SMART PROCESS MANAGEMENT

IDEAS FOR OIL AND GAS

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KEY RESEARCHERS

Prof Babs Oyeneyin
Prof Iain Steel
Prof Susan Craw
Prof Pat Pollard
Prof John McCall
Dr Mamdud Hossain
Dr Andrei Petrovski
Dr Gbenga Oluyemi
Dr Radhakrishna Prabhu

IDEAS RESEARCH INSTITUTE

Innovation, DEsign And Sustainability

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Oil and Gas production systems are becoming increasingly complex and difficult to control. At the same time, these systems require precise control and monitoring. Smart process management is about gathering, modelling and analysing data streams for the purposes of monitoring state, controlling operations and supporting key decisions in dynamic and complex environments. Oil and Gas and Computer scientists at the Robert Gordon University IDEAS Research Institute collaborate in multi-disciplinary teams to bring the latest sensing, modelling and analytic approaches to bear on complex real-world problems.

Research Expertise

- Computational fluid dynamics modelling
- Multiphase flow experimentation
- Fracture flow mechanics
- Probabilistic modelling
- Machine learning and optimisation

PRODUCED WATER MANAGEMENT

Dr. Mamdud Hossain, www.rgu.ac.uk/dmstaff/hossain-mamdud, m.hossain@rgu.ac.uk

Due to environmental concern, oil present in produced water needs to be removed before the produced water can be disposed. However, conventional separators fail to separate very small oil droplets from the produced water. The smallest droplets can be coalesced into larger droplets that are easier to separate in separators. In this collaborative project with Opus Plus, a thorough experimental investigation has been carried out to determine the effects of various design and operating parameters on the performance of a fibrous web coalescer. Based on the experimental data, a computer code has been developed for the design and process optimisation of the coalescer.

SAND TRANSPORT IN MULTIPHASE FLOW IN PIPELINE

Prof. Babs Oyeneyin, http://www.rgu.ac.uk/dmstaff/babs-oyeneyin,b.oyeneyin@rgu.ac.uk

The quest to bridge the oil supply gap necessitated increased activities in exploration and production in offshore deep water. However, there is a growing concern in how best to produce and transport unprocessed reservoir fluids from this deep water location through long subsea pipelines because of potential sand deposition which may cause blockage or complete plugging of the pipeline. The thrust of this research was to predict key operational parameters such as phase changes, flow patterns differentiation and pressure gradient in order to develop an effective sand transport velocity models (suspension & rolling) capable of preventing sand deposition in subsea pipelines.

SALINITYSCAN PROJECT

Prof. Babs Oyeneyin, http://www.rgu.ac.uk/dmstaff/babs-oyeneyin,b.oyeneyin@rgu.ac.uk

The SalinityScan project aims is to develop a subsea sampling and analysis system capable of monitoring the salinity of formation water. Most Multi-Phase Flow Meters (MPFMs) depend on a technology that relies on the water fraction salinity for accurate volume measurement. A successful completion of this project will lead to a method of sampling multiphase fluid at user-defined intervals, separation of fluids and performing salinity measurement of the water fraction and accurate measurement of the fluid volume fractions.

CONCEPTUAL PHYSICO-CHEMICAL MODELS FOR SCALE INHIBITOR-FORMATION ROCK INTERACTION

Dr. Gbenga Oluyemi, http://www.rgu.ac.uk/dmstaff/oluyemi-gbenga, g.f.oluyemi@rgu.ac.uk

Laboratory experiments were performed on a Clashach core as a clastic reservoir formation analogue to investigate the nature of the interaction between a chemical scale inhibitor and reservoir formation. The experimental results show that the interaction between chemical inhibitor and reservoir sand materials led to the weakening of sand fabrics, triggering sand failure and release into the flow streams. The results also show that the inhibitor-formation interaction is of great significance in formation rock geomechanical characterization for failure analysis optimization. Based on the experimental results conceptual physico-chemical failure models are proposed for analyzing and describing the inhibitor-formation interaction.

SUBSEA DIAGNOSTIC FAULT ANALYSIS

Dr. Andrei Petrovski, http://www.rgu.ac.uk/dmstaff/andrei-petrovski, a.petrovski@rgu.ac.uk

In a collaborative project with Viper Subsea Technologies Ltd., researchers at RGU are supporting Viper Subsea to develop a diagnostic fault analysis tool for subsea wellhead control systems. This will exploit the latest machine learning approaches to deliver a diagnostic tool that can be integrated topsides with a wide range of existing subsea production control systems. The tool will monitor the systems health on a continuous basis, identifying potential problems at the earliest opportunity

DRILLING RIG PERFORMANCE PREDICTION

Prof. John McCall, http://www.rgu.ac.uk/dmstaff/mccall-john, j.mccall@rgu.ac.uk

Selection of the appropriate rig for an offshore drilling task is a multifactorial problem with significant levels of uncertainty. With rigs costing hundreds of thousands of dollars per day, small differences in performance can significantly impact profitability. Factors affecting drilling performance include water depth, geology, rig equipment and management. A recent Knowledge Transfer Parnership with ODS-Petrodata created Bayesian Network models of around sixty key variables from rig market and well operations data. The model identifies multi-factorial relationships between the variables and predicts rig performance with 80% accuracy.

CONTACTS

For general enquiries, please contact:

Dr. Mamdud Hossain, Engineering, Environment and Sustainability Theme Leader, IDEAS Research Institute
Prof. John McCall, Digital Technologies Theme Leader, IDEAS Research Institute