

Dr. Pavel Spirov

spirov@kpsmetal.cz

Tel: +9647500385358



Educational Background

- PhD. Degree, in: Improvement of Gas Injection and Mobility Control via Foams, Co-solvents and Additives for Enhanced Oil Recovery, 2010-2014: Aalborg University, Denmark
- MSc. Degree, in: Oil and Gas Technology, 2008-2010: Aalborg University, Denmark
- European exchange Program, in: Chemical Engineering, 2006-2007: Vitus Bering, Horsens, Denmark
- BSc. Degree, in: Natural Resources Engineering, 2003-2006: Czech University of Life Sciences Prague, Czech Republic

Areas of Expertise

- Oil and Gas technology
- EOR (various), EOR - Supercritical CO₂, EOR - Foam application
- Petroleum engineering
- Process engineering
- Unconventional oil reserves - Extraction of hydrocarbons from tar sand, extra heavy oils
- Supercritical CO₂ for environmental purposes in oil and gas industry
- Energy, power generation
- Environmental engineering

Experience

- **Senior Petroleum Engineer Advisor, KPS Metal a.s.** , Urbánkova 231, 676 02 Moravské Budějovice, Czech Republic

1.10.2016 – ongoing

- **Senior Petroleum Engineer, Sina Energy**, Erbil, the Kurdistan Region of Iraq

15.1.2015 – ongoing

Work description:

1. Consultancy projects:
Petroleum refining, Power generation, LNG, Oil and gas Production, Reservoir engineering

- **Head of Petroleum Engineering Department, Soran University** - School of Engineering- Faculty of Engineering, Soran, Kurdistan

1.10.2015 - ongoing

Work description:

1. Teaching of following courses:
Petrophysics, Well logging, Formation evaluation, Reservoir Quality, Reservoir fluids, Process engineering and facilities, Separation processes, HYSYS, EOR, Thermodynamics, Gas cleaning and processing
2. Other activities:
Managing the petroleum engineering department
Ensuring that lectures are following rules and their teaching is up to nowadays standards
Leading the research activities conducted by petroleum engineering department
Organizing field trips
Organizing cooperation between university and oil and gas companies
Hiring and evaluating new personnel
Organizing field trips and cooperation between Kurdistan and the Czech republic

- **Lecturer and researcher at Petroleum Engineering Department, Soran University** - School of Engineering- Faculty of Engineering, Soran, Kurdistan

15.10.2014- 29.9.2015

Work description:

1. Teaching following course:
Petrophysics, Reservoir Quality, Reservoir fluids, Reservoir fluids and Rocks, Process engineering and facilities, HYSYS
2. Other activities:
 - Member of research council at Soran University, Engineering Faculty
 - Research

- **External researcher, Heirovsky Institute of Physical Chemistry, Czech Academy of Science, Prague, Czech Republic**

Work Description:

1. Geochemical methods of analysis of bitumen and biomarkers
Unconventional oil reserves – Tar sands

- **Researcher, AALBORG UNIVERSITY, Niels Bohr Vej 8, 6700, Denmark, 7.6.2010 – 31.1.2014**

Work description:

1. Researches in Enhanced Oil Recovery, soil remediation, bacteria of anaerobic digestion, tar sand extraction, tar sand upgrading
2. Writing articles
3. Work in Eclipse and Petrel (computer simulation of foam behavior for the Snorre Field, Norway, MEOR simulation for the same field)
4. Laboratory experiments with various lab equipment (the supercritical CO₂ extractor and GS MS chromatograph, microbiology equipment, etc.)

5. Lecturer of introduction course of Geology and Reservoir engineering
 6. Lab instructor for oil and gas students (how to work with the various laboratory equipment and instruments, health and safety instructions)
 7. Lecturer of reservoir simulation software's; Eclipse and Petrel
- **External co-operation, Engineer, ROSS ENGINEERING and Dansk Geotermi, Viborg, Denmark, 9.6.2012- 12.12.2012**

Work description:

1. Carrying various tasks during drilling of geothermal well
2. Dealing with drilling mud wastes, working with problem in drilling waste disposal
3. Experiments on Glycol based drilling mud
4. Dealing with hazardous materials

- **External cooperation/research, GEUS, Copenhagen, Denmark 1.9. 2012-10.10. 2012**

Work description:

Project proposals with a view of getting grants in:

1. Investigation of the potential of Danish shale gas
2. Common research of FAWAG application in the North Sea oilfield
3. Tonder geothermal project

- **External cooperation/research, Schlumberger Norway, Stavanger, Norway, 1.8. 2009-1.5. 2012**

Work description:

1. Software testing of new Foam Function model on Snorre field.
2. Publishing papers from research work
3. Further foam proposals
4. Performing simulations in ECLIPSE and PETREL

- **Internship, ALECTIA A/S, Teknikerbyen 34, 2830 Virum, Denmark, 3.1.2007-30.8.2007**

Work description:

1. Working on drinking water and groundwater chemistry project
2. Carrying arsenic removal from drinking water
3. Designing an equipment in a laboratory

- **Internship, Veolia Water, Prague, Czech Republic, 2.5.2005-1.9.2005**

Work description: Summer internship

1. Testing the wastewater quality and technological issues connected with the process
2. Analysis of wastewater, work in chemistry laboratory
3. Working with PI diagrams

Published articles

2017—

- 1) S. Rudyk, P. Spirov, Temperature effect on extraction and purification of used motor oil by supercritical carbon dioxide, *The Journal of Supercritical Fluids*, (2017).

<http://www.sciencedirect.com/science/article/pii/S0896844616303205>

- 2) S. Rudyk, P. Spirov, R. Al-Hajri, G. Vakili-Nezhaad, Supercritical carbon dioxide extraction of oil sand enhanced by water and alcohols as Co-solvents, *Journal of CO2 Utilization*, 17 (2017) 90-98.

<http://www.sciencedirect.com/science/article/pii/S2212982016304449>

-2016—

- 3) S. Rudyk and P. Spirov, Regeneration of used motor oil by supercritical carbon dioxide *Materials for Energy, Efficiency and Sustainability: TechConnect Briefs 2016*, TechConnect.org, ISBN 978-0-9975-1171-0

- 4) Howri Mansurbeg Daniel Morad, Rushdy Othman, Sadoon Morad, Andrea Ceriani, Ihsan Al-Aasm, Kamal Kolo, Pavel Spirov, Jean Noel Proust, Alain Preat, Hemin Koyi. Hydrothermal dolomitization of the Bekhme Formation (Upper Cretaceous), Zagros Basin, Kurdistan Region of Iraq: record of oil migration and degradation. *Sedimentary Geology*

<http://www.sciencedirect.com/science/article/pii/S0037073816300999>

-2015—

- 5) Pavel Spirov, Svetlana Rudyk, Testing of Snorre Field FAWAG in New Foam Screening Model, *Oil & Gas Science and Technology-Revue d'IFP Energies nouvelles*. Vol. 70 (2015), No. 6, pp. 1025–1033

<http://dx.doi.org/10.2516/ogst/2013193>

-2014—

- 6) S. Rudyk, P. Spirov, I. Jimoh, G. Vakili-Nezhaad, The bitumen upgrading of Nigerian oil sand by supercritical carbon dioxide modified with alcohols, *Energy & Fuels*, 28 (2014) 4714–4724.

<http://pubs.acs.org/doi/abs/10.1021/ef500493n>

- 7) S. Rudyk, P. Spirov, S. Hussain, Effect of co-solvents on SC-CO₂ extraction of crude oil by consistency test, *The Journal of Supercritical Fluids*, 91 (2014) 15-23.

<http://dx.doi.org/10.1016/j.supflu.2014.04.003>

- 8) S. Rudyk, P. Spirov, Upgrading and extraction of bitumen from Nigerian tar sand by supercritical carbon dioxide, *Applied Energy*, 113 (2014) 1397-1404.

Key scientific paper in: *Renewable Energy global innovations*

<http://dx.doi.org/10.1016/j.apenergy.2013.08.076>

<http://reginnovations.org/key-scientific-articles/upgrading-extraction-bitumen-nigerian-tar-sand-supercritical-carbon-dioxide/>

- 9) P. Spirov, Y. Ivanova, S. Rudyk, Modelling of microbial enhanced oil recovery application using anaerobic gas-producing bacteria, *Petroleum Science*, 11 (2014) 272-278.

<http://link.springer.com/article/10.1007/s12182-014-0340-7#>

-2013—

- 10) P. Spirov, S. Rudyk, Effect of RegenOx Oxidant As a Modifier on Crude Oil Extraction by Supercritical Carbon Dioxide, *Energy & Fuels*, 27 (2013) 1492-1498.

<http://pubs.acs.org/doi/abs/10.1021/ef400139w>

- 11) S. Rudyk, S. Hussain, P. Spirov, Supercritical extraction of crude oil by methanol- and ethanol-modified carbon dioxide, *J. of Supercritical Fluids*, 78 (2013) 63-69.

<http://dx.doi.org/10.1016/j.supflu.2013.03.006>

- 12) S. Rudyk, P. Spirov, E. Sogaard, Application of GC-MS chromatography for the analysis of the oil fractions extracted by supercritical CO₂ at high pressure, *Fuel*, 106 (2013) 139-146.

<http://dx.doi.org/10.1016/j.fuel.2012.12.004>

- 13) S. Rudyk, P. Spirov, Three-Dimensional Scheme of Supercritical Carbon Dioxide Extraction of Heavy Hydrocarbon Mixture in (Pressure; Temperature; Recovery) Coordinates, *Energy & Fuels*, 27 (2013) 5996-6001.

<http://dx.doi.org/10.1021/ef401008e>

- 14) P. Spirov, S. Rudyk, A. Tyrovolas, I. Jimoh, The Bitumen Extraction from Nigerian Tar Sand Using Dense Carbon Dioxide, *Chemical Engineering Transactions*, 32 (2013) 283-288.

- 15) J. Sanchez, S. Rudyk, P. Spirov, Removal of Grease from Wind Turbine Bearings by Supercritical Carbon Dioxide, *Chemical Engineering Transactions*, 32 (2013) 1909-1914.

-2012—

- 16) Spirov, P., Rudyk, S. and Khan, A. (2012) 'Foam Assisted WAG, Snorre Revisit with New Foam Screening Model', in SPE/North Africa Technical Conference and Exhibition, Cairo, Egypt, 20-22 February 2012, Society of Petroleum Engineers,

<http://dx.doi.org/10.2118/150829-MS>

-2011—

- 17) S. Rudyk, P. Spirov, E. Sogaard, 3D Model of Extraction of Oil from North Sea Fields by Supercritical Carbon Dioxide, Chemical Engineering Transactions, 24 (2011) 703-708.

Conference abstracts:

- 18) Mansurbeg H., Morad S., Othman R., Kolo K., Spirov P., El-Ghali M.A.K., Harchegani F.K., Al-Aasm Ihsan, DIAGENETIC AND RELATED RESERVOIR-QUALITY AND HETEROGENEITY IN PALEOCENE TURBDITIC SANDSTONES FROM THE UK CENTRAL GRABEN, THE NORTH SEA, 35th international geological congress, 27 August - 4 september 2016, Cape town, South Africa

- 19) S. Rudyk* and P. Spirov, Regeneration of used motor oil by supercritical carbon dioxide, TechConnect World Innovation, Conference and Expo, May 22-25, 2016, Washington, DC, USA

http://www.techconnectworld.com/World2016/sym/Carbon_Capture_Utilization.html

- 20) Svetlana Rudyk, Pavel Spirov, Rashid Al-Hajri, Gholamreza Vakili Nezhaad. Refractive index analysis for the characterization of upgraded oil extracted from tar sand by SC-CO₂, 11th International Symposium on Supercritical Fluids, Incorporating with Supergreen 2015, October 11-14, 2015, Seoul, Republic of Korea
- 21) P. Spirov, S. Rudyk, G. Khan, Rehabilitation of glycol based drilling mud wastes : Istanbul3Wcongress 2013
- 22) Y. Ivanova, P. Spirov, G. Khan, S. Rudyk ,Adaption of Application of Bacteria of Anaerobic Digestion Adapted to Higher Salinity to Microbial Enhanced Oil Recovery, SDEWES12-0018, Department of Chemical Engineering, Aalborg University, Esbjerg, Denmark, 2012
- 23) S.Rudyk, P. Spirov, E.Sogaard. Extraction of heavy oil by supercritical carbon dioxide, First Edition, 2010-12-07, ISBN: 978 -80 -02 -02247 -3 The 19 International Congress of Chemical and Process Engineering CHISA 2010 and the 7 European Congress of Chemical Engineering ECCE-7, CHISA 2010, 28 August - 1 September 2010 Prague, oral presentation

Working on projects:

- 24) Worked on patent together with Dr. Svetlana Rudyk

- 25) Participation in project - Arsenic in Danish groundwater and drinking water
ISBE: 978-87-92548-65-8 ISBN: 978-87-92548-66-5, Author: Loren Ramsay, Alectia A/S,

2009, in Danish, Assistant: P.Spirov

Communication Skills

English: Fluent
Russian: Fluent
Czech: Native

Courses

- Enhanced Oil Recovery for Carbonate Reservoirs, Workshop, Delft University, Netherlands (29.6-3.7.2015)
- Course in Raman Spectroscopy, Denmark (Spring 2013)
- Course in writing and reviewing scientific papers, Denmark (Autumn 2012)
- Course in Design and Analysis of Experiments, Denmark (Autumn 2012)
- Course of Image Analysis, Denmark (Spring 2012)
- Advanced course of Thermodynamics – Aalborg University, Denmark (Autumn 2011)
- PETREL training given by Schlumberger, Norway (Autumn 2009)
- ECLIPSE training given by Schlumberger, Norway (Autumn 2009)
- Course of waste separation processes , Austria (Spring 2005)

Expertise in software

- PETREL, ECLIPSE
- Aspen HYSYS
- Interactive Petrophysics (IP)
- Rhinoceros 4
- MATLAB
- CMG STARS
- Techlog
- Statgraphics Centurion
- IBM SPSS
- R
- ImageJ
- CES EduPack 2008
- PHREEQC
- Dia
- LaTeX
- Microsoft Word, Excel,
- EndNote, RefWoks
- Basic – GMS 6.5, ArcGis, Ansys
- Adobe Photoshop, Adobe Dreamweaver