

ENGINEERING

Conveyor Belt Cartage

Conveyor belts, up to ten miles in length, are providing the cheapest form of transportation of earth, coal and ore. They can deliver 600 tons of coal an hour.

By A. C. MONAHAN

► THE ENDLESS conveyor belt as a cargo carrier is not new, but improved belting and installation equipment of the past decade is bringing it into wider use.

It is now being successfully used in transporting earth, crushed rock, coal and similar materials over distances as great as ten miles.

These "long-haul" conveyor belts are in competition with roadway trucks and what railroads regard as short hauls. But they are doing the jobs with a high degree of efficiency and at a lower cost than other carriers.

Longer belt lines may be expected. One which has been proposed would carry iron ore and coal more than 100 miles. Another belt to carry subway passengers on a shuttle route in New York City has been suggested.

Used for Mining

The principal uses for which long-haul conveyor belts have been employed up to the present are in coal and ore mining and the removal of earth materials from one site to another. In building the Shasta Dam in California, some 12,000,000 tons of sand and gravel for masonry construction were transported nearly ten miles from pit to dam site over country too rough for economical cartage by rail or highway.

This belt, traveling like others over rollers in a supporting framework, followed the direct route from the pit to the site of the dam. It traveled up and down heavy mountain grades, crossed highways and railroads on steel trestles, and dumped at its terminal each hour about as much material as 600 five-ton trucks could have delivered in the same length of time.

The belt used on the Shasta Dam project was a rubber-covered cotton conveyor. Actually a series of belts were used, one dumping its load into the next. This is necessary because of the mechanical difficulties of operating a single long belt.

Rubber-coated cotton belting, unless of impractical thickness, is not strong enough in great lengths to withstand, when loaded, the "pull" of the powered head and tail pulleys at the ends.

For more permanent installations, belts with steel cable interwoven in them are available. These have far greater strength and permit the use of longer belts. But they are far more costly than the rubber-coated

cotton type. To help the latter, intermediate rollers are sometimes powered. Such rollers are equipped with vacuum cups to give a pulling grip on the loaded belt passing over them.

Rollers for belts on which loose material is carried, such as earth and coal, are built with a spool-shape so that they turn up the edges of the belt to keep the contents from spilling from the sides. The rollers may be made up of a number of wheels on the same axle, and in certain cases rubber-tired wheels are used.

A belt one yard wide carries about a ton of coal on each 45 feet of length, or two tons of crushed rock on the same length. Traveling at a rate of 450 feet a minute such a belt could deliver 600 tons of coal an hour, or about 14,400 tons in a 24-hour day.

The cost of belting and its installation for long hauls is high, but the cost of maintenance and operation is low. Where a considerable amount of material is to be moved, belt transportation is claimed to be the lowest costing method now in use. Also belts are transferable, and when one job is completed they can be used on another.

Part of the belt used on the Shasta Dam project later carried fill to the Anderson Dam in Idaho. There it moved more than 8,000,000 tons of clay two miles to form the core of the world's highest earthen dam. This Goodyear cotton-rubber conveyor was still in good condition.

One great advantage of belt conveyors is that they are suitable in rough country where other forms of transportation would be difficult. They can run up and down grades of at least 30 per cent, many times greater than can be used by trucks or ordinary railways. They can cross chasms, rivers, highways and railroads on relatively inexpensive narrow bridges because their loaded weight per linear foot is low. Where tunneling is used to avoid crossing high ridges, only a relatively small bore tunnel is necessary.

Help Develop Power

Another advantage is that loaded belts passing down steep grades can operate regenerative motors to develop power for other parts of the line, or for other purposes. On the Anderson Dam job, for instance, the downhill runs of loaded lines kept the belt running and also furnished electric power to light night-time work and power electric shovels.

In the development of satisfactory steel cable conveyor belts, much research work



TRANSPORTING CLAY—This conveyor belt, used to carry clay two miles from the pit to the Anderson Dam in Idaho, was installed with a cover to protect the clay en route from sun and rain.

was required. The steel must not only have strength and long life, but also be extremely flexible so that it passes easily over the head and tail pulleys. The cables now used are of the finely-stranded airplane type. They are sometimes plated with brass to provide a clinging surface for the rubber covering.

Predict Wider Use

Conveyor belts are now widely used in coal mining and even wider use is predicted for the future. Feeder belts carry the coal from working faces to a central belt. This brings the coal to the foot of a sloping belt that extends up a tunnel to the surface.

The coal comes to the surface in a constant stream. Operation of the belt system is claimed to be cheaper than by underground railway cars drawn by special locomotives and to be less hazardous than other forms of transportation.

What the future has in store for belt conveyors can not be predicted, but several projects have been proposed. A 100-mile belt in Ohio, that would extend from Lorain on Lake Erie to a point on the Ohio River, has been suggested. It would haul iron ore unloaded from boats on the Great Lakes to inland smelters. It would also bring coal from Ohio mines to the Lake Erie port for local use or for shipment by the iron-ore vessels to distant ports on the Lakes. It would mean cheaper transportation than now is provided by railroads.

Whether or not this 100-mile conveyor belt will be constructed remains a question. The railroads with which it would compete are reported to be fighting it. They are said to be afraid of the lower transportation costs that the belt would provide.

On the whole, railroads need not fear competition from belt conveyors. The latter type of cargo carrier is not suitable for general merchandise since each conveyor must be built for a particular product. In the Ohio case, the proposed belt would carry only ore and coal, the same belt carrying both these products.

Shuttle Train Replacement

Another novel proposal for a conveyor belt is in New York City to replace the present subway shuttle trains that transfer passengers between Grand Central Station and Times Square. This shuttle replacement plan, engineered by Goodyear Tire and Rubber Company and the Stephens-Adamson Engineering Company and already submitted to the New York Board of Transportation, would provide small, closely spaced passenger cars riding on an endless track of rubber conveyor belts and rubber-tired banks of accelerator wheels.

At the ends of the route, where the cars pass around a circular terminal, there would be moving platforms for loading and unloading. Passengers would step from moving cars or platforms onto these platforms.

The small cars, with seats, would pass around the circular terminal at the same rate of speed as the moving platform.

After loading and passing beyond the loading platform, the cars would move over pneumatic tire wheels to speed them up and carry them onto another conveyor belt of higher speed for the cross-town trip.

The moving platforms at the terminals would travel at a speed of about one and one-half miles per hour, half the usual pedestrian pace. Between loading points the cars would travel at 15 miles an hour. The cars would be turned around at either end on rollers by a large wheel and return in the opposite direction on the endless track.

Advantages claimed for this proposed conveyor-belt transportation system are its ability to relieve rush hour congestion by the peak load capacity of 32,000 passengers per hour in each direction and its speed in delivering passengers from platform to platform in two minutes, compared with the three minutes now required by shuttle trains. Operating costs of the new system would be less than one-half the present operating costs of the shuttle at peak load, the designers estimate.

Science News Letter, June 21, 1952



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PSYCHIATRY

Treat Patients as Persons

► IN THE future, your doctor may be equipped to give more attention to your feelings, fears and personal problems as well as to your aches and pains. He will treat you as a person, not an assembly of symptoms. He will, that is, if recommendations contained in a report issued in Washington by the American Psychiatric Association are followed out.

A major difficulty with modern medical education, the report points out, is a ten-

dency to teach that man can be understood exclusively through an unfolding of his inherited biological endowment in a given physical setting. This viewpoint fails to take into account human personality and the influence of interpersonal and cultural factors on personality development and physiological functions.

Today, undergraduate medical students in leading medical schools receive training in the principles of psychiatry. That is a step in the right direction, the report indicates. But the student needs more than that. He needs to have a much broader concept of human biology so that he will be able to use his training effectively in dealing with patients as persons.

The report criticizes medical schools for admission policies that make restrictions in regard to geography, sex, race or religion because they "may result in the exclusion of students who later on, as physicians, will be best able to serve the community."

The report makes public the proceedings of a closed conference of the American Psychiatric Association and the Association of American Medical Colleges held last year.

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