



Wednesday, 22 April 2009

SALA BARBARA

5° Palazzo Uffici - Eni E&P division

Via Emilia 1

SAN DONATO MILANESE

11:00

2008-2009 SPE Distinguished Lectures Series

**GUILT AND ABSOLUTION  
IN NATURALLY FRACTURED RESERVOIR CHARACTERIZATION:  
THE CAUSE AND DEVILISH EFFECT OF HETEROGENEITY**

*By Wayne Narr – Chevron ETC*

➤ **ABSTRACT**

The behavior of naturally fractured reservoirs (NFRs) is typically difficult to predict due to extreme heterogeneity of their flow-related character. This unpredictability affects most aspects of field management; surprises can accompany each well.

From our well-based scale of observation, we sample and test reservoir fracture systems below their representative elemental volume (REV). This is the ultimate cause of the unpredictability of their flow behavior.

Heterogeneity is caused by the complex and variable geometry and connectivity of the plumbing system of the reservoir (well, fractures, and matrix). Connectivity is a function of:

- a) Orientation of a well relative to reservoir fracture sets,
- b) Spacing of fractures in each set,
- c) Spatial variability of the fracture system,
- d) Effective length of fractures,
- e) Fracture height, and
- f) Fracture-matrix interaction (effective porosity, transfer).

What do we know, what might we know, and what are the limits of our knowledge? Which of the controlling variables can we understand and measure, to help predict aspects of reservoir performance? The one idea that I would like members to take away from is lecture is: because we sample the reservoir below its REV, there are limits to what can be known from downhole data alone; it must be placed into a larger context. Our understanding of these data requires that the NFR be interpreted in light of a) competent geologic understanding of fracture systems, integrated fully with b) sound, creative, engineering insight of observed flow behavior. This approach does not guarantee salvation, but it improves the odds.

➤ **BIOGRAPHY**

*Wayne is a Research Consultant on the Reservoir Simulation Research Team at Chevron Energy Technology Company in San Ramon, CA. He is a structural geologist, and works on both technology development and consulting projects involving characterization of naturally fractured reservoirs. His earlier industry experiences include a variety of structural-geology interpretation work, mainly involving complexly deformed fold-thrust belts, as well as related technology appraisal and development.*

*Previous positions at Chevron include leadership of the Structural Geology Team, and exploration geologist, with focus on Northern South America. Prior to this he held both exploration and research positions at Gulf Oil Corporation.*

*Wayne earned a Ph.D. in geology from Princeton University (1990), an M.Sc. from University of Toronto (1978), and a B.S. from Pennsylvania State University (1976).*