**COAL TRANSPORT BY SLURRY PIPELINES**

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Recently, the bids were opened for two ultra mega power projects, which are located at Sasan, M.P. and Mundra, Gujarat. These are coal-based projects each of 4000-MWcapacity. Sasan is a pit head project whereas Mundra is a coastal power project with imported coal. The tariff (RS 2.2 /- unit) quoted for Mundra is nearly one rupee per kwh over the tariff (RS1.2 /- unit) of Sasan. It implies that imported coal is costlier by one rupee per each kwh. The cost of imported coal is in excess over pithead coal cost by nearly RS 1400/- ton with calorific value of 3600 Kcal / kg or RS 2000/- ton with calorific value of 5200 Kcal/kg. It indicates that indigenously produced coal would cost far less than imported coal if the state of art mechanization is deployed and coal fields are managed efficiently.

Though Indian coals contain lesser heating value and higher ash content, they have few advantages, which are environmental friendly. T hese advantages are low sulfur content and non-existence of heavy metals content such as mercury, arsenic, lead, selenium, cadmium, etc. Low sulfur content will not mandate to implement de-sulfurisation plant. Absence of heavy metals does not pollute the surface water and ground water through chimney emission, dry ash usage and the decanted ash water. These environmental advantages will have major economic benefits over the power projects life as these effects are felt in wider area nearly 200 km radius of the ultra mega power project. Indian coals have higher ash deformation temperature, which facilitates higher design temperature in the boiler furnace.

The main hurdle in using the indigenous coal throughout the country is non-availability of transport linkages from coal mines to distant power stations. The available rail lines are already saturated with passenger and freight traffic and unable to take up the additional coal freight. One alternative to overcome this bottleneck is to implement cross country coal slurry pipe lines to transport coal to load centre power stations which are located far away from coal mines. When coal slurry pipeline is used to transport coal, these load- based power stations can generate power cheaper than following alternatives

1. Pithead power station with HVAC / HVDC transmission line.

2.Gas turbine combined cycle power projects with imported LNG / CNG

3.Coastal based power station with imported coal

4.Load centre power station with long distance coal transportation by rail network.

In coal slurry transportation, coal is powdered at mine head and mixed with water in 1:1ratio by weight and pumped to the power station in a cross-country pipeline. The slurry is pumped at a minimum velocity of 6 feet/ second to prevent settling of coal at the pipe bottom. Few pumping stations are used depending on the length of the pipeline and the terrain. Coal is separated from the water by dewatering and centrifuge process before using as fuel. The separated water is treated and used as partial (15%) make up to the cooling water system of the power station.

Our country is blessed with vast reserves of power grade coal. The coal deposits are located mainly in central part of the country. Coal can be transported from this region by slurry pipelines economically to any place in India with a maximum slurry pipeline length of 1500 KM. It is roughly estimated that Rs 800 per ton of coal is the present day cost for transporting coal over 1500 KM by coal slurry pipeline. Since most of the cost of coal slurry transport is during its construction, total transportation cost is less affected by inflation compared to any mode of coal transport. Since the coal is crushed and powdered at coal mining area, the power plant availability and reliability enhances to that of combined cycle plants.

The coal based power stations availability and reliability would increase in the absence of conventional coal handling plant, mill rejects handling plant, absence of foreign matter such as metal pieces & stones in coal and far less load on coal pulverizes / mills. Also site selection for new power stations would be easier and economical to identify asset is no more dictated by harbor / railway line availability. Coal based stations can be identified close to load centre subject to water availability in case coal is received by pipeline. One meter diameter pipe line can transport minimum 30 million tons of dry coal which would sustain 8000MW capacity power generation (super critical pressure type). The pipeline capacity can be increased further enhancing coal composition in slurry and increasing slurry velocity taking advantages of terrain. Whereas the same diameter gas pipeline can transport maximum 35 MCMD of natural gas. This amount of natural gas will sustain equal capacity (8000 MW) in combined cycle power generation.

Solids transportation by slurry pipe lines in India and abroad is well-established technology. Though coal transportation by slurry pipeline is not yet implemented in our country, long distance (nearly 250 KM) bulk transportation of Iron ore slurry pipelines across difficult hilly terrain is implemented long time back by Essar and Kudremukh Iron. Coal transportation by slurry pipeline is well-established technology in USA by late seventies. The technology is well matured with the wide availability of suitable slurry pumping equipment, slurry preparation plants, slurry pipe lines, dewatering equipment and engineering services such as hydraulic study labs, model testing, prototype lab testing, system engineering, etc. These technologies are not only used for coal but also for other ores enrichment and transport on extensive scale worldwide.

The coal transportation by pipelines could not prosper in USA from eighties onwards due to legal hurdles though it is undisputedly recognized as the cheapest coal transport mode. The US Government did not accord the status of “power of eminent domain” to the coal slurry pipelines unlike others such as oil pipelines, gas pipelines, railways, etc. According this status would have facilitated the acquisition of ‘right of way’ for a coal slurry pipelines under public convenience and necessity. T hough they deserved merit in all respects, this status is denied under the intense pressure from rail car companies, which were scared of losing their virtual monopoly on coal transport and loss of existing employment. Under these circumstances few coal slurry pipeline projects were undertaken considering private agreements for ‘right of way’. This was also not found possible as the rail car companies did not agree to permit ‘right of way’ across their lands. Thus the coal slurry transport industry could not pick up due to intense opposition from rail car industry in eighties onwards. Also the advent of using natural gas for power generation on large scale in developed countries has brought coal mining industry to stagnation from eighties onwards. The problems faced by coal slurry transport pipelines in USA are not applicable to the present situation prevailing in India since the railways are not scared of loosing coal freight, as they are unable to undertake additional bulk freight without expansion projects.

In the present Indian conditions only ability to transport coal at cheaper rates, is the dictating factor. Enactment of Electricity act 2003 has eliminated all direct and indirect restrictions in electricity generation paving way for tariff based PPAs for installing power stations. IPPsare also permitted to undertake coal mining for the needs of the power projects. However coal linkages/ transport from the mine to the distant located power stations by railways are not feasible. So IPPs are directed to implement the projects based on costly imported coal by locating them in coastal areas. Introduction of pipeline coal transport will facilitate all the coal-fired projects irrespective of their location with indigenous coal. IPPs can own / implement coal transport pipelines along with coal mining and power generation in the ultra mega projects schemes as single point responsibility. This would encourage the IPPs further quoting realistic prices by minimizing risks on foreign currency liabilities and uncertainty in international coal markets.

References:

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3) Black Mesa Pipeline.[http://www.blackmesapipeline.com](http://www.blackmesapipeline.com/)

4) Google search for “coal slurry pipelines”

 Note: This paper was first written in February 2007 and subsequently updated