

# Guest Lecture by Mr. N.K. Khatri at SPG Student Chapter I.I.T. Roorkee

SPG student chapter at the Department of Earth sciences, IIT Roorkee, organized a Guest lecture by Mr. N.K. Khatri, on 22nd of October 2013 on ***“Rock physics and reservoir characterization through surface measurements”***. Mr. Khatri is a distinguished geophysicist presently posted as DGM (GP) at Institute of reservoir studies (IRS), ONGC Ahmedabad. Around 80 students from the disciplines of geology and geophysics attended the talk and actively took part in the discussions as the topic was related to industrial application of their curriculum, moreover, the lecture was graced by the presence of faculty members of the department and found it enlightening.

Mr. Khatri initiated the talk by introducing the basics of “Rock physics” and the elastic parameters, their relation with lithology, hydrocarbon and porosity, and the behavior of  $V_p$ - $V_s$  curves for water saturated sandstones and limestones respectively. It was shown that the water saturated sands showed linearity whereas the limestones gave a nonlinear relationship between  $V_p$  and  $V_s$ . The relationship of densities and poisson's ratio with the fluid saturations and the rock parameters ( $K$  and  $\mu$ ) respectively was also portrayed. Importance of variation of  $V_p/V_s$  ratio with poisson's ratio was also emphasized upon. The talk later proceeded to the introduction of Gasmann and Woods equations which were used to determine bulk porosity of a rock using parameters

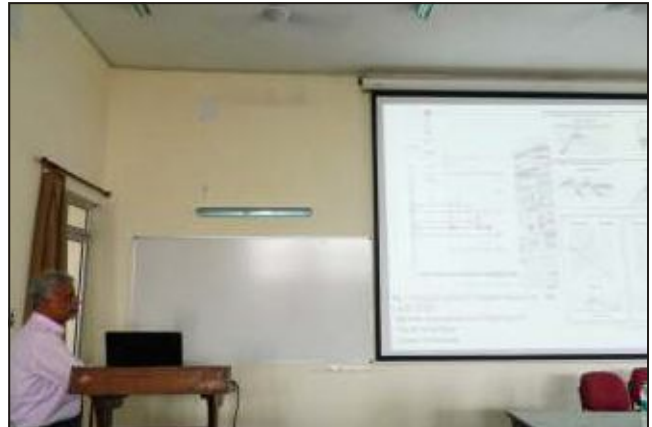
like bulk modulus of formation fluids, their saturations and the porosity.

All these parameters and their relationships were used for interpretation of the rock properties using seismic data with the help of case studies. The solution to the Zoeppritz equations with the Aki-Richards approximations were analysed for the two important parameters viz. reflection coefficient (A), the relative hardness of the rock across the interface and gradient (B), dominantly the relative Poisson ratios of the rock across the interface. The plots of A (intercept) versus B (gradient) were used to infer upon the type of fluid present for eg. Brine, gas, oil. The fluid line in these plots becomes nonlinear owing to the gas bearing and oil bearing formations i.e now A and B do not remain on the straight line. These AVO interpretation fundamentals were confirmed through well seismic tie of resistivity and porosity logs (Neutron log) shown in a particular case study. In which Lesser  $V_p$  and higher  $V_s$  corresponding to the gas interval showed the break in linear trend of  $V_p$  and  $V_s$ .

The interpretation part of the lecture showcased a number of case studies such as “High amplitude anomaly in Pliocene on seismic data are studied for presence of Hydrocarbon”, “Finger printing of high amplitude anomaly for gas sands of Pliocene in the fields of KG offshore where several wells had been drilled” and “Ruling out presence of hydrocarbon in deep waters of Mahanadi”.



Students and faculty members attending the talk



Mr. N.K. Khatri while delivering the lecture