



# Press Information

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## LIEBHERR OFFSHORE CRANES

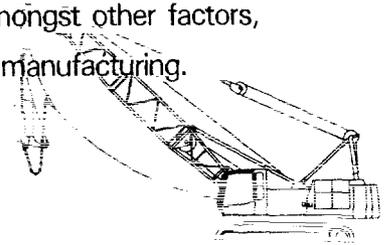
Today's offshore industry is one of the most innovative and complex sectors of the economy. The step for step development of more and more barren drilling regions goes hand in hand with the rapid development of offshore crane technology. Also, the noticeable slow exhaustion of shelf water fields is leading to a further exploitation of available deepwater resources, confronting the offshore industry with very special requirements.

Since the beginning of the offshore industry, Liebherr has been considerably engaged in the development of suitable cranes. Today, Liebherr is amongst the technical leaders for both rope luffing and ram luffing cranes and is an example for all other crane producers.

Liebherr Offshore Cranes are specially designed and produced according to individual market requirements which range from explosion-protection to diesel or electrical drive, from special lifting heights in excess of 2000 metres with ambient temperatures as low as minus 50°C.

Safety, quality, maintainability and after sales service are the most important criteria for our offshore cranes. The installation of Liebherr's own crane management system Litronic® provides the possibility to control and monitor all the systems in place to ensure safe crane operation. Special features such as system diagnosis, load cycle and machine data recording are available as optional items. All components used on our cranes have to pass a components qualification process prior integrating them. If operated by LIEBHERR crane personnel as part of crane health care contracts LIEBHERR is providing since the early 90s, we guarantee a mechanical availability of 98%.

New development concentrates on the improvement of existing crane design and the development of products requested by individual markets. This, amongst other factors, should allow Liebherr to extend its existing position in offshore crane manufacturing.



# Liebherr Offshore Cranes type "BOS"



# LIEBHERR

With their advanced technology, Liebherr offshore cranes, fitted with diesel-hydraulic or electro-hydraulic drive and electronic controls, have penetrated markets worldwide.

Liebherr have extensive experience in offshore cranes construction and can therefore offer the optimum solution for every application. In particular it is the simple and reliable opera-

tion which offers the most convincing benefits.

All crane functions and motions can be operated simultaneously under full load and at maximum speed with only two joystick controls. Variable integrators ensure positive, total control over hoisting and powered lowering operations with stepless acceleration and braking.



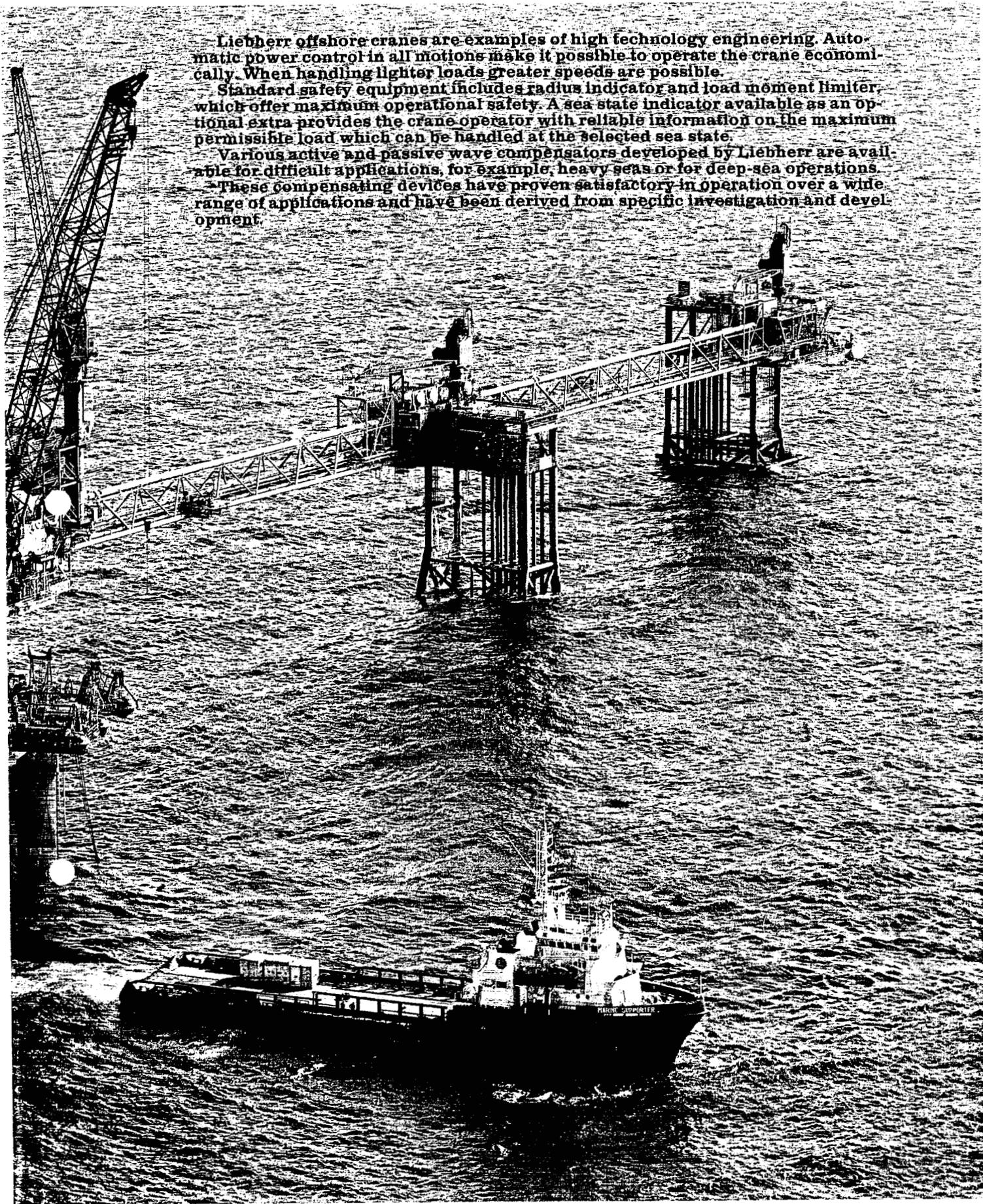
**The smallest detail is part of a well the**

Liebherr offshore cranes are examples of high technology engineering. Automatic power control in all motions make it possible to operate the crane economically. When handling lighter loads greater speeds are possible.

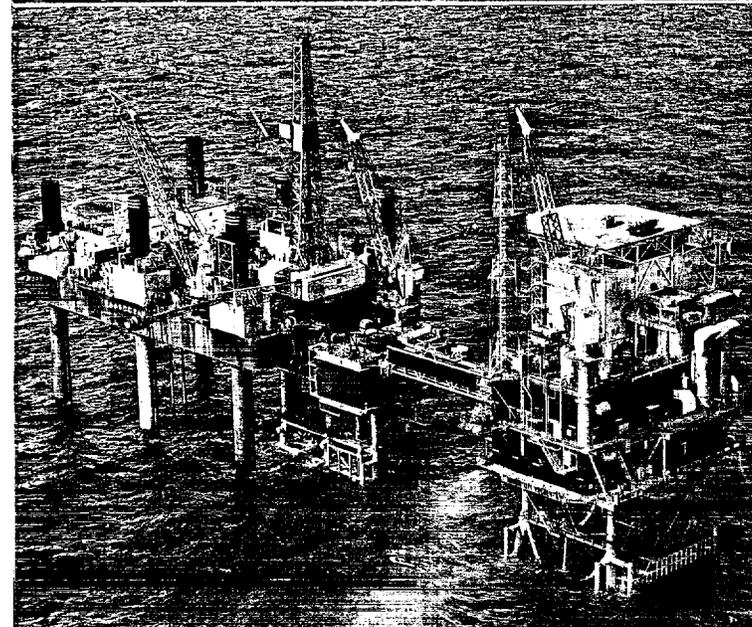
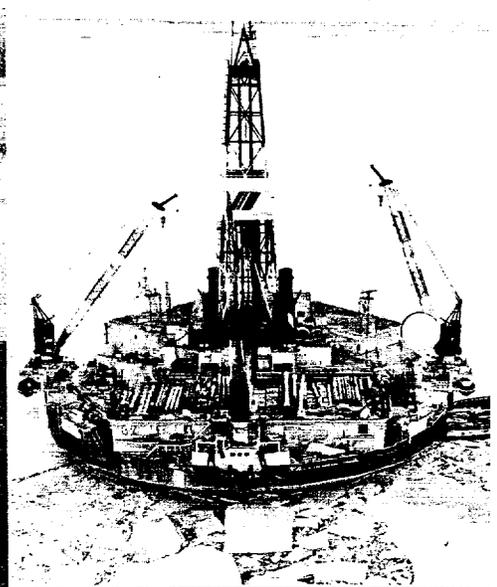
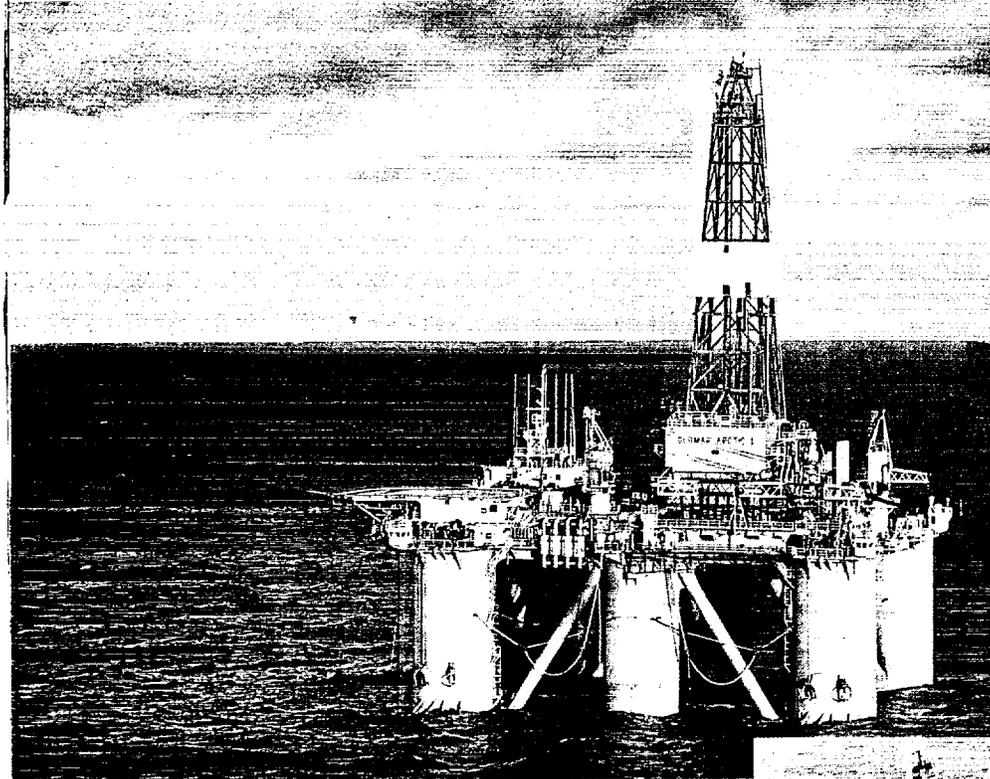
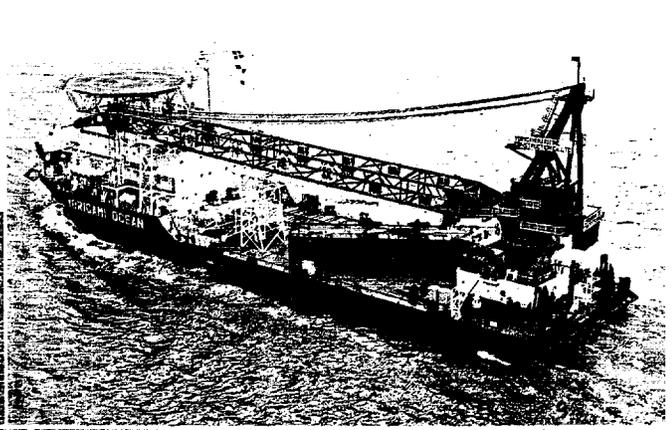
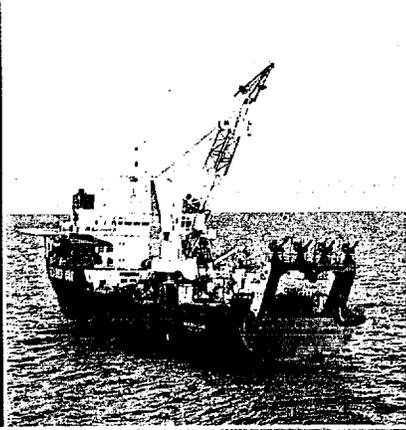
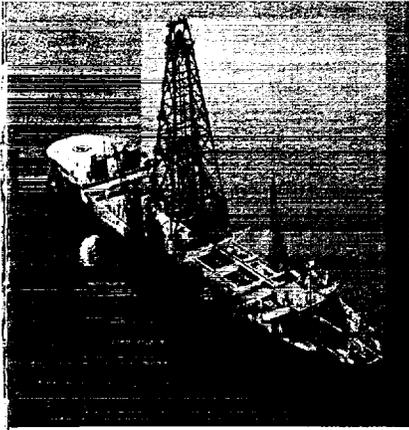
Standard safety equipment includes radius indicator and load moment limiter, which offer maximum operational safety. A sea state indicator available as an optional extra provides the crane operator with reliable information on the maximum permissible load which can be handled at the selected sea state.

Various active and passive wave compensators developed by Liebherr are available for difficult applications, for example, heavy seas or for deep-sea operations.

These compensating devices have proven satisfactory in operation over a wide range of applications and have been derived from specific investigation and development.



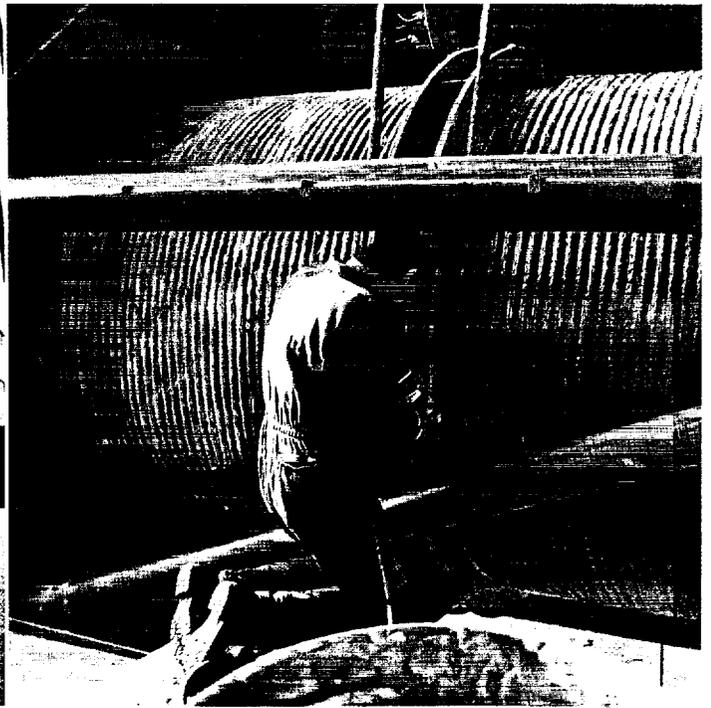
**light-out concept.**



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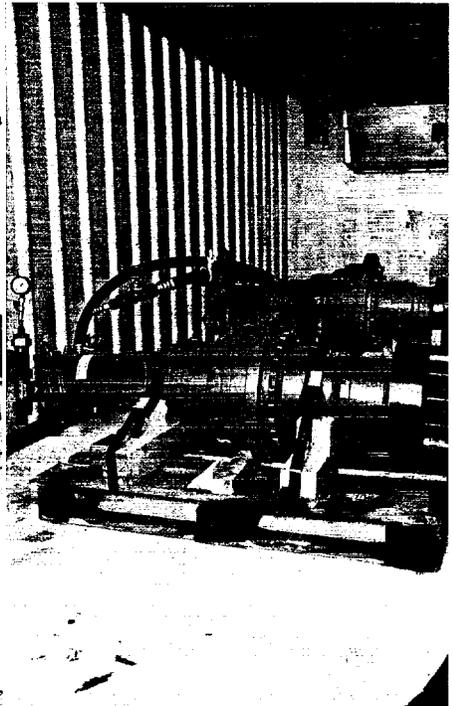
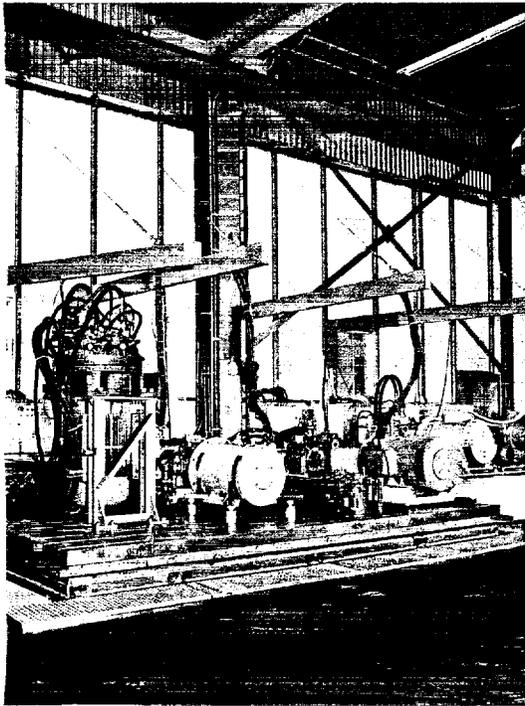
**Liebherr offer the ideal solution for special deep-sea operations. Single-rope operation or large rope pulley spacing at the boom head prevent the hoisting rope from twisting.**

**The appropriately dimensioned winch is adapted to large lifting heights and is normally designed to operate in one single layer.**

**A separate lubrication system in the hook block and operating on the pressure balance principle, ensures smooth operation even under water.**

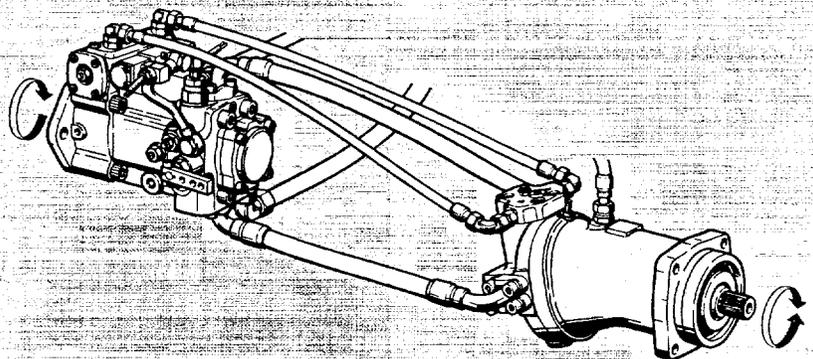
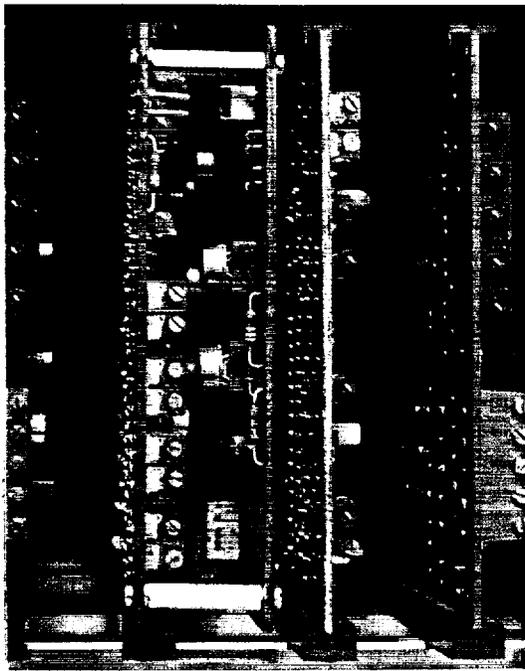


**The ergonomically designed cabin offers excellent visibility and supreme comfort thus ensuring fatigue-free operating conditions. The clearly arranged instrument panel which can be scanned at a glance is located adjacent to the operator's seat. The instrument and indicator lights identified by appropriate symbols, together with additional acoustic and visual warning facilities, permit effective supervision of all essential equipment and components.**

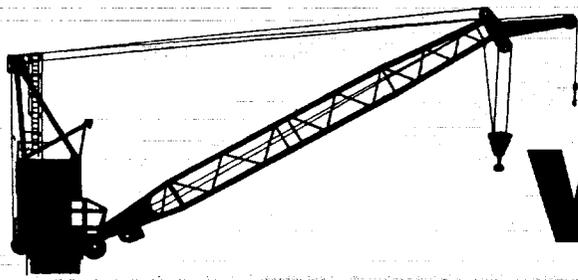


Liebherr pay special attention to testing the most varied mechanical, electronic, electrical and hydraulic components, by simulating realistic situations.

A highly developed measurement and control system enables movement, pressure and temperature curves to be precisely plotted and analysed. Liebherr's refrigeration chamber is specially equipped for testing the operating capability of components at extremely low temperatures. The test programme can be varied to specific requirements, enabling not only endurance and cold tests, but also vibration tests as well as sound and frequency measurements.

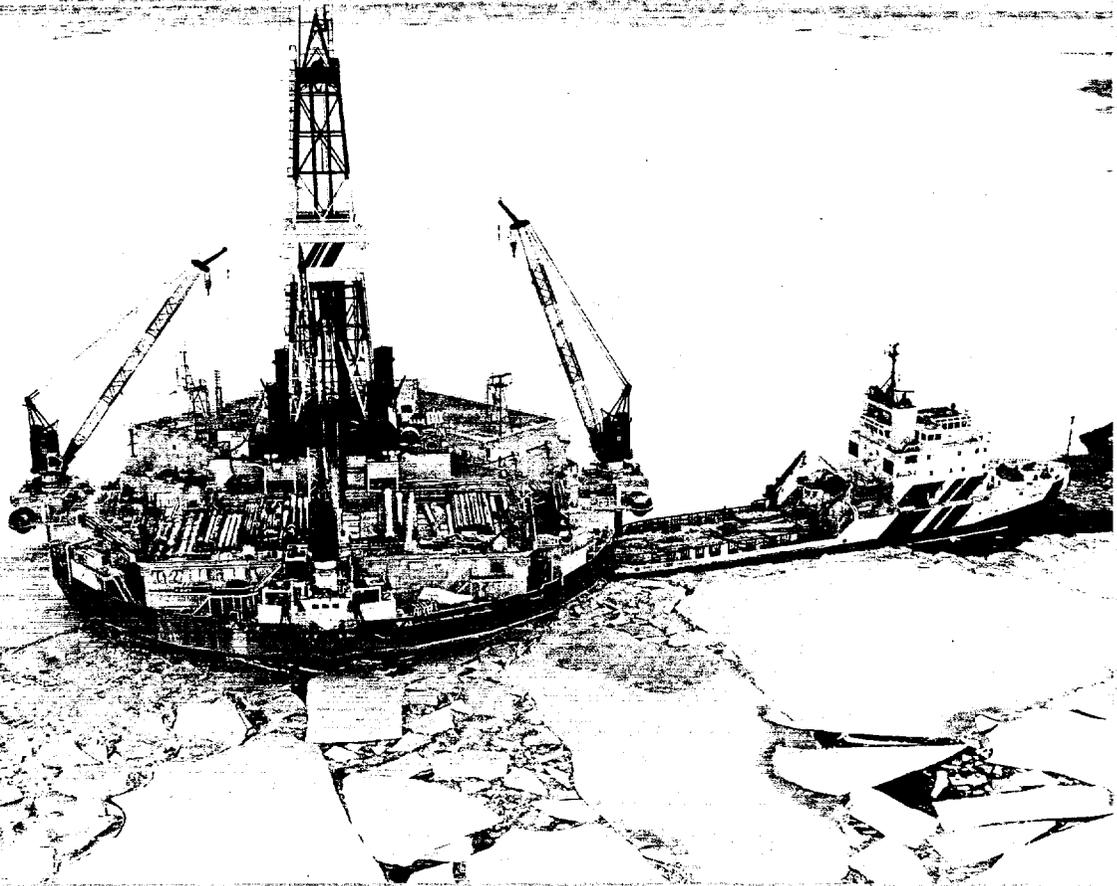


The electro-hydraulic control is a specific Liebherr development, ideally combining the benefits of electronics and the efficiency of hydraulic power transmission. This control system is characterized by high reliability as well as ease of maintenance. It is a pioneering development in crane control systems. Selected materials resistant to temperature fluctuation and vibration are used in the construction of the electronic control systems.



# Work Report

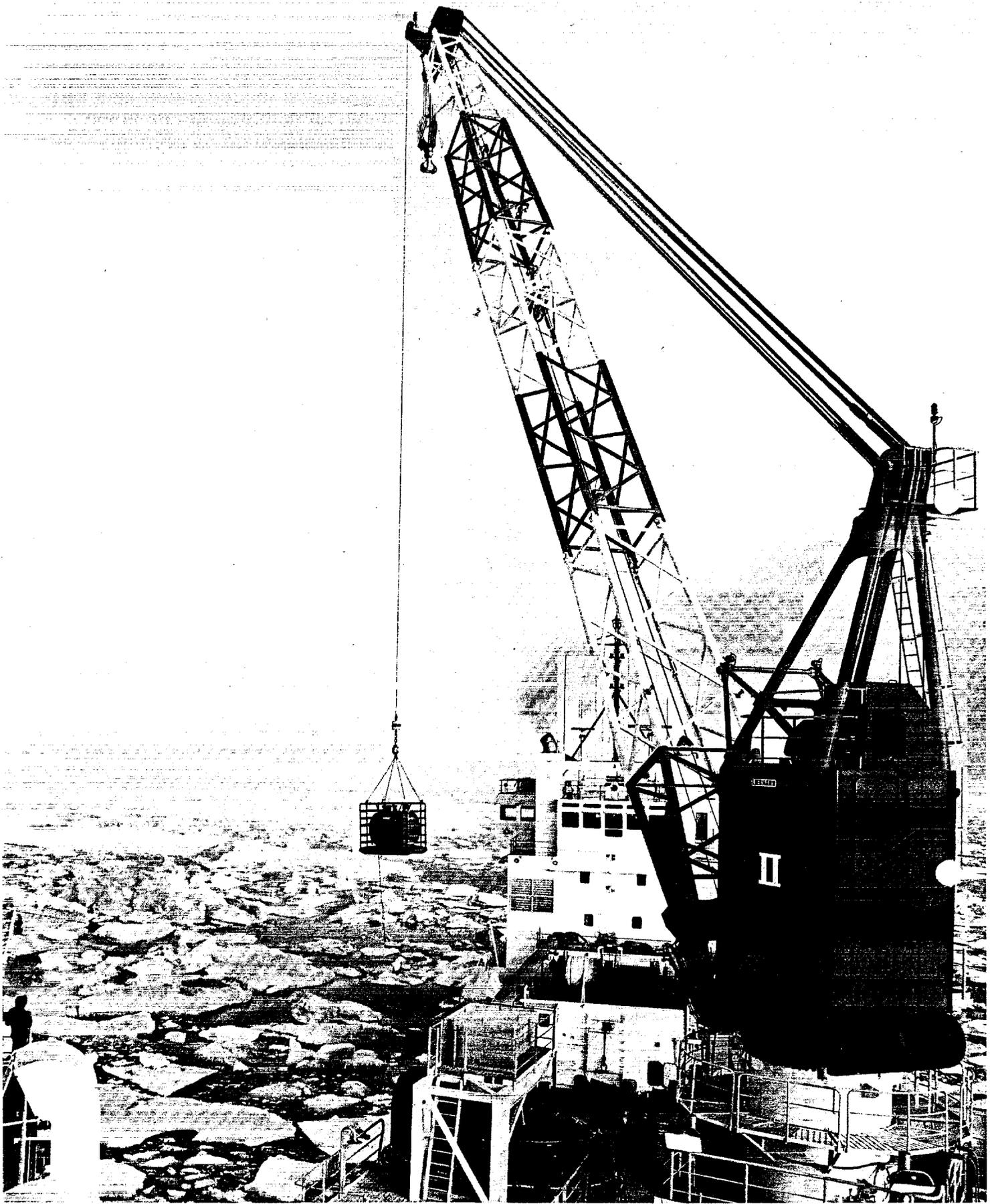
## LIEBHERR Offshore Cranes Type BOS 65/850 D



Beaufort Sea at ambient temperatures of  $-50^{\circ}\text{C}$

# LIEBHERR

How to build Cranes.



Liebherr design each crane for individual applications and develop the design in consultation with the customer. Liebherr offer state-of-the-art technology which includes:

- Explosion proof requirements
- variable sea-state criteria
- lifting height in excess of 400 m
- operating temperatures to -50 degr. C (Arctic conditions)
- specialised insulation
- utilisation of specially selected materials
- operation in wind speeds of 50 knots.



**The more demanding  
the application, the more obvious  
the benefits.**

## **The task**

Offshore in Canada's Beaufort Sea poses environmental challenges encountered nowhere else in the world.

The environmental conditions include water depths ranging from 20 to 60 metres, sustained wind up to 100 knots, currents at one metre per second and waves of up to seven metres.

Conventional drill ships can operate in the Beaufort sea only during the period of open water for 100 to 110 days per year. Then they are idle for the rest of the year.

After considerable research with this problem in mind, Gulf Canada Resources Inc. selected two drilling systems for use in exploring the Beaufort Sea.

The first is the drill vessel "Kulluk", a conical steel structure with a double steel hull for low temperature of  $-50^{\circ}\text{C}$ . It's the world's first floating type rig for polar use, intended for continuous operation 200 days a year. This unit was delivered in spring 1983 to Beau Drill Ltd., a subsidiary of Gulf Canada Resources Inc., Calgary.

The second is a Mobile Arctic Caisson named "Molikpaq" and was delivered in April 84. This unit is designed to meet the same environmental criteria as the "Kulluk". The significant design advance is its mobility and capability for being reused at other locations.

## **The Solution**

The "Kulluk" and "Molikpaq" are equipped with three LIEBHERR diesel-hydraulic Offshore cranes, type BOS 65/850 D, especially designed and constructed for load handling at ambient temperatures of  $-50^{\circ}\text{C}$  to  $+20^{\circ}\text{C}$ .

The cranes are designed to work with full load at 3 degrees heeling, 2 degrees trim and at 50 knots wind speed.

Design and construction is in accordance with ABS Regulations and Canadian Coast Guard Requirements.

## **General Description**

All drive units are located in the robust crane super structure, waterproof sealed off against ingress of sea-water.

An automatic overload protection device, with additional visual warning system in the driver's cabin, prevents crane overloading. Main hoisting gear, slewing gear and jib luffing gear can be operated simultaneously. All working movements can be continuously varied from zero to maximum speed. With regard to troublefree operation at extremely low temperatures, all hydraulic, electric and electronic components were carefully tested before mounting. The whole interior of the crane has been completely insulated with special materials and provided with individual devices in order to avoid cold flow.

## Technical Data

Load capacity	65,0 metric tons at 9,14 m outreach 13,5 metric tons at 37,19 m outreach
Lifting height (main hoist)	65 m
Lifting height (auxiliary hoist)	41 m
Working speeds	main hoist 0- 8,1 m/min with 65,0 metric tons 0-10,0 m/min with 52,0 metric tons 0-15,0 m/min with 35,0 metric tons 0-16,2 m/min with 32,6 metric tons  auxiliary hoist 0-105 m/min with 4,5 metric tons 0-120 m/min with 3,9 metric tons 0-152 m/min with 3,2 metric tons
Slewing speeds at full load	1,5 rev/min at even keel 0,7 rev/min at 3/2 degr. heel/trim
Drive	Mercedes Benz Diesel-engine Type OM 404, output 400 HP at 2300 rpm, continuous rating B, DIN 6270. Recirculation water cooling system. Diesel fuel day tank with 800 litres capacity.
Total weight	70 metric tons

Each crane fitted to the "Kulluk" is equipped with a special device for the inspection of the slewing ring.

## Equipment fitted for operating at temperatures as low as $-50^{\circ}\text{C}$

Diesel engine:	Special luboil, fuel and coolant are used, and heaters are fitted for both coolant and oil systems.
Hydraulic equipment:	Heaters for oil tanks, oversized hydraulic hoses.
Mechanical equipment:	Anti-condensation heaters are fitted in the machine room, special low temperature materials are used, and special packings (seals) in the gears.
Electrical equipment:	All electrical units are low temperature proofed. Heaters fitted in the switch gear cabinets.
Heating of the driver's cab:	Overdesigned electric heater, additional stand-by heating.
Heating of the machine room:	Electric stand-by heater, plus a diesel heater.
Structural parts:	Low temperature materials are used in construction of the boom, slewing column and pedestal adaptor.

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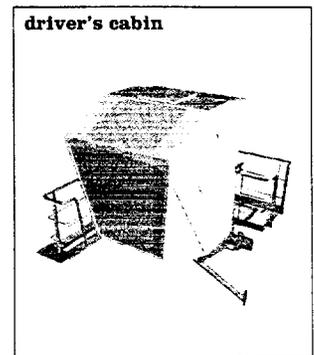
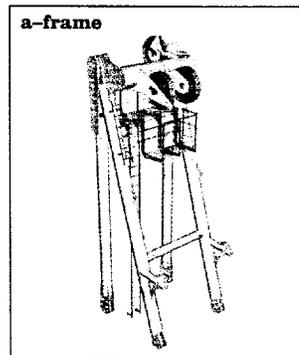
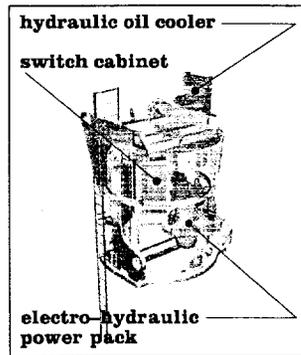
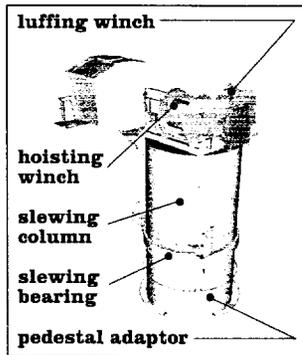
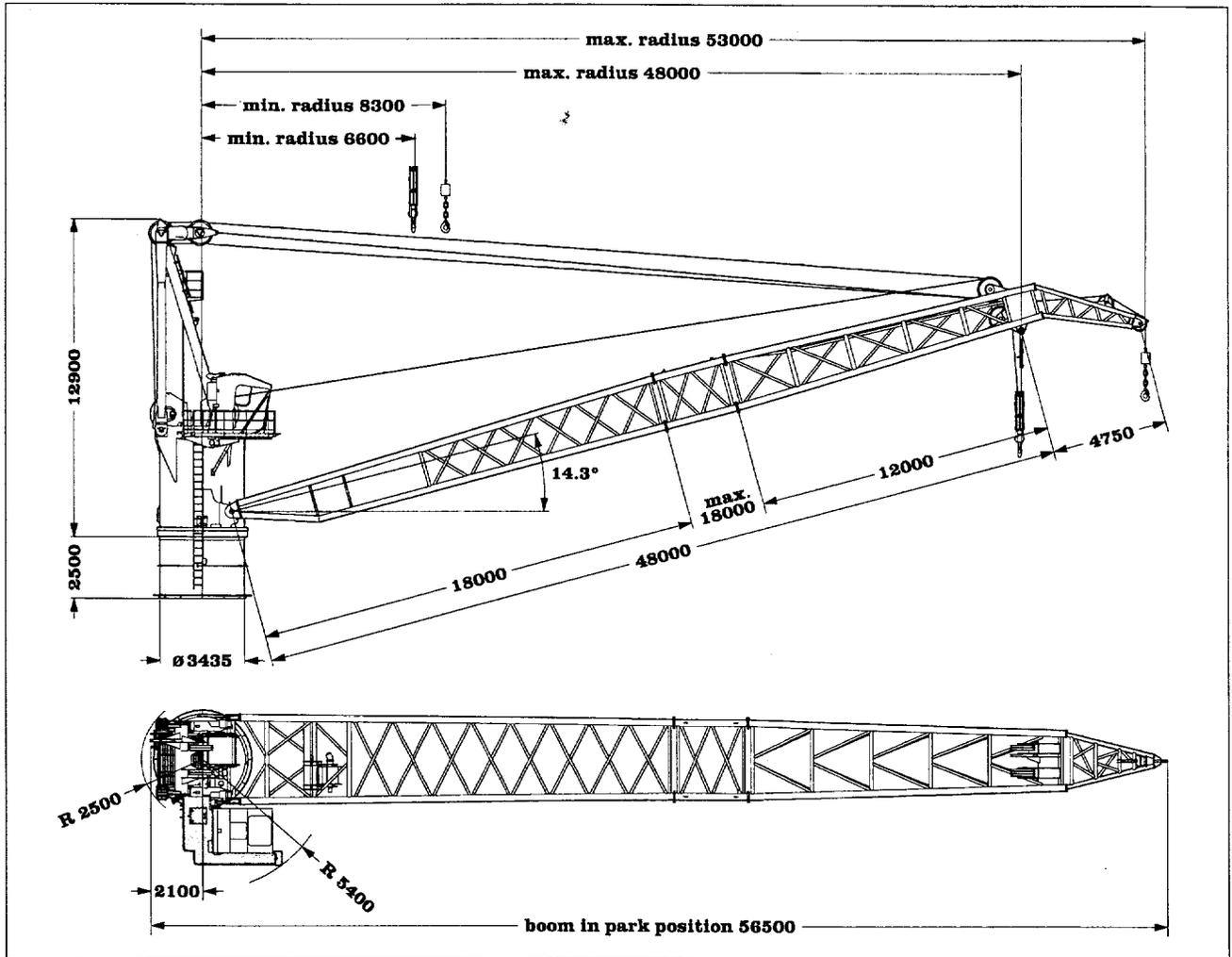
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# Liebherr Offshore Cranes

# CBO 3600

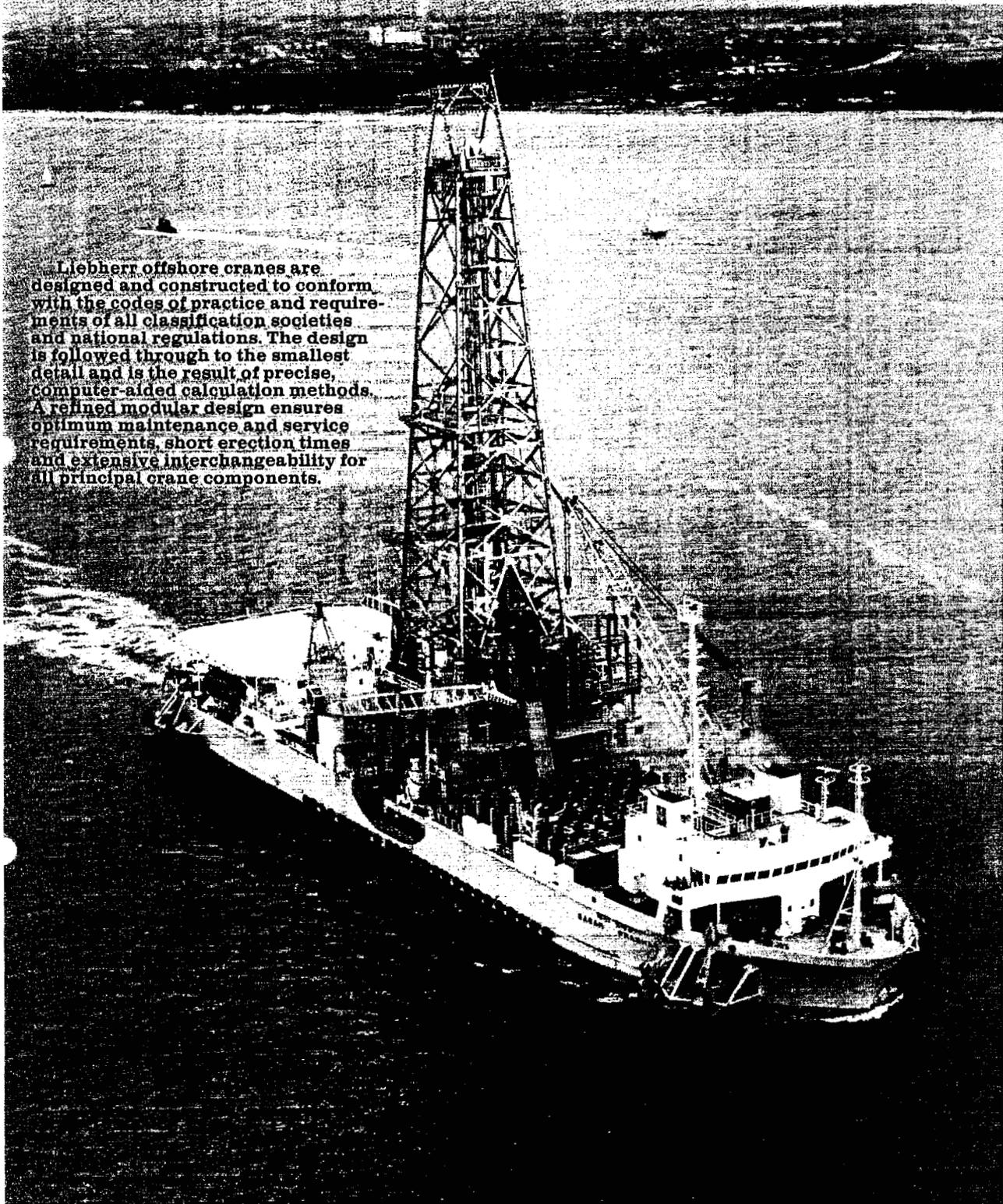
Litronic®

The synergy of wide experience, research and development for your success and benefit



# LIEBHERR

The name for cranes.



Liebherr offshore cranes are designed and constructed to conform with the codes of practice and requirements of all classification societies and national regulations. The design is followed through to the smallest detail and is the result of precise, computer-aided calculation methods. A refined modular design ensures optimum maintenance and service requirements, short erection times and extensive interchangeability for all principal crane components.

**The right crane for every task.**

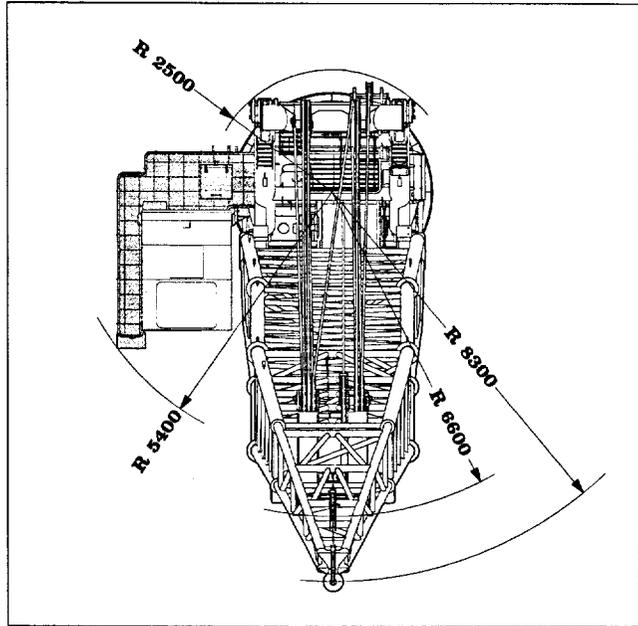
# Liebherr Offshore Cranes, Type CBO 3600 Litronic

- high performance
- high reliability
- low operational cost
- high quality standard (EN ISO 9001)
- worldwide service and spare parts network

Load diagram (acc. DNV including vessel motions)

Radius (m)	Main hoist significant wave height (m)				
	0.0 m (to)	1.0 m (to)	2.0 m (to)	3.0 m (to)	2.1 m (to)
6.6	80.0	47.3	27.6	17.7	11.5
10.0	78.0	44.5	26.4	17.3	11.3
15.0	72.0	40.9	24.8	16.8	10.9
20.0	62.0	37.8	23.1	16.2	10.4
22.0	56.0	36.6	22.3	15.9	10.2
25.0	51.1	33.1	19.8	14.2	9.9
30.0	42.5	25.9	14.8	10.4	7.1
35.0	36.1	20.4	11.2	7.8	5.1
40.0	31.1	16.7	8.7	6.0	3.7
45.0	27.4	14.3	5.1	5.1	3.1
48.0	25.9	14.0	5.0	5.0	3.0
Hoist rope-reveing	4-fall	4-fall	4-fall	4-fall	4-fall

Radii CBO 3600

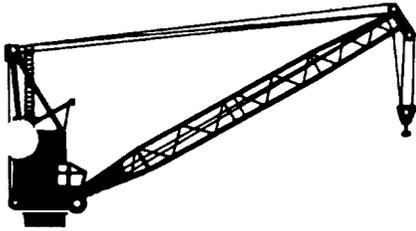


## Technical data

Capacities	main hoist	4-fall operation	80 metric tons
	whip hoist	1-fall operation	10 metric tons
Working speeds	main hoist	hoisting / lowering	0 - 13.5 m/min with 80 metric tons 0 - 22.0 m/min with empty hook
	whip hoist	hoisting / lowering	0 - 80.0 m/min with 10 metric tons 0 - 100.0 m/min with empty hook
	slewing	360° unlimited and unrestricted	0 - 0.6 rpm with full load and even keel 0 - 0.4 rpm with full load and 5° inclination
	luffing	from max. to min. working radius	105 sec. with 20 metric tons 105 sec. with empty hook
Hoisting heights	main hoist	below boom pivot point at min. radius	50 m
	whip hoist	below boom pivot point at min. radius	100 m
Electrical Power	main supply	electric motor	440 V, AC, 60 Hz, 3 ph - 345 kW
	aux. supply	lighting, heating, ventilation	220 V, AC, 60 Hz, 2 ph - 10 kW
	emergency supply	aircraft warning lights	220 V, AC, 60 Hz, 1 ph - 0.1 kW
Pedestal adapter		cylindrical	Ø 3435
Weight	total crane	excluding pedestal adapter	approx. 112 t

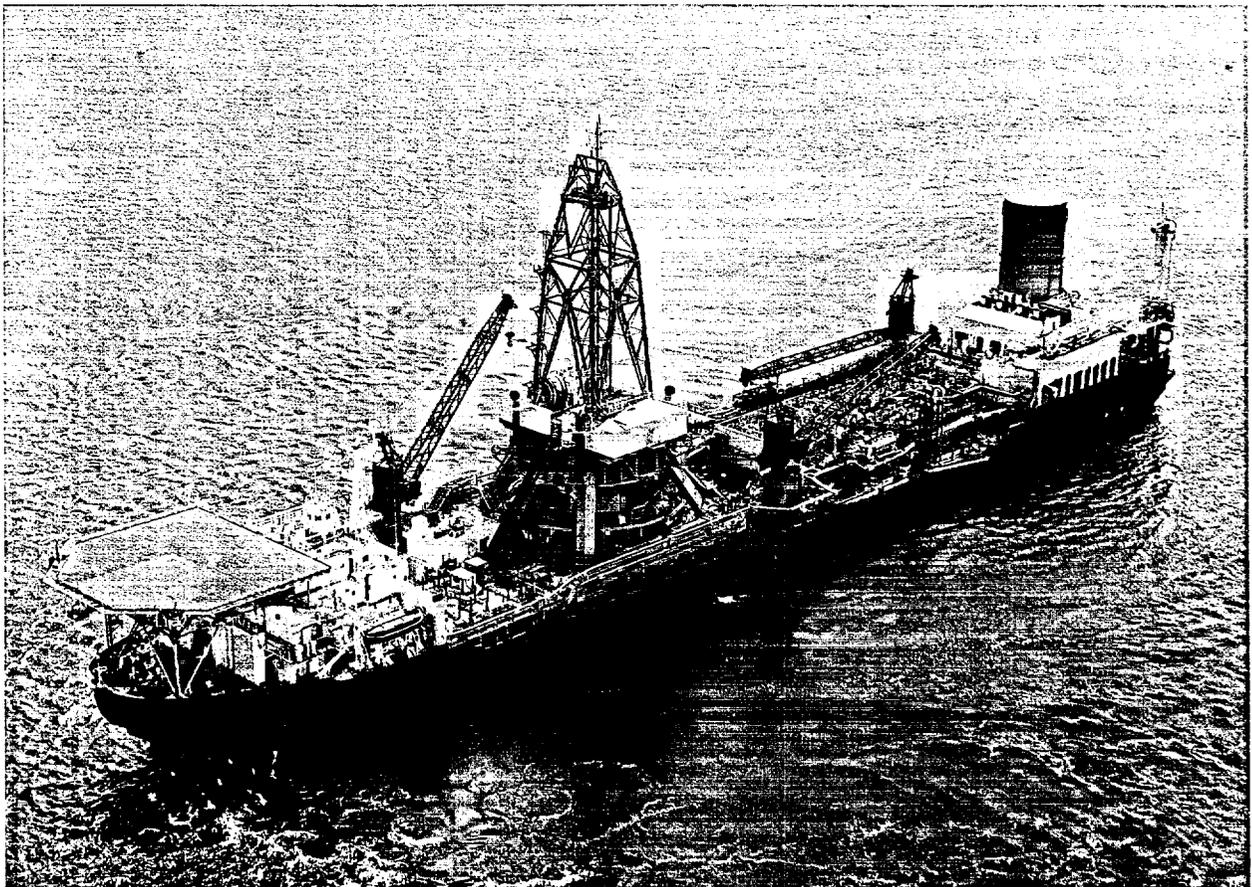
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Presented by:



# Work Report

## **LIEBHERR Offshore Cranes Type BOS 30/950 EX and BOS 30 (40)/950 EX (with special lift)**



PETROJARL I, the world's first deep water oil production and testing system, was built at the NKK Tsurumi works and delivered to the Norwegian owners consortium K/S Petrojarl A/S. Special new solutions and pumping methods are required when drilling for oil at increasing depths. The "PTS", designed for drilling and testing work, means that oilfields can be opened up and production started extremely rapidly. All operations can be carried out down to a depth of 650 metres. PETROJARL I can achieve a production capacity of up to 30.000 barrels of oil a day. Up to 192.000 barrels can be stored in its oil tanks. It goes without saying that only the latest in load handling equipment can satisfy its operators' material movement requirements. As the crane supplier, Liebherr has made a considerable contribution towards ensuring that a system of such special nature can function without any hitches. These offshore pedestal cranes were manufactured at Liebherr Japan Co. Ltd., a 50:50 joint venture between Liebherr and NKK.

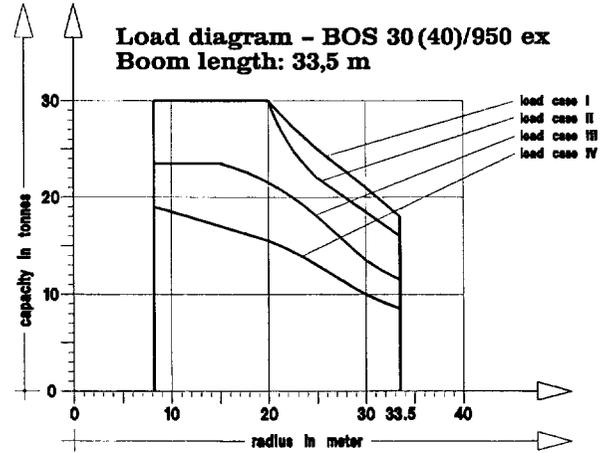
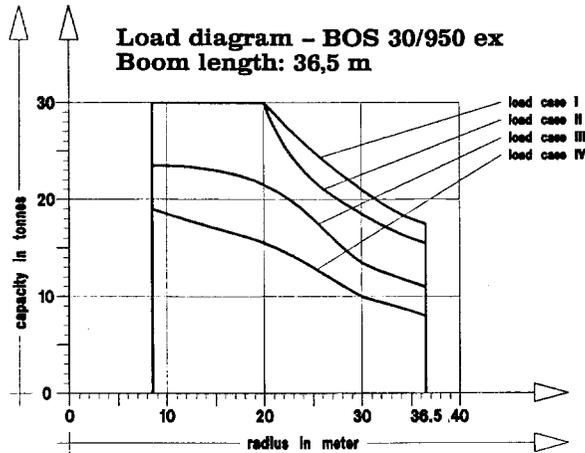
# LIEBHERR

How to build Cranes.

## General description

PETROJARL I is equipped with two Liebherr electric-hydraulic driven, explosion-proof offshore cranes of type BOS 30/950 ex and one BOS 30 (40)/950 ex. The cranes are specially designed and constructed for load handling at ambient temperatures of  $-25^{\circ}\text{C}$  up to  $+45^{\circ}\text{C}$ . One crane is delivered for safe operation in a Zone I, two cranes in a Zone II hazardous area, gas group IIA and IIB. A swell compensating system of constant tension type "CT", developed by Liebherr, which has proven satisfactory in a wide range of applications worldwide, is installed for difficult operation in heavy or deep sea. The key features in the successful concept of these cranes are high quality, advanced design, operating reliability and ease of maintenance.

## Technical data



Special lift mode: for handling of flexible riser reels  
 8,2 m - 15,5 m radius with 40,0 metric tons (supply boat lifts)  
 8,2 m - 18,0 m radius with 40,0 metric tons (on-board lifts)

## Definition

	Load case I platform lifts	Load case II	Load case III supply boat lifts	Load case IV
Sign. wave height H/3	-	0,5 m	2,0 m	4,0 m
Wind speed	25 m/sec.	25 m/sec.	25 m/sec.	25 m/sec.
Crane inclination	5°	5°	5°	5°
Offlead/sidelead	-	5°/2°	7°/3°	8°/4°

Max. lifting height: 30 m

### WORKING SPEEDS

(Automatic power output regulation in hoisting-, slewing- and luffing gear; infinitely variable speed control.)

**Hoisting:**

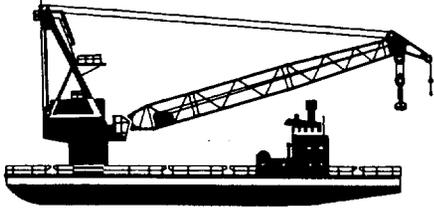
- 1-fall operation 0 - 100,0 m/min with empty hook
- 0 - 80,0 m/min with 4,0 metric tons
- 0 - 33,0 m/min with 14,0 metric tons
- 2-fall operation 0 - 50,0 m/min with empty hook
- 0 - 40,0 m/min with 10,0 metric tons
- 0 - 16,5 m/min with 30,0 metric tons

**Special lift:**  
 3-fall operation 0 - 12,0 m/min with 40,0 metric tons

**Slewing:**  
 0 - 0,8 rpm at even keel  
 0 - 0,4 rpm at 5° inclination

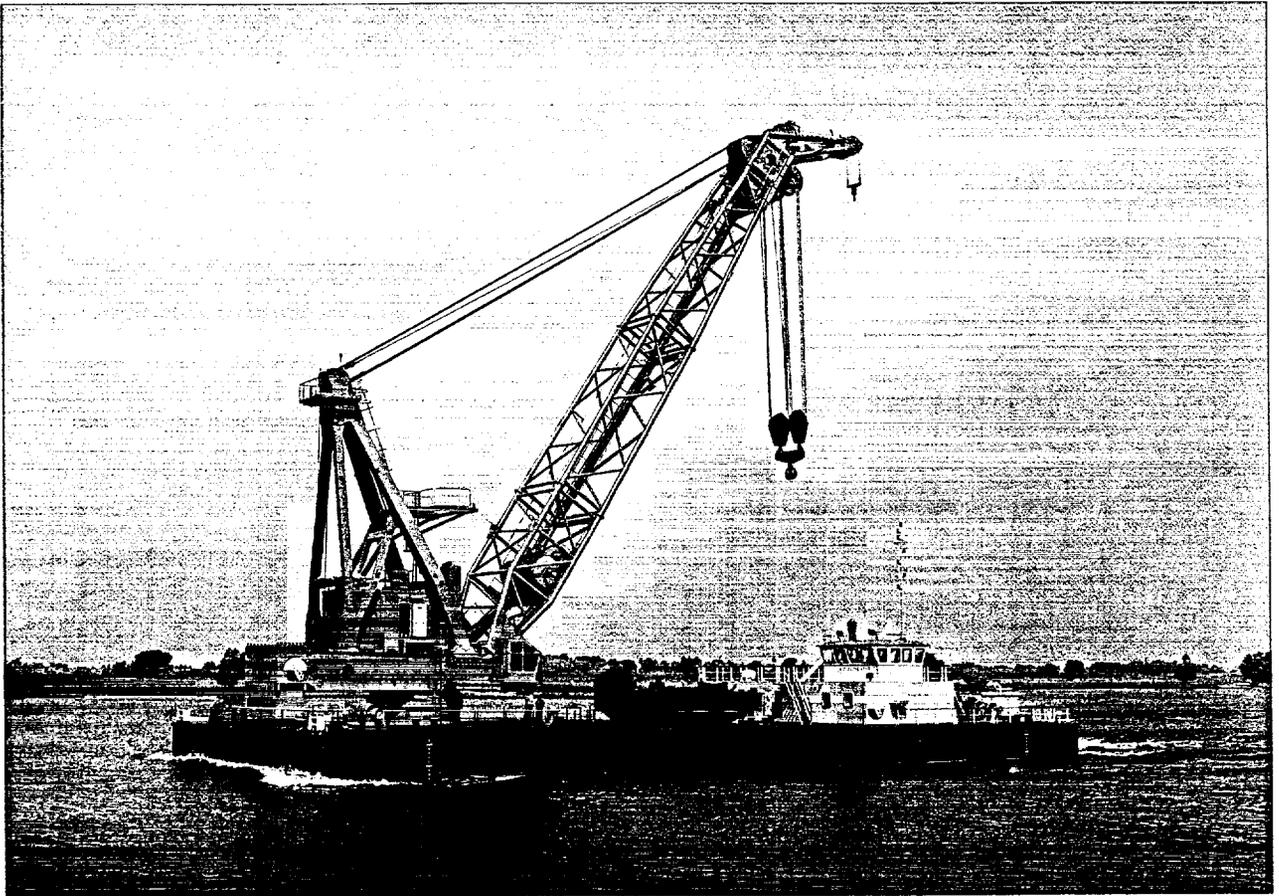
**Luffing:**  
 70 sec. from max. to min. radius with empty hook  
 180 sec. from max. to min. radius with full load

**Total weight per crane:** approx. 70,0 metric tons



# Work Report

## LIEBHERR Floating Offshore Crane Type FC 200/4800 D



Aided by outstanding up-to-date technology Damen Shipyards of the Netherlands designed and built the 200-tonne floating crane barge "ILLIZI" in the very short period of only eight months. Handed over to the Algerian owners Sonatram, the "ILLIZI" will be used for construction of new jetties and breakwaters with 120-to concrete blocks in sheltered Algerian waters and harbours. The barge meets the requirements of Bureau Veritas for operation in Mediterranean waters and is 50.5 m in length and 22 m wide. The most important features of the barge include the floating offshore crane of type FC 200/4800 D which is more than a match for the various tasks the "ILLIZI" has to perform. The success of this crane is not only based on its extremely solid construction and great availability but especially on its high economy and efficiency.

# LIEBHERR

How to build Cranes.

## Technical description

The floating offshore crane of A-frame design is driven diesel-hydraulically and has a combined electrical and electronic control system. Only proven materials and rigorously tested parts are used for fabrication. The crane has been designed to operate in seastate 2 conditions. It is equipped with 200 t/120 t lifting beams as well as various attachments for handling the 120 t concrete blocks, like spreader and a four-rope grab system including orange peel grab, stone grab and twin grabs. For grab operation the main and auxiliary hoist winches are used in tandem. The crane's counterweight of about 200 tons helps to keep the floating structure's angle of heel to a minimum with full grab and at max. radius. Great importance has been placed on the provision of adequate safety features, thus the crane is equipped with load measurement and control systems to ensure safe operation under all working conditions. Variable speed integrators enable positive, total control over hoisting and power controlled lowering operations with stepless acceleration and braking.

## Technical data

Load capacity:

main hoist:  
200 metric tons at 14 m outreach  
100 metric tons at 30 m outreach  
75 metric tons at 38 m outreach

auxiliary hoist:  
15 metric tons at 45 m outreach

Lifting height:

main hoist: 65 m (30 m below water level)  
aux. hoist: 70 m (30 m below water level)

Max. radius/min. radius:

main hoist: 38.0 m/10.6 m  
aux. hoist: 45.0 m/14.7 m

### WORKING SPEEDS

(Automatic power output regulation in hoisting- and slewing gear; infinitely variable speed control.)

Hoisting:

main hoist:  
0 - 8.5 m/min with 0 - 25 metric tons  
0 - 3.5 m/min with 0 - 200 metric tons

auxiliary hoist:  
0 - 70.0 m/min with 0 - 7 metric tons  
0 - 30.0 m/min with 0 - 15 metric tons

Slewing:

0 - 0.25 rpm with 200 metric tons  
0 - 0.08 rpm with 20 metric tons  
- with counterweight and at 5° heel/trim

Slewing range:

unlimited

Luffing:

7 min. from max. to min. radius

Grab operation:

Instead of an auxiliary hoisting winch, a twin rope hoisting- and closing winch is installed.  
Capacity: 20 metric tons (grab, load)  
Hoisting speed: 0 - 70 m/min with 0 - 6 metric tons  
0 - 30 m/min with 0 - 20 metric tons

Weight:

approx. 420 tons (incl. 200 t counterweight)