

The Increased Use of Belt Conveyor Self-Unloading Vessels

A Coming Development in Ocean Bulk Shipping

Roger M. Jones, Bahamas

Summary

The author underlines the importance of self-unloading vessels for Great Lakes shipping and explains the reasons why and how belt conveyor type self-unloading bulk carriers are being used or planned to be used to an ever increasing extent for bulk movements on ocean routes. A survey of major shipping companies shows which companies are already operating or are planning to operate ocean-going belt conveyor self-unloaders.

1. Introduction

Belt conveyor self-unloaders have been around for a long time — since 1908 on the Great Lakes. This type of ship with a highly automated belt system can discharge independent of any dock handling facilities. Actually, a self-unloading vessel with a long 250—260 ft deck boom, as most Great Lakes types are, can discharge where there is no dock — just a river bank or shore line with deep enough water for the captain to be able to nudge the vessel's bow close enough to get the end of the boom over the shore (Fig. 1).



Fig. 1: Belt conveyor self-unloader with 250 ft deck boom discharging salt onto shore stockpile while moored 100 ft off an unimproved shoreline where there are no dock or shoreside handling facilities of any nature available. (Photograph courtesy of Jones, Bardelmeier & Co. Ltd.)

2. Advantages of Self-Unloaders

The self-unloader has practically "taken over" for bulk movements of ore, pellets, coal, limestone and sand on the Great Lakes. Now the concept is catching on for special situation bulk movements on the ocean. For many years gypsum companies on the U.S. East, Gulf and West Coasts have received their gypsum rock in belt conveyor self-unloaders and Reynolds Metals have their own self-unloading vessels to deliver bauxite and alumina. D.K. Ludwig has used self-unloading ships of up to 155,000 DWT to deliver salt from Black Warrior Lagoon, Mexico, to Japan. Now the interest in self-unloading vessels is spreading, particularly as utility and cement plants switch from oil to coal and for the delivery of pellets to direct

reduction steel plants. If the plant is at or near deepwater, and the low cost method of delivering coal or pellets is by sea, millions of dollars for the cost of shore gantries, footings, dock face and sometimes dredging — to say nothing of shore crews to discharge — can be saved if deliveries are established right from the start by self-unloading vessels.

There are, of course, off-sets that have to be taken into consideration when comparing a self-unloader with a conventional bulk carrier discharged by shore gear. The capital cost of a self-unloader is estimated to be 15 to 20 % more than for a bulk carrier of comparable deadweight. Also, there is some loss of cubic capacity which can vary with the hold design and number of belts under the cargo hold. On the other side of the coin, however, in addition to the saving in capital costs setting up to discharge with shore gear and the savings in shore labor costs, the belt conveyor self-unloader can discharge at a continuous average discharge rate ranging from 2,000 t/h to 10,000 t/h depending mainly on the number and speed of the belts. A 30,000 DWT self-unloader can, and

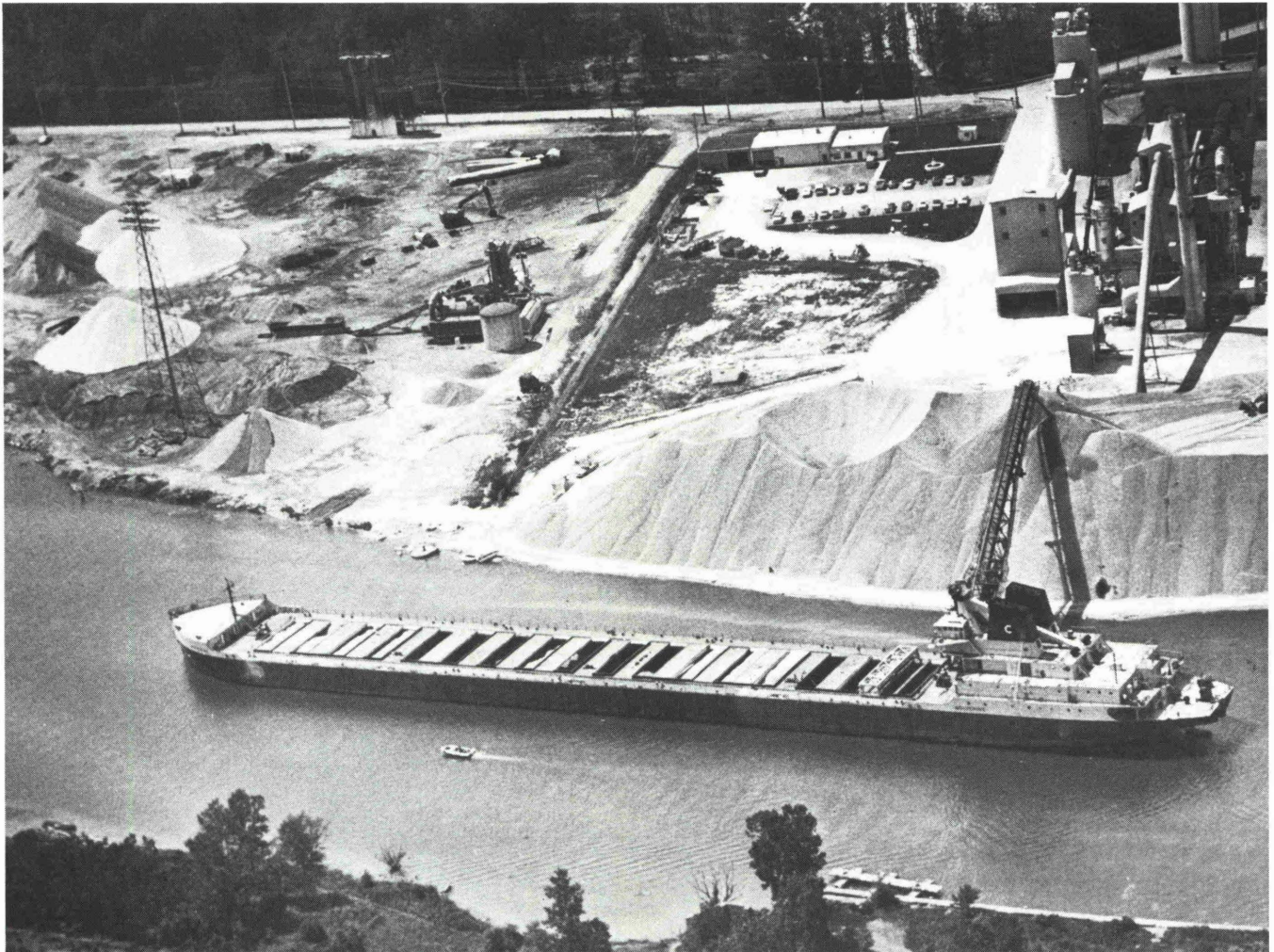


Fig. 2: Vessel moored 100 ft from shore in dredged channel discharges limestone on to shore stockpile where there is not even an improved dock face. (Photograph courtesy of Oglebay Norton Company)

regularly does, come into port, dock, unload and depart in 6—7 hours — where a conventional bulk carrier would probably be in port 2 or more days. Even the 60,000/70,000 DWT PANAMAX size unloader should be in and out in well under a day.

3. Where Should Self-Unloaders Be Considered

The types of situations where self-unloaders should be considered are:

- Where new plants are being built and there is no existing shoreside equipment in place.
- Where the volumes are relatively small — certainly for 150,000, 300,000 or 500,000 ton annual volumes, and maybe even up to 1.6—2 million tons, self-unloaders should be considered. On the Great Lakes, firms that are shipping 15 million tons of iron ore pellets a year are using self-unloaders exclusively.
- Where relatively short ocean hauls are involved — certainly under 1,000 miles but even on transatlantic routes for coal, phosphate, pellets, salt, bauxite and other such commodities.
- Where you have multiple discharge locations. If you have two or three different plants receiving raw materials, you can save the capital cost of two or three shore installations by the use of the self-unloader.
- Where you have an undeveloped or poor dock face (Fig. 2). Long boom self-unloaders can actually discharge onto a river bank or when lying 100 ft or 150 ft off a dock if the dredged depth alongside is insufficient. (In most circumstances, however, the self-unloader discharges while lying alongside an improved dock either into a surge hopper which loads railroad cars, trucks, or feeds a take-away shore conveyor; or discharges directly onto a dock stockpile).
- Where redistribution is from a central deep water terminal. Coal, for instance, may come into a deep-water port in Indonesia such as Batam Island in 150,000—200,000 DWT straight bulk carriers, then be reloaded to 20,000 or 30,000 DWT self-unloaders for final delivery to shallow draft ports without bulk unloading facilities in Indonesia, Malaysia, Thailand, and the Philippines.
- Where dust pollution is a real problem. Reynolds Aluminum Company, for example, have belt conveyor self-unloaders with a completely covered system for discharging. The whole system from belt to hopper is enclosed and there is practically no dust when handling bauxite or alumina.
- Where loading or top-off of large carriers is required. Self-unloaders can discharge directly into bulk carriers or barges. One unit, the COALER I (ex HALLFAX), tops off coal carriers in deep water below New Orleans.

4. Industry Survey

In 1981, six 28,000 DWT belt conveyor self-unloaders of Canada Steamship Lines were used to load 165,000 tons of metallurgical coal at Seven Islands, Quebec, into the 170,000 DWT bulk carrier YEMANJA for Japan. The self-unloaders loaded coal in a matter of hours at Lake Erie ports during a period when there was a 3—4 month delay loading coal at East Coast ports. They then went through the Welland Canal and Seaway to load the YEMANJA (Fig. 3). The loading at Seven Islands took less than 4½ days and the ocean vessel was able to load to a draft of 58 ft. In May 1982 six CSL self-unloaders loaded 160,000 of coal originally loaded at Lake Erie ports into an ocean bulk carrier at Seven Islands consigned to Nippon Steel in 60 hours!

In still another major coal exporting move, Canada Steamship Lines and Thyssen combined efforts during the 1981 shipping season to sell and deliver U.S. export coal to Europe.

During 1981, two CSL self-unloaders and a Thyssen vessel (M.V. WIDAR, a 150,000 ton ocean-going carrier) developed a regular monthly schedule in which the two lakers, each transporting approximately 25,000 tons of U.S. coal, unloaded into the WIDAR, which has already loaded 100,000 tons of iron ore, with the resulting split load of iron ore and coal destined for Rotterdam.

The WIDAR loaded approximately 100,000 tons of iron ore at either Sept Iles, Quebec, or Port Cartier, Quebec, and then anchored in the deep water bay of Sept Iles to receive about 50,000 tons of coal from the CSL self-unloaders. Two CSL self-unloaders loaded coal at Lake Erie ports and transferred the cargo directly into the WIDAR, in the bay of Sept Iles.

The self-unloaders took less than 12 hours to discharge the coal and even discharged simultaneously into the holds of the WIDAR. The WIDAR departed from Sept Iles at a draft of 60 ft destined for Rotterdam where both the ore and coal cargoes were unloaded.

There are a number of companies that are operating or have plans to operate ocean-going belt conveyor self-unloaders. U.S. Gypsum has its own Bermudian-based fleet; National Gypsum, Georgia Pacific Gypsum, and Domtar Gypsum have long term charter arrangements for self-unloaders with affiliates of Skaarup Shipping. Reynolds Metals, through their foreign shipping subsidiary, Caribbean Steamship Company, own four belt conveyor self-unloaders. Utah International, through its subsidiary Marcona Ocean Industries, owns the MARCONA CONVEYOR — a 74,000 DWT self-unloader which carries aragonite from the Bahamas to U.S. East Coast and Gulf ports. U.S. Steel's subsidiary, Navios Corporation, owns jointly with Upper Lakes Shipping the 74,000 DWT self-unloader PHOSPHORE CONVEYOR. Navios also charters from Papachristidis, the 30,000 DWT CAVALA.

Fig. 3: Canada Steamship Lines' lake self-unloader Jean Parisien discharges 25,000 tons of coal loaded at a Lake Erie Port over the deck of her sister ship H. M. Griffith which just completed discharge, at Seven Islands directly into the 165,000 DWT ocean bulk carrier Yemanja which delivered the cargo to a steel mill in Japan.
(Photograph courtesy of Canada Steamship Lines)



Algoma Central Railway owns the 24,000 DWT ALGOSEA which is going on long term charter to a Quebec Government entity to carry salt from the Magdalen Islands in the Gulf of St. Lawrence to Canadian and U.S. East Coast ports. D.K. Ludwig built the largest self-unloaders, the 155,000 DWT UNIVERSE KURE, to move salt from Mexico to Japan along with the smaller, 74,414 DWT UNIVERSE CONVEYOR. Upper Lakes Shipping Company Ltd. of Toronto has the largest fleet of ocean-going self-unloaders. When a 74,000 DWT ship is delivered in March 1983 from the Hyundai Yard in South Korea, it will be Upper Lakes' sixth ocean-going self-unloader plus the jointly owned ship with Navios. Upper Lakes, incidentally, has been blazing trails and pioneering the delivery of grain to Mexico in belt conveyor self-unloaders. Reportedly, the Mexican receivers are "pleased as punch" when the self-unloader comes in and in a matter of hours discharges the entire cargo at a "non-dock" while regular bulk carriers would have to wait days and weeks for a berth. A/S Kristian Jebsens has recently taken delivery of a 9,800 DWT self-unloader and a sister-ship is due for delivery in the fall — the first belt conveyor self-unloaders intended for service between North European ports.

American Steamship Company, a subsidiary of GATX, owns the largest fleet of self-unloaders in the world, 19 vessels of from 11,000 DWT to 62,000 DWT all operating on the Great Lakes. A.S.C. has recently been advertising its self-unloading expertise extensively in international publications and presumably are about to branch into ocean, foreign flag self-unloader operations. A.S.C., incidentally, owns the self-unloader AMERICAN REPUBLIC which has to be one of the

most maneuverable bulk carriers ever built. The 20,000 DWT vessel which shuttles pellets from a redistribution terminal in Lorain, Ohio (where 60,000 DWT self-unloaders deliver pellets from the head of the Great Lakes) to Republic Steel's plants in Cleveland 5 miles up the torturous, twisting, relatively shallow Cuyahoga River. The ship has twin 3,500 HP diesels which drive twin controllable pitch propellers revolving in Kort nozzles. In front of the port and starboard nozzles are two flanking rudders and at their rear there are two steering rudders — eight rudders. There are also controllable pitch bow and stern thrusters. The ship can move sideways or turn in her own length!

A.S.C. also has designed and is advertising a combination cement carrier/belt conveyor self-unloader for coal. The concept is to deliver coal to a coal burning cement plant and leave loaded with cement — a very efficient type of operation.

Canada Steamship Lines have ordered three 39,000 DWT full ocean-going self-unloaders with the first, ATLANTIC SUPERIOR delivering this summer and the other two in 1984 and 1985.

One word of caution. If you are contemplating using belt conveyor self-unloaders in your service — talk to companies presently operating this type of ship and go and actually see their ships in operation. It is a complex ship, there is a long learning curve and you should work with companies that already have the expertise and know what they are doing. If the belt conveyor system breaks down during discharge, it is just like a main engine break down at sea — the ship is out of service.