

---

# Evolution of bulk handling

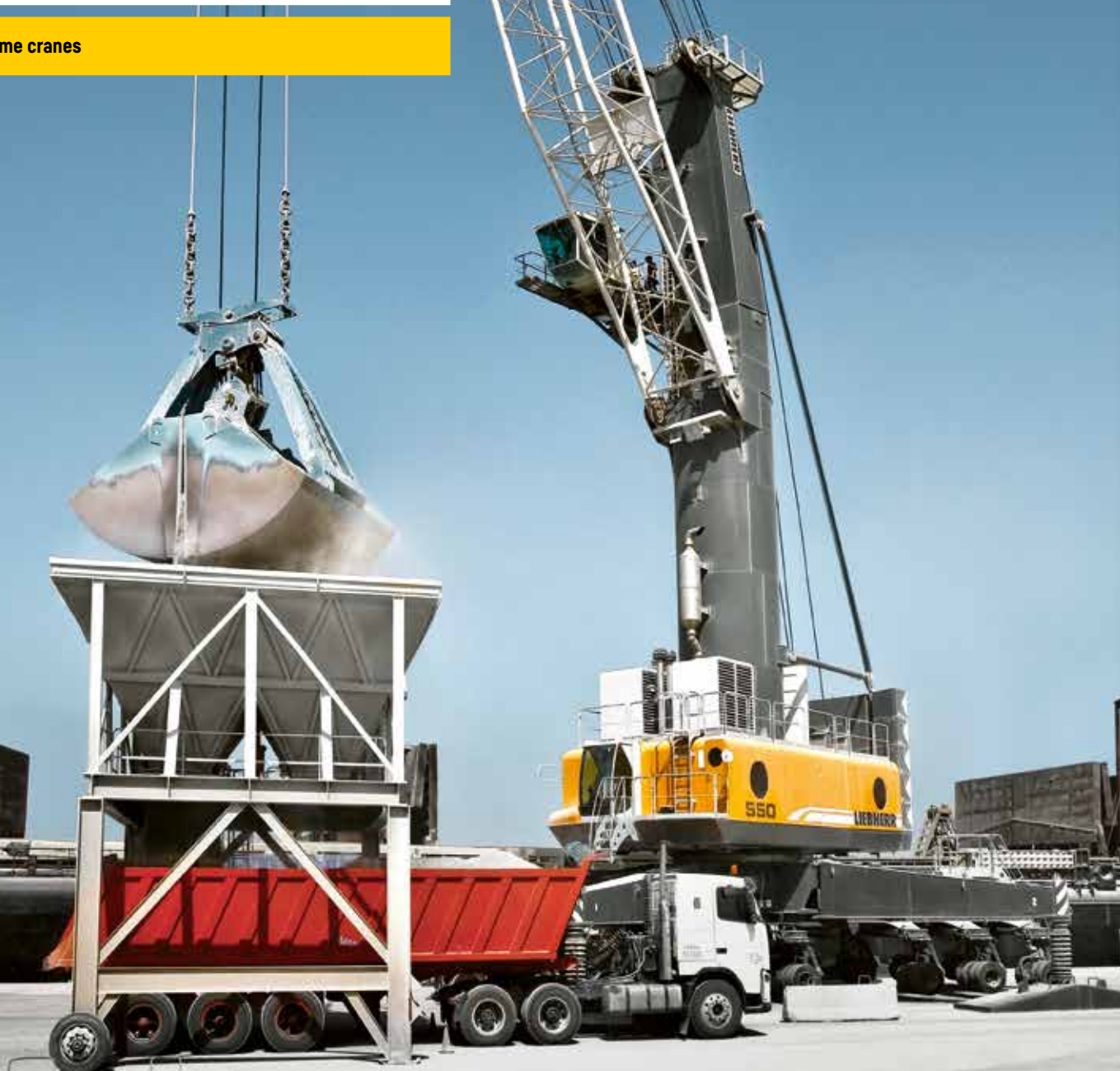
---

Liebherr SmartGrip®

[www.liebherr.com](http://www.liebherr.com)

**LIEBHERR**

Maritime cranes



# Mode of operation

SmartGrip operates as an intelligent system which optimises grab filling rates in a self-learning manner and has the potential to increase bulk turnover significantly. Test and analysis in the field have shown an average grab filling rate of 70%. SmartGrip utilizes the remaining 30%.

## System

Without any driver interaction the algorithm learns the machine setting and material properties autonomous within the first five lifts. In operation, the self-learning system automatically adjusts its behaviour by recognizing bulk density, compression and granularity as well as current frame conditions like depth of impression or type of grab.

## Driver

For crane operators the estimation of the material density and the right grabbing angle may turn out to be a real challenge. Using SmartGrip the driver just controls the closing of the grab. The system controls the filling of the grab to suit the load curve of the crane. This leads to a perfect crane utilization with avoidance of overloads.



# SmartGrip® benefits

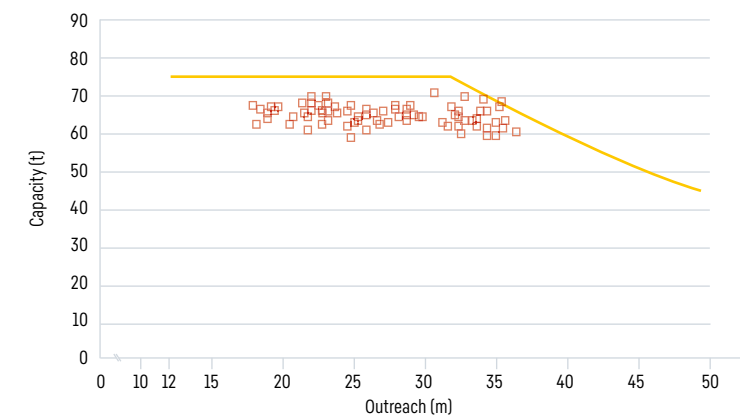
## Turnover

The intelligent SmartGrip grabbing technology revolutionises bulk handling in ports. The self-learning system improves the material handling performance. The handling rate can be increased by up to 30% as the system utilises the grabber capacity in full.

Load diagram without SmartGrip



Load diagram with SmartGrip



### Optimised filling rate

- Independent of incident angles
- Grab volume fits to max. outreach

### Reduced cycle times

- Less time for grab filling / MultiGrip
- Less fuel needed

### Reduction of turnover variance

- No need to change from a big grab to a small one if overloads accrue. SmartGrip prevents overloads with every grab size and ensures constant turnover.

## Lifetime

### Less overloads

- Less dynamic influence when handling sticky material: therefore bigger grabs can be used without harming crane structure
- Bigger grab can be used while system fills grab to optimum: that means one grab can handle wide range of materials of different densities

## Driver

### Reduced stress

- The system adjusts to different materials and densities
- Significant improvement of less skilled drivers

### Setting target loads manually

- Avoids overfilling for open grabs
- Can be used to prolong grab's life time
- Can be used to load specific amount of material e.g. 40 tonnes to load lorry

