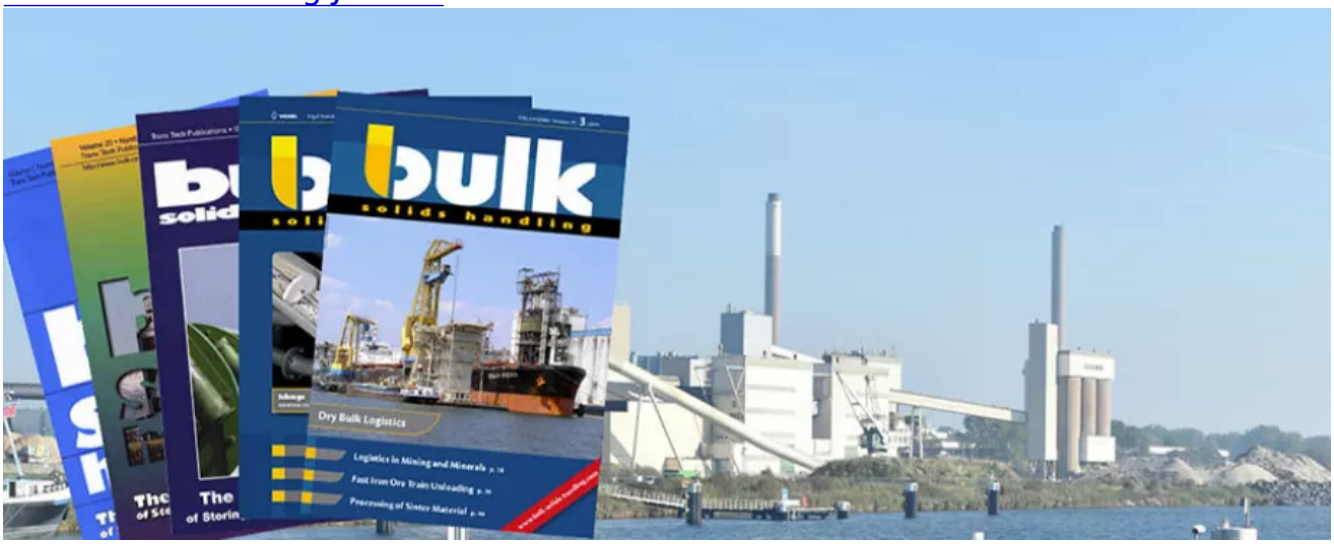
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Research Paper

Optimal Design of Continuous Conveyors

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This paper presents a procedure for the optimum design of continuous conveyors for bulk solids handling. The problem concerns the establishment of cost or objective functions which integrate the performance characteristics with the various cost factors involved. Using the general principles of engineering economic analysis it is shown that cost functions may be derived which take into account the energy costs and annual equivalent cost of equipment. The latter requires consideration of such factors as equipment or component life, salvage value, taxation rates and rates of return. The effects of inflation and variations in the annual differential escalation in the energy component costs are included in the model. Various optimization techniques are discussed and, by way of example, the optimum design of belt conveyor systems is described. Design information is presented for comparisons to be made between different modes of conveying.

As in any engineering design exercise, the design and selection of conveyors and handling equipment for a particular process or system involves the consideration of a number of alternative solutions. The overall or global problem requires comparisons to be made between different types of equipment and modes of transport with economic considerations playing a major role in the final decision making. When different modes of conveying and transportation are compared, such as belts, buckets, pipelines, rail and road, the variations in costs may differ by several orders of magnitude. Even when one mode of conveying, such as belt

conveying, is examined for a particular installation, within the range of possible combinations of conveyor size, speed and geometrical layout, there can be considerable variations in the overall costs. For the reasons stated it is particularly important that the conditions for optimum performance of particular types of conveyors and handling equipment be established. Furthermore, in view of the heavy dependence by industry on bulk materials handling operations, any increases in efficiency, even if only small, can lead to substantial cost savings.