

## COAL-OIL SLURRY PIPELINES: AN OLD IDEA IN NEED OF NEW RESEARCH

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This paper presents brief comments on the concept, background and need for further research on slurry pipelines of coal in crude oil suspensions. A prima facie justification for this approach to coal shipment is presented along with a list of research needs.

I am pleased to be able to put before this Conference on Transportation of Energy Materials an idea well worth consideration. Shipping coal in slurries of crude oil is not a new idea but one which has sat on the shelf for a long time due to lack of opportunity. In keeping with TRB's mission to highlight areas of needed research let us dust this one off and examine its potential.

It was good to hear Mr. Mario Cardulo highlight the idea at his luncheon address. Since the area is one which requires a great deal of research and since our main purpose is fulfilled in getting the idea out and on the minds of researchers, little needs to be added to what Mario has already said.

I will add that little now.

Specifically, coal-oil slurry is a sort of ride sharing concept in the energy transportation area. In order to ship a solid like coal in a pipeline it must be finely crushed and suspended in a fluid. Water is the medium usually mentioned. Others have suggested methanol, even air. Reasons for using crude oil as a carrier are persuasive on the face of it:

- First, water resources in many coal producing areas, particularly the West, are in short supply. This is especially so due to the need for water generated by increased mining activity already associated with the coal industry.
- Second, existing pipeline capacity may be used, with no displacement of oil, in several instances where the coal and the oil share the same general movement. Incidentally, the lack of coincidences in movement is the prime reason why this idea is now touted as new. The Canadians in Alberta studied the concept back in the Fifties and found it technically feasible at a preliminary level, but dropped it because oil and coal did not move together at distances or volumes great enough to warrant any further study.

- Third, the economics of pipelines, already favorably assessed for coal-water slurries under the proper conditions (concentrated supplies and demands for large volumes) are further enhanced when the pipe is required to move nothing except payload. Pipelines are the only mode of transport which apply energy only to the movement of payload and not to the movement of carrying equipment. Even with this advantage the energy efficiency of pipelines, on the average, is not as good per ton-mile as water or rail modes. Therefore, if an inert carrying medium must also be pumped, much efficiency is lost. In a coal-water pipeline with 50 percent concentration of coal by weight, the pipeline is, in a sense, moving also a tare weight of 50 percent. This is very high by the standards of other modes. In a coal-oil pipeline the "tare weight" is zero.
- Finally, many of the arguments for slurry pipelines in general also apply. These include very low noise, visual and traffic interruption impacts; steadiness of service in all kinds of weather; and a low susceptibility to strikes or other interruptions.

Whatever the value of these arguments, much research is needed to make the concept a reality. Specifically:

- Technical and experimental work needs to be done to determine the engineering coefficients necessary for a thorough economic evaluation of the idea.
- A survey of the logistical possibilities is required. Mr. Cardulo already mentioned a few. A Northern tier type pipeline for Alaskan crude with coal interjection on route is another.
- Refining and/or separation technologies must be outlined and experimented with.
- The chemical characteristics of the delivered product must be determined and assessed for marketability.
- Finally, regulatory jurisdiction, right of way privileges and other legal questions must be addressed - they cannot be resolved by research.