



# Efficient Container Handling by Reachstacker

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## 1. Introduction

In recent years reachstackers, which are more efficient than conventional large-size forklifts, are being used increasingly in container terminals in Japan to replace such forklifts. The volume of containers being handled worldwide is also increasing (Fig. 1), and accordingly we have developed a new type of reachstacker that may answer future replacement demands and can be expected to sell well in the future.

## 2. General description of the reachstacker

The reachstacker is a machine that is used exclusively to move and stack up empty or loaded containers in container yards. It also load containers onto trailers and unload containers from trailers. The introduction of reachstackers to replace conventional large-size forklifts is already a mainstream development in stevedoring operations at overseas ports and harbors, especially at local ports (where there are no large facilities such as gantry cranes) and at cargo transport terminals. The advantages of reachstackers are described below.

- (1) Containers not only in the first row but also in the second and third rows can be handled (Fig. 2).
- (2) There is good freedom of maneuvering while holding a container, facilitating accurate positioning at stacking.
- (3) The absence of a mast allows very good forward visibility and easy operation.

- (4) The absence of a mast and the low height of the machine allow easy yard-to-yard movement and entry into warehouses, etc. resulting in high mobility.

Recently in Japan, the operator's qualification for this type of equipment was changed from crane operator's license to fork-loader operator's license, which is easier to acquire than the former. This legal change has triggered an increase in the domestic demand for reachstackers.

## 3. Equipment characteristics

### 3.1 Handling performance

The newly developed reachstacker has the following handling capacities:

- 1st row (1st stack to 4th stack): 45 t  
(5th stack): 42 t
- 2nd row (1st stack to 4th stack): 29 t
- 3rd row (1st stack to 3rd stack): 15 t

A loaded container usually weighs approx. 30.5 tons so that almost all loaded containers in the 1st and 2nd rows can be handled.

In addition, the spreader installed at the top of the boom is intended for both 20 ft and 40 ft containers, and a side-shift mechanism, rotation mechanism and forward-backward tilt mechanism are provided to enable accurate container positioning during stacking up of containers.

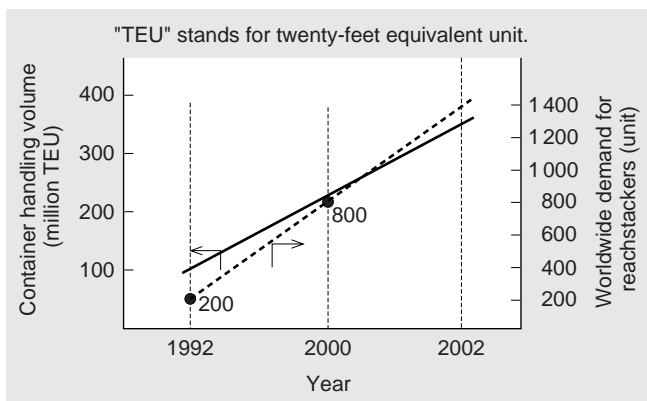


Fig. 1 Worldwide container handling volume and worldwide demand for reachstackers



Fig. 2 View of reachstacker at work

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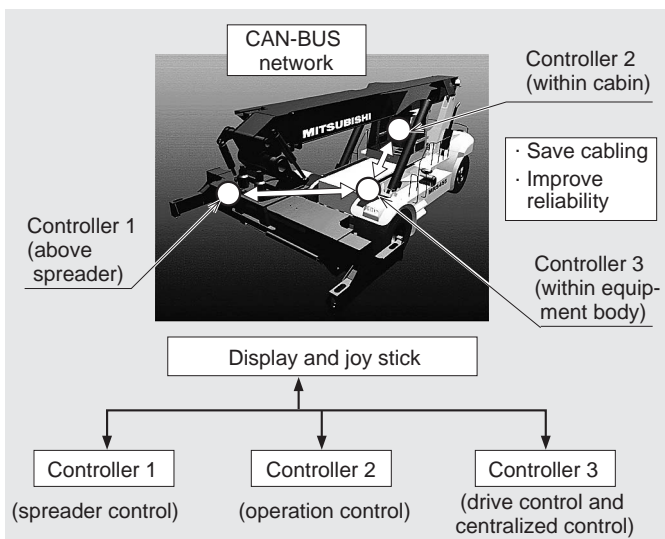


Fig. 3 Controller area network

### 3.2 Hydraulic control system

Pump discharge performance corresponding to the container load can be gotten by variable displacement pumps and load sensing circuits. This system eliminates the possibility, for instance, of the operation speed slowing down drastically when a heavy container is lifted, and improved operation efficiency can thus be expected.

Lifting, lowering and telescoping of the boom are controlled by a number of pump circuits that are independent of each other so that simultaneous operation and speed control of different functions, which are impossible with other manufacturers' equipment, have been enabled. These mechanisms can also provide very convenient and user-friendly functions such as vertical lifting and horizontal movement of containers.

### 3.3 Electronic control system

The structure of this reachstacker is characterized by its boom that can be retracted and extended like a crane and its cab that is movable forward and backward. Each of such movable parts is equipped with a device for controlling communications by controller area network (CAN). This system simplifies wiring details and improve reliability (Fig. 3).

In addition, a touch-panel type colored liquid crystal monitor is installed in the operator's cabin to display

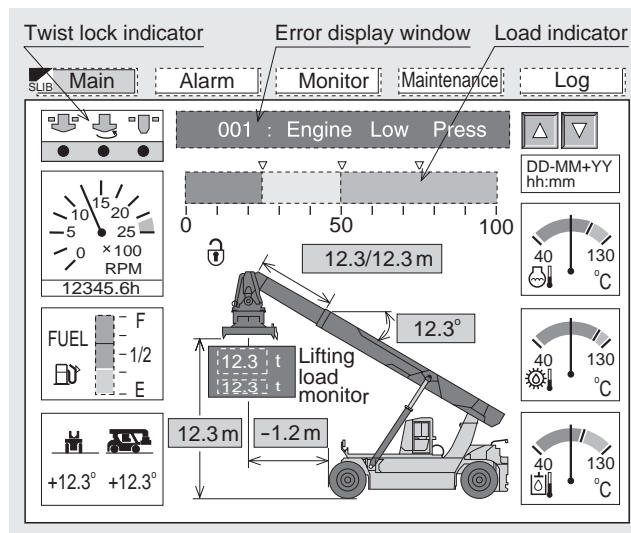


Fig. 4 Touch-panel type liquid crystal display

the basic equipment status indicators. These include engine tachometer and fuel gauge as well as spreader position, current lifting load, maximum permissible load, alarm, error messages and operation history that are very useful to the user and service side (Fig. 4).

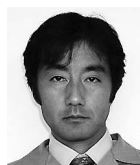
### 3.4 Safety considerations

A very important element of this reachstacker is the concept of safety considerations. While it allows handling of containers in the second and third rows, which no other conventional large-size forklifts can do, there is a possibility of overturning forward if the boom is operated improperly.

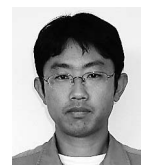
In order to prevent such a disaster, this reachstacker is equipped with a fail-safe function that automatically stops operation before overturning can occur, and thereafter allows only safe operation. The reachstacker also has a function that prevents lifting of a load heavier than the maximum permissible weight.

## 4. Conclusion

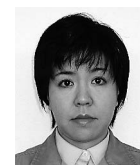
Various technical problems relating to functions and safety which were inherent to reachstackers have now been solved so that the newly developed reachstacker, Mitsubishi Heavy Industries, Ltd. believe, will be able to serve customers satisfactorily from now on with improved efficiency of container transportation.



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