



Technical Article

Continuous Surface Mine Materials Handling Systems

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This paper presents a review of three ongoing research projects dealing with continuous materials handling systems in open-pit mines in the USA. The systems include mine-run-rock conveyors high-angle conveyors and movable in-pit crushers. These material handling systems are being evaluated and applied to mining systems primarily to reduce the dependency on diesel fuel and to reduce mining costs.

Open-pit mining operations in the United States handle about $2.3 \cdot 10^9$ metric tons of ore and waste each year excluding coal sand, and gravel. Most of this material is handled by trucks. In recent years truck haulage costs have increased to where they account for more than half of all pit operation costs. It is expected that this figure will continue to rise, primarily because of increasing fuel and labor costs.

During the past 20 years several large mining operations have been very successful in developing high capacity conveyor systems. Some examples are: the brown coal industry in Germany, iron mining in the USSR copper mining in Zambia, and tar sand operations in northwest Canada One of the largest mines in the world is at Fortuna, Germany, where over 14,000 t/h are handled by conveyor belts. In the USA, several high-capacity conveying systems have been developed for applications other than mining. Examples are the Oroville Dam project and a

system which handles 18,100 t/h loading iron ore barges on the Great Lakes. The outstanding feature regarding these installations is their high continuous capacity which results in substantially lower costs.

Most of the systems mentioned handle alluvial-type material consisting mainly of fines, and have the following equipment in common: (1) wheel excavators or reclaimers, (2) shiftable conveyors, (3) crawler-mounted stackers and (4) steel cables core belting. According to Dennehy [1], a comparative recent assessment made in the U.S. and Europe revealed that there are some 80 different types of conveyors, 10 types of elevators, and 50 types of feeders. Conveyor technology in the lignite deposits of West Germany is perhaps the most developed and is now spreading to the tar sand and coal projects of western North America.