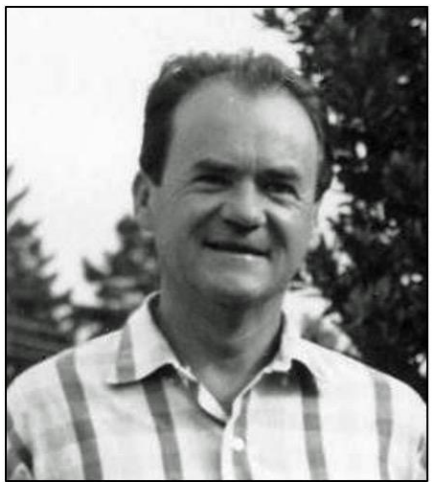
Name	**Russell James (1925-2014)**
Occupation/role	**Chemical Engineer, Department of Scientific & Industrial Research (DSIR)**
Years active	**1956 to 1989**

Key contribution

Two-phase flow transmission of geothermal steam-water mixtures, including measuring flow rates, pressure drop and enthalpy. Developing the “James formula” for measuring flow with lip-pressure.



Narrative

Contributions to the geothermal industry in New Zealand

Russell James was born in Barry, South Wales (UK), in 1925. He was educated at Barry County School, after which he took on an engineering apprenticeship in Gloucestershire and studied aircraft engineering at night-school. In 1952, he immigrated to New Zealand and joined the Chemical Engineering Section of the Dominion Physical Laboratories (later to be incorporated into the DSIR) based in Wellington. He continued his education by lecturing on Applied Thermodynamics and the Theory of Machines at the Polytechnic Institute: as he said “the best way to learn a subject is to have to teach it – keeping one step ahead of your students”.

In 1956, Russell transferred to DSIR’s Geothermal Research Centre at Wairakei, near Taupo, to assist with solving the multitude of chemical and engineering problems associated with developing the Wairakei geothermal resource. At this time, the NZ Government had committed to building a 192 MWe power plant, and as Wairakei was the first liquid-dominated geothermal resource in the world to be developed, understanding the transmission of two-phase steam-water mixtures was of high priority. At the time it was thought that transmission of steam-water mixtures through pipes might not be feasible because of “water hammer”, but Russell was able to show that this was not necessarily the case.

When Russell started working at Wairakei, about ten large diameter deep wells had been drilled and some of these could produce more than 10 MWe equivalent power. Developing a simple, yet accurate method to test such large two-phase wells was another project priority. Russell soon developed a passion for well flow measurement and had the luxury of being able to “play” with several of the powerful, high-pressure wells for his investigations. This led to the development of the “James Lip Pressure” method of determining the flow rate and fluid enthalpy of a geothermal well. Despite the incredible developments in flow measurement technology since 1960, this method remains the most efficient way to test

large geothermal wells – although it is still viewed with a degree of scepticism by some engineers due to its simplicity!

Development Aid and Educational Contributions

The New Zealand geothermal programme was suddenly curtailed in 1971, and Russell moved on to international work advising on United Nations geothermal development projects. In 1970 he spent six months in Turkey and El Salvador, and returned to Turkey for another five months in 1971. From 1973 to 1975 he was an on-call consultant for the Comisión Federal de Electricidad of Mexico, and made many visits to various Mexican geothermal fields. In 1974 he spent five months working for the United Nations in Chile, and in 1976 for three months in Central America. Later Russell was involved with development of several geothermal resources in Indonesia, and in Costa Rica.

Scientific Contribution

During his career Russell published numerous technical papers and DSIR Geothermal Circulars. He lectured at the Geothermal Institute (University of Auckland, NZ) and at the universities of California and Hawaii, and at the United Nations University in Reykjavik, Iceland. Russell was awarded the Cooper Medal by the Royal Society of New Zealand in 1970, the Angus Award by the Institute of Professional Engineers of New Zealand (IPENZ) in 1970, and the prestigious Special Achievement Award by the Geothermal Resources Council in 2002. He retired from the DSIR in 1989, but continued to provide geothermal advice in several countries.

Sources

NZGA Newsletter, March 2015. https://www.nzgeothermal.org.nz/downloads/NZGA-Newsletter-March2015-1.pdf, p4

NZGA, Nomination of Russell James for Life Membership of NZGA.

Rick Allis, Retrospective and Prospective Views of the Development of Wairakei Geothermal Field: 50 Years and Counting

Publications (a sample), he also wrote 46 Geothermal Circulars

James R., (1962) *Steam-Water Critical Flow through Pipes*, Proc. Inst. Much. Engrs. 176, 741.

James R., (1980) *Deductions of the Character of Steam-Water Wells from the Shape of the Output Curve,* 2nd Geothermal Workshop, Auckland, 1980.

James R., (1989) *One Curve Fits All*, Proceedings, 14th Workshop on Geothermal Reservoir Engineering, Stanford, 1989..