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6. Circular Bridge Crane, North Vancouver, BC (Canada)

Owner: *Vancouver Wharves Ltd.*
North Vancouver, BC
Canada

Engineer: *S.I. Bulk Handling Systems Ltd.*

Contractor: *Surrey Iron Works Ltd.*
Surrey, BC
Canada

Service data: *Spring, 1983*

Introduction

Surrey Iron Works Ltd. has recently designed, built and installed a fertilizer reclaim system utilizing a circular bridge crane. Before describing the features of the crane, it seems appropriate to outline, briefly the history leading to this unique application of a bridge crane.

Vancouver Wharves Ltd. is a major Canadian West Coast multi product trans-shipment terminal. One of the main products shipped through the terminal is Potash. Potash is received by rail car from Saskatchewan and trans-shipped primarily to Japan. The first shipment was made in 1963, and the traditional method of storage is in large, totally enclosed A-Frame sheds, the potash is dumped from bottom dump rail cars onto a conveyor belt which transports the product to the apex of the storage building where it is transferred onto a tripper conveyor which distributes the potash into its appropriate location within the shed. Reclaim is usually accomplished by gravity flow through openings in the shed floor which run along the centre line of the shed. However, only about 45% can be classed as «LIVE» storage and the remainder of the product has to be reclaimed by large front end loaders.

In 1965, in an attempt to increase the live storage, and cut down the use of mobile equipment, a 40000 ton capacity steel silo was constructed. The silo would provide a live storage capacity of 85% compared to 45% in a conventional A-frame building. The silo was designed to operate as a semi-mass flow discharge, and all tests to determine that the potash would, in fact, flow from the silo were carried out using I.M.C. potash from their mine in Saskatchewan. Over the years, between 1965 and 1976, potash from other producers was placed in the silo and it became obvious that the flow characteristics and behaviour in storage of the various producers varied tremendously (Fig. 1). Potash develops very high shear strength through age, pressure and moisture and is therefore not an easy material to handle by gravity.

In September, 1980, Vancouver Wharves Ltd. commissioned Surrey Iron Works Ltd. in conjunction with their associate company in Holland to conduct a program of testing the suitability of a Eurosilo reclaim system for use in the existing potash silo.

Once it had been determined that the Eurosilo system could dig and reclaim the potash at the required reclaim rate we set about planning the retrofit.

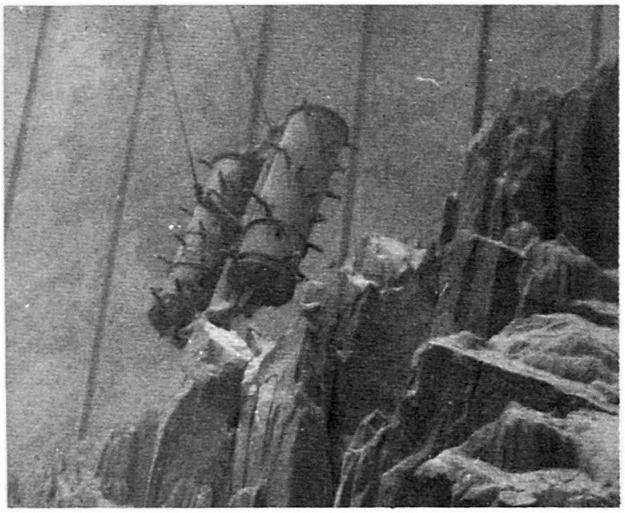

Fig. 1 Potash hanging up on silo wall
(It will not flow prior to installation of reclaim system)

As seen in Fig. 2 the Eurosilo system consists of a screw conveyor supported by cables from the rotating bridge crane . The screw conveyor is used in both filling and reclaiming of the material.

During the filling operation, the screw conveyor is lowered by the bridge crane until the flow of the silo or material is sensed. Material is fed into the centre of the silo roof and descends trough a telescopic chute to the screw conveyor which distributes the material to the perimeter of the silo, the screw conveyor is being moved in a circular motion by the bridge crane in order to spread the material, after a complete revolution the crane hoist raises the screw conveyor a pre-set layer hight. This procedure is repeated until the silo if full.

During reclaiming, the procedure is reversed, ie . . the screw conveyor is lowered into the material and pulls material from the wall of the silo to the centre reclaim.

The Crane

The crane is designed to carry the weight of the screw conveyor and frame which weighs 50 tons. The rotational speed of the crane is variable from 0-20 f.p.m. at the perifery of the silo. The main hoist speed is 6 f.p.m. Inside diameter of the silo is 120 feet.

Because the crane and reclaim system is installed in an existing silo, there were certain restrictions which we had to live with.

An existing monorail beam (10-I-25.4) had been installed when the silo was built. Our investigation showed that we required four idler trucks each with a load capacity of 5 tons, and that each truck load had to be spread over three roof trusses, this meant that the idler trucks had to be spaced at 17'-0 centers.

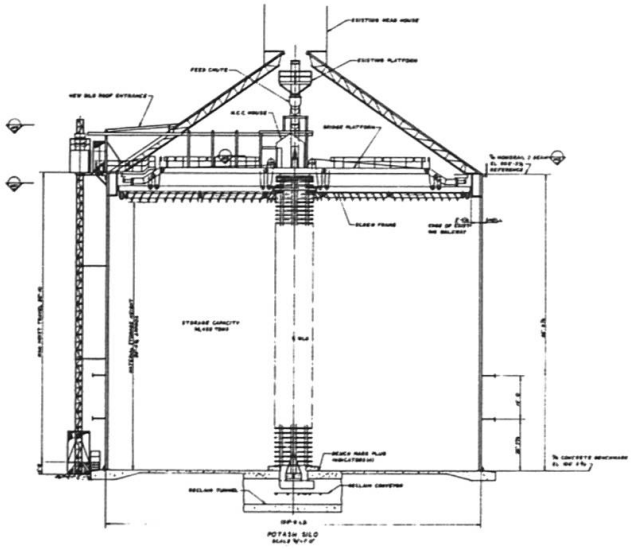

Fig. 2 Section of potash silo

With an existing monorail beam it was difficult to justify modifying the structure to be able to use a conventional top running drive truck. We therefore, choose to stay with the existing monorail and design a underslung friction drive. Our calculations showed that we would require four drives, each developing a tractive effort of about 3500 lbs. based on providing a lever arm of 2 to 1 we had to provide a spring tension of about 1700 lbs.

As well as being able to raise the screw frame up and down our rotating bridge crane has to pull the screw into the material that it is reclaiming. At a height of approximately 85'-0 the horizontal component of the screw frame is about 5 tons.

We are pleased to report that the unique way in which we employed a bridge crane has been very successful, the reclaimer which was designed to reclaim potash at 2500 tonnes per hour presently outputs 3100 tons per hour.

(Peter B. Hall)

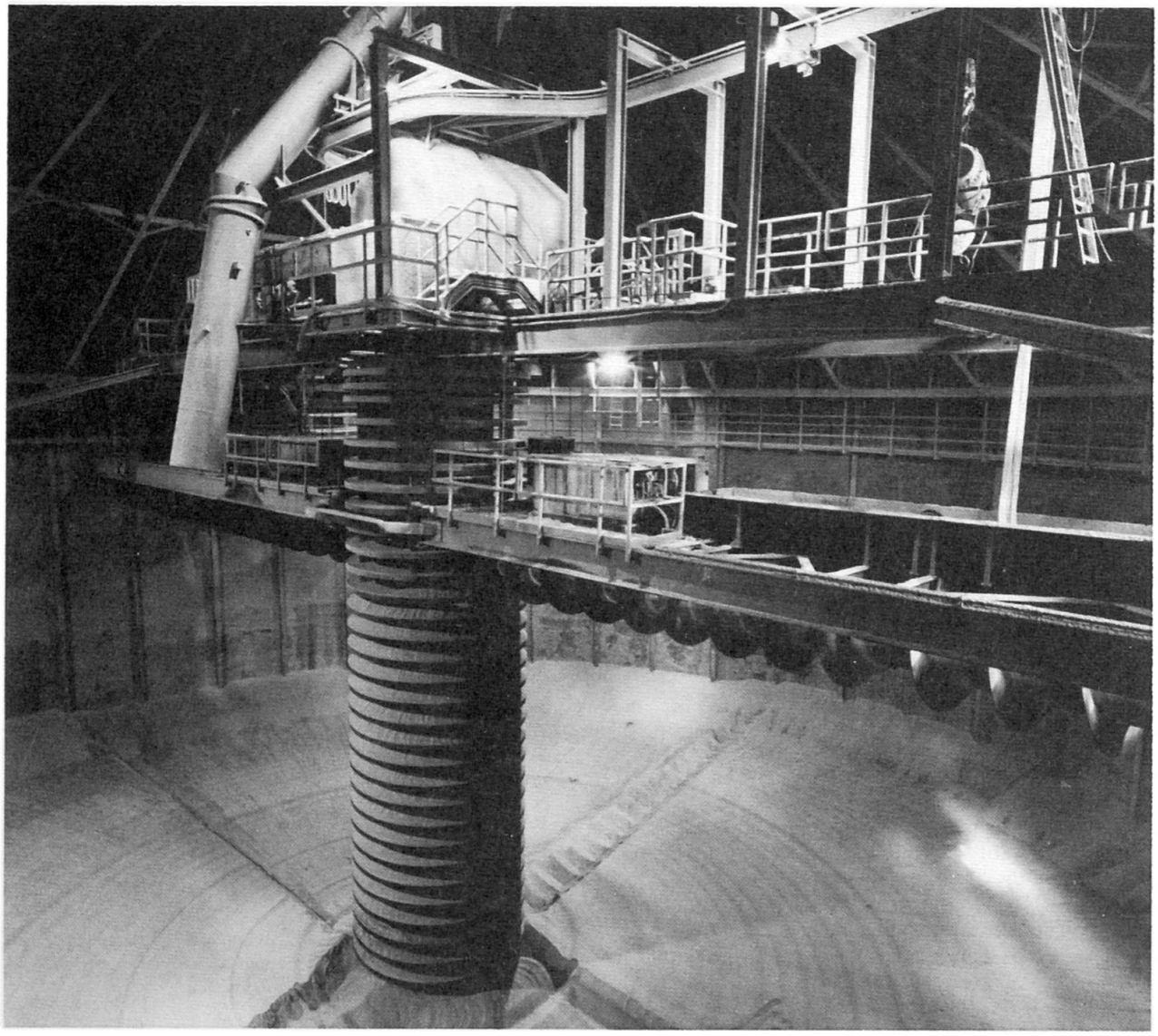

Fig. 3 Bridge crane and reclaimer installed in silo