

An LDI Training Webinar

# Geothermal Reservoir Engineering

By Dr. Roland N. Horne

This Geothermal Reservoir Engineering webinar is designed by Dr. Roland N. Horne to teach participants how to:

1. Apply knowledge of mathematics, science, and engineering to applications of geothermal energy.
2. Formulate and solve engineering problems related to applications of geothermal energy.
3. Use the techniques, skills and modern engineering computational tools necessary for engineering practice.

Dr. Roland Horne is well recognized as an expert in geothermal resources, and has been the Director of the Stanford Geothermal Program for more than 30 years. He has been the Technical Programme Chair of World Geothermal Congress in 2005, 2010 and 2015, and will be again in 2020 in Reykjavik (postponed until 2021). He was the President of the International Geothermal Association (IGA) 2010-2013.

## WEBINAR CONTENT

### Simple Reservoir Modeling

- Diagram conduction and convection; explain which applies to a geothermal reservoir.
- Sketch a Boiling Point for Depth (BPD) curve for a fluid-dominated system and a vapor-dominated system and explain why they are different.
- Explain how and why the amount of energy in place in steam vs. water differs depending on whether it is measured by mass, energy or volume.
- Explain the relative amounts of heat energy stored in water, steam, and rock. (Note the implications for geothermal resource exploration and energy generation.)
- Calculate the amount of wastewater produced vs. useful energy output for the given conditions.

### Expanded Reservoir Modeling

- Explain Darcy's Law for the flow of a fluid through a porous material; then, explain how and why the controls on flow change for a two-phase system.

- For a water-saturated porous rock, explain the relationship between pressure, temperature, amount of liquid water and amount of water vapor; illustrate with examples of what happens when conditions (e.g., pressure) change.
- Explain the relative compressibility of water, steam and a two-phase system.
- Estimate in-place saturation under different conditions.
- Compare in-situ saturation to flowing saturation, and in-situ enthalpy to flowing enthalpy.

### **Analysis of Measurements in Wells**

- Calculate heat loss to surroundings by conduction.
- Estimate flow rates based on temperature and pressure logs.
- Interpret temperature and pressure logs to determine feed zone depths.
- Interpret temperature and pressure logs to determine reservoir pressure and temperature.
- Estimate the energy loss during single-phase and multiphase flows in wells.

### **Reservoir Simulation**

- Use p/z models to estimate steam reservoir size and ultimate recovery.
- Use decline curves to estimate recoverable reserves.
- Construct a reservoir simulation model of a reservoir.
- Perform natural state modeling and history matching.
- Perform forecasts of future reservoir performance.

### **Reinjection Design**

- Understand the pressure, thermal and chemical changes that take place in the reservoir during reinjection.
- Design tracer tests for the analysis of reinjection.
- Interpret tracer tests using porous medium and fractured medium models.
- Optimize the reinjection strategy.
- Understand the range of experience in reinjection at geothermal fields worldwide.

### **WHO SHOULD ATTEND**

This course is perfect for new and experienced geothermal reservoir engineers.

In attending this course, new geothermal engineers will learn the concepts and techniques to assess and manage geothermal reservoirs.

For experienced geothermal engineers, you have an excellent opportunity to deepen your understanding of geothermal reservoirs and to discuss your field challenges with Dr. Roland Horne when you attend the course.

## ABOUT DR. ROLAND N. HORNE



Dr. Roland N. Horne is the Thomas Davies Barrow Professor of Earth Sciences at Stanford University, and Senior Fellow in the Precourt Institute for Energy. He was also formerly Chairman of the Petroleum Engineering Department from 1995 to 2006.

He holds BE, Ph.D. and DSc degrees from the University of Auckland, New Zealand, all in Engineering Science.

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He is an internationally-recognized expert in the area of geothermal energy, optimization and well test analysis and has twice been an SPE Distinguished Lecturer.

Under him, more than 54 people have obtained Ph.D. degrees at Stanford University. Currently, Stanford University is recognized as one of the top schools in the world for the study of geothermal reservoir engineering.

Prof. Roland Horne has written more than 125 technical papers, is the author of the book *Modern Well Test Analysis* and has contributed to five other technical books. He is an SPE Honorary Member, and a member of the National Academy of Engineering in the USA.

### Delivery Method

This is an online course delivered using Zoom.

### Daily Schedule

Session 1 - 8:00 am to 9:30 am

Session 2 - 10:30 am to 12:00

Western Indonesia Time (WIB) +0700 UTC/GMT

**Webinar date:** October 6-9, 2020

**Webinar fees:** IDR 28,000,000. per person

## **ENROLLMENT**

Two ways to enroll:

1. Enroll online at [www.lditraining.com](http://www.lditraining.com)
2. Email your enrollment message to LDI Training at [lditrain@indo.net.id](mailto:lditrain@indo.net.id)