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Research Paper

Geology and Prorpects of Lignite Resources in Western Rajasthan, India

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ABSTRACT-*The Tertiary deposits in the Palana area of the district of Bikaner in Rajasthan are known to contain lignite. The State Directorate of Geology and Mining, Government of Rajasthan, has just begun to keep track of new lignite occurrences from various locations in the districts of Bikaner, Barmer, and Nagaur. Additionally, the enormous Tertiary deposits found in Rajasthan's northwest call for careful research, which could one day reveal the area's true lignite potential. The study covers the findings of a thorough investigation into the quality, resource potential, and some elements of utilization of the Palana lignite field, as well as the quality and traits of some of the new deposits discovered in recent years. The study highlights the extensive exploration of the more recent areas that may prove to be a source of additional lignite deposits in this fuel-scarce portion of the country and demonstrates that there is substantial potential for using the lignite of the Palana basin.*

Keywords- *State Directorate of Geology and Mining,Tertiary deposits, Palana lignite fieldetc*

I. AN OVERVIEW ABOUT RAJASTHAN STATE

Rajasthan state covers an area of approximately 3,50,000sq.kms. which has been divided into two major parts by Aravalli mountain range that strikes NE-SW. The area west of Aravalli mountain range is western Rajasthan and is also known by Rajasthan basin which comprises of three smaller Basins, referred as subbasins in the Thesis. These subbasins from north to south are the Bikaner-Nagaursubbasin, the Jaisalmersubbasin, the Barmer-Sanchorsubbasin fig (1). These subbasins encompasses an area of 1,26,000sq.kms. in which sedimentation took place during Mesozoic-Tertiary periods.

The Bikaner-Nagaursubbasin covering an area of 70,000 sq.kms. is bounded in south by Pokaran-Nachana high, in north by subsurface Delhi-Sargodha ridge and in the east by Aravalli mountain. It opens up towards north-west. The Jaisalmersubbasin covers an area of 45,000 sq.kmsbounded by Devikot-Nachana uplift towards east and south east. The Barmer high marks its southern limit. The Barmer-Sanchorsubbasin is an elongated narrow grabben and separated from Jaisalmersubbasin by Devikot-Nachana uplift and occupies an area of about 11,000 sq.kms. The Barmer-Sanchorsubbasin can be related to northern continuation of Combay basin.

The occurrence of Lignite in these Subbasins is confined to sedimentary sequence of lower tertiary period and occur as arcuate and linear tracts covered by sand and or recent sediments. The Lignite occurrences in these subbasins are characterized by limited areal extent, irregular disposition, lateral facies variation and highly heterogeneous thickness of individual seams. The complex lithological setup, short lived and localized favourable condition for Lignite formation, absence of marker horizons and a thick quaternary cover are main constraints in exploration. However the occurrence of Lignite from all these subbasins indicate formation of Lignite in lower tertiary era.

Significant Lignite deposits have been proved at many locations prominent once being Barsingsar, Gurha, Bithnok, Hadla, Riri in Bikaner district. Kasanu, Matasukh, Kuchera, Lundsar, Merta road in Nagaur district and Giral, Jalipa, Sonari in Barmer district. Mining is in progress at Giral in Barmer district, Kasnau, Matasukh in Nagaurdictrict,Barsingsar, Gurha in Bikaner district.

II. INTRODUCTION TO LIGNITE: A FUEL

Lignite is fossilized solid fuel of vegetative origin and is the younger member of the coalification series next to Peat and is also known as Brown Coal. The total geological reserves of Lignite in the country are 38 billion tonnes. Though the Lignite mining in India reported long back during 1898 in state of Rajasthan. Systematic mining of Lignite started after the formation of Neyveli Lignite Corporation (NLC) and commercial Lignite production from its mine in Neyveli started during early 1960. In Rajasthan Lignite was mined at Palana and continued intermittently up to 1966. As many as 66 underground shafts are present in the area. After the initial exploration of 50s the exploration activity for Lignite remained dormant for nearly two decades. In view of comparatively low priority on Lignite in past and its isolated nature of occurrence confining to the tertiary period, due emphasis on the preparation of national inventory was given in the sub group II report on coal and Lignite for formulation of IX plan. This was improved upon in X plan, where, deposit-wise, category-wise, Lignite inventory was given. This forms the basis for orienting the exploration and developmental programmes for Lignite during X plan and beyond. The exploration of Lignite in last decade has been oriented at a systematic data acquisition on seam disposition, quality and other parameters which influenced

In order to enhance future exploitation of Lignite in Rajasthan, Neyveli Lignite Corporation Ltd. (NLC) carried out exploration by engaging Geological Survey of India (GSI), Mineral Exploration Corporation Ltd. (MECL) and Directorate of Mines and Geology, Rajasthan. At present Rajasthan is having largest Lignite reserves next to Tamil Nadu.

III. BACKGROUND

In order for the human species to survive on Earth, energy is vital. The surface of the planet has energy in a variety of forms that must first be studied before being used for human needs. Either the energy source is renewable or not. Solar energy, wind energy, and hydropower are examples of renewable energy sources that can be used continuously and do not become exhausted or depleted from use. Natural processes do not replenish or replace nonrenewable energy sources at a rate commensurate with their consumption. These include all types of fossil fuels, including coal, lignite, oil, and natural gas. India has abundant coal reserves, mostly in the northern, eastern, and central regions. Water and coal, which are the two main energy sources, are insufficient in Rajasthan. Thus, the finding of lignite resources in Rajasthan offers significant promise for the production of electricity. Lignite has only recently been mined on a small basis, and it has been used in the cement and brick industries, among others. Lignite reserves must be extensively exploited if the state is to meet its energy needs.

The majority of the Bikaner district is made up of Quaternary alluvium and desert sands. The tertiary rock exposures are best developed 54 km west of Bikaner, in the area of Kolayat. According to subsurface data, the basement upon which the Tertiary rocks are deposited contains rocks from the late Proterozoic Marwarsupergroup, Permo-carboniferous Badhaura formation, and Jurassic Lathi formation. Table II provides the Tertiary Stratigraphy of the Bikaner-NagaurSubBasin. Iterative Sequence consists of the Jogira formation, the Marh formation, and the Palana formation.

OCCURANCE OF LIGNITE

Lignite occurs at various localities in the area in the Palana formation. The formation overlies the Bandhaura formation with a pronounced unconformity. The upper boundary of the formation is gradational with the overlying Marh formation. The formation consist of Variegated shales and clays in association with Carbonaceous shales, Shaly Lignite, Lignite seams and Sandstone. Profuse development of Lignite in the formation indicates of subtropical swampy environment. The lower units of the Marh formation comprise fuller's earth, which constitutes the most dominant component of the formation occurring as intercalated bodies with argillaceous limestone and shale. Cross bedded sandstone with light to dark coloured clays constitute the prevailing lithology in the upper part of the formation. No fossil has been recorded from the formation.

(1) Barmer-Sanchor Subbasin

Table I: Ultimate analysis of Giral Lignite

Sample	%C	%H	%O	%N	%S
GL-1	71.63	5.13	19.45	0.74	3.05
GL-2	70.42	5.17	20.18	0.87	3.36
GL-3	69.33	4.79	20.89	0.82	4.17
GL-4	69.78	4.98	20.78	0.93	3.53
GL-5	70.12	4.87	19.99	0.78	4.24
Average	**70.25**	**4.98**	**20.25**	**.82**	**3.67**

Table II : Ultimate analysis of Thumbnil Lignite

Sample	%C	%H	%O	%N	%S
GL-1	70.27	4.99	21.10	1.01	2.13
GL-2	72.02	4.89	22.13	0.52	1.01
GL-3	72.45	5.11	21.13	0.56	1.03
GL-4	71.38	5.17	21.89	0.54	1.05
GL-5	69.89	5.21	22.12	0.80	1.98
Average	**71.20**	**5.07**	**21.67**	**.68**	**1.44**

(III) Bikaner-Nagaur Subbasin

Table III: Ultimate analysis of Palana Lignite

Sample	%C	%H	%O	%N	%S
PL-1	68.63	4.92	21.48	0.82	2.11
PL-2	68.86	4.78	21.94	0.72	2.01
PL-3	69.12	4.91	20.01	1.03	2.81
PL-4	69.96	4.88	20.74	0.76	1.99
PL-5	70.62	4.96	21.56	0.96	1.79
Average	**69.35**	**4.89**	**21.14**	**.85**	**2.14**

Table IV: Ultimate analysis of Matasukh Lignite

Sample	%C	%H	%O	%N	%S
ML-1	68.96	4.86	22.13	0.75	1.39
ML-2	70.49	4.80	23.36	0.59	1.08
ML-3	71.40	4.90	23.08	1.54	1.02
ML-4	69.96	5.13	21.98	0.57	1.07
ML-5	70.61	4.88	23.49	0.60	1.11
Average	**70.64**	**4.91**	**22.80**	**.61**	**1.13**

IV. CONCLUSION

Rocks rich in organic material are the main source of hydrocarbons in sedimentary basins where oil and gas are found. Coal can, under some circumstances, be a source rock for considerable amounts of oil and/or gas in sedimentary basins, according to geochemical analyses conducted in several basins. For instance, research in the Assam basin have indicated that one of the main sources of the oil found in the basin is the Tertiary coal formation. The ability of coal to be transformed into liquid fuel through the use of appropriate equipment is also widely known. In addition to coal, carbonaceous shale, which has a highkerogen content, can also be a source of liquid fossil fuels. It is referred to as oil shale. Due to rising demand and volatile oil prices, unconventional fossil fuels are becoming more and more important as energy options. The more significant ones are underground coal gasification (UCG), coal-to-oil conversion, coal bed methane (CBM), shale gas, oil shale, gas hydrate, and shale gas. It was established that these coals contain the necessary qualities for conversion to liquid fuel in a study conducted by Oil India Limited, Duliajan on the viability of doing so for Assam coal1. Based on organic geochemical analyses, a preliminary assessment of the potential of lignite from two lignite mines in the Rajasthani districts of Bikaner-Nagaur and Barmer has been conducted in the current study. Lignite is a mushy, brown fuel that resembles a cross between peat and coal in terms of its properties. Compared to high-ranking coals, lignite can be converted into gas and liquid petroleum products more easily because to its high volatile matter content. Lean shale has less than 2% total organic carbon (TOC), rich shale has between 2 and 12% TOC, oil shale has between 12 and 35% TOC, and coal/lignite has more than 35% TOC. The Indian states of Tamil Nadu, Jammu & Kashmir, Rajasthan, Gujarat, Kerala, and Puducherry all have lignite deposits. The estimated 39 billion tonnes of lignite reserves total. Western Rajasthan's Barmer-Sanchore and Bikaner-Nagaur basins contain lignite. Lignite deposits can be found in the Lower Palaeocene to Middle

Eocene formations in the Bikaner-Nagaur basin and the Early to Middle Eocene formations in the Barmer-Sanchor basin. Estimates place Rajasthan's total lignite reserves at 4.22 billion tonnes. In reaction to the worldwide tectonic processes that caused the separation of the Indian plate from Gondwana during the Jurassic and Cretaceous, rift basins formed in western Rajasthan during the Phanerozoic era. NW-SE and NE-SW trending fault networks have significantly governed the evolution and shape of Mesozoic to Tertiary basins. Three sedimentary basins—the Jaisalmer basin, the Barmer-Sanchor basin, and the Bikaner-Nagaur basin—were formed during the Phanerozoic crustal evolution of western Rajasthan.

REFERENCES

[1]. Singh, P.K., Singh, M.P., Singh, A.K., (2010). Petrochemical characterization and evolution of Vastan lignite, Gujarat, Indai. Intrnational Journal of Coal Geology.

[2]. .Salpeteur, I., Raju, S. V. and Mehrotra, A., Oil shale exploration in the Assam–Arakan basin. In Paper presented at the 28th Oil Shale Symposium, Colorado School of Mines, Golden, Colorado, 13–15 October 2008.

[3]. Roy, A.B.,Jakhar S.R., 2002. Geology of Rajasthan (Northwest India) Precambrian to Recent. Scientific Publishers (India), Jodhpur.

[4]. Sharma, K. K., K–T magmatism and basin tectonism in western Rajasthan, India. Results from extensional tectonics and not from reunion plume activity, 1999.

[5]. Bhandari, A., Phanerozoic stratigraphy of western Rajasthan India: a review. In Geology of Rajasthan: Status and Perspective (ed. Kataria, P.), MLS University, Udaipur, 1999, pp. 126–174.

[6]. Gouch, L.P., Shacklette, H.D., and Case, A.A., 1979. Element Concentrations Toxic to Plants, Animals, and Man. Gelogical Survey Bulletin, United States Government printing office, Washington.

[7]. Patra, J., 2010. Report: Effect of coal based industries on surface water quality, Department of Mining Engineering, NIT, Rourkela.

[8]. Tripathi, S. K. M., Kumar, M. and Srivastava, D., Palynology of Lower Paleozoic (Thanetian–Ypresian) coastal deposits from the Barmer Basin (Akli Formation, western Rajasthan, India): palaeoenvironmental and palaeoclimaic implications. Geol. Acta, 2009, 7, 142–160.

[9]. Behar, F., Beaumont, V. and De B. Penteado, H. L., Rock Eval 6 technology: perfomances and developments. Oil Gas Sci. Technol. Rev. IFP, 2001, 56, 111–134.

[10]. Bordenave, M. L., Applied Petroleum Geochemistry, Editions Technip, Paris, 1993, p. 524.

[11]. Ghose, K. P., 1983. Generalised structural and metamorphic map around Batia, Udaipur District, Rajasthan; a study. Indian Jour. Eart Sci., 10.

[12]. Schopf, J.M., (1960). Field description and sampling of coal beds. U.S. Geological Survey Bulletin 1111(B).