

Curriculum Vitae

Henry Richard Irrgang

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Academic Qualifications: BSc (Hons), Sydney University, 1966 in Mathematics
MEngSc, University of New South Wales, 1982 (part time)

Citizenship: Australian

Current Employer: Consultant working through Irrgang Reservoir Management Pty Ltd

Previous Employment: Command Petroleum / Cairn Energy (Dec '94 – October '98)
Bridge Oil / Parker & Parsley Australasia (Dec '90 - Dec '94)
Esso Australia Limited (Aug '73 - Dec '90)
Data Analysis Pty Ltd (Dec '68 - Aug '73)
Postgraduate Research in Mathematics, Sydney University, 1967 / 68

Professional Activities: Society of Petroleum Engineers NSW/ACT, member since 1983,
Committee member since 1992 and Section Chairman 1998 - 2008.
Member of Steering Committee and Session Chairman for the 1995
SPE Forum on Gas Reservoir Management.
Member of the Technical Committee for the 1998 and 2002 SPE
APOGCE.

Referees: Leigh Brooks, Expl Mgr, AWE, phone +61 2 9460 0165
Andrew Young, Anzon Limited (SPE President 2003)
Professor Ashok Khurana, University of Adelaide

Career Summary

- 38 years experience in Reservoir Engineering in technical, supervisory and management roles.
- Strong technical skills based on in depth knowledge and intuitive understanding of reservoir flow behaviour. Understands the assumptions and limitations underlying reservoir engineering techniques and can select the appropriate tools to draw reliable conclusions.
- Participated in almost all simulation studies and field developments, and most of the exploration well evaluations during his time with Esso, Bridge Oil and Command Petroleum.
- Major early role in the very successful reactivation of the Kutubu fields and evaluation of the PNG gas project.
- Prepared the reservoir development plans for the very successful Ravva, Cliff Head and Tui Area developments
- Strong working knowledge of Reservoir Geology and Geophysics allows good teamwork with the Geoscientists, based on effective communication and mutual respect.
- Broad knowledge and experience in related disciplines such as drilling, facilities design, economic analysis, and commercial areas resulting in effective participation in integrated asset teams.
- An enthusiastic worker. Can handle a wide range of complex assignments with minimum supervision.
- Good report writing and presentation skills. Can communicate effectively and build excellent rapport with foreign Government and Joint Venture staff.

Professional Work Experience

Reservoir Management Consultant – November 1998 to Present

- Principal client for 3 ½ years was Oil Search Limited (essentially on a full time basis). Influenced the Kutubu operator to increase/refocus reservoir management activities and successfully mitigate field decline through operational changes, well producing zone changes and workovers. Completed an integrated review of field OWC and GOC movement and drainage pattern, and identified potential infill drilling locations. Participated closely with the operator during construction, history matching and prediction runs for the new reservoir simulation models.
- Represented Oil Search on the PNG/Queensland Gas Project in estimating incremental blowdown oil and NGL reserves and field deliverability, reviewing compositional simulation modelling, and specifying/auditing the complex gas deliverability and scheduling model.
- Continued the mentoring role for Cairn Energy's Indian national PE staff, and interpreted RFT, interference and buildup tests, and PLT logs. Guided and reviewed the Ravva Field simulation studies.
- Reviewed the end of stage 1 Integrated Reservoir Study results for the Santos SA Business Unit gas fields and reviewed/recommended forward plans. These external reviews resulted in a significant change in focus and approach.
- Reviewed the reserves and development plans for an overseas gas field on behalf of the Santos Southeast Asian Business Unit. This required review of the probabilistic reserve estimation methodology and integrating the results of detailed modelling of pressure buildups and material balance. Recommendations were provided for optimisation of the completion strategy for multiple stacked, sand production prone reservoirs.
- Currently on long term contract with AWE providing reservoir management advice for all of AWE's producing assets, exploration and new venture evaluation. At various stages, seconded to AWE JV partners, e.g. ROC Oil for the Cliff Head Field Reservoir Development; Transworld for the Tui Area reservoir Development; and Origin for the Yolla and Trefoil simulation studies. Participated in the evaluation, acquisition and reservoir development planning for the Ande Ande Lumut field in Indonesia, including subsequent successful divestment of 50%.

Command Petroleum Limited / Cairn Energy Asia Limited - December '94 to October '98

- Chief Reservoir Engineer, promoted to Reservoir Engineering Manager in April 1998 reporting to the General Manager in Madras (Ravva Asset Manager).
- Supervised 1 - 3 technical staff in Sydney and mentored 5 Madras Petroleum Engineers.
- Kicked off the Reservoir Engineering and many Petroleum Engineering functions for the Ravva Field Development, essentially from “scratch”. Ravva is a 260 MMBOE structurally and stratigraphically complex oil and gas field, offshore the east coast of India. During the course of development reserves more than doubled, while well requirements reduced.
- Provided input to tender preparation and evaluation for the Ravva Facilities EPIC contract, Drilling, Data Acquisition (coring, logging, testing), Well Services (including CH wireline), and Core and Fluid Analysis Contracts.
- Prepared detailed procedures for Core Handling/Processing, Drillstem and Wireline testing, and Slickline Pressure surveys for use by the national staff.
- Carried out preliminary gas lift design for tubing and equipment sizing.
- Established the company’s technical credentials in the Petroleum Engineering area with the Joint Venture and Government, and achieved excellent rapport with their representatives, through technical workshops and clear communications. This was despite the very different approaches to Development Planning, Data Acquisition and Reservoir Management. In particular, we resolved their serious concerns re well and reservoir flow rates.
- Obtained timely JV approvals for the development, exploration and appraisal wells (in close conjunction with our Geoscience staff), and workovers and completions.
- Established close liaison with our Geoscience staff to permit a truly integrated reservoir description. Extensive use of production and pressure data allowed definition of fluid systems, reservoir continuity and boundaries.
- Conducted studies re injection source groundwater wells, water compatibility and treatment. Specify, tendered and awarded the groundwater well drilling and arranged technical supervision. Provided guidance and quality control for commissioning of the water injection system and monitoring of injection well performance.
- Assisted with studies re sand production prediction, well capacity testing and sand monitoring procedures, and reviewed gravel packing procedures.
- Directed and ensured quality control of an extensive reservoir surveillance programme at Ravva. The pressure data quality achieved allowed valid conclusions to be reached by comparison of well pressures that are only a 1-2 psi apart. Analysed an extensive suite of pressure buildup, falloff, interference and pulse tests, and production and RST logs.
- Carried out multi-reservoir linked material balance studies, participated in/supervised three major simulation studies, and presented/gained JV approval for the conclusions.
- Prepared an Updated Ravva Development Plan including recommendations for a production rate increase and associated investments. Obtained Operating Committee and Government approval.
- Had a major role in complex negotiations for a gas sales contract with Gas Authority of India Ltd.
- Evaluated 3 major producing asset acquisitions and presented at board level.
- Provided Petroleum Engineering support for non-operated assets at Skua, Yemen, and Tunisia, and for exploration well evaluation.

Bridge Oil Limited / Parker and Parsley Australasia - December 1990 to December 1994

- Senior Engineering Advisor
- Managed Bridge Oil's interest in the Airlie Joint Venture. Achieved influence with the operator to significantly change reservoir management plans, including infill drilling, workovers and gaslift operations. Initiated a JV task force to review operating costs, achieving approximately \$3 million annual savings.
- Evaluated several offshore discovered field development joint venture opportunities in China and participated in negotiations. Prepared an innovative field development for an offshore field and gained technical acceptance from CNOOC and other Chinese partners, and an offer to let us participate. Built excellent relationship with the Chinese companies resulting in offers to let us review other marginal field JV opportunities. However, the BOL board decided against doing business in China.
- Prepared a successful retention lease application, including removal of a well commitment.
- Reviewed stimulation options for Waggamba Field. Designed, AER'd and gained JV approval for a fracture stimulation (not carried out due to stuck packer).
- Carried out/supervised three reservoir simulation studies.
- Performed a detailed review of Tirrawarra Patchawarra gas field performance and assisted with BOL's case for the Review and Adjustment. Reviewed the performance of other Cooper Basin gas and oil fields.
- Evaluated four significant discovered field/producing asset acquisition opportunities including reservoir, facilities, costs and economics.
- Managed BOL's operated Surat Basin interests during an intensive phase of development of the northern area and of exploration. Justified two gas compression expansion projects. Re-activated production from four "watered out" wells. Achieved record production from extremely mature fields, requiring close liaison with operations staff.
- Received Best Paper Award at the 1994 APEA Conference (Management of Thin Oil Columns).

Esso Australia Limited - August 1973 to December 1990

- Joined the Production Department Technical Computing Services Group and was promoted to Group Supervisor 10 months later.
- Developed EAL required technical software, provided support for Exxon and other software packages, organised Production Department computing and data communications hardware, and liaised with EAL Information Systems Department.
- Developed a Production System Optimisation/Forecasting and Gaslift Allocation program, and a Production/Processing Material Balance and Royalty/Excise System (both used for 15+ years).
- Debugged, enhanced and supported the local version of Exxon's reservoir simulation program, including provision of advice on convergence and efficient modelling.
- Transferred to the Reservoir Engineering Group as Reservoir Developments Supervisor in January 1980, with 5 - 10 reservoir engineers in the group. At the time Mackerel and Tuna development drilling was in progress and these were followed by Snapper, West Kingfish, Cobia, Fortescue, and Flounder development drilling.
- Responsibilities included close liaison with Production Geology to define well locations, well and reservoir data acquisition and analysis, specification of completions and facilities requirements, and obtaining JV and Government approvals.

- Introduced the use of RFT pressure profiling in deviated wells at Tuna against strong operational opposition. This vital data allowed definition of fluid systems and contacts for the over 30 additional pools discovered during development drilling. Snapper field was also a challenging development with a 6.5 m pancake oil column, concurrent gas cap and oil zone production, and highly variable well producing characteristics.
- Reviewed and implemented revised methodologies for Reserve Probability Analysis.
- Prepared the development plan for the Bream field, a stratigraphically complex thin oil column reservoir.
- Supervised the Reservoir Studies Group (also within Reservoir Engineering), comprising 4 - 7 engineers, from late 1984. Responsibilities included field simulation studies (including Mackerel, Fortescue, Halibut/Cobia, Snapper, Kingfish and West Kingfish and other minor field/segment models), development feasibility studies (including Perch, Dolphin, Whiting, Tarwhine, Seahorse, Blackback, Yellowtail, Mulloway), reservoir management, reserves reporting (including Monte Carlo methods), and Government/JV liaison.
- Responsible for the development drilling phase of Bream. This successful development considerably exceeded its reserves and production targets. Justified the drilling of 5 horizontal wells, the first by EAL.
- Completed and gained Corporate approval for the development plans for West Tuna and Bream B (projects cancelled after the 1986 oil price crunch and re-worked some years later).
- Gained Government approval for field production rate increases including Snapper, West Kingfish, Cobia, Fortescue and Bream.
- Prepared three successful "New Oil" classification applications.
- Evaluated a number of discovered field acquisition opportunities. Led the reservoir evaluation team resulting in the successful acquisition of an interest in Jabiru and Challis.
- Primary contact for exploration support activities, including prospect evaluations, well evaluation (coring, wireline and production testing decisions), and appraisal well decisions. Primary contact with the Gas Marketing Department.
- Seconded as lead EAL representative in the Resource Optimisation Study. This joint EAL/EPRCo task force evaluated reserve growth opportunities, including marginal fields, infill drilling, attic recovery, and near miscible gas injection projects.
- Prepared the technical case and appeared as a technical witness for Esso in court proceedings relating to an excise dispute.
- Prepared and delivered the Field Development Planning section of the Exxon wide, inaugural Applied Reservoir Management School.

Data Analysis Pty Ltd - December 1968 to August 1973

- Carried out software development, statistical analysis, data processing and client liaison for the computer service bureau side of this small Mining and Petroleum industry consulting business.
- Appointed to run the bureau side of the business (other than financial) in 1970, with 2 - 4 staff reporting to me.
- Developed innovative software for geostatistics, processing of aeromagnetic data, contour mapping, interpretation of Dipmeter data, open cut mine optimisation, and digitising, editing and display of seismic interpretation data. The dipmeter processing program proved very popular and by 1973 Data Analysis was processing almost all of the dipmeter data in Australia.

Personal Details

Date of Birth:	10 August 1944
Marital Status:	Married to Rosemary
Children:	Michael and Steven
Leisure Activities	Tennis, Downhill and Cross Country Skiing, Hiking, Reading, Maths and Science, and a strong interest in most styles of Music.

Professional Training

Received extensive training throughout my career. Highlights include:-

- EPRCo's Applied Reservoir Management (as student and lecturer)
- Economics
- EPRCo's Reservoir Geology for Engineers
- Seismic Exploration - Modern Concepts; Seismic Interpretation for Reservoir Characterisation
- Geostatistics
- Basic Log Analysis
- Production Logging
- Drillstem Testing and Advanced Well Test Analysis
- Exxon's Drilling School
- Exxon's Completions and Workover School
- Hydraulic Fracturing and Acid Stimulation
- Natural Gas Processing
- Supervision, Management and Personal Development (Incl. Negotiating Skills, First Aid)

Software/Computing Experience

- Reservoir Simulators (Eclipse, CMG, Exodus, Exxon's MARS)
- PanSystem and Saphir
- Prosper, FloSys (Nodal Analysis, Wellbore Hydraulics, and GasLift Design)
- CMGPROP, Design II, Chemcad and Props (Hydrocarbon Properties, Phase Behaviour, and Process Simulation)
- Microsoft Office (Excel, Word, Exchange, Outlook, PowerPoint)
- Programming Languages include Fortran, Visual Basic, SAS, Excel Macro