

Towards zero operational costs of loading facilities for bulk fluids

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Introduction

The ultimate goal is to achieve a zero cost of ownership for any installation. But is that a reasonable goal? The logical answer would be no. However, when it comes to loading facilities, a well thought out concept would allow one to come a long way towards this target.

The transfer of fluids is the backbone of companies who produce or trade these fluids or provide storage capacity. At the end of the day, it is the fluid flow that keeps the meters counting and that generates the cash flow. This article will discuss the last part of the liquid transfer line: the loading facility; the most critical part of the transfer of fluids between a storage tank and a tanker.

The Loading facility is a flexible part in the liquid transfer line as it needs to follow the horizontal and vertical movements. This flexibility requires the use of loading hoses or loading arms; this is particularly vulnerable to risks, due to emergency situations, faulty operation and wear and tear.

Loading and unloading process at the jetty

Loading and unloading of ship tankers is a challenging event which includes several risks. Considering the dynamics inherently associated with a transport vessel while connecting and transferring to and from a liquid cargo transfer system, such as a hose loader or loading arm, accidents can easily happen during any of the operational phases.

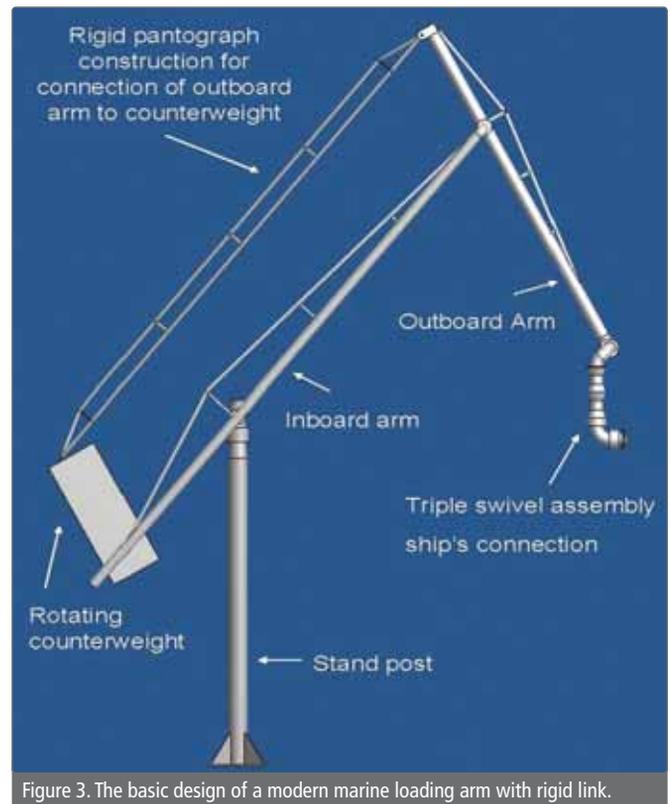
Marine loading hoses and marine loading arms are two available alternatives to transfer liquids between a storage tank and a tanker, as they offer the required flexibility. Ship to shore connections made by hoses offers better flexibility, but compared to loading arms they are prone to tear and wear; they have a limited lifetime and require relatively inconvenient operation. Hoses are often subject to periodical tests and inspections, once or twice a year, thus they inherently include a certain yearly cost of ownership. From a safety point of view, automatic emergency release provisions with 'zero' spillage are hardly available for hoses and neither are actuated quick couplers that make life easier for operators.



Figure 1. A marine loading arm in operation.



Connections made by marine loading arms achieve a fully rigid connection, still with the possibility to follow all the ship's movements by the use of swivel joints in between the steel pipes, and so solve the disadvantages of loading hoses. They can also be executed with automatic 'no spillage' emergency release couplers



and equipped with powered quick couplers to increase personal safety and to protect the environment. The structural design of the marine loading arms is an extremely important factor when it comes to required maintenance.

The human factor contributing to the cost of ownership is not always visible, but it has a close relation to the convenience of operation and the maintainability of the loading arms. Any difficulties in the everyday operation and in the maintenance procedures will have a decided impact on the operators.



To increase job satisfaction and job performance, the facility and the operation of loading arms and maintenance should be designed through the eyes of operators and maintenance crew and suited for one man operation. For example, flexible wires with pendants for regular loading arm control should be avoided, as they can cause accidents and are prone to getting damaged, thus causing unexpected movements of the arms.

Design of the loading arms

It is worthwhile having a detailed view of the design of the loading arms, since it is a crucial factor when it comes to required maintenance. Simplicity of design of marine loading arms combined with an optimal structural configuration will allow a close to zero cost of ownership.

Counterweight balancing: rigid link versus cable link

The moveable parts, called inboard arm and outboard arm, are counterweight balanced (see Figure 3). Marine loading arms can have two separate counterweights, one for the inboard arm and one for the outboard arm, or a single rotating counterweight that is a combination of both. The linkage between the moveable loading arm pipes and the counterweight can be made by either a cable and wheel assembly or a rigid steel bar (see Figure 4). A cable system needs regular inspection, greasing and re-tensioning, whereas with a rigid connection the balancing is set one time in the factory and never again.

Self-supporting structure versus separate support frame

The liquid carrying piping can be supported by a frame that bears all the weight of the liquid line. This configuration is a complex one and should be avoided for all applications other than cryogenic or extremely corrosive fluids. Improvements in swivel joint design have eliminated the need for a separate support frame, even for extreme large dimensions. This means that self-supporting loading arms can be applied as a standard, which is a significant improvement towards the goal of simplicity.

Swivel joints

The performance of marine loading arms depends on the swivel joints. Modern, high performance swivel joints allow leak free operation for years, without the need for periodical greasing or any other maintenance. A multi-year warranty, which includes all the swivel joint parts, is essential to achieving zero cost of ownership.

Marine loading arms configuration

Marine loading arms with symmetric design beside the recommended self-supporting structure and rigid linkage have a proven record of reliability thanks to the equal division of forces within the entire structure (See Figure 5). With the basic maintenance limited to a few grease points only, the uptime is practically 100 percent and the cost of ownership is practically zero.



Figure 5. Symmetric Marine loading arm.

Conclusion

Modern, symmetric marine loading arms with rigid link and self-supporting structure and executed with high performance swiveling joints provide a close to zero cost of ownership for the loading equipment. Extra attention to a simple and intuitive way of operation will further minimize the operational costs.

ABOUT THE AUTHOR

Robin Boot is sales and marketing manager of Kanon Loading Equipment B.V. He joined the company in 1999, and has since been involved in many marine loading arm projects worldwide.

ABOUT THE COMPANY

Kanon Loading Equipment B.V. is a first class supplier of marine loading arms with innovative symmetric design. They also provide top and bottom arms for truck and rail- folding stairs, loading platforms and swivel joints. Ease of handling, safety for operator and environment, reliable performance for many years, are basics for the design of KANON equipment.

ENQUIRIES

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