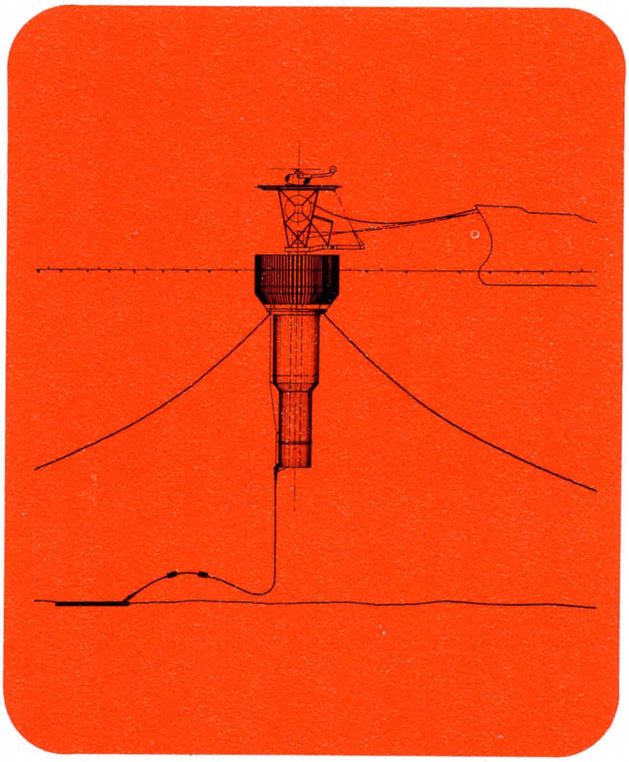
No. 18

Oil Report

IHC offshore division

NEW DEVELOPMENTS

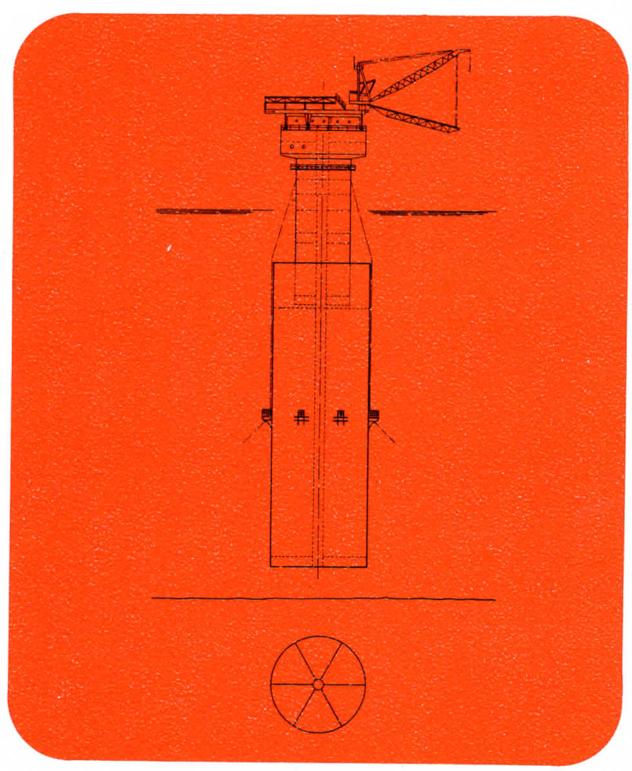


Exposed Location Single Buoy Moorings

Shell Internationale Petroleum Maatschappij B.V., have placed an order with IHC Holland for the construction of two new and revolutionary type offshore tanker loading terminals.
To make tanker loading in open seas a feasible and reliable operation the design of these Exposed Location Single Buoy Moorings (ELSBM) incorporates a semi-submersible columnstabilized structure to ensure minimum response to roll and heave
An important advantage gained from the improved behaviour is that it will substantially reduce the damage risk to the submarine hoses between the ELSBM and the pipeline manifold.
A total of eight anchor chains hold the facility on location over the seabed.
A superstructure mounted on top of the main body can rotate in a horizontal plane.
Offtaking tankers bow-moored to the superstructure can rotate through a full 360 degrees, enabling them to assume a position offering least resistance to the combined forces of wind, waves and current.
Crude is transferred via the ELSBM to the tanker by a hose string normally coiled on a reel located on the superstructure. During loading, the oil hose is partly unreeled and suspends freely from the reel to the tanker. The oil hose will be kept in equilibrium by means of a counterweight which can move in the central shaft of the substructure.
The first company to gain the benefit from the new design will be Shell U.K. Exploration and Production Ltd., who will install an ELSBM in the British North Sea.

Spar storage tanker loading terminal

A combined storage/loading unit has been developed jointly by Shell and IHC for use in deep water and rough conditions.
Shell U.K. Exploration and Production Limited has awarded a construction contract for this new type of floating storage and tanker loading facility to a joint venture formed by IHC Holland and Wilton-Fijenoord, member of the Rhine-Schelde-Verolme Group.
Shell U.K. Exploration and Production Limited is a subsidiary company of Shell U.K. Limited which is acting in the North Sea offshore operations in the United Kingdom part of the Continental Shelf on behalf of both Esso Exploration and Production U.K. Ltd., and Shell U.K. Limited, each of whom will bear half of the cost of this project.
The joint venture IHC/WF has been formed in order to pool IHC Holland's experience in engineering and building of offshore tanker loading and offloading facilities with the ample building capacity of Wilton-Fijenoord for structures of this size.
The upper section of the cylindrical unit comprising the turntable, mooring equipment for tankers, accommodation, power plant, diving equipment, etc. etc. will be constructed by IHC Gusto at Schiedam while the lower part, the actual storage section, will be built by Wilton-Fijenoord.
The two sections will be towed separately from the Netherlands to a Norwegian fjord for upending, assembly and commissioning. After this operation the 137-metre long unit will be towed out to the Brent field where it will be installed in 155 metres of water.



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No.18

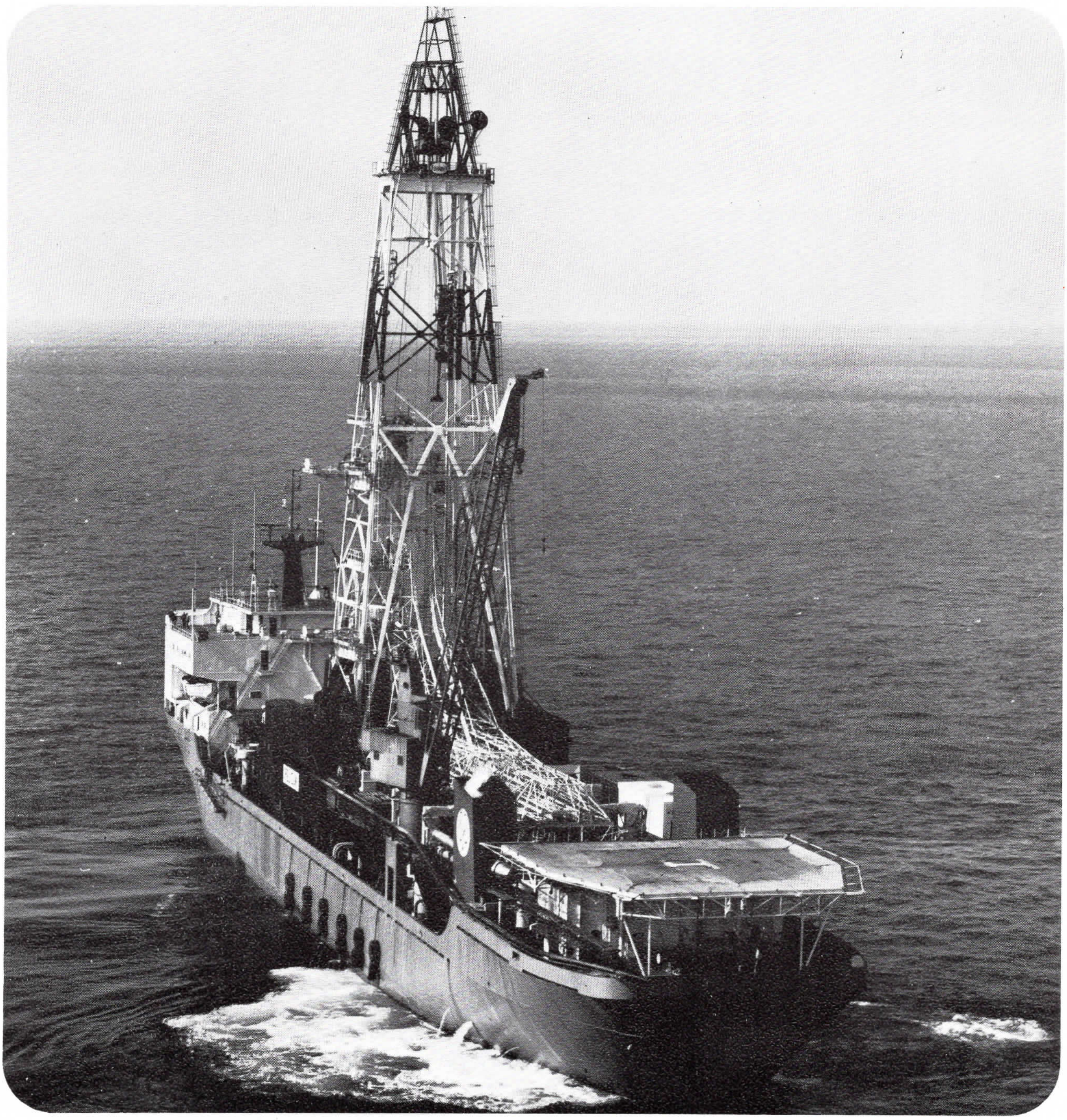
IHC OFFSHORE DIVISION-PO BOX 11-SCHIEDAM-HOLLAND-TEL.010-26 04 20-TELEX 23159

Front page

The dynamically-positioned drillship *Pélican,* free of any mechanical mooring device. Ask for a free copy of the IHC-bulletin describing this modern vessel.

HEAVE COMPENSATING DEVICES

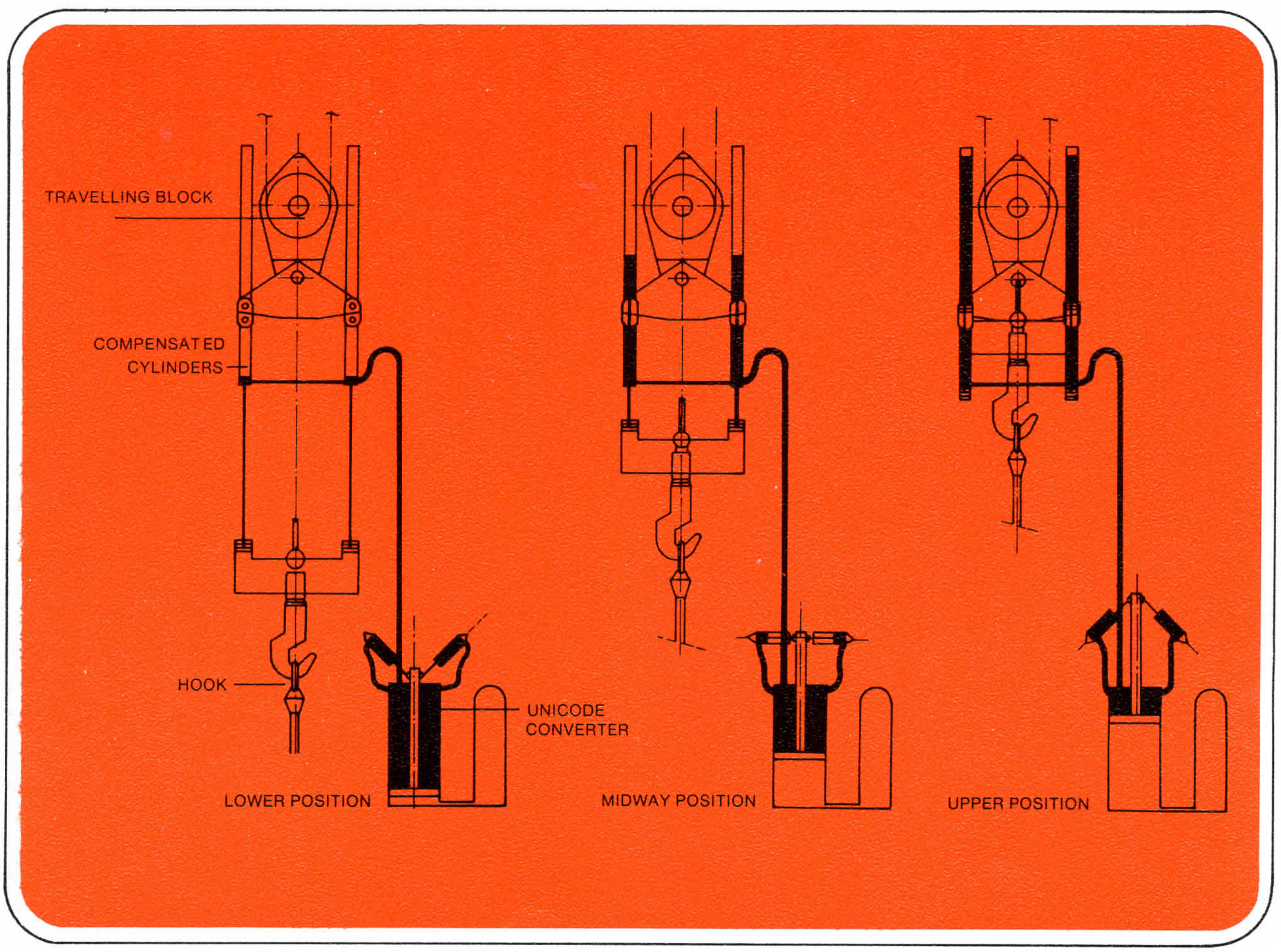
Within the next ten years the oil industry will be producing hydrocarbons from water depths of 500 metres or even more.
Exploratory drilling in water deeper than 100 metres will continue to utilize moored or dynamically-positioned floating units. Floating rigs will also be used to drill development wells operated with subsea production systems. Critical components in such operations will include the mooring or positioning of the vessel, the riser, the subsea control unit (blowout preventer), the drilling equipment, and the heave compensating devices.
As early as 1935 IHC Holland became aware that the cost of any seabed or subsea operation could be substantially improved if means could be found to offset the wave-induced up-and-down movement of the vessel. This would allow the operational tool to be kept on the seabed for as long as possible; it would substantially reduce cost-consuming time lost when the tool was riding inactive between seabed and water surface.
In 1937 the first motion compensator for general dredging operations was installed on an IHC-built suction dredger. Know-how gained in the manufac-

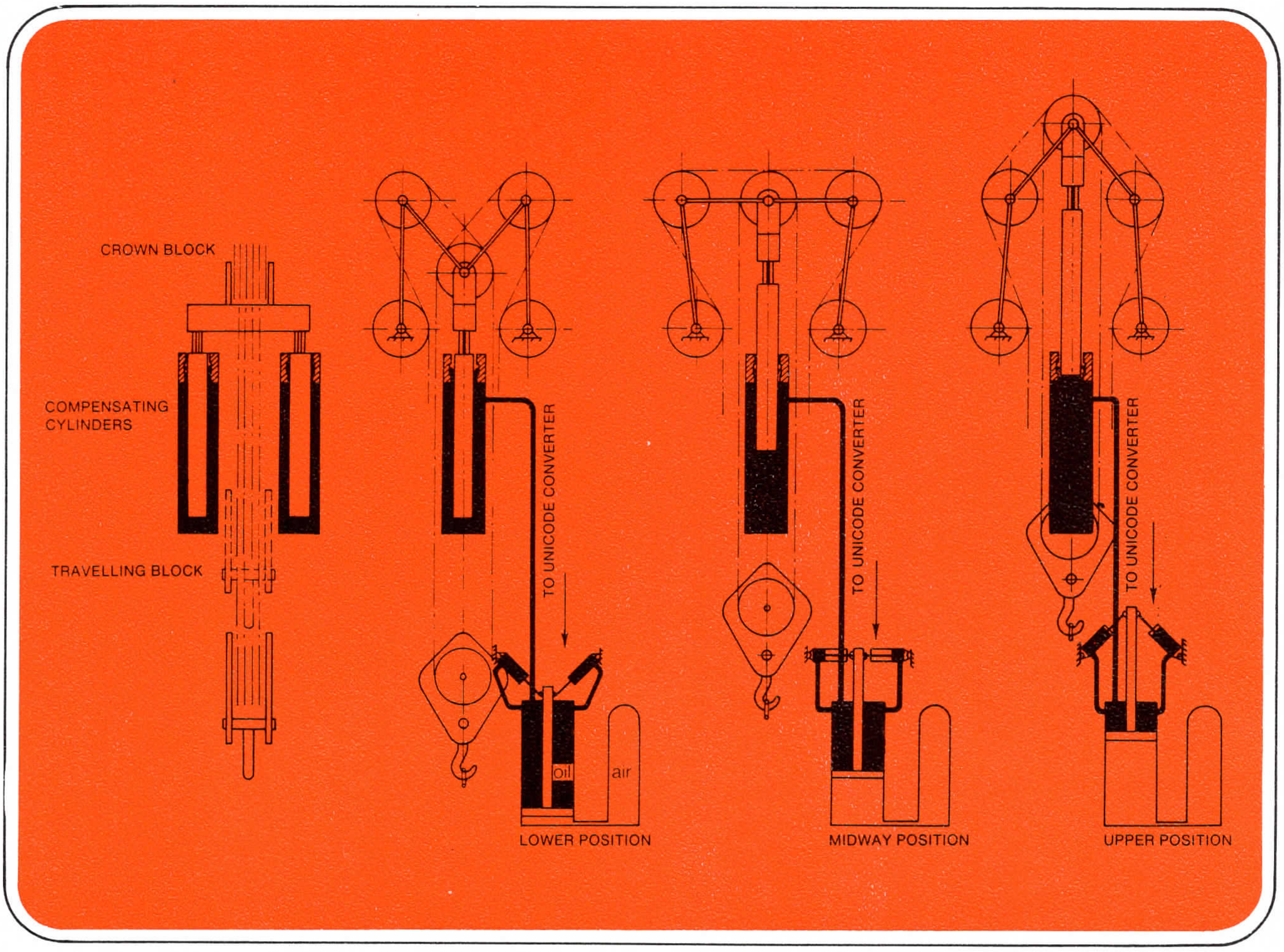


ture of more than 200 successful suction-hopper marine heave compensating devices has been applied to the development of a wide-range of equipment in this and other closely related fields. Some phases of the research involved were carried out in cooperation with Institut Français du Pétrole (IFP), another pioneer in the motion-compensating field.
The range of heave-compensating equipment now available from IHC comprises:

Drillstring heave compensator
To eliminate wave-induced vertical motion of the drill string during operations from a floating or semi-submersible drilling vessel so that operations can be performed under conditions approaching those of a fixed platform. Since the load on the bit is under constant control, maximum penetration rates will be achieved while gaining increased life in drilling bits. The use of bumper subs is eliminated and other operations such as fishing, logging, coring and the landing of a BOP are greatly simplified.
Two types are available – the compensator can be installed between the crown block and the derrick; it can also be incorporated into the design of the travelling block. Both types are able to maintain the preset tension on the drill string to within very close tolerances and completely independent of any vertical movement. Capacities range from 220 to 330 tons; strokes from 15 to 25 ft.

A. Travelling block assembly with twin hydraulic cylinders mounted between the frames of the block and the normal standard hook. Can be readily applied to existing drilling equipment and is recommended



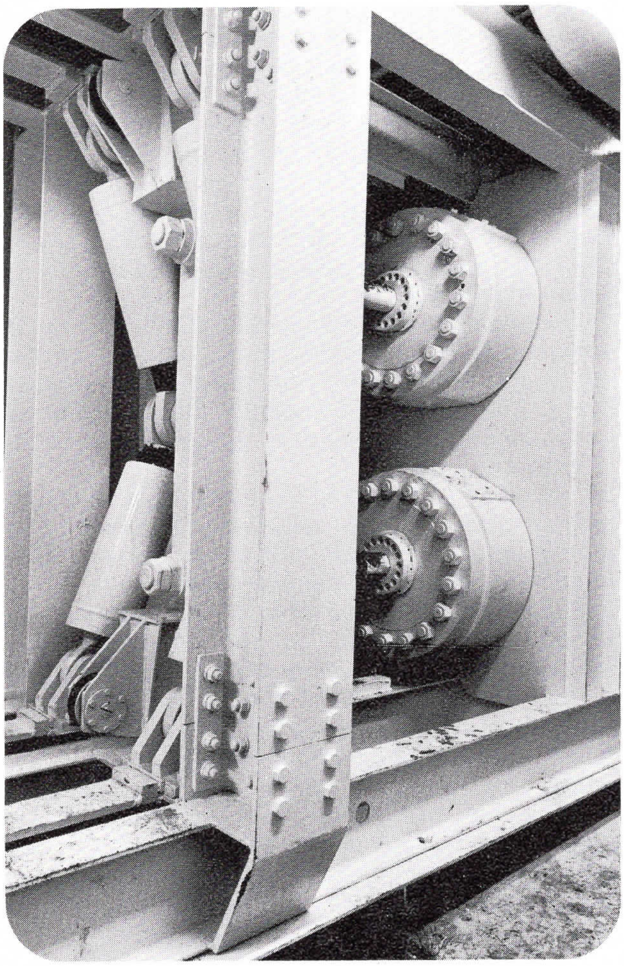


where additional bulk on the derrick would impair stability.

B. Crown block assembly installed between the crown block and derrick without increasing the derrick height. Fixed hydraulic piping eliminates damage-prone flexible hoses. Since the crown block is held motionless with respect to the seabed, but not with respect to the derrick, pivoted-arm sheave assemblies are incorporated into the design to eliminate extra ton mileage by taking up the slack in fast and dead lines.
Optional equipment includes a sensing line tie-to-ground system which actually drives the compensator to maintain the distance between the crown block and the seabed at a constant level. Ideal for landing BOP's, fishing, logging, setting packers or re-entry.

Line tensioners designed specifically to maintain a constant tension on a line as this is taken in or payed out as the vessel rides the waves. Ideal for maintaining constant tension on guidelines and risers, and for the bumpless landing of subsea equipment on seabed or wellheads.
The line to be tensioned is reeved over double sheaves located at the moveable and fixed ends of an hydraulic cylinder. Standard sizes are for line tensions of 16,000; 70,000; 85,000 and 100,000 lbs with maximum line travel in all cases 40 ft. Non-standard sizes can be assembled to meet specific tension or line travel requirements.

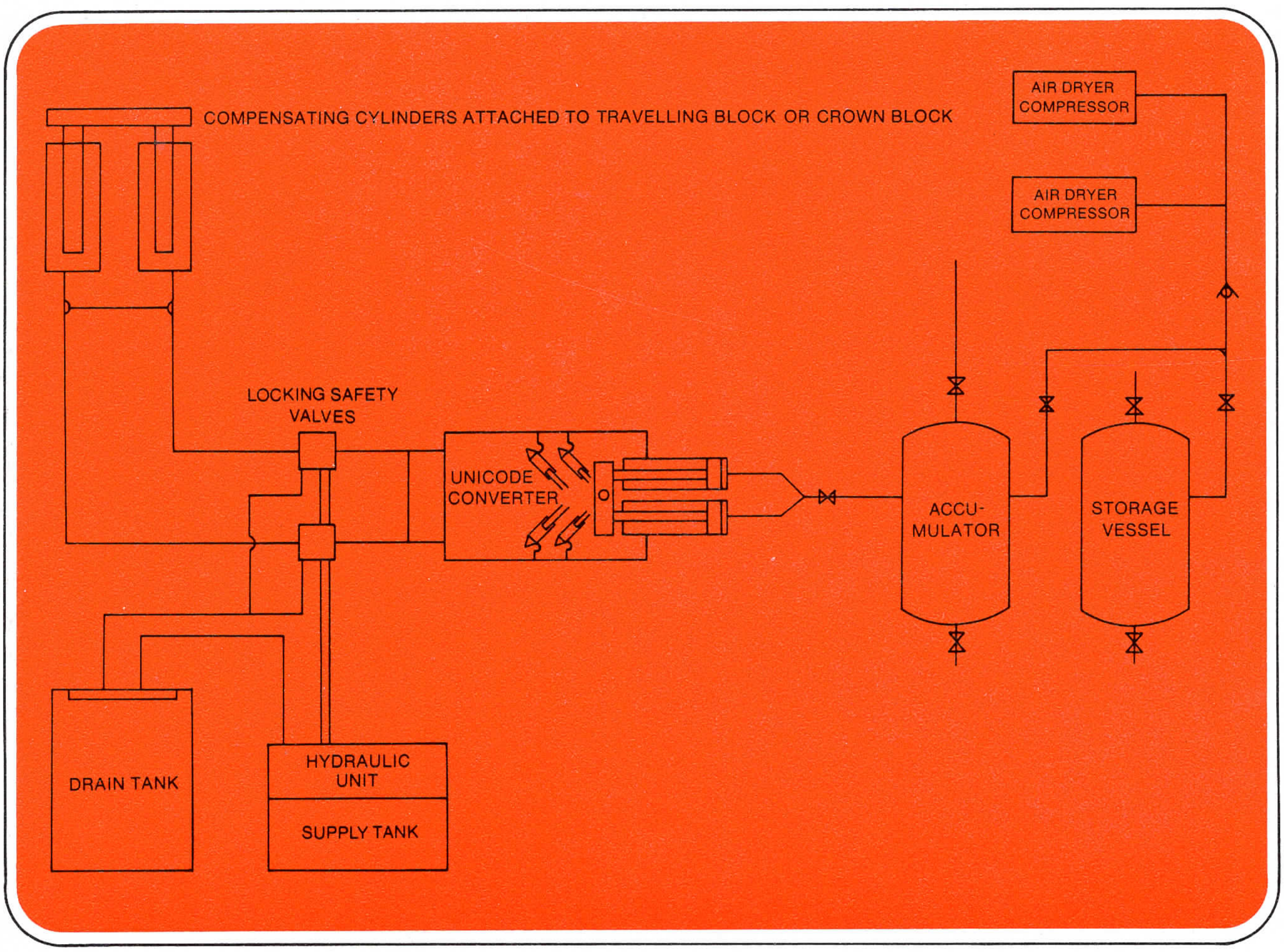
Compensated platform for dampening the heave effect of a work platform, and any equipment mounted



on it, with respect to the floating vessel. To maintain the distance between the platform, and the equipment it is carrying, and the seabed at a constant level, the platform is suspended from one or more constant tension cylinders. One of the many applications envisaged for this configuration is as work platform for core-drilling equipment: it could also be used effectively for the lowering and raising of diving bells.

Crane-hook heave compensator comprising an hydraulic cylinder installed between the travelling block and hook of the crane to eliminate the vertical motion of the hook, and its load, relative to the seabed. Since the hook will be fixed in space vertically, conditions will be simulated which are similar to those on fixed platforms or jackups. Applications forseen are on cranes installing offshore equipment, or cranes located on floating drilling vessels to offload stores and equipment from attendant supply vessels.

Unicode converter (patented by IHC and IFP)
A common component of all IHC-developed anti-heave devices is the hydraulic cylinder. For the efficient functioning of all the systems sofar described, it is essential that the forces exerted by the plunger or piston of the cylinder be maintained at a nearly constant level over the full stroke of the plunger. In other words, fluid flowing into the cylinder of the assembly must have a constant pressure irrespective of the volume of oil physically present in the cylinder. On conventional single compensating systems, pressure is held accurately to within acceptable tolerances by utilizing a conversion system whose gas



or air volume is many times greater than the volume of the piston stroke. Normally, these systems comprise a hydraulic cylinder and an accumulator functioning as a spring. Since the volume of gas required for effective compensation is large, the accumulator is of necessity oversize and high-priced.

In place of large expensive accumulators, IHC engineers working together with IFP researchers, developed a system whose accumulator volume is roughly 35-times smaller than on a conventional system. The compact 'Unicode' converter, with a total theoretical load variation of only 3%, is available as a separate unit for specific customer applications.

How it works

The major function of the 'Unicode' converter is to supply or receive, on demand, hydraulic fluid under a wide range of volumes but at a nearly constant pressure. It also functions as a medium exchanger.

The IHC - IFP designed 'Unicode' converter consists in the main of a pair of hydraulic cylinders whose pistons are connected to four pivot-mounted backup cylinders. The system is mounted in a rigid supporting frame.

The active fluid volume flows into two main cylinders which have fluid on one side of their pistons and pressurized air on the other. The gas side is connected directly to the accumulator of the system. Fluid flowing into the main cylinders will force the pistons against the gas. This decreases the gas volume but increases the pressure exerted by the gas against the fluid. Outgoing fluid from the two main cylinders reverses the action and reduces the effective pressure.

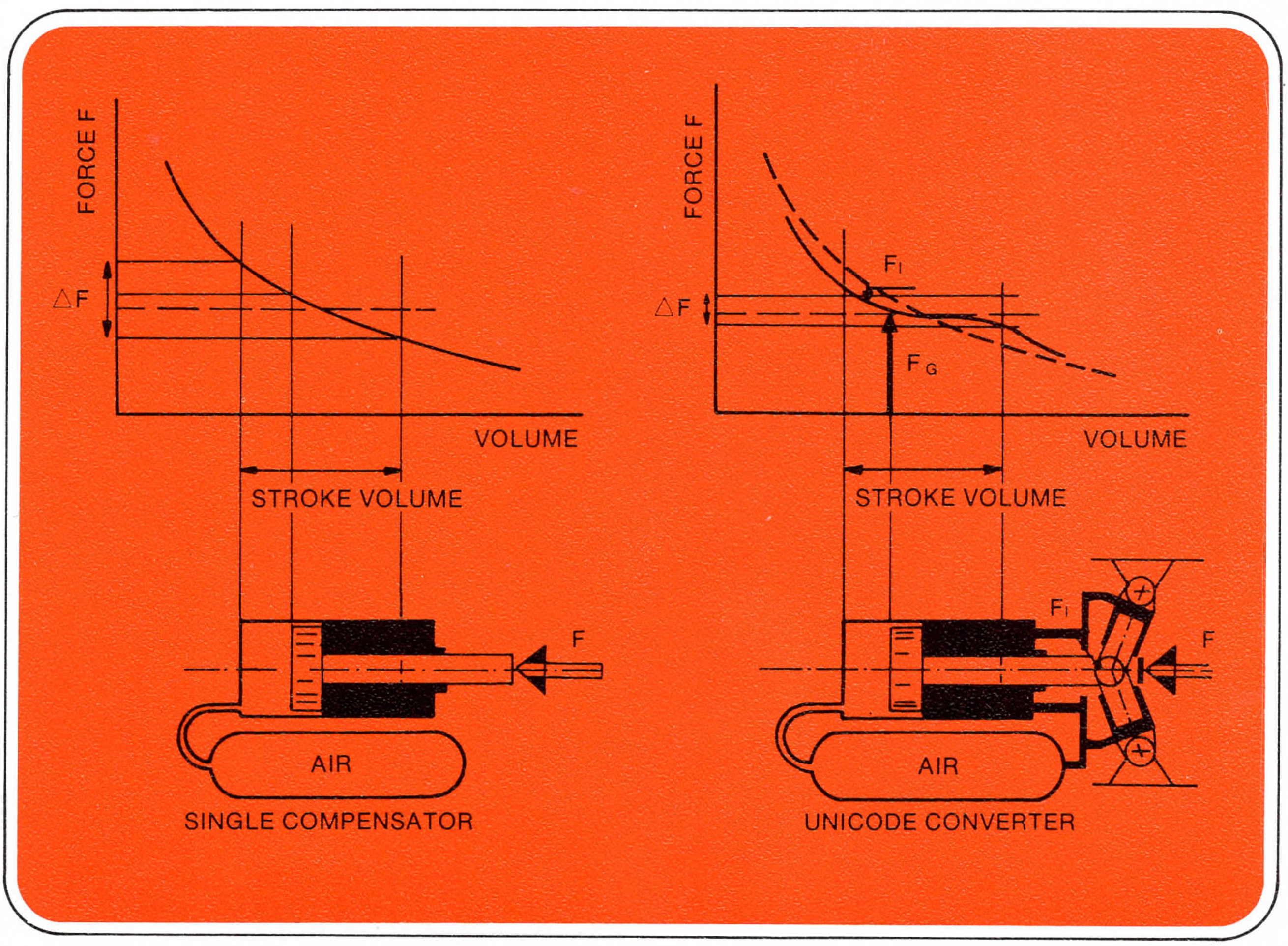
Pivot-mounted backup cylinders connected to the top ends of the main cylinder pistons will substantially reduce oil pressure variations. With the main cylinder pistons in the midway position, the four backup cylinders will be located at right angles to the main pistons and the force exerted will be zero. As the main pistons move to their maximum out or in positions, the four backup cylinders will be exerting maximum force but of a different sign on the main-cylinder pistons. Each backup cylinder is connected directly to the main cylinders.

Depending on the specific application, the Unicode converter can be connected to the active hydraulic cylinder or cylinders by fixed pipes or by flexible hoses. Fluid at almost constant pressure will be transmitting from the converter through the connecting pipes or hoses.

As optional equipment, a compressor working through backup storage vessels can be provided to allow pressure on the gas side of the 'Unicode' converter to be increased instantaneously.

During operation of the system, the force exerted by the hydraulic cylinder or cylinders will always equal the weight or force applied to the piston of the active cylinder. As weight or force is added or taken away, the force exerted by the hydraulic cylinders can be accurately controlled by regulating pressure in the gas accumulator of the system.

Safety valves incorporated into the design of the converter system will automatically shut off the flow of hydraulic fluid to the cylinders should the flow rate increase above the safe working level. This might be caused by line breakage or by the sudden removal of load applied to the piston of the active cylinder.



NEW SBM SYSTEM USES NO SUBMARINE HOSES

by W. J. van Heijst, Monaco

It is now accepted that a Single Buoy Mooring (SBM) is the most reliable mooring system for VLCC's in sea conditions which would be prohibitive for other types of operations. Although crude carriers with 1-million dwt are still only in the drawing-board stage, SBM systems capable of handling these huge vessels have not only been designed, they are already in use.

Since every hour of loading or discharge time costs a great deal of money, SBM's designed to handle VLCC's must have an adequate throughput enabling the vessel to load or discharge its cargo within the accepted practical limit of 25 hours. In the case of a 500,000 dwt tanker, this would mean that the SBM should be capable of handling a pumping rate of 20,000 ton/hour. Although hose suppliers can manufacture hoses able to withstand a fluid velocity of about 20 m/sec., the flow resistance or pressure drop inherent with such a flow velocity is completely unacceptable except in singular cases, like in tail-end hoses which are generally of a reasonably short length. Pumping capacities presently available, combined with the excessively long length of most loading and discharging hoses, result in a flow velocity normally of about 7 m/sec. To handle a pumping rate of 20,000 ton/hour at this flow velocity would require the use of at least three parallel hoses, each 24-in. in diameter, if the VLCC is to be turned around in the allotted 25 hours.

While the running of three parallel hoses is mechanically quite feasible, under no circumstances whatever would this be the most elegant way to overcome the difficulty of handling a high pumping rate. The ideal solution, and certainly the more elegant approach, would be to utilize a single hose system with a large internal diameter.

Floating and submarine hose requirements

There are a number of limitations governing the use of large diameter hose. These can be better understood if the following technical information is borne in mind.

The permissible minimum bending radius of a hose $R_{B\ min}$ is proportional to the diameter D of the hose bore. Normally $R_{B\ min}$ will be about 6 x D. However, there is evidence that small diameter hoses are less damage-prone when bent to their minimum radii than are large diameter hoses.

In use, floating hoses follow the contour of the water surface over their full length. It is therefore essential that the point where the hose is connected to the buoy follows the same motion pattern as the floating hose. When floating hoses are connected to a rigid structure or to a floating body vertically restricted in its motions, heavy bending stresses would occur in the hoses due to sea motion. This would cause unnecessary wear and a shortening substantially of the hoses' useful service life. Therefore, one of the basic design criteria of the SBM calls for a large waterline area compared to its mass. Combined with a catenary anchor chain system, this will ensure that the motion of the buoy body is kept always 'in phase' with the motion of the floating hose. This will result in low bending moments in the hose connected to the buoy with a consequent prolongation of its useful service life.

On the other hand, any large vertical movements made by the buoy will have a detrimental effect on the submarine hose system connecting the buoy to the pipeline manifold on the seabed. This hose string has to be relatively long in order that the buoy may ride easily and without restriction on the sea surface at high tides and at maximum expected wave heights. If the hose were not long enough it would be stretched unnecessarily. On the other hand, when the buoy is riding small waves at low tide conditions, the hose string should not be bent beyond the safe bending radius. Finding just the right length of hose string and the correct configuration to meet both these design criteria is by no means easy.

One of two basic configurations can be employed – the Lazy S or the Chinese Lantern (see Fig. 1). In both cases, the pipe string will be held in the desired configuration by maintaining a delicate balance between rigidity and effective equilibrium which is obtained by counterbalancing the hose weight with either buoyancy tanks or floats.

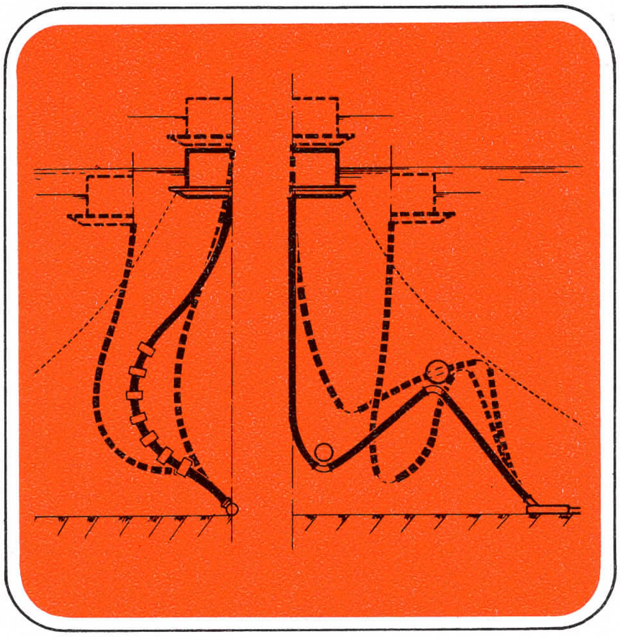
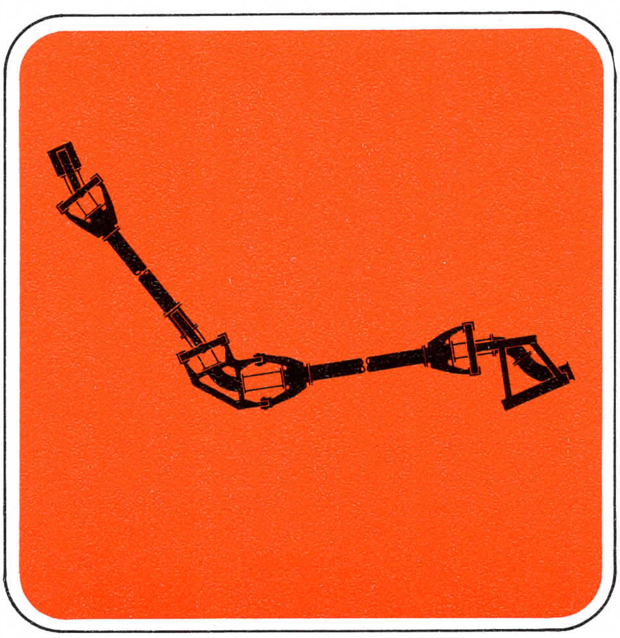


Fig. 1
Typical underwater hose configurations. Left: Chinese Lantern. Right: Lazy S

Several factors could disturb this delicate balance: currents, buoy movements, wave action and changes in the specific gravity of the fluids pumped through the hoses.
As shown in Fig. 2, the specific gravity of the fluid being pumped through the hose will have quite a significant effect on the configuration of a 30-in. submarine hose string. Present-day practice, in order to minimize pollution, is to pump seawater through the hoses after crude has been loaded or discharged. It is extremely difficult to design a hose configuration which could cater effectively to the requirements of both fluids. This applies in particular to large diameter hoses where, since the radius of bend is obviously less, the permissible deviation from the optimal configuration will therefore be smaller.

Fig. 2
Curve showing the weight increase of the hose when filled with oil compared to the weight of the hose filled with air (in percentages).



The flexpipe system
'Flexpipe' developed by SBM Inc. provides the answer to the subsea hose problem. The system comprises a vertical pipe connected to the SBM, and a horizontal pipe connected directly to the seabed pipeline manifold. The pipe sections are linked together to form a continuous flow line, all connections being made by universal joints (see Fig. 3).
'Flexpipe' is designed so that it will allow the buoy to make exactly the same excursions as would a conventional flexible submarine hose system. It allows the installation of an optimal mooring point system in respect of mooring forces and fully meets the bend-restriction requirements of floating hoses. The configuration of the 'Flexpipe' system will be maintained in all conditions since the system will be virtually uneffected by buoyancy and weight. Since movement of the system is eliminated almost com-

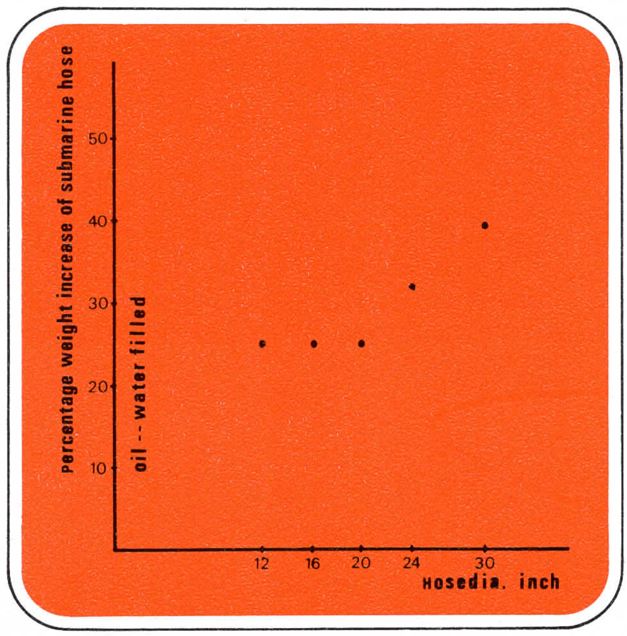


Fig. 3
Layout of the 'Flexpipe' system

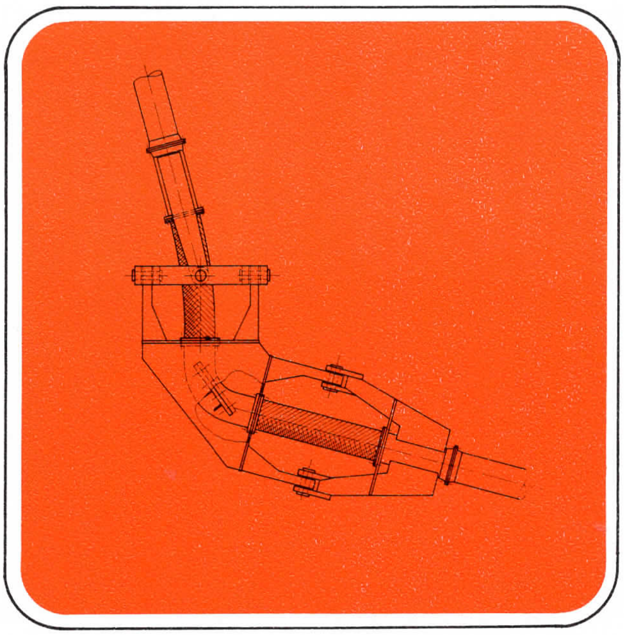
pletely, its location in relation to the buoy will always be known.
The 'Flexpipe' acts as a strongly dampened pendulum with a low center of gravity. Therefore, current forces perpendicular to the system will cause only a small sideways excursion of the elbow joint. In fact, sideways movement is to all intents and purposes negligible in currents running at up to 4 knots. Currents running parallel to the system will have no effect whatever on the configuration since the 'Flexpipe' is not free to move at all in that direction. 'Flexpipe' will follow immediately all vertical excursions of the SBM, with the direct result that there can be no out-of-phase motions between the component parts of the system.

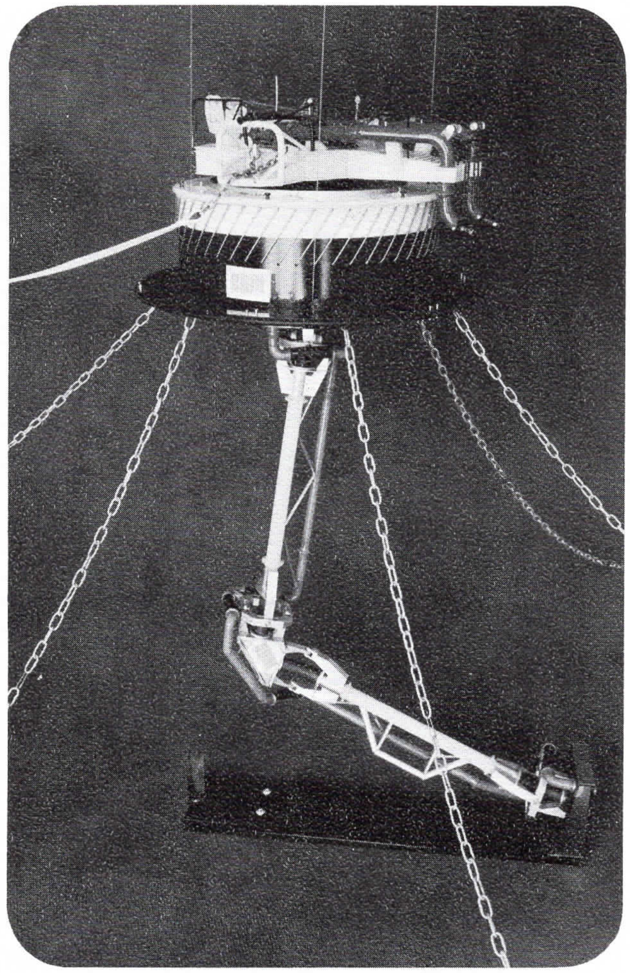
Universal-joint experience
Hooke-type universal joints have been used by IHC

Fig. 4
A twin-product single 'Flexpipe' system connected to a standard SBM (main product line 30-in., ballast line 20-in.)

Holland (parent company of SBM Inc.) for more than 30 years: they are incorporated successfully into the design of IHC's well-known series of suction hopper dredgers.
Joints have been developed to take hose diameters up to a maximum of 48-in. While their present application is a radically new approach, they have been chosen for the 'Flexpipe' design because:

- they allowed the supporting part of the unit to be assembled completely independent of the fluid connection,
- they avoided the use of swivels and rotating joints, and provided positive sealing,
- they enabled hose to be located inside the joint so that the hose is only bent, but not subjected to any additional external stresses.

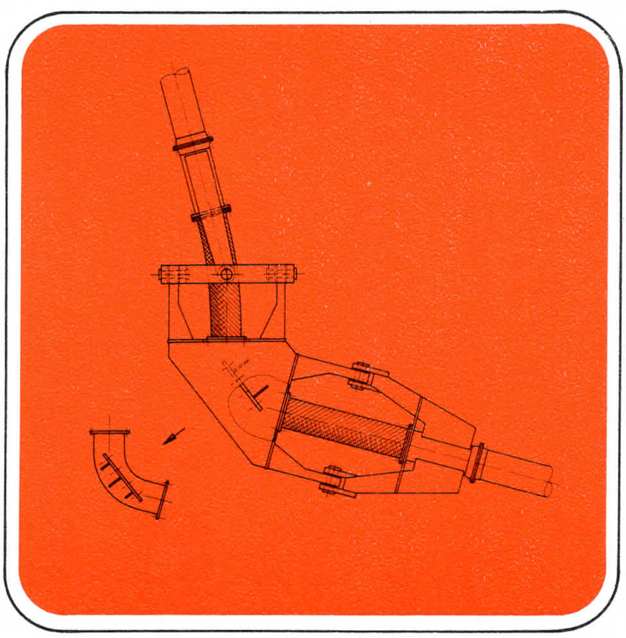


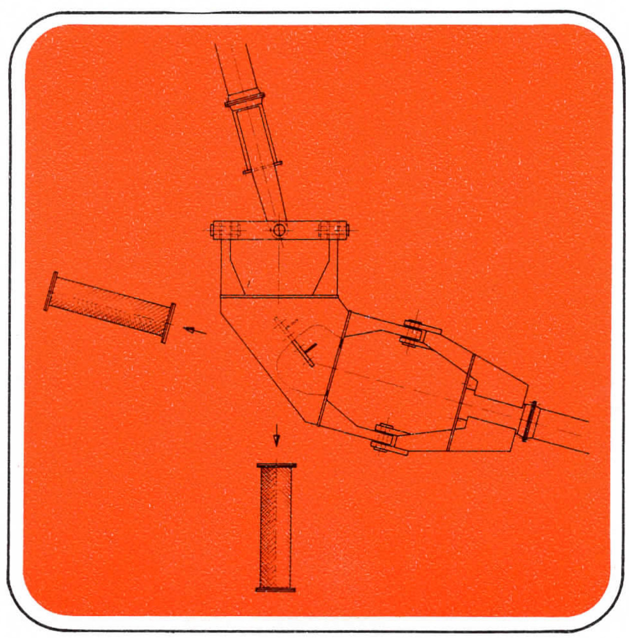


Simple servicing

The only parts of the 'Flexpipe' assembly which are subject to movement are the joint bearings and the flexible hoses located inside the joints.
The hinge bearing consists of a large diameter stain-

Fig. 5
Replacement of a flexible hose connector can be made without dismantling the universal joint assembly.





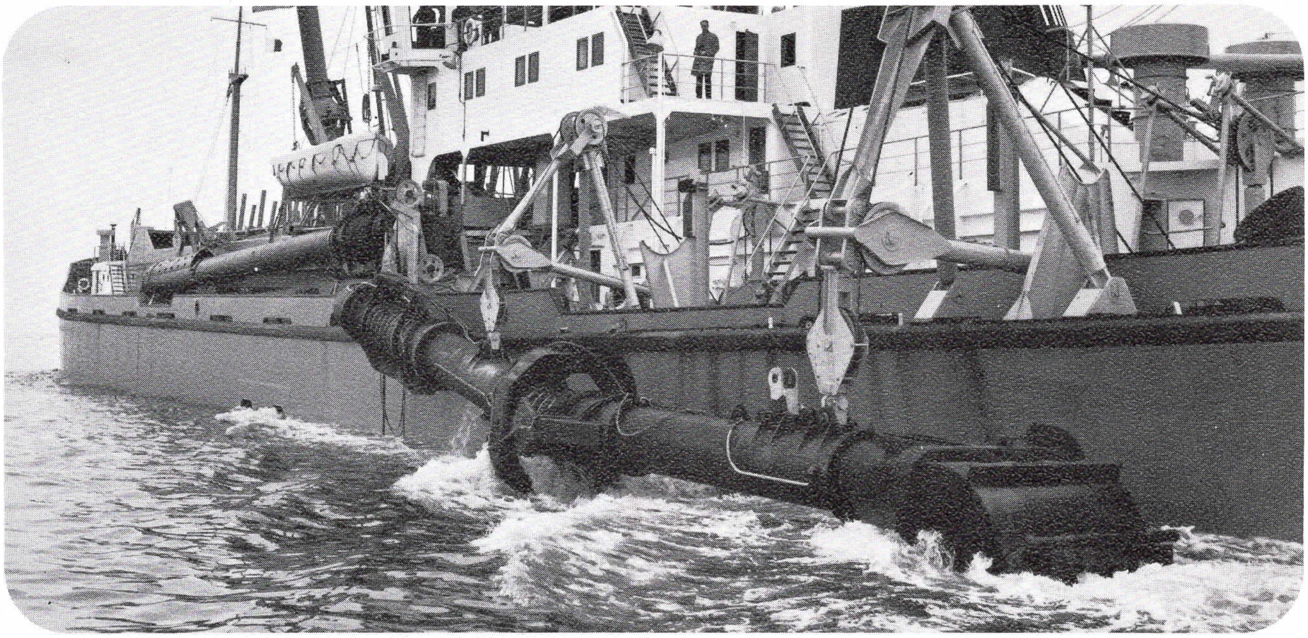


Fig. 6
A universal joint of a type used on a suction hopper dredger. The diameter of the suction pipe is 40-in.

less steel pin mounted in seawater-lubricated bushes. These latter are similar to the bushes used conventionally in the rudder and propeller shaft bearings of large vessels: the expected average life in this particular application is in excess of five years. The flexible-hose connectors are of special design and are completely kink-free. The carcass is made of a standard oil resistant inner liner with layers of steel wire embedded in the rubber. There is no coil reinforcement.
Model test results have shown that the angles to which the 'Flexpipe' joints are bent are relatively small, even under the most severe sea conditions. This is because the system's freedom of movement is restricted. Consequently, a hose life of several years can be expected, even under the toughest sea conditions.
The flexible hoses positioned inside the joints can be replaced easily without having to dismantle the universal joint assembly. The whole operation is so simple that renewal can be made without requiring the services of heavy lifting equipment. Hose replacement operations can be suspended at any time if conditions so require, since the hose connections are not themselves an integral part of the assembly and are not essential to the continuity of the 'Flexpipe' system. Suspension of work would be difficult and be coupled with a high element of risk with conventional large diameter hose systems, where replacement of the hose normally takes a long time. And, since the system is not in balance during the replacement period, it would be liable to further damage should the replacement work have to be interrupted because of deteriorating working conditions.
The 'Flexpipe' design is such that maintenance of the complete underwater system has been reduced to an absolute minimum.

Unlimited throughput
'Flexpipe' is available in diameters of 24, 30 or 36-in. or even larger, with the result that the system can be used to meet any required throughput rates. 'Flexpipe' can also be combined with one or two independent flowlines of smaller diameters such as e.g. 16-in. (see Fig. 4).
If specifically required, two or more parallel 'Flexpipe' systems can be installed easily between the seabed manifold and the SBM. One spreader bar located between any two adjacent 'Flexpipe' systems will prevent chafing of physical contact between any parts of the system no matter what their individual positions. A multi-'Flexpipe' system of this nature would be ideal for loading or offloading a number of different products, particularly where a high throughput rate is desirable.
The system is designed for easy incorporation into the layout of most existing SBM systems, without requiring any modification to the buoy itself. Installation is carried out in three separate stages:
- connecting the horizontal leg to the seabed manifold,
- connecting the vertical leg to the SBM, and
- connecting the two legs together.

All parts of the system can be made neutrally buoyant in water, or are eventually self-floating when the pipes are filled with air: so light equipment only will be required for the installation of the complete system.

Features
The advantages of the new 'Flexpipe' layout over a conventional submarine hose system are:
- substantially improved reliability,
- minimum maintenance and repair,
- no chafing between parallel flow lines,
- virtually unlimited troughput of more than one product,
- no adjustment of buoyancy tanks or floats,
- easy installation.

Summing up, the ideal large-throughput system to cater for the mooring and the loading and offloading of VLCC's would comprise a large double string diameter floating hose system between the buoy and the vessel's manifold, and a long-life, maintenance-free 'Flexpipe' between the seabed pipeline manifold and the buoy intake.

A CHAMPION CRANE FOR THE 'CHAMPION'

IHC Holland designed and build the offshore crane for the *Champion* workship. It has lifting capacities of 800 tons revolving and 1200 tons in fixed position.

Commissioned in July 1972, Heerema Engineering Services' workship *Champion* has already set several world records for heavy lifts; in July 1973 an already magnificent record was topped when the *Champion* placed a 1150-ton section of 'B' deck on its jackets in the Phillips 'Ekofisk' field. This was a near capacity lift for the 800/1200 ton IHC crane installed on the *Champion.*

Currently, the *Champion* is the most powerful derrick ship in operation anywhere. The 30,000 dwt Shell tanker *Velutina* was converted in the NDSM yards at Amsterdam to the workship *Champion.* This involved the removal of the aft ship, the accommodation and the bridge deckhouse and incorporating 1600 tons of new steelwork into the construction.
Wing tanks running the full length of the hull were used to widen the vessel to the 100 ft required for lifts of 800 ton over the side.
Other work carried out before the *Champion* was inaugurated for service included the installation of an engine room for providing power to the crane, a pump system and crew quarters for 120 men. The electric power system of the unit is based on three 640 kW generator sets and auxiliary equipment. On board are heavy-duty piledriving steam hammers like the Menck 7000, 2500 and 1500.
The ram weight of the 7000, the most powerful hammer yet conceived for offshore duty, is 77 tons and the rated drop energy is 630,000 ft/lb.
Powerful winches were installed to provide the 'finger-tip' manoeuvring capability required by a work vessel of this kind. The two manoeuvring or anchor winches on board are each equipped with four drums and a warping head; pneumatically-actuated friction clutches enable gear and speed changing whilst the winch is in use. At 300 ft/min the main drum has a pull of 17 tons on the second layer of wire, and a pull of 100 tons at 50 ft/min.
Pride of place in the vessel's equipment goes to the IHC-built offshore crane with a capacity of 800 tons at a 70-ft working radius, through full 360° rotation. Heerema Engineering Service, together with IHC engineers, developed a special tie-back configuration

for the giant crane which enables it to lift up to 1200 tons over the vessel's stern. This is achieved by unhooking part of the cable harness from the A-frame and extending it towards the vessel's bow where it is connected to pad eyes located near the forward end of the ship. Anchored in this way, and functioning solely over the stern, the giant crane will lift 750 tons at a radius of 120 ft, or 1200 tons at a radius of 90 ft. Using tierods only to fasten the crane tail to the vessel's deck, this IHC giant is able to make a straight lift over the stern of 800 tons at a working radius of 90 ft.

Apart from its unique lifting capacity, the IHC crane installed on the *Champion* was chosen by Heerema Engineering Service for a second, highly vital reason if the vessel was to fulfil its role as an efficient high payday/year working rate derrick vessel. The hinge at the lower end of the boom is located high over the top of the deckhouse with the result that, even with the boom lashed down to the stowed position, there is ample space between the deck and the boom underside to store bulky cargo packages, including deck sections and platforms. The main advantage however, which came with the adoption of this boom hinge configuration was that wider loads could be handled much easier at short radii.

Start from scratch

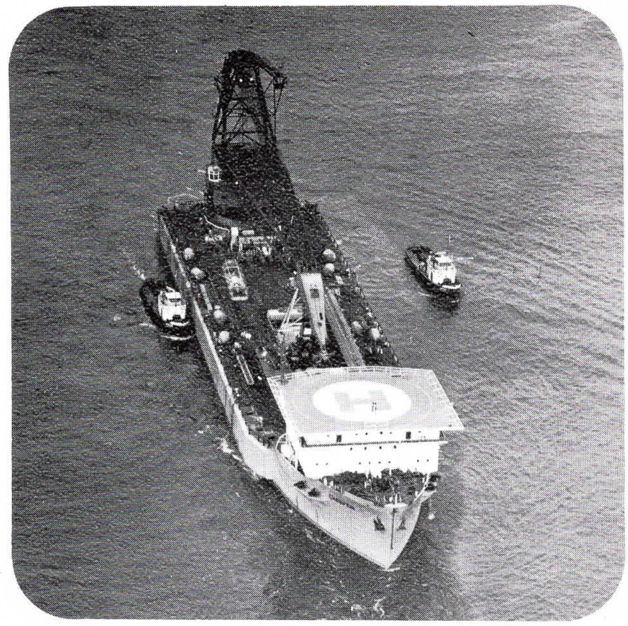
When Heerema Engineering Service first indicated the capabilities it would require for the crane unit to be installed on the *Champion*, IHC engineers realized that they would have to start from scratch. Preconceived ideas were abandoned completely; the need was approached from the basic requirements of the job to be done and the conditions to be met. While some of the good points of their earlier offshore crane models could be retained, new parameters would have to be established by IHC engineers, including lifting capacity, reach, desired line speed, etc. The new crane would also need the ability to work at full rated capacity under at most 5° list conditions.

Weight for the given size and capacity would have to be kept as low as possible; if expensive deck space were to be conserved, the tail swing had to be short. Controls would have to be given a capability which would enable the crane to be used for making lifts from ships and barges as they rise and fall with the waves at the sea.

IHC's offshore crane design engineers came up with a number of innovations which resulted in the final design of an offshore crane which has since proved its complete effectiveness in the working conditions for which it was initially designed.

For instance, they designed an unusually high A-frame to provide the geometry to support the boom and loads on the hook at maximum distance. This resulted in the specified high lifting capacity. Additionally, the weight of the steel members used in the construction of the high A-frame served as a part of the counterweight which, on an offshore vessel, represents unneeded weight. Since the counterweight is conventionally located in the crane tail, its repositioning meant that expensive deck space would not be required to accommodate the tail swing.

Conscious also of the need for improved safety at



sea, IHC perfected a device which ensures that the maximum permissible load at a given outreach, or the maximum permissible outreach at a given load, is not exceeded. The load-moment safety device installed in the operator's cabin of the *Champion* crane incorporates a visual instrument from which the operator can see at a glance the actual load moment as a percentage of the maximum permissible value; from his reading he can decide whether the crane can be safely topped with a given load. An audible signal will be given when the load moment reaches 95% of the maximum permissible. The topping and hoisting motors will be automatically shutdown if the load moment increases a further 5%.

After manufacture, the 800/1200 ton crane was installed on the vessel and subjected to proving tests and sea trials. The vessel was then classified as meeting the requirements of Lloyds Register of Shipping for their class notation ✠ 100A1 "crane-workvessel". The crane was given an ABS classification.

Tough assignments

In early August 1972, almost immediately following the vessel's inauguration, the *Champion* carried out the first of the many 'first-evers' chalked up in its short career to date. It installed a six-pile production platform for Amoco in that company's 'Indefatigable' Field in U.K. waters using a completely new technique for North Sea offshore operations.

The six-pile floating pontoon later to form the platform was equipped in Rotterdam with all the necessary production equipment, headers, etc. De Long temporary jacking systems were installed on all six legs, each 72-in in diameter, and the platform was towed out to the open sea. The legs were jacked down slightly to provide better stabilization and the complete production platform package was then towed to the installation site.

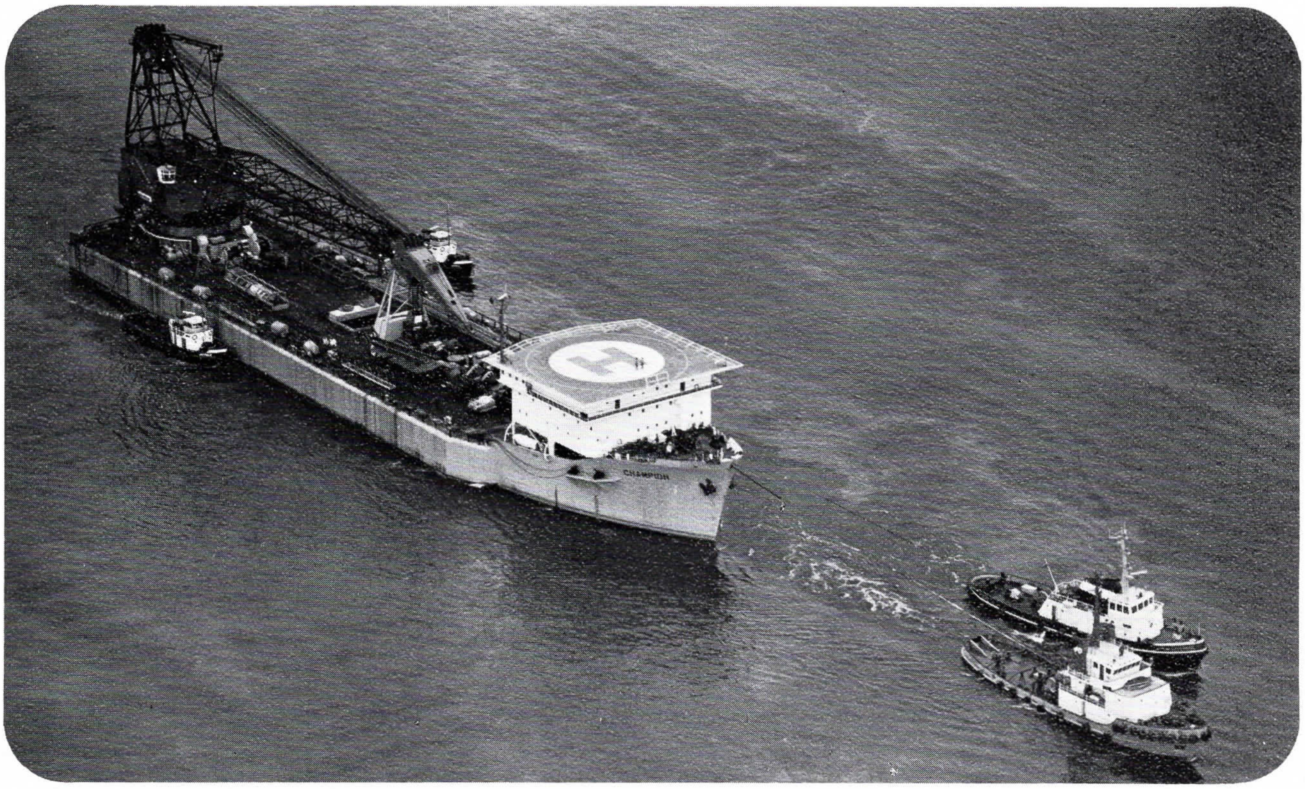
On location, the legs were lowered to the seabed and the platform elevated to give 10-ft of clearance above the water. The jack holding one of the legs was then released completely and the Menck 2500 piledriving steam hammer with a drop energy of 226,000 ft/lb carried by the *Champion* was used to drive this

single leg to an initial penetration of 30 ft. The De Long jacking system was re-engaged on this partially driven leg, and released on another so that this too, could be driven to a penetration of 30 ft. This performance was repeated five times until all legs were driven 30 ft into the seabed. The operation was repeated again in the same order so that the legs were driven to their final penetration depth of 55 ft.
After all legs were set, the platform was elevated to the required height. The projecting leg lengths were then cut off, the legs shimmed and completely welded out. Finally, the De Long jacks were removed and returned to the supplier.
The complete platform setting operation was concluded in only two weeks; it was so successful in all phases that Amoco plans to use the same method this year to set a four-pile platform in the same field.

Record lifts made

The *Champion* was then put to work on a long-term contract with Phillips Petroleum Co. Working in that company's 'Ekofisk' Field, the vessel has been regularly breaking lift records one after the other. It set an all-time record early in July of this year when it hoisted two six-pile deck sections into place in the 'Ekofisk' field. Each deck section weighed 1100 tons; including shackles, slings, seafastenings etc., total weight of the individual lifts was of the order of 1150 tons.

Towards the end of May this year, the *Champion* lifted into place the two four-pile deck sections of Phillips 15-slot 'A' platform. Total weight of each lift was 950 short tons, a new offshore record at that time. A bare week later, the *Champion* again flexed its muscles in preparation for several big lifts scheduled for July. Its warming-up run consisted of lifting the complete quarters platform into place onto its jacket in the 'Ekofisk' Field. The 950 ton four-pile package had been completely outfitted and testing was completed before leaving the fabricator's yard. The platform was lifted complete in one go onto its supporting jacket. The lower deck section contains the utilities for the living quarters plus supplementary services for two other platforms, while the upper deck will take permanent quarters for 72 men and temporary quarters for 120 men, plus a helicopter deck.
Both the 'A' platform and the 'Q' quarters platform were built for Heerema Engineering Service by IHC Holland at their yards in Schiedam.
Early in July, the *Champion* lifted the two six-pile deck sections of Phillips platform 'B' into place. Each deck section weighed 1100 tons; together with shackles, slings and seafastenings total weight at lifting was about 1150 tons. The 12-pile 24-slot platform will have two-level deck sections. Upper and lower deck sections were fabricated by Saipem at Ravenna, but were later towed to yards in Holland where the hooking-up of the upper and lower deck sections was carried out. By adding this extra phase to the onshore fabrication programme, Heerema Engineering Service was able to reduce offshore hook-up time by at least two months.
For the record lifts with the *Champion* Heerema Engineering Service praised the performance of the IHC 800/1200 ton crane installed on the workship.
Towards the end of this year, Heerema Engineering Service will take delivery of the *Thor,* a converted tanker on which is installed another heavy-duty IHC offshore crane able to lift 1600 tons through full rotation and 2000 tons stationary over the stern, both at 100-ft radius. Already the *Thor,* with its IHC designed crane, has been contracted long-term by British Petroleum for work in the 'Forties' Field in the northern North Sea, where the biggest platforms ever are soon to be installed.



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