Non-Linear Effects In Reservoirs: Are We Missing Something ?

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(FESWA-ASEG Seminar, October 11th, 2000)

We are accustomed to looking at and interpreting phenomena in the context that the effect we see on a medium is linearly dependent on the influence we apply to that medium. Linear effects are inherent in such laws as Hookes Law, and apply when the influence and the effect are small. Linear laws lead to simple equations that can be solved by simple harmonic motions, and therefore predictable behavior. All materials will eventually fail this test of linearity and, in particular, materials that are present in reservoirs can exhibit strong non-linearity. The non-linearity leads to interesting phenomena and gives opportunity, if conditions in the reservoir are suitable, for observation of non-linear effects and possible measurements which would otherwise not be available. Non-linear effects will arise from the matrix rocks in a reservoir, from the gas, oil and condensate in the reservoir and from the interactions that occur between those phases.

The talk outlined some of the non-linear effects that will be observable in reservoirs, and speculated on others which may be present, and how they might be measured. The talk also discussed what implication they might have on measurement, production and the economics of oil and gas recovery.

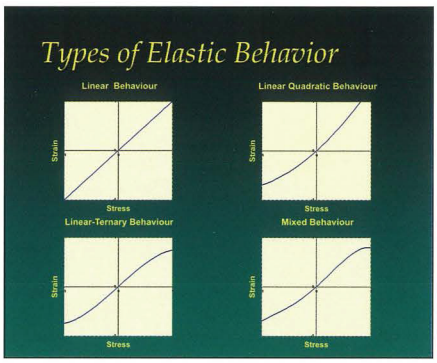

Fig. 1.

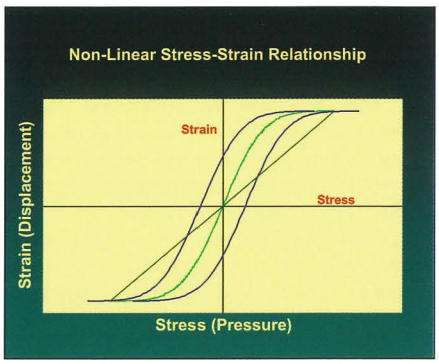

Fig. 2.

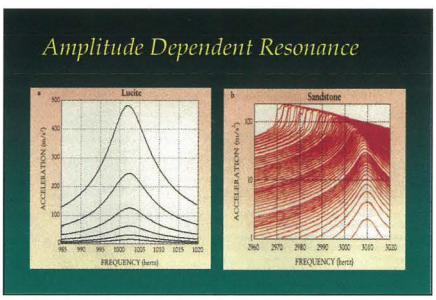

Fig. 3.

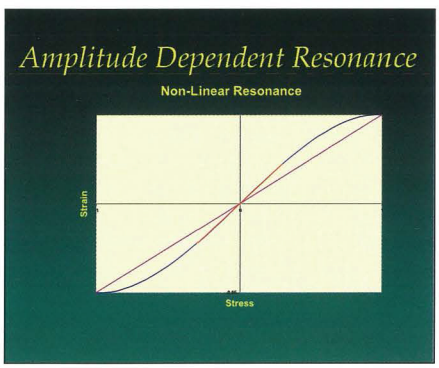

Fig. 4.

PESA News No. 51 (2001)