

Shiploading technology: bag (un)loaders

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The bag loader, developed by the Hamburg Company FTH – Fördertechnik Hamburg Harry Lässig, was very commonly used in the 1970's.

At the time containers were not closed as they are today and bags needed special equipment for transport.

Today, dependent on volume and destination, the use of standard containers instead of bags or even bulk is quite common and it takes advantage of the necessity of returning boxes to their original destination.

Feeding and post-cleaning and transportation, makes the use of containers in the end, quite expensive.

Therefore bag loaders or combined loader/unloaders or combined with bulk goods are still used for sugar, fertilizer, cement, and plastic.

Ship bag loader for sugar

This project was developed by Maquinas Condor Brazil and Neuro Industrietechnik in Germany with the support of former employees of FTHL.

The task was to make a complete bag spiral chute with loading head for a Cargill plant for sugar export in Guaruja, Brazil.

The existing loader was loading 1,500 t/h bulk sugar and was replaced by a new 3,000 t/h bulk ship loader. This ship loader was partly dismantled and erected at the other side of the bag terminal. All this action of dismantling and new equipment assembly was done during ship changes without interruptions to operations.

The client also expressed the wish to have a bigger working range because of the fact that receiving ships are now bigger than in the past. The spiral chute with loading head is composed of:

- Receiving chute that introduces the bags to the spiral chute.
- Spiral chute. Its special shape controls the bag speed during loading. It has a section that allows telescoping through rotation movement.
- Lower rotating plate that at any position feeds the loading head.
- Loading head; this head rotates by approx. 270° and can reach 360° with the telescopic rotating movement of the spiral chute. It has telescopic belts that are adjusted in order to place the bag close to empty space. This telescopic movement allows for positioning the bags under the hatch wings.

System description

Telescoping spiral chute

The spiral chute was developed in order to store bags and cartons continuously in the ship with a crew of only three people working. One person operates the controls while the others position themselves at the front of the loading head to guide the descending bags without wasting efforts to carry or turn them. The crew can change in alternating turns of 10 to 15 minutes. The machine capacity is up to 4,000 bags/hour.

To warrant a constant flow of bags, a bag store is required to compensate for interruptions and irregular arrival of bags. This storage area should be positioned immediately before the distribution area. The spiral chute is ideally suited to store a good number of bags without any additional costs, an advantage no other descending conveyor can offer.

Moreover, the spiral chute, contrary to other descending conveying elements, has no mechanical parts, hence no additional trouble factors.



The special shape of the spiral chute controls the bag speed during loading. It has a section that allows telescoping through rotation movement.

Due to the special shape of the spiral, a constant speed is guaranteed regardless of bag size or material. In special cases, for example abrasive cement bags, the stainless chute plates may be covered with PU plates.

The telescoping spiral chute consists of the following parts:

- Torsion-proof welded platform in coarse sheet and section iron construction, with welded-in centre tube, linked to the boom by means of a radial ball-and-socket joint for maintenance-free operation due to plastic packings, and kept in a straight vertical position by a parallel guidance.
- Spiral chute in stainless sheet steel 2.5 mm thick, consisting of individual cascade shaped sections, with one side continuous welding, and outer reinforced flat iron border, properly grounded and stained after welding.
- Reinforcing basket in strong tube construction, enclosing the whole fixed part of the spiral chute.
- The fixed part of the spiral chute is provided with an anti-weather-cover which can be demounted in small pieces.
- Winding stairs in the stationary part, with slide-proof steps, hand and leg rails (optional).
- Adjustable guide roller mounted on roller bearings protected by strong casing, and connecting link guide, both mounted on the main tube to pilot the telescopic part.



The head rotates by approx. 270° and can reach 360° with the telescopic rotating movement of the spiral chute. It has telescopic belts that are adjusted in order to place the bag close to empty space.

- Telescopic tube for exact bedding between the guide rollers, with machined finish and lower, stiffened base plate and helically welded-on guide-bar.
- The respective telescopic part for the corresponding firm part of the spiral chute in stainless steel plate construction, with reinforcements and supports to the base plate, arranged for telescopic spiral motion.
- Telescopic pull rod built-in into the tube with roller bearing, acting as a guiding device, operated by differential hydraulic cylinder in pulling position, self blocking by lack of working pressure.
- Hydraulic aggregate with immersed pump, outside mounted electromotor, pressure control by means of solenoid valves, mounted on the spiral chute platform connected to the cylinder with hydraulic hoses.
- Steel flange at the end of the telescopic part to take up the turntable.

Loading turntable

Consisting of:

- Stainless steel plate disk with slightly arched and polished surface, edge of half round steel, welded together with the side face.
- Ball bearing slewing ring between telescopic tube and distribution head.
- Drive by geared motor over toothed wheel gearing with engagement to the toothing of the ball bearing slewing ring and to the plastic covered bag wiper, placed on dollies.
- Plastic covered bag wiper, arranged slewable.

Distribution head

Designed as a triple telescopic belt conveyor. Working range: 3 – 11 m radius from the central tube, consisting of:

- One main frame in welded sheet and hollow section construction with torsion rigidity, bolted underneath the loading turntable. Ball bearing slewing rim notched at the outside, with lateral installed gear brake motor. With transfer chute from the turntable to the telescopic belt conveyor, made of steel plate with anti-wear cover plastic.

- Drive pinion and intermediate wheel on roller bearing with wear resistant wheels on roller bearing and with side guide rollers.
- Telescope motors with pinions fitted for engagement to the racks of the telescopic part.
- **1st telescopic part:** with strong T-shaped beams and conveyor frame in light construction with welded profiles and belt drive by air-cooled electro drum motor. Travelling beam with replaceable wearing rails. Telescope motor with chain drive to the pinions fitted for engagement to the racks. Rubber belt with roughened surface. Idlers with precisions bearings, labyrinth packing and permanent lubrication.
- **2nd and 3 telescopic part:** with self-supporting conveyor frames and carriage to take up the running wheels and driving motors.

• 1 additional belt conveyor

Belt width 650 mm

Axle distance 2 m

This additional belt conveyor is used to reach into the hatch corners and is suspended from the top of the third telescopic conveyor and can be locked by hand in four positions (+15, horizontal, -15, and -30 degrees).

Light construction in welded profiles with belt drive by air-cooled electro-drum.

Maintaining the flow is the key for a good loading operation and optimal use of the entire system. It starts reclaiming the material from the storage area. Fluctuations in the reclaiming should be avoided using a hopper for bulk and the spiral chute for bags as buffer.

A good loader depends also on a good designed flow starting from storage, normally passing through a scale and conveying system that is accessible at any point of the way of the ship loader.

The conveyor that connects the tripper car to the shiploader is also very important to maintain the flow.

Bulk-bag – combined ship loader

Various types are available:

- Bag shiploader with spiral chute
- Bag ship loader with clamping conveyor
- Combined bag and bulk ship loader with spiral chute and loading tube
- Combined bag and bulk ship loader with exchangeable spiral chute and loading tube, with resting tower on the jetty
- Barge loader with spiral chute for bags
- Combined bag and bulk barge loader with spiral chute and loading tube
- Combined bag and bulk barge loader with exchangeable spiral chute and loading tube, with resting tower on the jetty
- Ship (un)loader with spiral elevator for bags and cartons, with 360° curved segment conveyors.

Special applications are also possible like transfer of bags using the gravity.

ABOUT THE AUTHOR AND THE COMPANY

Tomas Kisslinger has twenty years experience in bulk handling, especially in grain related areas. He has been Managing Director of NEUERO Industrietechnik since 1992.

NEUERO is a manufacturer of mobile pneumatic conveyors, grain vacs and ship unloader/loaders for transport of bulk materials such as bulk grain, meals, plastics and alumina.

NEUERO started in pneumatic grain conveying over 80 years ago with the manufacture of small agricultural machines. Since then, the company has delivered equipment in the 20 t/h to 2,000 t/h range to many installations around the world. NEUERO has two companies with sales, engineering, manufacturing and service facilities in Germany and in the US.

ENQUIRIES

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