

## Pneumatic mid-size ship unloaders for Cimentos del Archipiélago



### Midsized shipunloaders

In the program for this workshop is mentioned that low cost unloaders are developed for bulk carriers of approx. 20.000 dwt.

Being a Dutchman my eye was directly triggered by the words "low cost". And I was thinking: can shipunloaders be produced at half the price as 5 years ago?

Let me try to clear at the start of this presentation that producers of shipunloading equipment cannot produce a Rolls Royce car for the price of a small Japanese car!

So what had the organisation in mind when they distributed the program:

1. A wider range of shipunloaders
2. Lower operational and maintenance cost.

In the past only pneumatic shipunloaders were offered tailor made. Mechanical shipunloaders were offered in two or three types. That is why sometimes oversized shipunloaders were handy size ships.

By extending the number of types of mechanical shipunloaders, clients do get the possibility to select a smaller (cheaper) one.

Producers of pneumatic shipunloaders however offered already tailor made equipment, so how could they reduce the cost on these shipunloaders!

Van Aalst Bulk Handling BV has concentrated the past years his efforts of the engineering department on product development. What could be done to improve the equipment and how could the shipunloaders be made cheaper.

A good example of how efforts have resulted in a new type of ship unloader are the two units which we delivered to Cimentos del Archipiélago here on the Canary Islands.

The efforts of our engineers have resulted in two shipunloaders which:

1. Have lower operational cost

2. Less wear and low maintenance cost
3. Longer lifetime on critical parts
4. Self propulsion

Let me enlighten all four items in more detail.

### Lower operational cost:

Power consumption forms an important proportion of operational costs. Van Aalst Bulk Handling BV has developed a system, which adjusts power consumption according to the quantity of cement, to be unloaded. Conventional pneumatic ship unloaders are equipped with a PLC which only controls the unloading process. Van Aalst Bulk Handling BV has extended this PLC.

The shipunloader, which is in operation now on the Canary Islands is equipped with a program, designed to reduce the power consumption during periods of limited operation (such as clean up) or no cement is being sucked into the unloading system.



In this way, power consumption can be reduced by more than 40% during clean up, compared to conventional pneumatic ship unloaders.

In addition new transfer vessel outlets, designed to optimise the mixture of transport air and material (cement), further reduce the power consumption of this shipunloader.

Tests have been carried out on this optimising program, which along with operational results from the new shipunloader on the Canary Islands indicate that power consumption during the complete unloading process can be reduced by 20%.

### Reduced maintenance costs:

The basic concept behind the shipunloader was to develop a unit with two transfer vessels with a "build in" filter system incorporated into each.

Filter elements.

To reduce maintenance costs the design was altered to include only one filter vessel and two transfer vessels and in

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this particular case only one filter system is installed in the filter vessel.

This one filter system has a longer life expectancy than filter elements in transfer vessels; because the latter are exposed to pressure during the outloading cycle of the vessel. Filter elements installed in a filter vessel don't have this disadvantage and therefore have a longer life. The three vessel configuration needs just one filter system, the two vessel configuration needs a filter system in each vessel. Fewer filter elements are used, thus reducing the cost for maintenance on filter elements by 50%.

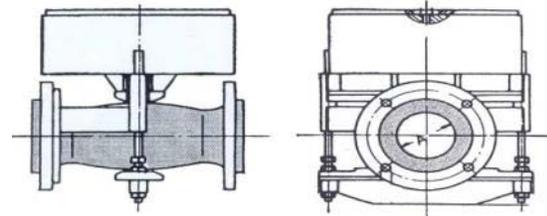
Another advantage of the filter vessel is that it is designed with a walk-in air plenum. To exchange the filter element, not the complete top of the filter vessel has to be lifted off. For maintenance on the filter elements, or to exchange the elements, only the entrance door has to be opened allowing the maintenance engineer to step inside this plenum. Maintenance can be performed during all weather conditions and without the costs of an additional crane.

#### Valves.

The inlet valves of a shipunloader with only two transfer vessels wear quickly as the cement passes the valves at high speed, due to the suction air. The newly delivered shipunloader avoids this problem as the cement drops from the filter vessel into the transfer vessel by gravity. The outlet valves of the transfer vessels of the new shipunloader also have been newly designed to reduce maintenance costs. Previously used butterfly valves were found to wear quickly due to the high speed at which the cement passes the valves. One can say that in fact the valves are sand blasted. A special valve, which has proven its reliability and strength in other industries, has been installed on the new type of shipunloader.

This type of valve has two advantages:

1. Due to its special construction and material the valve lasts much longer and the lifetime of the valve can be guaranteed for a much higher amount of cement handled.
2. Only a small part of the valve has to be exchanged when it finally has been worn out. Not the complete valve has to be exchanged like has to be done with butterfly valves. The small part of the "new" valve can be exchanged very quickly and in a simple way which leads to reduced maintenance and/or down time of the shipunloader. The limited extra costs associated with this filter vessel can be repaid within a year due to the significant reduced maintenance costs.



#### Longer lifetime on critical components.

I have already pointed out that maintenance cost are linked to longer life time on critical components:

1. Longer lifetime of outlet valves
2. Longer lifetime of filter elements and a reduced number of filter elements.

But one of the most critical components of a pneumatic unloader is the suction arm. The suction arms of the shipunloaders for Cementos del Archipiélago have three features:

- a. Rotating fluidising nozzle
- b. Separate hydraulic pumps
- c. Safety valves

Like all Van Aalst Bulk Handling BV suction arms, the units on the Canary Islands are equipped with a rotating fluidising suction nozzle. This nozzle is executed as a hydraulic



operated, low speed cutting head, which loosens and fluidises the (packed) material. By proper fluidising of the cement, before it is sucked into the system, the capacity of the unit increases. But the main advantage of the fluidisation of the cement is that the stresses on the arm are reduced significant. And while the stresses are reduced, the lifetime of the arm is much longer.

Next to the stresses on the arm, which are occurring when the arms is swept through the cement during the unloading process, the movements of the ship can cause stresses on the arm. Specially when a ship is pushed up by waves, the stress on the arm can be very high. Special valves ensure in that case that the hydraulic pressure will be released and the arm will rise with the ship. When the wave and the ship goes down, it is however the task of the operator to follow the down going movement of the ship.

Safety first: In case of an emergency it is possible to lift the arm out of the shipshold with the hydraulic pump of the rotating nozzle. One does not have to look for the assistance of a harbour crane in that case.

### **Self propulsion of the shipunloaders**

The mobility and manoeuvrability of shipunloading equipment.

Almost all shipunloading equipment is mobile. This to be able to reach into all shipsholds, which have to be unloaded.

Only a few unloading installations are mounted on fixed positions and at these occasions the ship has to be moved along the jetty. This is more complicated and not preferable when the ships are bigger than about 3.500 dwt.

Everybody knows harbour cranes, which move along the docks over rail tracks. These harbour cranes are high and during stormy days can be fixed at the rail tracks for security. Wheel load is delivered over the tracks and reduces the point loads on the docks.

Also big mechanical unloaders (bucket wheel and screw type) are mainly rail track mounted. An extra advantage in this case is the necessity to drop the unloaded material onto a fixed installation for further transport. Rail track and transport installation (belt conveyor) can be fixed at a given distance.

#### No flexibility

Rail track mounted equipment can not move freely in the harbour area, and obstructs other activities.

More and more cranes and other unloading equipment are delivered with rubber tyres. It increases the mobility of the equipment and can reduce the amount of unloaders needed in a harbour.

Two items are important when a decision is made for rubber tyre mounted equipment.

- I. Which wheel load is allowed in the harbour area

## 2. The stability during unloading operations

By adding or reducing the number of wheels, the wheel load can be adjusted. The stability of the unloader can be increased with a (hydraulic) jacking system.

### Self propelled

Almost all unloading equipment which is mounted on rubber wheels, or on rail tracks is self propelled. The wheels are driven by electric, hydraulic or diesel motor and no additional equipment is needed to move the unloaders in the harbour area.

Remarkable is the fact that pneumatic shipunloaders for cement, which are rubber tyre mounted, mainly are delivered without propulsion, these unloaders must be pushed or pulled along the jetty or in the harbour area by a pulling track big front end loader or similar.

The shipunloaders for Cementos del Archipelago have their own propulsion. We have to admit that Mr Santiago of Cementos del Archipelago was the initiative behind this concept.

All four wheelsets of the units are equipped with hydraulic motors.

Contact the author [Hans van Est of Van Aalst Bulk Handling](#) or visit the [Van Aalst Bulk Handling website](#)

