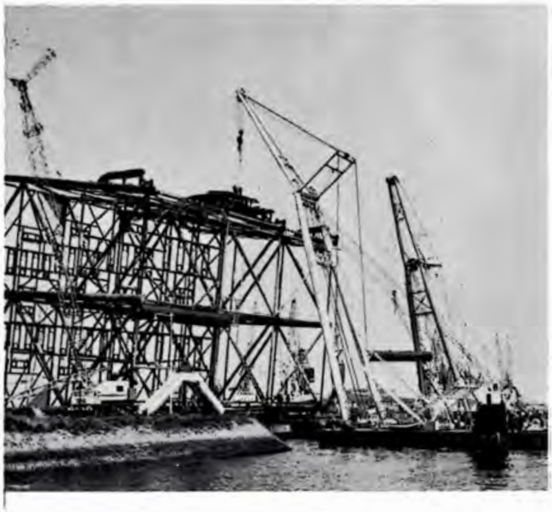
No. 7

I.H.C. HOLLAND

# OIL REPORT

I.H.C. HOLLAND - OFFSHORE DIVISION - P.O. BOX 11 - SCHIEDAM

# TWO GIANT STRUCTURAL STEEL OBJECTS DELIVERED IN ONE WEEK



Early in May two giant steel structures were shipped from the Schiedam yard of I.H.C. Holland's Offshore Division. The first of these formed part of a Field Terminal Platform built for the Atlantic Oil Producing Company and destined for the Britisch sector of the North Sea exploration area. The platform consists of the following sections:

(a) anchorage and supporting structure (supplied earlier by I.H.C. Holland)
(b) cellar and main decks (shipped recently).

Together, the cellar and main decks weighed 1,105 tons. They were shipped in four sections, viz.

| | |
|---|---|
| No. 1 deck section (northern) 16 x 20 x 17 m (52'6" x 65'7" x 55'9") | 400 tons |
| No. 2 deck section (southern) 16 x 14 x 19 m (52'6" x 45'11" x 62'4") | 400 tons |
| No. 3 deck section (centre) 11 x 17 m (36'1" x 55'9") | 100 tons |
| Accommodation block | 130 tons |
| Equipment | 75 tons |

In the same week an even larger piece of offshore equipment left Schiedam. This was a well jacket 43 m (141'1") high and measuring 50 x 45 m (164'0" x 147'8") at the base. Weighing 900 tons, it was hoisted on to a pontoon in a single operation.

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SBM
SINGLE BUOY MOORINGS





# NEW DEVELOPMENTS

Since our last issue, the task of imparting a new structure to the I.H.C. Holland Group has been completed. This has resulted in the creation of three Divisions which in principle operate independently. These are the Dredger, Offshore, and Mining and Transport Divisions. The organizational plan of the Offshore Division is now consolidated (see page 5)

Against the background of these changes, it is our earnest hope that our Oil Report will become an even more important link between us.

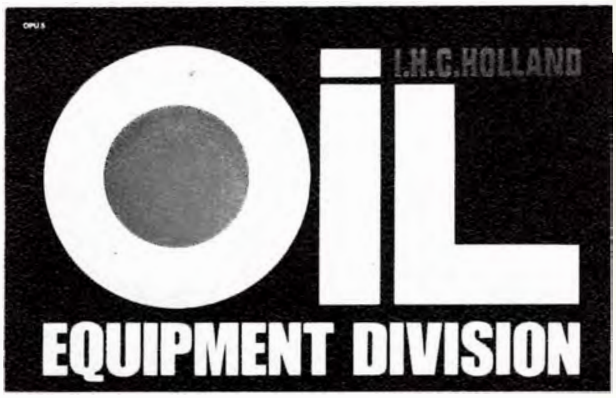
I.H.C. Holland has an extensive Research and Development organization, the work of which will feature regularly in this publication. High on the list of the research projects carried out are a number concerned with jack-up rigs. In collaboration with, among others, the Netherlands Ship Model Basin in Wageningen, the Mineral Technological Institute (the Group's own Laboratory) and the Netherlands Hydraulics Laboratory, both in Delft and the National Aeronautics and Space Laboratory in Amsterdam, the following projects have been undertaken:

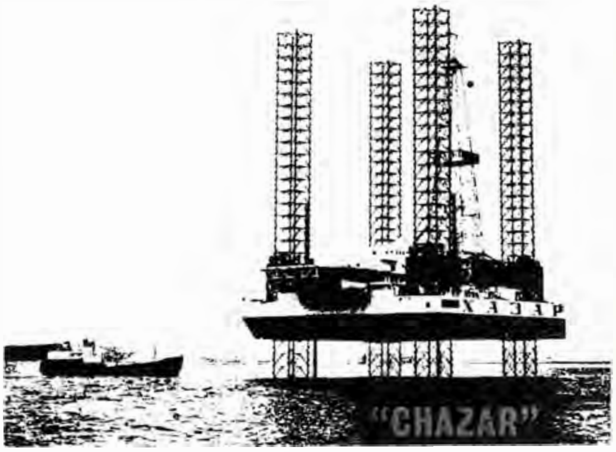
— Tests to determine hydrodynamic coefficients ($C_d$ and $C_m$).
  The programme of tests carried out by the Netherlands Ship Model Basin mainly concerned three-dimensional, open framework legs and hollow square-section legs, all with protruding toothed racks.
— Hydraulics laboratory investigations to obtain insight into impact loads caused by breakers on the legs of crane platforms.
— Windtunnel tests to establish the $C_d$ and $C_m$ values of toothed racks (N.A.S.L., Amsterdam).
— Tests to determine the forces exerted on the legs of self-elevating structures by regular and irregular waves (N.S.M.B.).
— A series of tests involving leg cans of differing shapes was conducted with the aim of establishing the optimum form. The following characteristics were measured:
  — the amount of scouring in the immediate vicinity of the leg can
  — the relationship between leg can form and rate of penetration of the leg into the sea bed
  — the increase in penetration by the leg under dynamic load in relation to the leg can shape
  — the effect of scouring on the increase in penetration of the leg under dynamic load.

Allied to these tests, I.H.C. Holland has developed computer programmes for:
— the calculation of wave forces
— strength calculations for open framework legs
— the measurement of stress in all elements of the pontoon structure by the finite element method.

Although of a summary nature, this list provides a sound indication of the depth and extent of the research conducted by I.H.C. Holland in order to obtain the data vital to the successful design and operation of equipment which it manufactures. Typical of the fruits of such research is the offshore rig *Sedneth II* which, as is widely known, is one of very few able to operate under the most exacting conditions. This rig has worked continuously in the most difficult locations in the North Sea. The rig *Chazar*, built for Soviet account, is also of revolutionary design. Delivered in three sections, and towed from Rotterdam to the Caspian Sea via Leningrad, this rig has operated for a considerable period without a single enforced shutdown. Brochure OPU 5, copies of which are available on request, contains a full description of the *Chazar*.

Study, investigation and testing have produced many designs which are ahead of their time. With its knowledge and experience, the Offshore Division of I.H.C.

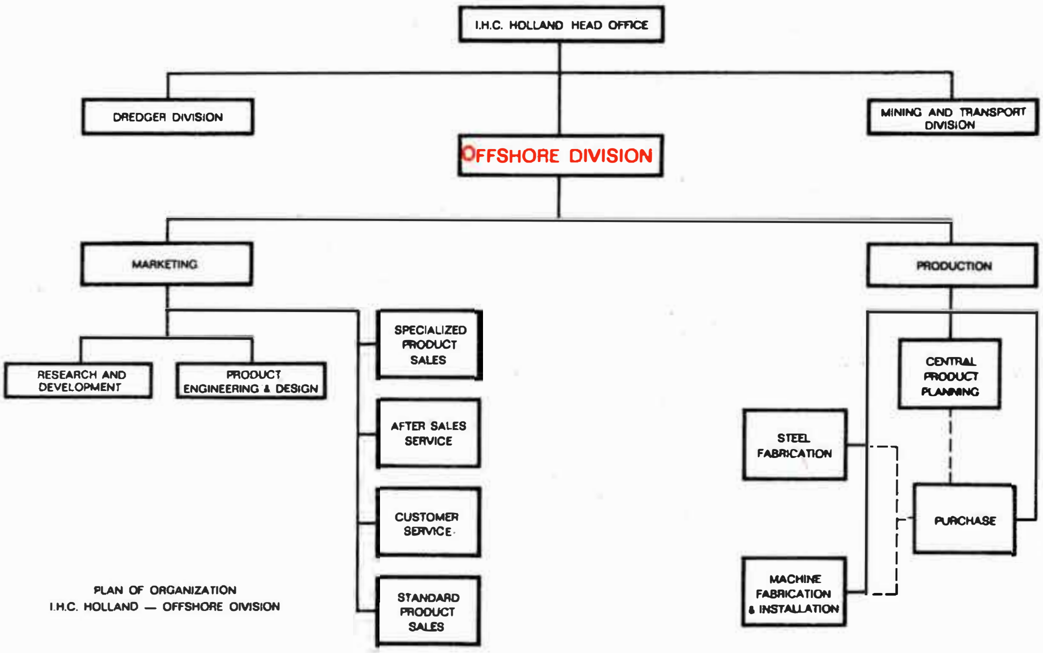



Holland is able — and qualified — to assist in solving the many and diverse problems which arise in the offshore industry.

Oil Report is an excellent medium for open discussion of problems of this nature. To start the ball rolling, as it were, our Research & Development group has reacted to a publication by a firm in the Offshore industry; the reaction, entitled "A unique compensating device", appears on page 6.

We shall be interested to learn your reaction on this subject, or indeed on any offshore matter. Our columns are at your disposal!



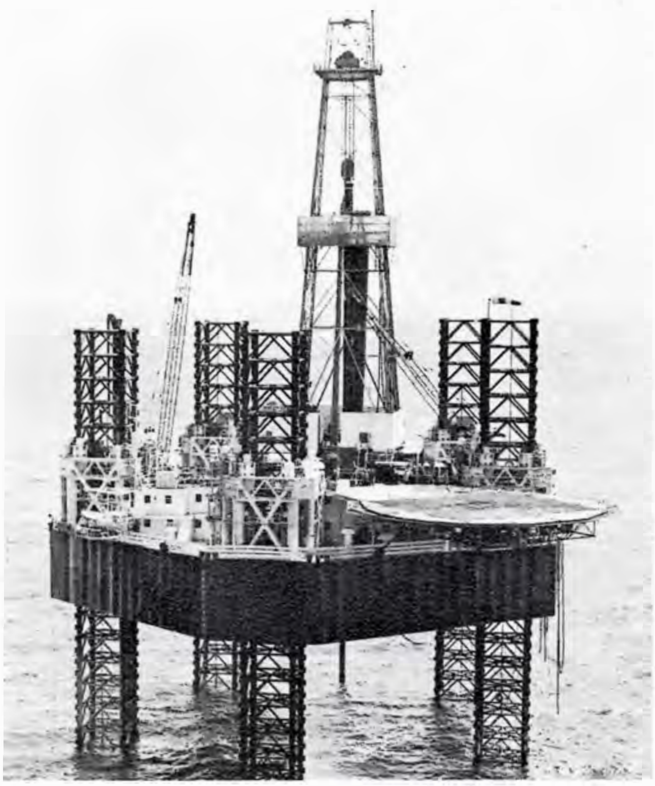

PLAN OF ORGANIZATION
I.H.C. HOLLAND — OFFSHORE DIVISION

# 'SEDNETH II' on location

The September, 1968, issue of Oil Report contained a description of the 5-spud jack-up rig *Sedneth II*.

Since April, 23rd of this year the rig has been drilling for the Nederlandse Aardolie Maatschappij (N.A.M.) in Block L2 in the Dutch sector of the North Sea. The position of the location is 53° 51′ N., 4° 34′ 31″ E.

The accompanying aerial photograph gives a good general impression of this rig. While resembling the *Ile de France* in basic concept, the *Sedneth II* differs in one visible respect: whereas the *Ile de France* is equipped with a crane travelling on a circular track, the *Sedneth II* has two stationary slewing cranes.



**ASK FOR PUBLICATION OPU 4 'SEDNETH II'**

# UNICODE, a unique compensating device

**By John Sjouke, M. Sc., Mech, Eng.
Head of the Research and
Development Department of
I.H.C. Holland Offshore Division.**

There has long been a need for a device which will allow the heaving motions of buoyant drilling rigs to be isolated from the drill strings during submarine drilling operations. The bumper subs at present in use have serious drawbacks from the point of view of heave compensation.
A disadvantage of taking up the relative movement at or near the lower extremity of the drill string is that if a blow-out preventer has to be used, the drill string will be arrested with respect to the sea floor while its upper extremity remains connected to the moving pontoon or vessel.
The Research & Development group of our Offshore Division has produced an interesting design (UNICODE) for a compensating device for insertion between the crown block and the derrick. Although primarily intended for drilling operations, UNICODE has much wider applications.

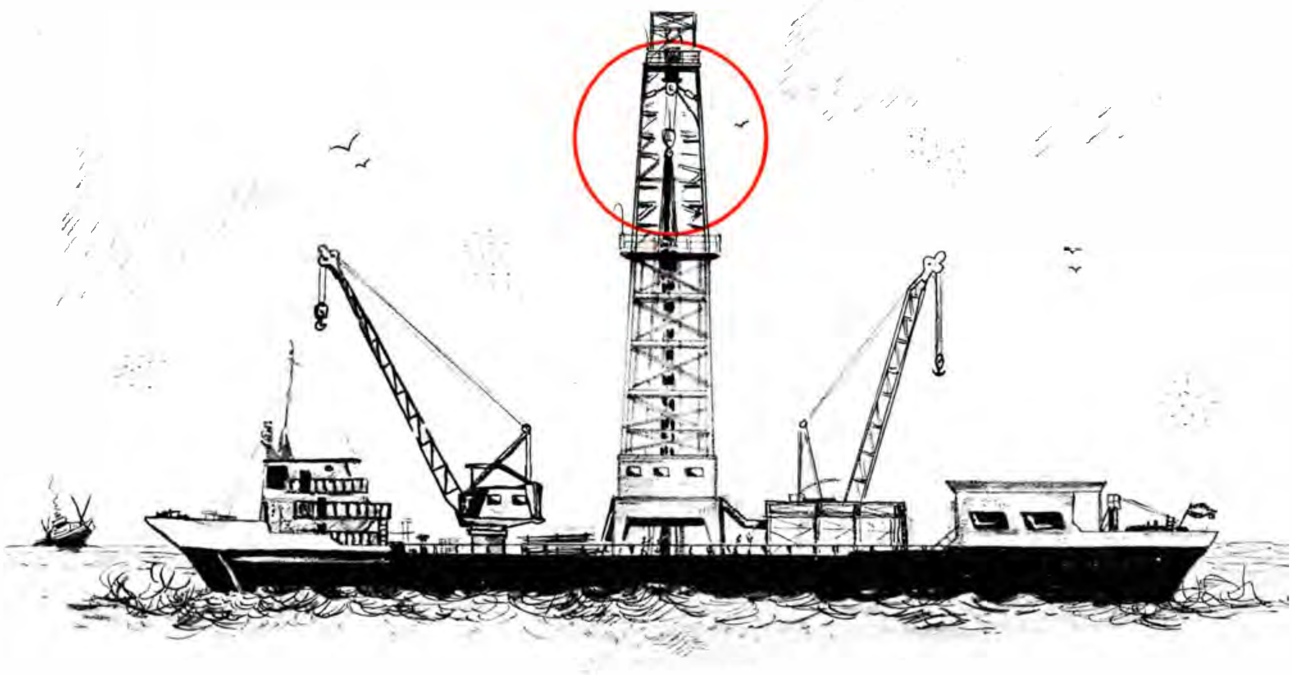
**Basic principle**
The retention of control over the bit loading was among the basic features of the design. This implied that a high degree of accuracy was required.
The bit load will generally be of the order of 5-10% of the compensated load, and thus the accuracy of the device was required to be of the order of 3%, and preferably less, in order to afford satisfactory bit load control.
In the commonly used single compensating systems consisting of a hydraulic cylinder and an accumulator which acts as a spring, it is necessary to employ an air volume many times greater than the plunger stroke volume in order to achieve a satisfactory degree of accuracy.
For the volume of air V present in an accumulator where the pressure P is present, it is held that P.V = constant (isothermic process).
By approximation it can be shown that

$$\frac{\Delta P}{P_o} = \frac{\Delta V}{V_o}$$

where

$P_o$ = mean pressure
$V_o$ = mean volume
$\Delta P$ = minor pressure variation
$\Delta V$ = minor volume variation = stroke volume

Thus we see that, for example, at a permitted variation of 10% in pressure $\frac{\Delta P}{P_o}$ over the whole stroke, an air volume $V_o$ equal to 10 x the stroke volume $\Delta V$ is required.
Where **large stroke volumes** and/or **small permitted pressure variations** are involved, very large and costly accumulators are demanded.
In this type of compensating system, the force exerted is of course proportional to the pressure in the accumulator. This fact is illustrated in Fig. 2.
In spite of the relatively small air volume $V_o$ and the large stroke volume $\Delta V$, the permitted variation in force is limited to $\Delta K$. Thus, in fact, section A B C of the curve P.V = constant must become $A_1$ B $C_1$. This is achieved by the variable auxiliary forces $K_1$ and $K_2$.
In the midway position these forces should be zero.
In the I.H.C. Holland design, the auxiliary force is obtained with the aid of two pivot-mounted cylinders. In the midway position, these lie at right angles to the main cylinder. They are connected to the accumulator. The arrangement is shown schematically in Fig. 3. Depending upon the ratio of the piston areas a and A, and the ratio of $\frac{a.b}{V_o}$, in which b is the distance between the pivot point of the auxiliary cylinder and the centreline of the main cylinder, and $V_o$, the volume of air in the accumulator in the midway position, the pattern of the force exerted through angle $\varphi$, i.e. the stroke Y, can be calculated with the aid of the following equation



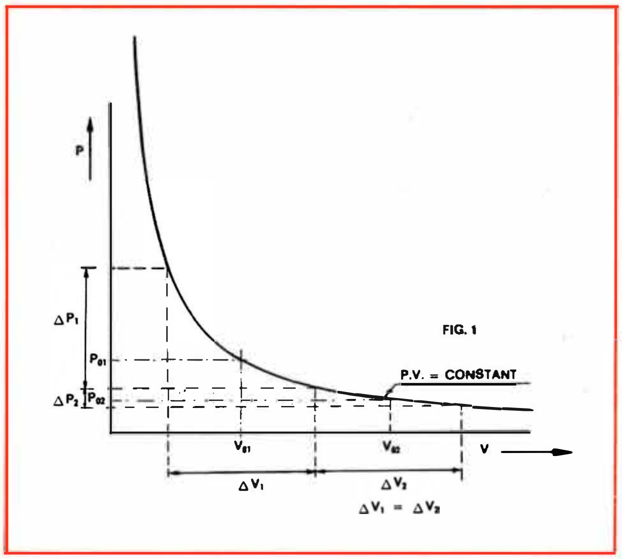



FIG. 1

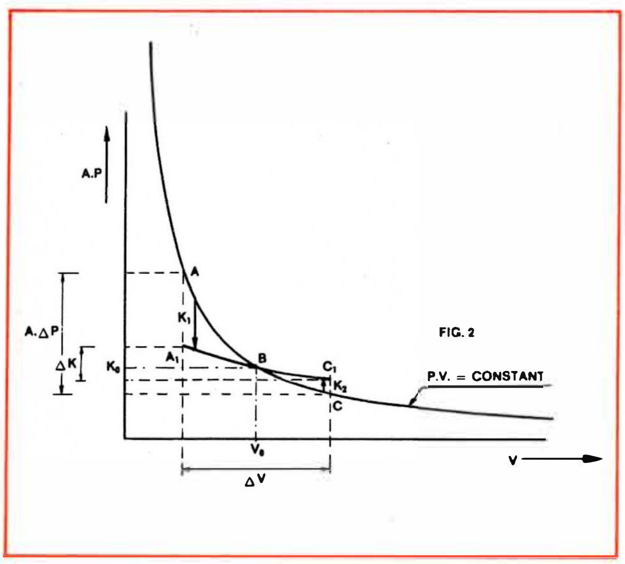



FIG. 2

$$\frac{K}{K_0} = \frac{1 + 2\,a/A \text{ sine } \varphi}{1 + \dfrac{Ab}{V_0}\tan\varphi + 2\dfrac{ab}{V_0}\left\{\dfrac{1}{\cos\varphi} - 1\right\}}$$

Depending upon the choice of value for a/A and $ab/V_0$ and the operating range $\varphi$, almost any desired curve for K can be obtained.
Some examples are given in Fig. 4.

Moreover, at a given stroke, and irrespective of the value of $Ab/V_0$, an optimum value can be found for a/A at which the variation in K will be minimal.
In order to provide a comparison with a single compensating system, let us assume that, in the extreme positions, $\varphi_m = 45°$, so that $Y_m = b$.
We see that:

1. Where $V_0 = 2$ x stroke volume
   the optimum ratio a/A = 0.33
   The accuracy is thus $\Delta K/K_0 = 5\frac{1}{2}\%$.
   With a single compensating system a volume of air $V_0'$ equal to 18 times the stroke volume would be required;

2. Where $V_0 = 3$ x stroke volume
   the optimum ratio a/A = 0.22
   The accuracy is thus $\Delta K/K_0 = 3\frac{1}{2}\%$
   With a single compensating system a volume of air $V_0'$ equal to 29 times the stroke volume would be required;

3. Where $V_0 = 4$ x stroke volume
   the optimum ratio a/A = 0.165
   The accuracy is thus $\Delta K/K_0 = 2.3\%$
   With a single compensating system a volume of air $V_0'$ equal to 44 times the stroke volume would be required.

In these examples, the I.H.C. Holland compensating device reduces the accumulator capacity by factors of 9, 9.7 and 11 respectively.

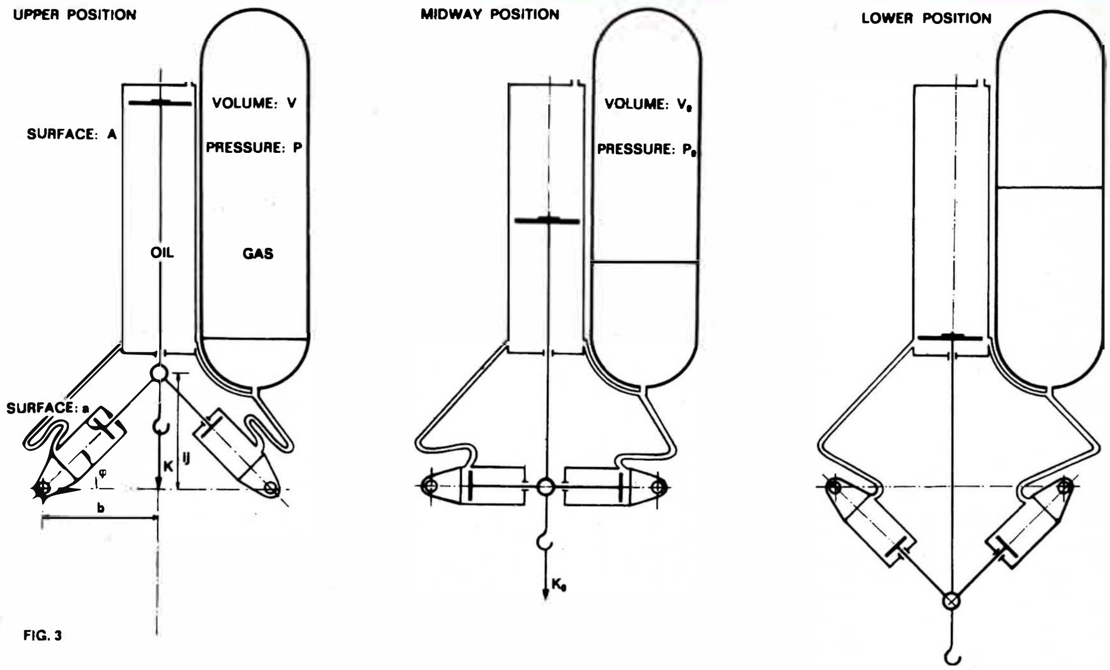



FIG. 3

A further improvement in the values shown above for $\Delta K/K_o$ can be obtained if the optimum operating range is chosen, but if $\varphi_m$ is not held to 45° or thereabouts. This improvement stems from the asymmetrical character of the $\Delta K/K_o$ curves.

Varying the distance b and the ratio a/A in the system shown in Fig. 3, and connecting the auxiliary cylinders to a suitable, separate accumulator (if necessary at a mean pressure other than $P_o$), enables a wide range of spring constants to be obtained. This opens up a wide field of applications.

In addition, this device can readily be converted from a force regulating mechanism to a displacement regulating mechanism by attaching the crown block to an object on the sea bed by means of a light cable. As long as the weight of the object is greater than the limits of regulation of the compensation device, the crown block will remain at a fixed distance from the bed.

**Construction**

In compiling the graph in Fig. 4, friction was ignored; for the purpose of comparison of the device with a single compensating system this factor is of acceptable proportions. In practice, however, friction adversely affects the accuracy of both systems.

In order to assess the effect of friction and minimize its effects, the Research & Development team constructed a test rig for the evaluation of various types of ram seal.

In order to eliminate excess ton-mileage of the main hoisting cables, guide pulleys and links are incorporated. The mounting of the device on the crown block requires that the height of the derrick be increased slightly and that the cross-braces be strengthened. The effective stroke is about ten feet.

**Advantages**

To obtain satisfactory bit life it is imperative that the applied bit loading should not exceed the permitted limit for any of the strata through which penetration is expected.

The device described here — patents for which have been applied for — provides for regulation of the bit loading simply by varying the mean pressure $P_o$.

UNICODE compensates the relative movement between the ship and the drill string with greater accuracy than is obtainable with a single-cylinder compensator.

An incidental advantage of the I.H.C. compensator is that, since variations in load can be adjusted by means of the gas pressure in the accumulator, the gas consumption of the device will be considerably lower than that of an installation with a single cylinder working between the same limits of regulation.

Particularly where high pressures and large stroke volumes are involved and yet accurate control is vital, the savings in time and money achieved will more than offset the cost of the additional cylinders and structural components.

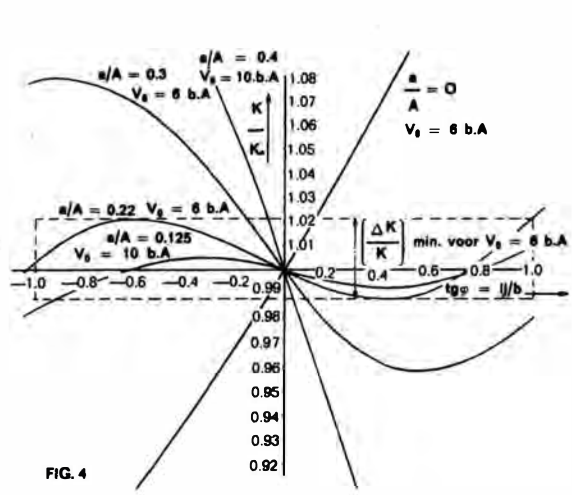



FIG. 4

# THE FIRST JAPAN-BUILT I.H.C. HOLLAND SELF-ELEVATING PLATFORM

A self-elevating platform now being built by Kawasaki Heavy Industries under licence from I.H.C. Holland, and destined for Offshore Equipments Ltd., is due for delivery at the end of October 1969.
An important feature of this relatively small sized platform for underwater civil engineering use is the auxiliary machinery arrangement in underdeck spaces. This affords increased working space on the deck. Although the platform is at present not equipped with all the machinery required for civil engineering purposes, additional units, such as a crawler with a hoisting capacity of 200 tons, can be fitted at any time.
The platform is equipped with a communication system. Equipment for underwater excavation, drilling, pipe-driving and harbour construction can be installed. The well-equipped accommodation consists of messroom, galley, washroom, etc.

## Principal dimensions

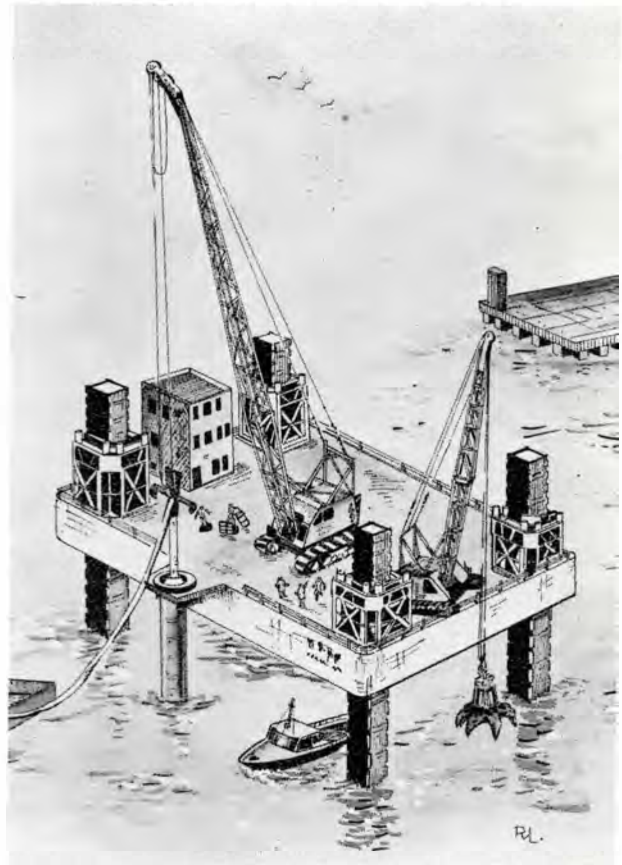
| | |
|---|---|
| Length | 42.00 m (138′) |
| Breadth | 24.00 m ( 79′) |
| Depth at side | 3.65 m ( 12′) |
| Depth at centre | 3.75 m ( 12′4″) |
| Weight as built | 1,865 tons |

Accommodation for 16 men.

## Design particulars

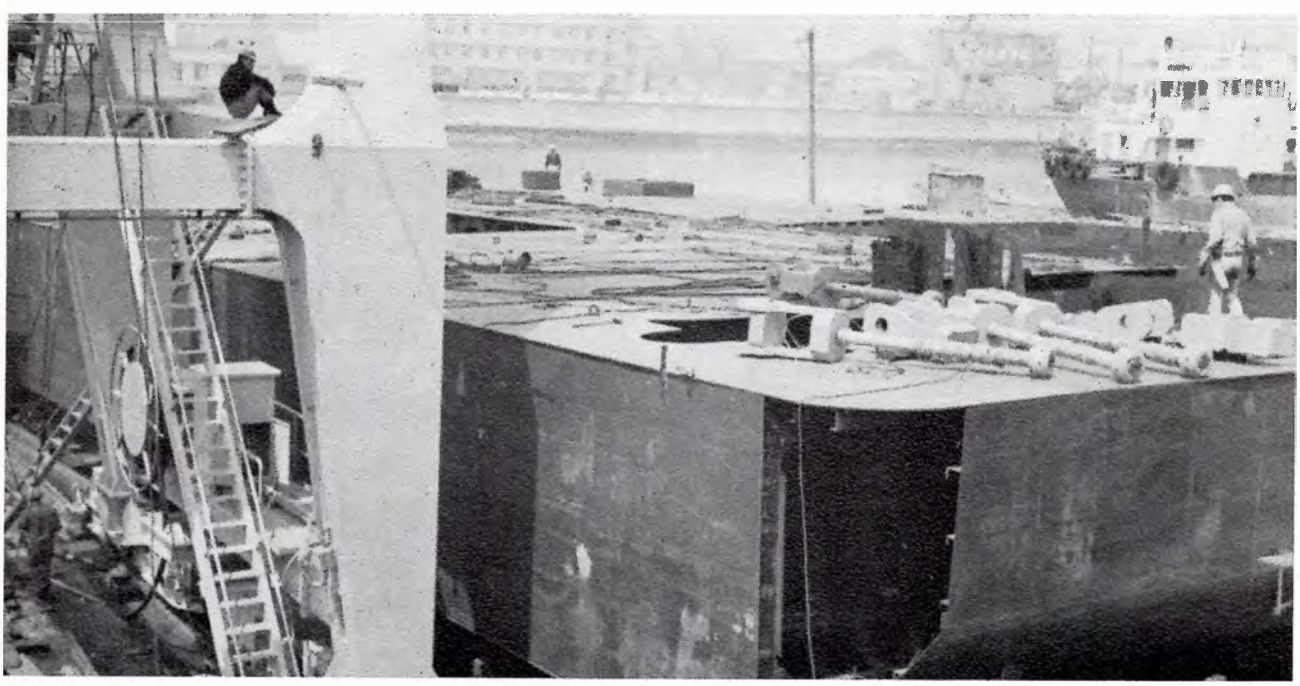
The platform is designed to operate in the following conditions:

| | |
|---|---|
| Wind velocity | 60 m/sec (200 ft/sec) |
| Current | 4.0 knots |
| Wave height | 5.5 m (18′) |
| Seawater temperature | 0-32° C |
| Loading capacity | |
| under tow | approx. 100 tons |
| in operation | approx. 400 tons |




Artist's impression of the platform.

The pontoon under construction at Kawasaki. It was launched on July 19, 1969.



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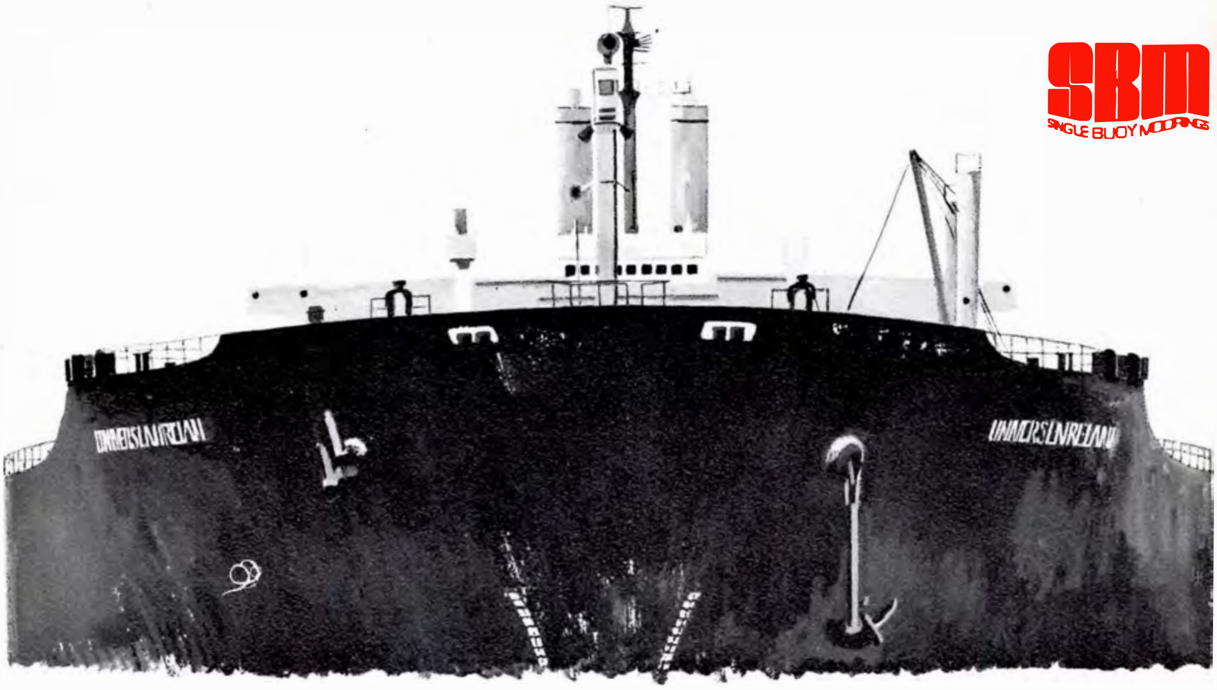
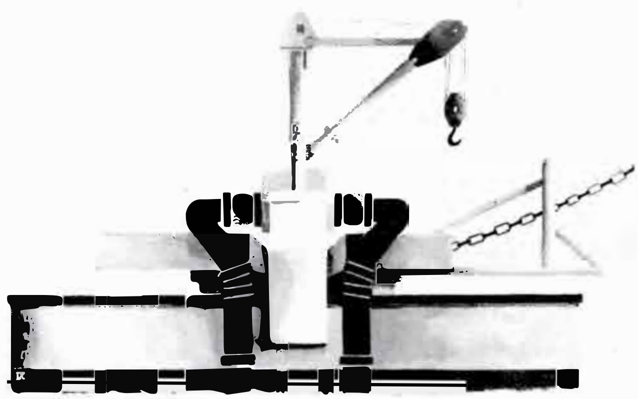


# the big boys are here



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S.B.M. Inc. offer a complete service based on the world's best Single Buoy Mooring System and embracing:

| | |
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| Preliminary phase: | bottom survey and feasibility survey |
| Turnkey project : | supply and installation of buoy and laying of pipeline to shore terminal |
| Management : | operation and management of system. |

Manufactured by I.H.C. Holland, these systems are products of research and experience, including model testing programmes on tankers of up to 1,000,000 tons.
They incorporate a revolutionary turntable giving smooth-as-silk turning action, and improved chain stoppers which reduce friction and minimize wear.

Let us quote for your requirements.

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# S.B.M. Inc., a new marketing company of the I.H.C. Holland Group

As larger and larger tankers came into service, larger and larger single buoy mooring systems were required to service them. Thanks to very advanced research, I.H.C. Holland was chosen as supplier for 19 of the 25 SBM systems constructed during and since the era of mammoth tankers dawned.
That research has continued, and our Offshore Division can look back on the successful completion of tests of systems suitable for vessels of 1,000,000 d.w.t.
To meet anticipated developments in this sector of the offshore industry, a new company, S.B.M. Inc. has been established with registered offices at Zug in Switzerland. S.B.M. Inc. will not only handle the marketing of single buoy mooring systems but will also undertake turnkey projects. The design and construction of these systems continues to be the responsibility of the Offshore Division.
S.B.M. Inc. offers a complete service embracing:

| | | |
|---|---|---|
| Preliminary phase | : | feasibility study and/or bottom survey |
| Turnkey project | : | design, supply and installation of buoy and pipeline to shore |
| Management | : | operation and maintenance of SBM terminals. |

Correspondence intended for S.B.M. Inc. should be addressed to P.O. Box 6185, Rotterdam, Holland.

SBM SINGLE BUOY MOORINGS

# Meet the president of S.B.M. Inc.

Born on 12the December, 1933 in Schiedam, Robert Smulders, M.Sc., Mech. Eng., attended a secondary school in Rotterdam and later studied at the Delft University of Technology, where he took a degree in mechanical engineering.

For two years of his stay at the university he was assistant to Professor Van Wijngaarden, Head of the Dredger Department.
After graduating from Delft he took a course in general economics at the University of Economics in Rotterdam.

Called up for military service, he underwent training at the Reserve Officers School. He left the service with the rank of first lieutenant, having worked in the Procurement. Department of the Dutch army, where his responsibilities covered, among other things, standardization of the artillery equipment used by the NATO powers.

On returning to civilian life in 1961, Robert Smulders joined Werf Gusto as a project engineer. During the first years in business he obtained practical experience in industry in Europe, the U.S.A. and the Far Eeast. Five years later he was appointed assistant director. Under his leadership, the further development of the single buoy mooring system was undertaken.

Starting from the original type, which was suitable for tankers of up to 35,000 d.w.t., systems were developed for vessels of 240,000 d.w.t. and plans laid for mammoth buoys for 300,000 and 500,000-tonners.

Looking even further ahead, models of 1,000,000 d.w.t. tankers have been tested at the Netherlands Ship Model Basin at Wageningen for the purpose of obtaining data concerning the mooring stresses and other factors of importance in the design of future single buoy systems.

On 1st April, 1969, Robert Smulders was appointed President of S.B.M. Inc.

# I.H.C. Holland present at major exhibitions

The I.H.C. Holland stands at the Offshore Exploration Exhibition in San Diego, Calif., and the International Chemical and Petroleum Engineering Exhibition in London were very well attended. In particular, our Single Buoy Mooring systems and jack-up rigs attracted attention. Representatives of the Group were also present at the Offshore Technology Conference in Houston.

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1


1 The I.H.C. Holland stand at the I.C.A.P.E. in London.

2 Mr. P. C. Witte, Netherlands Minister Plenipotentiary, was among those who inspected the model of the inshore workover platform *Cowrie One*.

3 The I.H.C. Holland stand in San Diego. A model of the 5-spud jack-up rig *Ile de France* is visible in the foreground.

3