

Prof. Bahtiyar Ünver, Hacettepe University, Turkey

- 13 : 50 – 14 : 10
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Professor Ünver has more than 35 years of experience in working in industry, academic research, teaching and consulting to mining industry and tunneling. His principal expertise and research interests lie in coal mine design, strata control and numerical modelling in mining and tunneling. He obtained his PhD from Nottingham University, UK. He has worked in underground coal mines for 5 years. He supervised 8 PhD and 25 MSc dissertations. He has led and worked in very many scientific and industrial projects. He is the writer of about 100 papers. Prof.Dr. Ünver is currently the Chair of the Mining Division of Hacettepe University.

Comparison of Conditioned Radial Basis Function and Kriging: Estimation of Calorific Value Distribution in a Coal Deposit

Abstract:

Coal still plays a vital role in electricity generation worldwide. Coal as a source of thermal power plant must satisfy certain quality characteristics. Among quality characteristics calorific value is the most important one. For this reason, spatial estimation of calorific value of a coal deposit is a primary concern. Classical techniques like kriging, inverse distance and similar interpolation techniques are used to perform such spatial estimations. Unfortunately, due to the smoothing effect of these techniques minimum and maximum values of the estimations are same as the raw data. The aim of this study is to compare novel conditioned radial basis functions and kriging estimation methods. The study was implemented at a coal deposit named as Trakya Coal Field which is located at the Northwestern of Turkey. To implement the study, solid model of the coal deposit is generated by using sections. Block model that honors the solid model was also constructed. Calorific value distribution is firstly estimated by using kriging method. Experimental variograms are calculated and model variograms are fitted to those variograms. Following the kriging, a novel conditioned version of the radial basis functions is used for estimations. A MATLAB code is written to perform estimations with radial basis functions. Gaussian kernel function is used to estimate the calorific value distribution at the deposit. Results of both estimation methods are compared. Due to the nature of the novel conditioned radial basis function approach, lower and upper tails of the estimates are closer to the original data set which is the desired property of any estimation. Also, the variance of estimations with conditioned radial basis function is higher than kriging which means that novel method suffers less from smoothing in comparison to kriging.

Session 1

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IS-103
Prof. Herman Potgieter, University of the Witwatersrand, South Africa

- 14 : 10 – 14 : 30
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Herman Potgieter currently holds a joint appointment as a professor at Manchester Metropolitan University in the Department of Natural Sciences and in the School of Chemical and Metallurgical Engineering at the University of the Witwatersrand, South Africa. As an experienced materials scientist and trained metallurgist and chemist, Herman has worked in a number of research areas dealing with, amongst others, stainless steels, platinum group metals, cement and cementitious materials, polymers, water treatment, waste management and metals extraction. He specialises in corrosion of stainless steels, extraction of metals from ore and waste sources and in the utilisation of fly ash.
Herman's career spans time at various organisations in the public (25 years) and private (14 years) industry, such as The Uranium Enrichment Corporation of South Africa, Council for Mineral Technology, Pretoria Portland Cement Co. Ltd., University of Pretoria, University of the Witwatersrand and Tshwane University of Technology. He has contributed to numerous local, national and international conferences and seminars, regularly acts as reviewer for a number of different journals and has published more than 200 peer-reviewed journal papers, 3 book chapters, 2 patents, 40 conference papers and a number of popular and technical papers. A total of 11 Ph.D and 39 master's degree students have successfully completed their research projects under his supervision. Ten postdoctoral researchers have worked with and were supervised by Herman during his academic career.

How Suitable are Unmined Coal Seams for CCS? A South African Case Study

Abstract:

Carbon capture and storage (CCS) seems to be the most immediate form of action that can be implemented for instantaneous reduction of CO_2. The injection of CO_2 into deep-unmineable coal seams, not commercially viable for coal production, is a possible mitigation option under CCS for permanent underground storage of CO_2. As a spin-off, useful coal-bed CH_4, referred to as enhanced coal bed CH_4 (ECBM), could be extracted from the coal seam following CO_2 injection. In South Africa (SA) it has been estimated that approximately 1.2 Gt of CO_2 could be stored in coalfields. Although not currently the preferred option for geological storage, coalfields provide the largest onshore CO_2 storage possibility. This contribution describes the adsorption of CO_2 and simulated flue gas in a two different SA coal samples, taking into consideration differences in coal properties, the volume of CO_2 and flue gas that can be stored under varying pressures, and temperatures. Two SA bituminous coal and anthracite samples with varying ranks and maceral compositions were used in the investigation.

Results show comparable behaviour and performance with published literature in terms of the degree of variance in coal properties (with respect to rank, maceral and mineral content, moisture, ash contents and temperature variance) and the uptake of CO_2., but the simulated flue gas presents new and novel information. Higher rank anthracite coal have a greater absorption propensity, whereas the lower rank bituminous coal tend to exhibit lesser CO_2 uptake. However, this is dependent on the coals' petrographic composition. In terms of addressing the adsorption parameters, such as pressure, particle size, temperature, etc., it was determined that with increased pressure, more adsorption takes place for both coal types. With regards to particle size, it has been noted that as particle size decreases, an increase is noted in the amount of CO_2 adsorbed, presumably due to the increased surface area.

Provided certain conditions are adhered to, coal in unmined coal seams in South Africa offers a viable option for carbon dioxide capture and storage.

Session 1

London Time GMT+1

IS-104
Dr. Nan Zhang, University of Manchester, UK

- 14 : 30 – 14 : 50
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Nan Zhang is a senior lecturer in Chemical Engineering at the University of Manchester, UK. He graduated with a Bachelor of Science in Chemical Engineering from Tsinghua University in PR China, completed his PhD in the Department of Process Integration at UMIST. In between, Nan joined Luoyang Petrochemical Engineering Co. of SINOPEC, obtaining extensive industrial experience as a process engineer for refinery process design. In 2000, he became a lecturer at the Centre for Process Integration, UMIST. In 2007, he co-founded Process Integration Limited, as a Director and then later became Vice President. Nan has over 28 years' experience in the refining and petrochemical industries and holds a technical leadership role in many industrial projects. He has also executed and conducted several industrial and industrially oriented research projects for major international oil and gas companies. The variety of projects cover new designs and retrofit studies and implementation. His main professional specializations include refinery modelling and optimization with molecular management, refinery hydrogen management, heat integration in the process industry, modelling and optimisation for industrial utility systems, emissions reduction, and reliability, availability and maintainability.

Session 1

London Time GMT+1

Systematic Hydrogen Integration in Oil Refineries

Abstract:
Hydrogen is an important and expense utility in oil refineries. Due to environmental legislations on product quality and the pressure to reduce carbon emissions, improving hydrogen utilisation efficiency becomes one of the key areas of attention in oil refinery operations. In this presentation, the development of hydrogen integration technologies since mid-1990s will be reviewed, including hydrogen pinch analysis, hydrogen network modelling and optimisation, and the integration of detailed hydroprocessing models in refinery hydrogen management. Industrial case studies will be used to demonstrate the effectiveness of the developed methodology.

Session 1

London Time GMT+1

IS-105
Dr. Suresh S. Agrawal, Offsite Management Systems LLC (OMS), Houston, Texas, USA

- 14 : 50 – 15 : 10
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Dr. Suresh S. Agrawal is the founder and CEO of Offsite Management Systems LLC (OMS), Houston, Texas, USA. OMS specializes in advanced process control systems and has developed, installed and managed many innovative and technologically advanced automation software products, and integrated solutions for the automation of offsite operations of Chemical, Oil and Gas (COG) industries in countries like India, Mexico, Columbia, USA and Eastern and Western European countries.
He graduated from Indian Institute of Technology, Mumbai, India with a Bachelor of Chemical Engineering. He then obtained master's and PH.D. degrees in Chemical Engineering from Illinois Institute of Technology, Chicago, USA.
Dr. Suresh S. Agrawal has 30+ years of experience at senior technical / management positions with international companies and he has successfully managed many advanced refinery process control projects in numerous countries. Dr. Agrawal is a registered professional engineer in the state of Illinois, USA and is a member of American Institute of Chemical Engineers and Instrumentation Society of America. He has published and presented 30+ papers in international publications and conferences in the areas of advanced process control. He also offers consultancy to a number of refining and process industries worldwide and delivers training seminars in the areas of his expertise.
He was also co-editor and sole author of two chapters in the 811 pages ASTM manual "MNL58- Petroleum Refining and Natural Gas Processing" published in 2013.
He has recently launched eLearning online Academy which offers 200+ audio-video topics with English/Spanish sub-titles for the downstream refining professionals. The academy offers "Pick-N-Choose", advanced special, Free courses, and structured curriculum for MCOR (manage, Control, Optimize and Reconcile) strategy of the refining operations.

MCOR Strategy for the Effective and Efficient Downstream Refining Operations

Abstract:

A typical refinery produces 200+ products with different specifications for various end usage. These products are made in two distinct operational areas, namely, onsite and offsite. Onsite operations in a refinery focus only on all process units that manufacture not directly marketable components products, whereas offsite operations make blended products for the end-market. More than 90% of marketed refinery products, such as gasoline, diesel, fuel oil, LPG, Kerosene, etc., are made in offsite operations, and thus they control and affect the refinery's bottom line. Unfortunately, offsite operations in most, if not all, worldwide refineries are neglected historically despite the proven benefits of paying attention to this area to employ the latest technology and manage it efficiently.

This paper will present a strategic roadmap for effective and efficient refinery offsite operations by discussing four aspects of MCOR. These aspects are management, control, optimization, and reconciliation. The management starts with deploying adequate infrastructure such as tank farm, tank gauging system, field equipment, analyzers, blender, etc. The control aspect focuses on manufacturing (in offsite operations) of blended products using the infrastructures to ensure that products are made to sell them in the marketplace. However, this step does not guarantee that the blended products are made optimally using optimization systems such as linear/non-linear programming techniques and is done in the third step of optimizing production. A classic example of optimization of production is fuel blending systems which use sophisticated three levels of optimizers to make products on specs but at the least cost. The last check of the impact of adequate infrastructure, control of manufacturing, and optimization of productions is done to reconcile hydrocarbons, also known as mass reconciliation or oil loss which is the ultimate proof of technology employed and efficiently used in the offsite operations.

Last but not least, all efforts to manage offsite operations effectively and efficiently can be of no benefit if the staff is not trained adequately and regularly in each of the areas discussed above. This paper also discusses a strategic training curriculum extending over 12-16 months to train, educate and improve the skills of offsite operations staff to reap the benefits of technology employed.

Session 1

London Time GMT+1

IS-106
Prof. J. Richard Elliott Jr, The University of Akron, USA

- 15 : 10 – 15 : 30
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: J. Richard Elliott is Professor of Chemical Engineering at the University of Akron in Ohio. He has taught courses ranging from freshman tools to senior process design as well as thermodynamics at every level. He has worked with the NIST lab in Boulder and ChemStations in Houston. He holds a Ph.D. from Pennsylvania State University.
He is the coauthor with Carl Lira of Introductory Chemical Engineering Thermodynamics, the lead author of the Thermodynamics section of Perry's Chemical Engineering Handbook, and the lead author of the forthcoming Sixth Edition of The Properties of Gases and Liquids. He has authored over 85 papers ranging from work on equations of state and databases for the American Petroleum Institute's Databook to recent work on supercritical pretreatment of biomass, thermodynamic perturbation theory, and molecular simulation of transport coefficients at high pressure.

Recent Advances in Thermophysical Property Prediction

Abstract:

For decades, The Properties of Gases and Liquids (PGL) has been a standard reference for professionals in the field, advanced undergraduate, and graduate students. With 27,000 google scholar citations and counting, this book serves a similar role to "Consumer Reports" in objectively evaluating the range of estimation methods available in the literature. Nevertheless, this important resource has not been updated since 2001. The current authors have undertaken to provide this update, with careful attention to the many changes in technology and methods that have occurred over the years. Our mission is to survey the entire field of physical property estimation to promote the best approaches and objectively characterize the quality of the available data and methods, such that current applications are reliable and future progress of the field is advanced.

A lot has happened since the fifth edition of PGL was published. Broadly speaking, advanced computer methods have become much more feasible for practical engineering calculations. These include quantum mechanical (QM) methods like quantum density functional theory (DFT) and local coupled cluster theory, especially for formation reaction energies. Molecular simulations like Monte Carlo (MC) and molecular dynamics (MD) methods have also advanced, especially for vapor pressure and viscosity. Additionally, group contribution (GC) methods have become more sophisticated, with second and third order groups in many cases. Despite the increased sophistication, these approaches are not guaranteed to be more accurate than traditional methods, so rigorous evaluation of all available methods, both old and new, is essential for practical application. Doing so requires the specification of a common set of metrics against which the performance of all methods is compared. This set of metrics cannot simply be obtained from the original literature as the range of compounds, conditions, and comparative statistics varies from study to study. Our findings so far show predictive improvements of nearly an order of magnitude for formation reaction energies, vapor pressure, and high-pressure viscosity. Improvements for surface tension are also encouraging.

Session 1

London Time GMT+1

IS-107
Dr. Hilal Ezgi Toraman, Pennsylvania State University, USA

- 15 : 30 – 15 : 50
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

Bio: Hilal Ezgi Toraman, Virginia S. and Philip L. Walker Jr. Faculty Fellow, joined the Department of Chemical Engineering and John and Willie Leone Family Department of Energy and Mineral Engineering at the Penn State University as a tenure-track Assistant Professor in Fall 2019. Her research is co-funded by the Institutes of Energy and the Environment at the Penn State University. Dr. Toraman has been recently named the Virginia S. and Philip L. Walker Jr. Faculty Fellow at the Penn State University for her contributions in teaching, research, and service as a Fuel Science Faculty. Prior to joining the Penn State faculty, Dr. Toraman served as a postdoctoral researcher with the Delaware Energy Institute at the University of Delaware under the guidance of Dion G. Vlachos. She received her PhD in Chemical Engineering from Ghent University in 2016 under the guidance of Kevin M. Van Geem and Guy B. Marin (2012-2016). Dr. Toraman's research was in the field of thermochemical reaction engineering for upgrading complex feedstocks such as biomass and plastic waste. Her PhD was supported by Ghent University Graduate Research Fellowship. She continued her research in experimental and computational investigation of shale gas conversion to fuels and chemicals between 2017 and 2019 in the group of Dion G. Vlachos at the Delaware Energy Institute. Her expertise is reaction kinetics, advanced analytics including comprehensive gas chromatography, detailed fuel characterization, microkinetic modeling, and data science. Her main areas of interest are process development for upgrading of unconventional feedstocks such as shale gas, biomass, and plastic waste through fundamental understanding of the reactions. She has given more than 20 oral/poster presentations and invited talks at national/international conferences and universities and published 11 peer-reviewed articles.

Direct Conversion of Methane to Fuels and Chemicals

Abstract:

The revolution in hydraulic fracking producing shale gas at record volumes and low prices has intensified the interest in the production of fuels and chemicals from methane. Currently, methane is indirectly converted into fuels and chemicals through syngas, an energy intensive and large capital investment process. Syngas is in turn converted to ammonia (the Haber-Bosch process), methanol for the production of olefins, gasoline, and aromatics, as well as olefins and fuels via the Fischer-Tropsch process. Yet, more than 90% of methane is globally combusted for mobility and energy. The direct conversion of methane into liquids remains one of the chemistry grand challenges. Non-oxidative conversion of methane over iron atoms on silica can provide a potential catalytic route to directly produce ethylene. However, its mechanism remains elusive. Herein, we perform multiscale simulations to elucidate the key pathways and provide insights into how to tune this process. Extensive density functional theory calculations are conducted for the surface reactions, which are coupled to nearly 10,000 gas-phase reactions. The entire model is assessed with new experimental data. Ab initio phase behavior indicates that iron atoms form isolated carbides under reaction conditions. Unlike decades of prior hypothesis for CH3 radical desorbing from the catalyst and recombining to form ethane in the gas-phase as the sole C2 formation mechanism, ethylene is predominantly produced on the catalyst and is consumed by gas-phase reactions to acetylene and aromatics. Highest ethylene selectivity with high methane one-pass conversion can be achieved by eliminating gas-phase reactions.

Session 1

London Time GMT+1

- 15 : 50 – 16: 05
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

G21-304-A
Miu Ito and **Yuichi Sugai**

Study on Foam Enhanced Oil Recovery Technique Using Foam Generating Microorganism Activated by Nanobubbles

Abstract:
Pseudomonas aeruginosa was found to generate foam in a culture medium containing nanobubbles that can be effective for EOR in this study.

Session 1

London Time GMT+1

- 16 : 05 – 16 : 20
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

G21-305E
Fu-Wei

Numerical Simulation Research and Analysis of Main Controlling Factors of Water Inrush from Concealed Subsidence Columns

Abstract:
In order to clarify the role of mining on the surrounding rock failure and water inrush of the karst collapse column in the working face floor, the concealed karst collapse column in the floor of Geting Coal Mine is taken as the research object, and the FLAC3D numerical simulation software is used to analyze the mining process. The stress field in the vertical direction, the plastic failure zone and the displacement change in the vertical direction are analyzed and studied, and the water inrush process of the hidden floor karst collapse column under different advancing distances is analyzed. The research results show that with the continuous increase of the advancing distance, the plastic failure range of the karst collapse column continues to increase, and the vertical displacement of the floor continues to increase. When the plastic failure zone of the coal floor and the plastic failure zone of the karst collapse column are connected, Water inrush accidents from the karst collapse column of the floor are prone to occur.

Session 1

London Time GMT+1

- 16 : 20 – 16 : 35
- Meeting ID: **924 8819 7241** Meeting Link: https://zoom.us/j/92488197241

G21-406
Devi K, **Shashank Sharma** and Rajesh Nair

Evaluating Spatial Variability of Subsurface Carbon Stock and Free-phase Gas Using Ground-penetrating Radar and Direct Measurements in Coastal Landforms of South-West Indian Peatlands

Abstract:
Organic rich soils (peat) store significant amounts of global soil carbon (C) in the form of methane (CH_4) and carbon dioxide (CO_2). Peat soils act as sinks and are a source of greenhouse gases (GHG) which occur in the form of Free Phase Gas in coastal landforms. South-West India has an extensive wetland system and is the primary source of GHG emissions, and CH_4, in particular, has high potential to contribute to global climate change. In this scenario, this study sheds light on how SW Indian peatlands contribute to the global carbon cycle. The soil C stock and GHG spatial distribution in three distinct topographic coastal landforms within the peatland region were investigated: site 1, Muthukulam in the wetland boundary; site 2, Ramapuram in the paleo-sand ridge, and site 3, Eruva in the paleo-drainage channel. The combination of non-destructive Ground Penetrating Radar (GPR) and direct measurement (coring) in conjunction with the C core analysis helped in building the relationship between the GHG storage in the landforms of varying C stocks. Moreover, Common offset GPR has the ability to image subsurface features, lithological boundaries, coastal landforms, and peat-forming environments. The result from this study depicts the importance of different landforms in the storage of C and GHG in SW Indian peatlands.

Session 2

London Time GMT+1

IS-201
Prof. Kun Sang Lee, Hanyang University, South Korea

- 13 : 30 – 13 : 50
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Dr. Kun Sang Lee is currently a Professor of Petroleum Engineering at Hanyang University, Seoul, South Korea. He graduated with BS and MS in Mineral and Petroleum Engineering from Seoul National University, Seoul, South Korea. He completed his PhD in the Department of Petroleum and Geosystem Engineering, The University of Texas at Austin, U.S.A. Dr. Lee joined the Department of Earth Resources and Environmental Engineering at Hanyang University in 2011. Prior to joining Hanyang University, he worked as a research specialist with Kumho & Co. and a professor in the Department of Energy and Environmental Engineering, Kyonggi University, Suwon, Kyonggi, South Korea. Dr. Lee has published more than 21 books, 12 book chapters, and 150 peer-reviewed journal papers and participated in several industrial projects on enhanced oil recovery, unconventional reservoirs, and environmental applications. He was an Editor-in-Chief, Geosystem Engineering and is a Topic Editor-in-Chief, MDPI.

Integrative Modeling of Asphaltene Deposition and Three-phase Hysteresis for CO_2-LPG EOR

Abstract:

CO_2 injection has been found to be an efficient method for not only enhanced oil recovery (EOR) but also greenhouse gas sequestration as a carbon capture and storage (CCS) technology. Among the CO_2 injection schemes, water alternating gas (WAG) is an effective way to improve both EOR and CCS performances. To improve the performance of WAG, liquefied petroleum gas (LPG) can be added into CO_2 stream leading to minimum miscibility pressure (MMP) reduction. However, CO_2 and LPG injection lead to asphaltene precipitation and deposition because of a change in oil composition, which results in formation damages by reducing porosity and permeability and altering wettability. Since these formation damages affect EOR and CCS performances simultaneously, this study systematically examines the mechanisms of asphaltene precipitation and deposition based on fluid modeling and compositional simulations during CO_2-LPG WAG. To precisely investigate the effects of LPG on CCS-EOR, an integrated model including asphaltene deposition and three-phase hysteresis in CO_2 fluid system has been developed.

In the integrated model WAG for formation damage and three-phase hysteresis of CO_2 WAG, the alteration of rock wettability by asphaltene deposition leads to a decrease in oil and gas mobility and an increase in water mobility. The addition of hydrocarbon solvent as LPG into the CO2 stream accelerates the asphaltene deposition resulting in lower gas mobility. From reservoir simulations performed in different LPG concentrations and WAG ratios, it is confirmed that the performance increment of CCS-EOR by increased amount of LPG and water injection becomes lower, and the economic evaluation based on LPG price should be carried out for a successful field application.

Session 2

London Time GMT+1

IS-202
Assoc. Prof. Takuya ITO, National Institute of Technology, Japan

- 13 : 50 – 14 : 10
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Dr. Takuya ITO is a young Associate Professor in the Department of Chemistry and Biochemistry at National Institute of Technology, Numazu College, Japan. He received his PhD in Engineering degree from Nihon University under Prof. Hirano in 2012. From 2013 to 2018, he conducted research on biomass gasification and liquefaction as an Assistant Professor under Prof. Kojima at Seikei University. Since 2018, he has been working at NIT, Numazu College, and is conducting chemical engineering education while continuing research on biomass energy conversion. He has been an editor of the Journal of the Japan Institute of Energy since 2014, an editorial board member of the International Journal of Oil, Gas and Coal Technology since 2018, and a permanent secretary of the Tokai Branch of the Chemical Society of Japan since 2020. He has been engaged in various contract/joint researches from/with national institutions and private companies. He has published 46 peer-reviewed articles and made more than 50 oral / poster presentations at national / international conferences, and has received several awards.

Session 2

London Time GMT+1

Development of New Horizontal Rotary Kiln with Internal Transport Mechanism

Abstract:

A new horizontal rotary kiln with a simple internal transport mechanism for biomass gasification is proposed. The inside of this kiln is divided into two chambers by the mechanism with two spiral ways. Then, the biomass and heat medium particles put in the kiln moves to each other between the two chambers via the mechanism. However, since the lower part of each way in the mechanism is filled with particles and functions as a gas seal, the gases in the two chambers hardly mix. By using one chamber as the combustor and the other, the gasifier, the heat of the combustor can be supplied to the gasifier by medium particles. As a result, synthetic gas can be obtained without being diluted by nitrogen in the air.

Session 2

London Time GMT+1

IS-203
Dr. Xiangzeng Wang, Shaanxi Yanchang Petroleum Group Co., Ltd, China

- 14 : 10 – 14 : 30
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: XiangZeng Wang is Chief Geologist of Shaanxi Yanchang Petroleum Group Co., Ltd, China. He holds a PhD of Geological engineering from China University of Geosciences (Beijing), and has about 30 years experience in the exploration and development of ultra-low permeability and unconventional reservoirs. Dr. Wang led the first integrated full-process CO2 capture, utilization and storage project in China. By combining the low CO2 capture cost of coal chemical industry and CO2 enhanced oil recovery of low permeability oilfield, Yanchang Petroleum had built the first CCUS integration project independently operated by one single enterprise of Aisa.
Dr. Wang won three National Science and Technology Achievement Awards in China, 21 invention patents, 50 published papers. He is also honored with Li Siguang Geological Science Award in China, Sun Yueqi Energy Award and Outstanding Engineer Award etc.

CCUS Contributes to Carbon Neutrality

—The Research and Practice of CCUS of Yanchang Petroleum（Group）CO., Ltd

Abstract:

The CCUS project of Yanchang Petroleum is the first full-process integrated CCUS project in China.The presentation mainly introduces the advantages of Yanchang Petroleum in carrying out the CCUS project, the technology progress of CO2 capture, CO2 flooding and storage monitoring, and the prospect of the CCUS Project of Yanchang Petroleum.

Session 2

London Time GMT+1

IS-204
Dr. Konstantinos Kotzakoulakis, SINTEF, Norway

- 14 : 30 – 14 : 50
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Konstantinos Kotzakoulakis (Research Scientist in SINTEF) has a PhD in environmental modelling, and PostDoc in Physical Oceanography, modelling the effects of different environmental processes on the circulation of non-passive particles, including oil-spills in the ocean. He also has more than 10 years of professional experience in the oil industry as an R&D engineer and project leader developing petroleum reservoir fluids sampling and properties measuring techniques.

Session 2

London Time GMT+1

Latest Advancements in SINTEF's State of the Art Oil-spill and Produced Water Numerical Models

Abstract:
We present the most recent additions to SINTEF's state of the art numerical models for the simulation of oil-spills and produced water releases. There is a range of improvements covering, the physics of the models, such as new advanced turbulent diffusion algorithms and effects of ice on the oil-spill trajectory, the biology of models, such as the exposure, uptake and effect of toxic mixtures to stationary, passive and actively swimming organisms, and the assessment of the environmental risk based on stochastic simulations. These new capabilities are already incorporated in the latest SINTEF OSCAR and DREAM software releases with the exception of the improved environmental risk assessment calculation that is currently in progress.

Session 2

London Time GMT+1

IS-205
Dr. Florence Vermeire, Massachusetts Institute of Technology, USA

- 14 : 50 – 15 : 10
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Florence Vermeire is a Postdoctoral Researcher in the Green group. She is working on pharmaceutical discovery and synthesis planning and predicting chemical properties with the aid of machine learning.
She received her Diploma and Ph.D degree in Chemical Engineering from Ghent University. During her Master studies she did two internships at Proviron and Total-Lukoil Zeeland Refinery. For her Master dissertation she performed research in the field of polymer design on nitroxide-mediated (co)polymerization. Florence did her Ph.D at the Laboratory for Chemical Technology under the guidance of prof. Kevin Van Geem and prof. Guy Marin. For the acquisition of experimental results, she spent three months in the group of dr. Frédérique Battin-Leclerc at LRGP in Nancy and one month in the group of prof. Fei Qi at NSRL in Hefei.
For her thesis, Florence studied the gas-phase decomposition and oxidation chemistry of biomass-related model components. The investigated model components are representative for fractions available in biodiesel, oxymethylene ether fuel additives, bio-oil and a bio-naphtha produced from lignocellulose biomass. She used a combined experimental, quantum chemical and computer-aided automatic kinetic modeling approach. Experimental measurements were done on three different units, a tubular reactor with a dedicated analysis section involving GCxGC, a jet-stirred reactor with online GC and a tubular reactor connected to SVUV-PIMS. Microkinetic models are developed using the software Genesys. During her thesis, Florence highly contributed to improving the thermodynamic and kinetic databases by performing quantum chemical calculations. These were done using Gaussian v09 or v16 on the high-performance computing infrastructure at Ghent University.

Session 2

London Time GMT+1

Artificial Intelligence and Automation in Chemical Kinetic Modeling

Abstract:
The chemistry of simple molecules can be extremely complex. Thermal decomposition, combustion, and pyrolysis processes often involve hundreds of intermediate species and hundreds of thousands of elementary reactions between those species. In the last decade, computer-aided kinetic modeling software has been developed to deal with those large kinetic models. One open-source example of such software is the Reaction Mechanism Generator (RMG) developed in the Green Group at Massachusetts Institute of Technology. RMG has demonstrated success in automatically developing kinetic models for the pyrolysis of oils, high-temperature pyrolysis of natural gas, combustion of biofuels, *etc.* The number of significant species and reactions in gas-phase kinetic models increases exponentially with the number of heavy atoms in the fuels. One of today's challenges for automatic kinetic modeling software, and one of the highlights of this talk, is how to deal with detailed elementary-step kinetic models for molecules with more than ~6 heavy atoms or for surrogate mixtures. Most recently, RMG has been used to develop a kinetic model for a Jet-A surrogate, and it has been used to describe the chemistry for PAH formation.
These kinetic models contain so many thermodynamic and kinetic parameters (*e.g.* k's, K_{eq}'s) that they cannot all be determined experimentally. Instead, most of those parameters are determined automatically using structure-activity relationships. The few thermodynamic and kinetic parameters that are sensitive towards the concentration of certain desired products, are typically refined with high-level theoretical calculations or experimental measurements. Estimates of thermodynamic and kinetic parameters are available in a user-friendly form on our popular (~1,000 unique visitors per month) website (rmg.mit.edu). Recent advances in artificial intelligence for applications in chemical engineering have opened a new route for the fast and more accurate prediction of such chemical properties. This talk will center around the application of machine learning using message passing neural networks for the fast predictions of thermodynamic and kinetic properties in the framework of computer-aided chemical kinetic model development.

Session 2

London Time GMT+1

IS-206
Prof. Evren M. Ozbayoglu, University of Tulsa, USA

- 15 : 10 – 15 : 30
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Evren M. Ozbayoglu is currently a "Chapman Endowed Wellspring Professor" of The University of Tulsa (TU), McDougall School of Petroleum Engineering, and the Director of The University of Tulsa, Drilling Research Projects (TUDRP). He has earned his BSc in 1996 and MSc in 1998 from METU. He earned his PhD degree from The University of Tulsa in 2002. He started working at METU as a full time faculty, and continued working at METU till 2009 August. Since then, he is working for TU. Dr. Ozbayoglu has numerous publications and participated in several industrial projects on major drilling engineering topics as well as wellbore hydraulics, hole cleaning, and tubular mechanics. He was awarded for SPE Regional Drilling Engineer Award, 2019, "Outstanding Technical Editor Award" for SPE Journal, SPE Reservoir Application & Engineering, and SPE Drilling & Completion for years 2012, 2013, 2015, 2018, "SPE Regional Distinguished Faculty Award – Mid-Continent Region – 2013" within 2012-2013 academic year. He is an SPE member since 1994, and ASME member since 2015.

Applying Data Driven Models in Cuttings Transport Problem

Abstract:

Drilling practice has been evolving parallel to the developments in the oil and gas industry. Current supply and demand for oil and gas dictates search for hydrocarbons either at much deeper and hard-to-reach fields, or at unconventional fields, both requiring extended reach wells, long horizontal sections, and 3D complex trajectories. Cuttings transport is one of the most challenging problems while drilling such wells, especially at mid-range inclinations. For many years, numerous studies have been conducted to address modeling of cuttings transport, estimation of the concentration of cuttings as well as pressure losses inside the wellbores, considering various drilling variables having influence on the process. However, such attempts, either mechanistic or empirical, have many limitations due to various simplifications and assumptions made during the development stage. Fluid thixotropy, temperature variations in the wellbore, uncertainty in pipe eccentricity as well as chaotic motion of cuttings due to pipe rotation, imperfections in the wellbore walls, variations in the size and shape of the cuttings, presence of tool joints on the drillstring, etc causes the modeling of the problem extremely difficult. In this presentation, data driven models are discussed to address the estimation of cuttings concentration and frictional loss estimation in a well during drilling operations, instead of using mechanistic or empirical methods. The training of the models are determined using the experimental data regarding cuttings transport tests collected in the last 40 years at The University of Tulsa – Drilling Research Projects, which includes a wide range of wellbore and pipe sizes, inclinations, ROPs, pipe rotation speeds, flow rates, fluid and cuttings properties. As the inputs of the data driven models, independent drilling variables are directly used. Also, as a second approach, dimensionless groups are developed based on these independent drilling variables, and these dimensionless groups are used as the inputs of the models. Moreover, performance of the data driven model results are compared with the results of a conventional mechanistic model. It is observed that in many cases, data driven models perform significantly better than the mechanistic model, which provides a very promising direction to consider for real time drilling optimization and automation.

Session 2

London Time GMT+1

IS-207
Assoc. Prof. Dayanand Saini, California State University, USA

- 15 : 30 – 15 : 50
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Dr. Dayanand Saini is an Associate Professor of Engineering in the Department of Physics and Engineering at California State University, Bakersfield (CSUB), California, USA. At CSUB, as a Co-PI (Principal Investigator) for the National Science Foundation (NSF) funded Center for Research Excellence in Science and Technology (CREST), he researches the feasibility of carbon capture, utilization, and storage (CCUS) projects in depleted oil fields and deep saline formations of California. An author of two CCUS-focused Springer Briefs books, Dr. Saini, recently founded a company to commercialize his patent-pending technologies. He has published more than a dozen technical articles in premium scientific journals. His research interests and areas of expertise include geologic and terrestrial CO2 storage, CO2-reservoir oil minimum miscibility pressure (MMP), numerical reservoir modeling, reservoir rock/fluids interactions, thermal and non-thermal enhanced oil recovery (EOR) methods, produced water management and treatment, pressure transient analysis, and general petroleum engineering topics. Before joining CSUB in 2013, he was a Research Manager (Reservoir Engineering) with the Plains CO2 Reduction (PCO2R) Partnership led by the Energy and Environmental Research Center (EERC) at the University of North Dakota, North Dakota, USA. Dr. Saini also worked as an Assistant Executive Engineer (Reservoir) with Oil and Natural Gas Corporation Limited (ONGC), India, from 2001 to 2006. He holds a Ph.D. degree in Petroleum Engineering from the Louisiana State University (LSU), Baton Rouge, Louisiana, USA.

Is My Oil Green Enough?

Abstract:

Consumption-related (i.e., value chain products) emissions pose the biggest challenge to greenhouse gas (GHG) emission reduction goals of the oil and gas (O&G) industry. Such emissions contribute to almost 90% of the carbon footprint of the O&G industry and require all types (i.e., avoid emissions, reduce emissions, switch fuels, sequester, and offset) of GHG emissions mitigation strategies for a sustainable future.

The CCUS (CO_2 capture, utilization, and storage) is one of the mitigation strategies that relies on the core competency of the O&G industry. However, a life cycle analysis (LCA) of the expected GHG emissions from the crude oil, which run from production, storage, and transportation through to refining and use, is always necessary for determining the scale and types of mitigation strategies needed for transforming conventional crude oil to a near net-carbon neutral or green crude oil.

In this present study, using the typical LCA results of direct and indirect GHG emissions resulting from crude oil production via simultaneous CO_2-enhanced oil recovery (CO_2-EOR) and CO_2 storage (i.e. CO_2 EOR+) method, efficacy of CCUS-based mitigation strategy was evaluated. The results indicate that the crude oil produced with CO_2 EOR+ method can be up to 40% greener compared to status quo (i.e., convention oil production without CO_2 EOR+) scenario. For achieving almost, a near net-carbon neutral or green crude oil, offsetting of the direct and indirect GHG emissions associated with crude oil production and consumption, a dedicated geologic CO_2 storage (i.e., CO_2 storage in deep saline formations) method will be necessary.

Session 2

London Time GMT+1

IS-208
Assoc. Prof. Japan Trivedi, University of Alberta, Canada

- 15 : 50 – 16: 10
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Consumption-related (i.e., value chain products) emissions pose the biggest challenge to greenhouse gas (GHG) emission reduction goals of the oil and gas (O&G) industry. Such emissions contribute to almost 90% of the carbon footprint of the O&G industry and require all types (i.e., avoid emissions, reduce emissions, switch fuels, sequester, and offset) of GHG emissions mitigation strategies for a sustainable future.

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Session 2

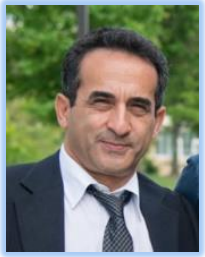
London Time GMT+1

Advancements in Characterization and Modeling of Viscoelastic Polymers for Successful Chemical EOR

Abstract: With more than 500 field applications, mainly onshore and recently offshore, polymer enhanced oil recovery (EOR) is one of the widely used EOR methods around the world. Global polymer flooding EOR production forecast is projected to be around ~90,000 bbl/day for 2021 and expected to rise 5-10% for the next 5 years. However, the existing knowledge around polymer selection and reservoir modeling mainly overlook the observations of injectivity anomalies and residual oil saturation (SOR) reduction. With the availability of new types of commercial polymers, (associative, co-, ter- and sulfonated) the polymer characterization methods and modeling need a fresh look. This presentation looks into conventional lab testing methods for polymer characterization and drawbacks with specific case studies. New methods for polymer testing, especially extensional rheology and their incorporation into various models for predicting injectivity and SOR are discussed. Direct methods for molecular weight, radius of gyration determination, and polymer conformation changes under saline conditions are also presented for various commercial polymers that can help optimizing dosage at reservoir salinity with lower adsorption.

Session 2

London Time GMT+1



IS-209
Prof. Shahab D. Mohaghegh, West Virginia University & Intelligent Solutions, Inc.

- 16 : 10 – 16 : 30
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

Bio: Shahab D. Mohaghegh, a pioneer in the application of Artificial Intelligence, Machine Learning and Data Mining in the Exploration and Production industry, is Professor of Petroleum and Natural Gas Engineering at West Virginia University and the president and CEO of Intelligent Solutions, Inc. (ISI). He holds B.S., M.S., and Ph.D. degrees in petroleum and natural gas engineering.

Including more than 30 years of research and development in the petroleum engineering application of Artificial Intelligence and Machine Learning, he has authored three books (Shale Analytics – Data Driven Reservoir Modeling – Application of Data-Driven Analytics for the Geological Storage of CO2), more than 200 technical papers and carried out more than 60 projects for independents, NOCs and IOCs. He is a SPE Distinguished Lecturer (2007 and 2020) and has been featured four times as the Distinguished Author in SPE's Journal of Petroleum Technology (JPT 2000 and 2005). He is the founder of Petroleum Data-Driven Analytics, SPE's Technical Section dedicated to AI, machine learning and data mining (2011). He has been honored by the U.S. Secretary of Energy for his technical contribution in the aftermath of the Deepwater Horizon (Macondo) incident in the Gulf of Mexico (2011) and was a member of U.S. Secretary of Energy's Technical Advisory Committee on Unconventional Resources in two administrations (2008-2014). He represented the United States in the International Standard Organization (ISO) on Carbon Capture and Storage technical committee (2014-2016).

Petroleum Data Analytics (PDA);
Engineering Application of Artificial Intelligence & Machine Learning in the Petroleum Industry

Abstract:

Petroleum Data Analytics (PDA) is the engineering application of Artificial Intelligence & Machine Learning in petroleum engineering related problem solving and decision-making. PDA will fully control the future of science and technology in the petroleum industry. It is highly important for the new generation of scientists and petroleum professionals to develop a scientific understanding of this technology.

Similar to the application this technology in other engineering related disciplines, Petroleum Data Analytics addresses two major issues that determine the success or failure of this technology in our industry: ***(a)*** the differences between "engineering" and "non-engineering" problem solving and decision-making, and ***(b)*** how AI&ML is differentiated from traditional statistical analysis. Lack of success or mediocre outcomes of AI&ML in our industry has been quite common. To a large degree, this has to do with superficial understanding of this technology by some petroleum engineering domain experts and concentration on marketing schemes rather than science and technology.

Session 2

London Time GMT+1

- 16 : 30 – 16 : 45
- Meeting ID: **923 7884 2444** Meeting Link: https://zoom.us/j/92378842444

G21-302-A Rakan Albader and **Asrar J. Al-Enezi**

Evaluating Spatial Variability of Subsurface Carbon Stock and Free-phase Gas Using Ground-penetrating Radar and Direct Measurements in Coastal Landforms of South-West Indian Peatlands

Due to New Kuwait Vision 2035 and in line to the proceedings of the Ministry of Oil higher management the initial stepping-stones were utilized to coordinate and manage the flow of digital data from and to the Ministry through a dedicated integrated electronic platform.

Combined efforts by the higher management department in the Ministry and Kuwait Oil Company ensured a collaborative agreement on integrating and merging physical data from several points of entry to one digital doorway. Therefore, the information Technology department brought about the necessary steps and precautions to develop a reliable network capable of accumulating and securing such data within the dashboard of the system. The dashboard combines stored information and newly introduced data instantaneously to produce the appropriate pie charts line graphs and bar graphs for each of the three regions North Kuwait, South East Kuwait and West Kuwait. As a result, each of the regions is displayed with information regarding approvals on research and development, daily drilling data, monthly production reports, safety statistics, environmental impact and average price of all three resources Oil, gas and water alike.

The system has introduced the ability of instant supervision, increasing the dependability on the electronic portal. As well as, decreasing processing time drastically with an adequately secure data storage. The dashboard proves to be a reliable tool for managing and organizing complex sets of data and merging them to the appropriate branch within the dashboard.

The system provided high speed data transmission, increased productivity and workflow efficiency, reduced reliance on paperwork instead of using traditional methods of transferring, printing and distributing information in the usual way to reduce errors in data storage, archiving and retrieval. Thus, greatly reduced processing time and the ability to immediately supervise all aspects of Technical Affairs in the Ministry of Oil.

Listener List

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Listener 1	Miu Ito, Kyushu University, Japan
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Listener 4	Touraj Riazi, Ontario Treasury Board, Canada
Listener 5	Nazly Riazi, McGill University, Canada
Listener 6	Shiva Soleimani, Montreal, Canada
Listener 7	Joelle Parent-Proulx, Montreal, Canada

Thank you for your attendance!

See you next year!