

***Thermogenic Petroleum Gas in Sagar District, Madhya Pradesh – Arun K. Shandilya, Dept. of Geology, H.S. Gour Univ., Sagar – 470 003; (Email: akshandilya\_U@rediffmail.com)***

The discovery of the rare gas helium in hydrocarbon rich zone in the Garhakota and Rahatgarh tahsil of Sagar district, M.P., is a unique finding in the history of Earth science in India. It is remarkable that helium contents varies from 0.34% to 0.732% along with 72% to 99% of methane and ethane, and minor amount of oxygen, nitrogen and CO<sub>2</sub> gases in the hydrocarbon rich zone recorded during the geochemical and stable

isotope analysis. It has been found in the stable isotope  $\delta^{13}\text{C}$  value, methane is -43.6‰ to 54.9‰ w.r.t. PDB and for the ethane gas is -24.9 to -26.4‰ w.r.t. PDB in the samples collected at Rahatgarh, Meerkhedi, Piparia, Bhutoli villages in Sagar district. The occurrence of rare helium gas in the hydrocarbon rich zone was reported for first time in Jan., 2007 from the tube wells of Sagar district, which were

geochemically and stable isotopically analyzed at KDMIPE Dehradun and NGRI, Hyderabad. The result of the stable isotopic analysis of ethane gas indicate that it is of thermogenic origin, which must have been formed at very high temperature and pressure condition in the deeper horizon of the great Vindhyan sedimentary basin of early Proterozoic (>500m.y.) period.

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At present studies on the leakages of rare gas helium along with petroleum gases in the hydrocarbon rich zone have been done in the samples of soil, water and gas collected from the tube wells located in the various villages in the Rahatgarh, Garhakota tahsils of Sagar and Patharia tahsil of Damoh district. Leakage of petroleum gas was reported first in 1980 from the Meerkhedi village located on Sagar-Vidisha road, at about 15 km from the Rahatgarh town and in 1993, in another tube well at Rahatgarh the leakages was reported by the author.

Leakages of hydrocarbon gas has been discovered in Piparia-Bhutoli area near Chinnoaa in Garhakota Tahsil in Sagar district and Batiyagarh village in Damoh district, about 140x20 km<sup>2</sup> area. The bore well varying in depth from 340-400 ft.

The Director of Exploration, KDMIPE, ONGC, Dehradun had sent a team of geologists on 8th May 2007, along with the team the author visited the Piparia-Bhutoli and Rahatgarh and Meerkhedi area and collected the samples of soil, water and gas. Then we observed that this air cum gas coming out from the bore well is burning in blue flame. In the month Jan.2008 a letter was written to the Director General, GSI, Kolkata and to the Director, NGRI, Hyderabad for further investigation under the joint collaboration with H.S. Gour University. A team of scientists from NGRI visited various bore wells and collected the samples of soil, water and gas from difference localities mentioned below:

*Piparia Bhutoli:* The area covers part of toposheet no. 55M/1 and is accessible by a 3 km village road from town Garhakota and around 45 km East of Sagar on the way to Damoh. The leakage of petroleum gas is reported from 8 tube wells in March 2007.

These bore/tube wells varying in depth from 260 to 400 ft of Shri Bhagwan Ssingh Yadav (lat: 23°47'59.2"N, long 79°05'29.6" E, Elevation 448 m). The tube wells (depth 400 feet) of Sri Asharam Patel S/o Sri Ghappu Patel (lat: 23°48'20" N, long: 79°50'20.7" E, elevation 450 m).

*Rahatgarh:* This village is located 40 km west of Sagar on the way to Bhopal. In the bore well of Shri Leeladhar Tiwari (Tiwari Dhawa: lat: 23°57'15.7" N, Long: 79°25'03"E, Elevation 484 m), the tube well is situated on the Deccan Trap – Vindhyan contact. The leakage of petroleum gas is reported since 1993.

*Meerkhedi:* This tube well (lat: 23°45'56"N, Long: 78°18'9.6"E, Elevation 440 m) belongs to Shri Dhan Singh. The area falls in the toposheet no. 55 I/5. This tube well is the eastern extremity of village Meerkhedi, 13 km of Rahatgarh on the way to Vidisha. This tube well is pouring petroleum gas since 1984 with enormous bubbling in the water. The tube well is located on the contact of Deccan Trap and Vindhyan sandstone (inlier). The quantity of petroleum gas bubbling increases day by day.

*Mahalwara:* In the borewell of Sri Halle Singh Lodhi at Mahalwara about 11 km north of Patharia railway station in Damoh district. The tube well water is inflammable with flames reaching a height of up to 1 m.

The present gas leakages has been discovered in the dried tube wells, located on sandstone, shale and limestone rocks of the Rewa and Bhandar Group of the Vindhyan Supergroup. These petroliferous rocks are overlain by the Lameta bed in the western part of the Pipariya and Bhutoli area in Garhakota tahsil. The western part of present area is overlain by the rocks of upper Cretaceous Deccan Trap flows,

which are intercalated with intertrappean limestone. The area where the leakages of petroleum gas had been discovered is located on the alluvial soil. The Deccan Trap rocks are exposed west of the Chinnoua village in Garhakota tahsil. The sandstone and shales are dipping 10 - 15 degree towards SE. The topography is more or less flat with some low lying areas near the stream.

Western fringe of the Rahatgarh and Meerkhedi areas are covered mostly by the Deccan Traps, except few inliers of the rocks of Rewa Group and Bhandar Group of the Vindhyan Supergroup.

The ONGC Dehradun has concluded that the seepage gases of Piparia Bhatoli and Rahatgarh are predominantly methane (72.14%-84 % in Piparia Bhutoli and 99% in Tiwari Dhaba, Rahatgarh borewell and are devoid of higher hydrocarbons. The hydrocarbon gases seem to have predominance of bacterial methane.

The detail geochemical and stable isotopic studies of the natural petroleum gas and water samples was done in the laboratories of NGRI. The following are the findings:

The presence of the ethane gas in both the localities, and  $\delta C_{13}$  value is in the range of -24.9‰ w.r.t. P.D.B. and - 26.4 ‰ w.r.t. P.D.B. indicate the thermogenic source of these gases.

The samples of the Piparia-Bhutoli-Rahatgarh-Meerkhedi containing 72% to 99% of methane, 0.34% -0.742% of helium, along with oxygen, carbon dioxide and nitrogen. The stable isotopic  $\delta C_{13}$  value is in the range varying from -43.6 ‰ w.r.t PDB for methane -24.66 ‰ w.r.t. PDB for ethane at Piparia-Bhutoli to -54.9 ‰ w.r.t. PDB for methane and 26.4‰ w.r.t PDB for ethane at Rahatgarh are indicative of the thermogenic origin.