Professor Ken Sorbie - CV

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Brief CV

Ken Sorbie is the Cairn Energy Professor of Petroleum Engineering in the Institute of Petroleum Engineering (IPE) at Heriot-Watt University (HWU). He has a first degree in Chemistry from Strathclyde University (1972) and a DPhil in Theoretical Chemistry/Applied Mathematics from the University of Sussex (1975). Following this, he did postdoctoral research at Cambridge University working on theoretical aspects of semi-classical molecular quantum theory. He has worked in oil related research for over 30 years, firstly with the Department of Energy (now DECC) laboratory at AEE Winfrith where he led a group working on improved oil recovery, flow through porous media and reservoir simulation and, since 1988, at Heriot-Watt U. Ken has a wide range of research interests in Petroleum Engineering - described below. He also teaches Reservoir Simulation on the HWU Masters course which he has taught previously in Edinburgh, at the HWU Centre in Tomsk, in Kazakhstan and elsewhere.

Current Research

Ken's current research is in 3 main areas: (i) on the fundamentals of multi-phase flow through porous media, and (ii) on oilfield chemistry, particularly mineral scale formation and control, and (iii) in Improved Oil Recovery (IOR/EOR) both by gas injection (WAG) and chemical methods such a polymer, surfactant etc.. Previously, Ken has also worked on several aspects of reservoir description, reservoir simulation and upscaling.
Ken currently has active projects on the basic science and pore-scale modelling of two- and three-phase flow in porous media, including (i) a project with a specific focus on the mechanisms of WAG processes; (ii) a project on applying image reconstruction methods to generate pore network models which can be used for 2 and 3 phase flow calculations and (iii) a project on polymer flooding. In the oilfield chemistry area, Ken is PI of the Flow Assurance and Scale Team (FAST) joint industry project (JIP). This 3 year (2010 – 2013), £2million FAST project is sponsored by an industrial consortium of over 20 companies and was first launched as a JIP by Ken in 1989 and the project has been continuously active since that time. The current phase of the project (FAST 4) currently has 22 industrial sponsors; Ken is Co-PI with Profs. Mackay (HWU) and Neville (Leeds U.). Since joining Heriot-Watt U. in 1988, Ken and his close research collaborators have raised around $30m of research funding.
He has published over 320 technical papers on his research (which are all downloadable in pdf format from the IPE website and a book, Polymer Improved Oil Recovery (in 1991 and also downloadable).

Honours and Awards

1. Ken was appointed as a Society of Petroleum Engineering (SPE) Distinguished Lecturer in 2000 – 2001 lecturing on Oilfield Scale Prevention.
2. In 2001, he was elected a Fellow of the Royal Society of Edinburgh (FRSE).
3. Ken was awarded the Society of Core Analysts (SCA) 2004 Technical Achievement Award which he received at the SCA annual conference in Dubai, UAE. (http://www.scaweb.org/about_awards.shtml)
4. In 2008, Ken was awarded the SPE IOR Pioneer Award for his contributions to Improved Oil Recovery which was presented at the SPE IOR Meeting in Tulsa, Oklahoma in April 2008 (http://www.speior.org/pioneer.asp).
5. Ken was nominated as the Cairn Energy Professor of Petroleum Engineering in 2008.
6. Since 2010, Ken has been a Visiting Professor at the China University of Petroleum at Qindao, China.
7. He has been invited to accept a Lifetime Achievement award from The Royal Society of Chemistry (RSC Speciality Chemicals) for his contribution to Oilfield Chemistry research and teaching, which he will collect in November 2013 at the 30th Anniversary RSC Meeting on Chemistry in the Oil Industry in Manchester, UK.

Teaching and Short Courses

MSc TEACHING COURSE

RESERVOIR SIMULATION: I have taught this 10 day course on Reservoir Simulation since 1988. I wrote the original notes and I have presented the course (with colleagues) at Institute of Petroleum Engineering, Heriot-Watt U. in Edinburgh. It has also been presented at many of the Approved Learning Units (ALUs) around the worls e.g. in Tomsk, Russia, Qindao in China, in Almaty in Khazakstan, Dubai, Malaysia etc. The course notes are available as a Distance Learning (DL) module in the IPE Petroleum Engineering DL Course It can also be taught as a Short Course as part of CPD.

SPECIALISED SHORT COURSES

1. INTRODUCTION TO OILFIELD SCALE (with Professor Eric Mackay): This course presents a 2 -3 day introduction to the basics of mineral scale formation and prevention in the oilfield. How such common scales as calcium carbone ($CaCO_3$) and barium sulphate ($BaSO_4$) form and how they are prevented using chemical scale inhibitors and other methods are reviewed in some detail. Both topside and downhole scale management are discussed including how to design scale inhibitor "squeeze" treatments using the HW software (SQUEEZE 7) which was originally wriiten by Ken. This course is an Society of Petroleum engineers (SPE) Approved short course for CPD. Ken usually teaches this course with his colleague, Professor Eric Mackay, but both Eric and ken can also deliver this entire course on their own. This course has been presented >50 times over the last couple of decades.
2. OILFIELD SCALE - MASTERCLASS (with Professor Eric Mackay): This advanced 2 - 3 day course is for professionals who require a more in-depth understanding of the formation and prevention of Oilfield Scale e.g. well technologists, oifield chemists, production engineers, reservoir engineers, service company personnel etc. The course goes into much more technical detail than the Introductory course above. Hands-on squeeze design modelling using the SQUEEZE software is usually included. However, when this course has been presented, it has often been modified to meet the specific interests/needs of the particular course attendees. In various forms, this has been presented ~20 times. Both Ken Sorbie and Eric Mackay present this course together and separately (depending on the specific blend of topics).
3. FUNDAMENTALS OF THREE PHASE FLOW IN SYSTEMS OF NON-UNIFORM WETTABILITY (with Dr M.I.J. van Dijke): This 2 -3 day advanced course presents a review of recent research on the basic (mainly pore level) physics of three phases (gas/oil/water) in a porous medium. Some of this material is well known but much is recently developed theory by various contemporary researchers including the present authors. The fundamental physics of three-phase flow is studied on several different scales, including the intra-pore scale (capillary entry pressures), the scale of a bundle or network of pores and, to some degree, the continuum or Darcy scale (relative permeabilities). On all of these scales three-phase flow is intrinsically different from two-phase flow, in that the relevant three-phase flow parameters cannot straightforwardly be derived from (a combination of) the two-phase parameters, as is often assumed. This course has been presented about 20 times over the last 15 years.
4. INTRODUCTION TO ENHANCED OIL RECOVERY (EOR); This 2 -3 day course presents a review of the main Enhanced Oil Recovery (EOR) methods under the heading Gas based, Chemical and Thermal, although onlythe first two (Gas and CEOR)) are dealt with in detail. The level is suitable for anyone who has a reasonable technical level in petroleum/reservoir engineering. The course goes into some detail of the mechanisms of oil recovery by gas injection and WAG and all the known recovery mechanisms are reviewed. Likewise for Chemical EOR (CEOR), polymer flooding, surfactant/polymer flooding and alkali/surfactant/polymer (ASP) flooding are all reviewed in detail. This course has been gives about 15 times to date.
5. POLYMER FLOODING - SPECIALISED WORKSHOP/COURSE: 3 years ago, a major operating company asked Ken to put together a detailed state-of-the-art 2 day workshop/course on all aspects of polymer flooding. This was delivered over a 2 day period along with some detailed follow up sessions. This was very well received and the course can be presentd more widely (and has been for other companies).
6. RESERVOIR PHYSICS: This 2 -4 day course has been slowly assembled by Ken over the last decade, having its roots in a course "The Fundamentals of Multi-phase Flow Throug Porous Media" which Ken has deliver many times over the last 20 years. This Reservoir Physics course focuses only on the fluid flow aspects of flow through porous media, and not on the "rock physics" such as acoustics etc. The course takes a basic physics approach to the well known concepts in fluid flow and simulation of flow in oil reservoirs such as capillarity (capillary pressure), wettability, relative permeability etc. The main objective of this course is to explain the fundamental physics/chemistry of the processes and show how an understanding of these basics can explain most of what we observe in flow through porous media. Having said this, we also indicate where the physics/chemistry is unknown and certain phenomena are difficult or impossible to predict.

Outside Interests

Outside work, Ken enjoys walking in the Scottish Mountains and he ran the Edinburgh Marathon in 2005 and 2006, and in May 2011 he ran the Edinburgh half-marathon. He has survived the 200 mile Coast to Coast walk across England in July 2011 and the 190 mile Offa's Dyke walk along the Welsh/English border in 2012. Ken also thinks he knows something about music, although this is often questioned by his daughters and his friends.

Book and Course Notes

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