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BUREAU OF LAND MANAGEMEN	TECHNICAL NOT	E	No.1
S.	U.S. DEPARTMENT OF THE INTERIO	R – BUREAU OF LAND MANAGEM	IENT
Subjects:	Iron Ore, Direct Reduction Proce Steel Ore, Direct Reduction Proc	SSES ESSES	
Reference:	Engineering and Mining Journal,	October 1969.	
Data:			

Contains several articles concerning direct reduction processes:

- Pages 67-73 describes the Mexican HyL process, the only commercially available process. It gives the steel-making economics for a plant capable of producing 250,000 metric tons of steel billets per year (copy attached).
- 2. Page 98 describes the Standard Oil (N. J.) Fluid Iron Ore Direct Reduction (RIOR) process tested in Nova Scotia. It speculates on location of a commercial facility of about one million tons per year.
- 3. Page 130 discusses a possible \$30 million integrated steel plant using the HyL process to be built by Sovereign Industries in Arizona. Sovereign has an extensive area of black sand deposits located near Black Mountain, Arizona.

Steelmaking economics using HyL direct reduction

An analysis of the cost factors for an integrated facility is presented in the table below by Swindell Dressler Co., a division of Pullman, Inc. The figures are based on a plant with a capacity of 250,000 mtpy, using natural gas as the prime energy source for all phases of the process from iron ore reduction to electric power generation. The only outside utilities required, according to company spokesmen, would be water and natural gas.

The cost figures are taken from data derived from commercial operation of the HyL plant at Monterrey, Mexico. These statistics provide for all facilities necessary to produce specification steel. The bases used for the calculations include the following:

Ore: 60% Fe, sized $\frac{1}{2}$ to 2-in., with analysis, reducability and physical characteristics comparable to those used at the Monterrey plant. The latter uses Mexican ore of a relatively high 6 to 9% silica content which increases conversion costs in the electric furnaces and also increases the rate of electrode consumption while reducing refractory life. Ores of higher iron content and a lower percentage of silica will reduce gangue problems with benefits in reduced operating costs and greater plant output, reports Swindell-Dressler.

Natural gas: heating value of 935 Btu per cu ft minimum; sulphur, under 5 grains per 1,000 cu ft; and supplied at 150 psig.

Ore reduction: involves 85% metallization; the average charge to electric furnace would be 60% sponge and 40% scrap iron. The figures are based on plant production of 330 days per year.

The costs do not include: spare parts and warehouse supplies; real estate; site clearing; and preparation (site is assumed level and clear); special foundation requirements; all utility main supply lines outside of the site; import duties and inland freight charges.

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