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Conversion of a Port Facility from Import to Export at Longview, Washington

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Summary

The determination of new ways to cut costs in these times of economic uncertainty is essential in running a successful business. Arco Petroleum Products Company a Division of Atlantic Richfield company recognized an opportunity for a substantial cost saving in transporting calcined petroleum coke to market by simply building an economical port facility at a location that would enable them to drastically cut their normal rail haulage distance.

1. Search for New Port Facilities

The calcined petroleum coke produced at the Arco Cherry Point Refinery near Bellingham, Washington is presently hauled by rail to the port at Sacramento, California where it is transhipped to ocean going vessels. In order to reduce the rail travel distance, exhaustive studies were made of alternative coke export terminal sites where the necessary capital investment could be recovered by rail haulage cost savings in a relatively short time.

Arco's persistant efforts paid off. The site selected for a bulk cargo export facility is at the Port of Longview which is situated at the confluence of the Columbia and Cowlitz rivers, in the state of Washington, 66 miles (106.2 km) from the Pacific Ocean. Its location reduced the rail haulage distance approximately 600 miles (965.4 km).

Fig. 1: Alumina Import Facility Longview, Washington

The site was formerly occupied by an alumina import facility. It was built about nineteen years ago for Reynolds Metals Company to transfer alumina from ship to railroad cars. Two large steel storage tanks were used to contain the alumina between load-in and load-out. The facility also includes a pier structure, fendering system, railroad spur, conveyors, air slide feed and reclaim system. A photograph of the original installation is shown in Fig.1. It had been idle for about ten years when Arco decided upon its use.

2. Conversion of an Import Facility into an Export Facility

The alumina bulk cargo import facility at Longview, Washington is presently being converted to a calcined petroleum coke cargo export facility. Soros Associates, consulting engineers, working in close cooperation with Arco Petroleum Products Company Research and Engineering personnel, was contracted to provide the following services:

- Conceptual planning
- Preparation of the necessary engineering documents and drawings
- Assistance in securing construction and operating permits
- Procurement
- Construction liaison and commissioning.

Arco personnel assumed construction management responsibility. The project is presently in the construction stage and is expected to be completed in May 1983.

To keep the capital expenditures to a minimum, certain parts of the existing facility will be reused and adopted to their new role. At present, all the equipment will be for the exclusive purpose of handling calcined petroleum coke. There exists the possibility that the railcar dump station may be modified in the future or another railcar dump station may be constructed at some future date expressly for handling commodities other than calcined petroleum coke.

3. Commodity Characteristics

The physical properties of calcined petroleum coke are as follows:

Bulk density	50 lb/ft³ (801 kg/m³)
Surcharge angle	20°—25°
Angle of repose,	
natural	37°
internal	50° ± 2°
Particle size	3/4" to 0" (1.9 cm to 0)
Moisture content	0.01%
Oil content	0.5%

Particle size distribution:

Sieve Size (Tyler Mesh)	% Retained
4	25.0
8	25.0
20	23.0
50	16.0
65	4.0
100	4.2
200	2.2
—200	0.6

Calcined petroleum coke is electrically conductive. Airborne coke dust presents no explosion hazard. Ignition temperature is 790°C but would not be ignited by a spark. The coke is considered to be moderately abrasive.

4. Description of the Operation

The coke produced at the Arco Cherry Point Refinery will be transported by rail to Longview in 100 short ton (90.7 metric ton) capacity covered bottom dump hopper cars.

The operation at Longview will be as shown on the flowsheet in Fig. 2. The coke will be unloaded from the railcars, conveyed to storage, reclaimed from storage and conveyed to vessel via shiploader.

Annual throughput of coke may reach 250,000 metric tons (275,580 short tons). Car unloading and storage in-flow will have an annual operating duration of at least 833 hours — say 900 hours. Shiploading will have a corresponding annual operational duration of 278 hours — say 300 hours.

Shiploading one consignment could extend over a 24 hour period.

5. Description of the Facility

Incoming railroad cars will be coupled in strings of up to twelve cars and placed within reach of a car positioner by a locomotive. The car positioner, under the control of an operator, will move the string through the unloading station spotting successive cars over the dump hopper. Car hopper doors will be opened and closed by the operators. Provision has been made to handle bottom dump trucks if necessary. No part of this operation will be automated. Three and one third cars will be unloaded each operating hour to give an unloading rate of 300 metric t/h (331 Short t/h).

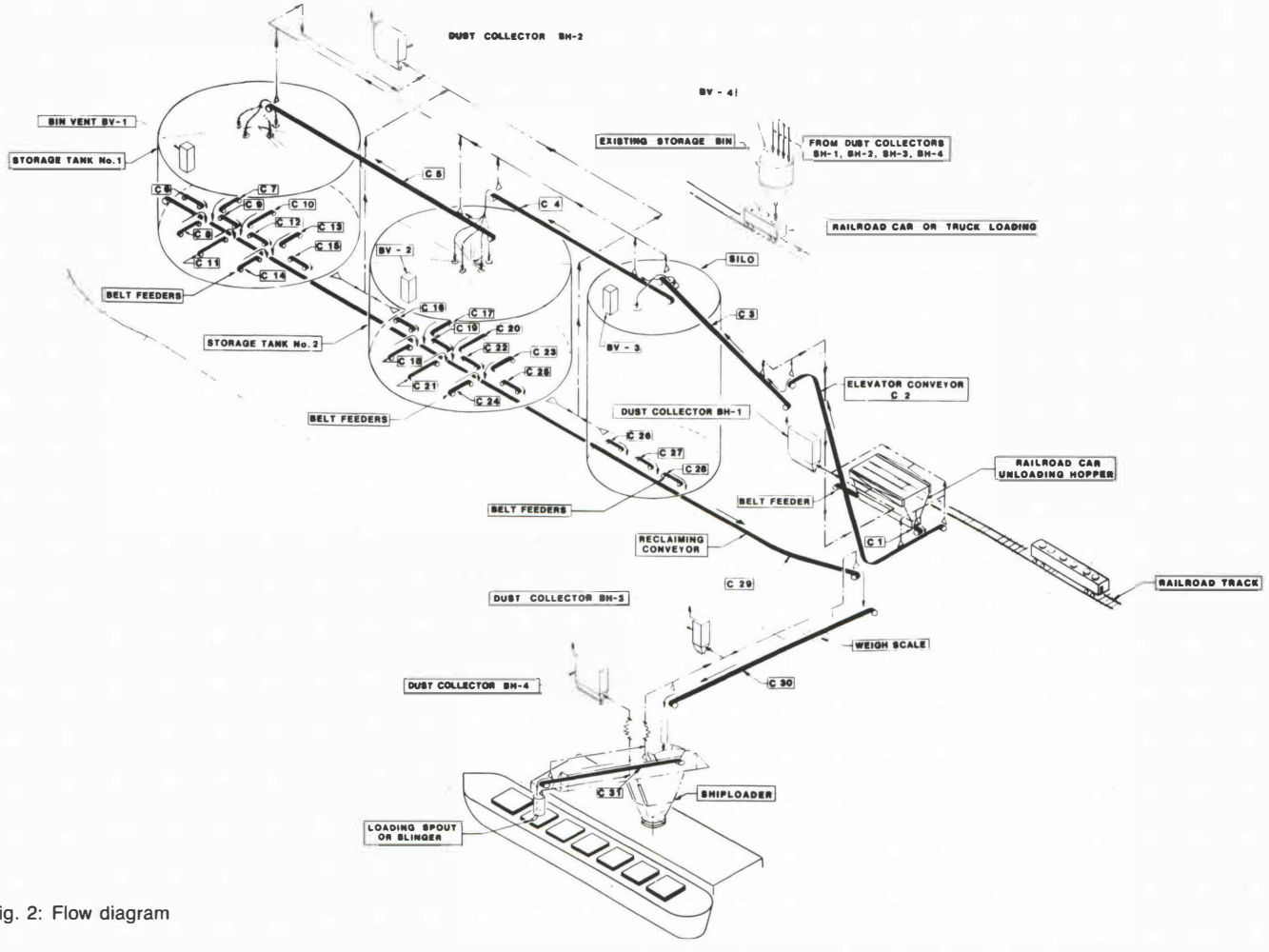

Fig. 2: Flow diagram

The dumper station will be enclosed. A dust collector will capture dust generated in unloading.

Beneath the track dump hopper will be a 60" (152.4 cm) wide belt feeder to regulate the flow of coke at a 300 metric t/h rate and to transfer the coke to a FLEXOWALL elevator (Fig. 3) feeding to storage.

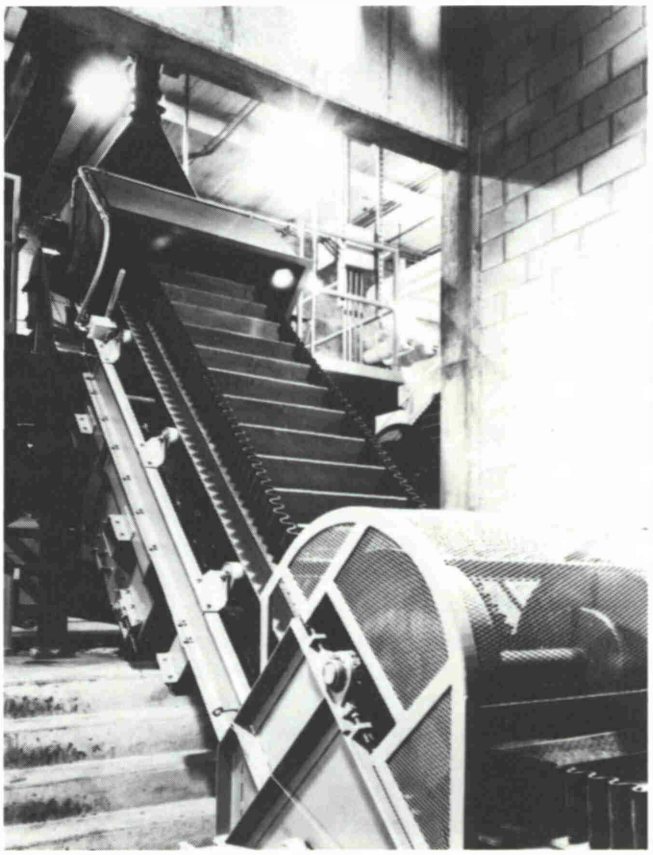

Fig. 3: Flexowall elevator

An elevator rather than conventional belt conveyors will be used at this point to overcome severe space and height limitations created by the desire to reuse the existing railroad tracks and steel storage tanks. The elevator will be a packaged unit consisting of a special conveyor with all its mechanical components complete with casing and drive. The unit will operate at an inclination of about 75° from the horizontal. The special conveyor belt will have a channel section consisting of flat conveyor belting with upstanding corrugated side members, vulcanized to the belt. In addition, cross cleats will be attached to the side walls at regular intervals. The conveyor assembly will be enclosed in a dust tight steel enclosure with provisions for dust off-takes at the head and tail ends.

Arco required a total live storage capacity of 20,000 metric tons. The existing steel tanks were inadequate in size to accommodate this quantity. Therefore, an additional concrete silo will be provided to compliment the existing pair of steel tanks. The FLEXOWALL elevator will discharge onto an overhead silo feed conveyor system. Storage draw-off will be accomplished by gravity to 23 reclaim belt feeders discharging onto the reclaiming belt conveyor system.

The existing steel tank proportions were such that a new system of feed chutes and draw-off outlets would be required to take advantage of the available volume. A radially uniform load-in and draw-down of the coke will be necessary so as to cause circumferentially uniform loading of the tank shells.

The existing air-slide feed and reclaim system was unsuitable for the new installation and was removed.

Since the existing tank bottoms were at ground level, the tanks had to be raised by being jacked-up approximately eleven feet so that reinforced concrete reclaiming tunnels could be installed and additional storage could be provided.

The new concrete silo was designed as a free standing structure supported by a cluster of piles.

The coke will be fed to each storage tank by a belt which will discharge through a bifurcated chute at a rate of 300 metric t/h. The maximum total rate of tank out-flow will be 900 metric t/h which will be discharged to a 42" (106.7 cm) wide reclaim conveyor belt and transferred to the 42" (106.7 cm) wide shiploading conveyor.

Conveyor belt widths were selected to provide the required volumetric capacity at modest belt speeds of not more than 500 ft/min (152 m/min). Belt feeders, however, will operate at approximately 100 ft/min (30.5 m/min).

A weigh scale will be installed on the inclined conveyor which feeds the shiploader. This device was provided to measure bulk material flow rate only.

The shiploader conveyor will discharge its load onto a slewing and luffing, fixed location shiploader. In order to load a ship's hatch without moving the vessel, a telescopic boom conveyor will be provided. The shiploader structure will be able to pivot 180° on a turntable platform. Its counterweighted boom will luff from minus 15° from the horizontal to plus 30° from the horizontal. The telescopic boom conveyor will have 38 ft (11.6 m) of movement. The boom conveyor discharge chute will be provided with a rotating spoon, adjustable for trajectory. A belt slinger interchangeable with the spoon for load trimming will also be provided. The slinger will be self-contained but with control and power cables for quick coupling to those from the power and control cables mounted on the shiploader. Material can be thrown at least thirty feet (9.14 m) from the slinger when the discharge angle is 30°. The range of movements of the shiploader will be such as to be able to fully load a vessel hatch without having to resort to moving the vessel along its berth.

Operating controls for the shiploader will be on a pendant control panel which will have sufficient cable to allow it to be used either on dock or aboard ship. These controls include the shiploader controls plus a sequenced conveyor train start, a sequenced conveyor stop and a simultaneous all conveyor stop control.

The shiploader will be supported on piles and will be located on the existing pier structure which will be only modified to the extent necessary for its accommodation. Additional dolphins and moorings have been provided for berthing and mooring the largest vessels expected. The Port of Longview made all the required pier structure and fendering system modifications.

Bulk carriers ranging in size from 2,000 DWT barges to 60,000 DWT vessels are anticipated to dock at the facility. A captive fleet of bulk carriers will not be utilized. No ship

haulage machinery has been provided; ships will use their own gear for warping alongside the pier.

An artists conception of the project at completion is shown in Fig. 4.

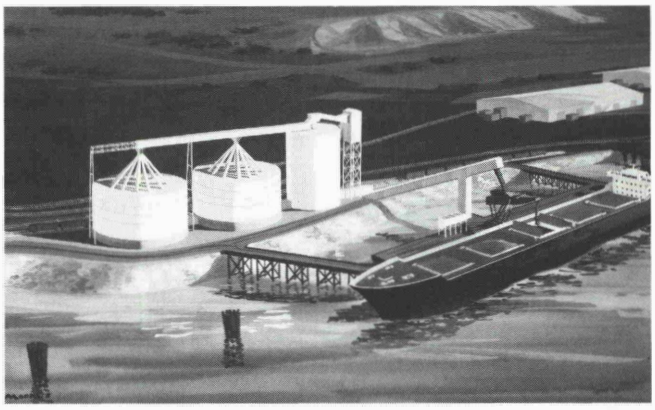

Fig. 4: Calcined Petroleum Coke Export Facility Longview, Washington

6. Dust Control

Dust control will be of paramount concern for the facility and emissions to atmosphere will be prevented at all points of dust generation by use of air pollution control equipment and total enclosure of storage and transfer systems.

Dry self-cleaning bag type dust collectors will be connected by ducts to the railcar unloading station hopper, belt feeders, belt conveyors, tunnels and the shiploader. Dry self-cleaning bag type bin vent collectors will be mounted directly on each of the tanks and silo. All external conveyors will be totally enclosed in galleries to control dust emissions. Loading to storage and reclaim from storage occur within an enclosed area to also control dust emissions.

Dust collectors will be activated for about 900 hours per year for the railcar unloading and the storage in-flow system. Collectors used in reclamation from storage and with shiploading will operate about 300 hours per year. Bin vent collectors will operate independently when a tank or silo is being filled and will discharge dust directly back into the tank or silo. Dust from each of the dust collecting systems will be pneumatically transported to an existing railcar/truck loading bin for disposal.

Dust control measures taken on the shiploader will be more complex than elsewhere at this facility. Load and discharge points will be enclosed and provided with duct take-offs. The conveyor will be protected from wind and weather by hood covers. The hood covers will be arranged to extend and contract in unison with the boom shuttling motions.

Dust control will be exercised during shiploading operations in essentially two modes. For the most part a loading spout with a concentric air duct will be used; the discharge end of the spout being maintained in close proximity to the deposited material. In this situation dust laden air will be drawn into the duct at a rate of about 4000 ft^3/min.

In the other mode, a power slinger or spoon will be suspended in the vessel hold; the dust laden air in the hold being contained by a hatch tent. In this situation an air volume of 30,000 ft^3/min will be exhausted from the enclosed space through a duct concentric with the loading spout.

7. Vacuum Cleaning

To clean up spilled coke or coke dust, all conveyor galleries, transfer points and work areas will be provided with an industrial vacuum system. This system will consist of nozzles, flexible hose and header arrangement, all connected to a single collecting unit.

This conversion of an idle import facility into a profitable export facility will benefit both the Atlantic Richfield Company and the Port of Longview. Reduced transportation costs will be achieved, capital savings will be realized from the reuse of existing structures and increased port business will result.

Innovative opportunities such as this must be constantly sought after to improve the rate of return of on-going operations.

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