



Heerema

First in performance







Prepared for the present - preparing for the future.

A good reputation is something that must be earned. Heerema has earned it through the successful execution of many hundreds of projects, all at maximum performance whatever the conditions.

Our clients, the international oil and gas industry, judge performance on results and have entrusted us with their most demanding, often pioneering projects. That is why Heerema's track record has become unparalleled in this industry.

This success is the achievement of people; personnel who have worked with us many years, developing techniques and the equipment they so expertly operate.

We believe they are the world's most experienced and capable offshore construction team, one that is a fine blend of engineers, mariners and construction people.

The industry we serve is in the midst of a period of great change. The economic pressures exerted upon our clients is felt immediately in all oil service activities, and the offshore construction segment is no exception. We too are changing in order to continue serving our clients in the best possible way.

An example of such action is the upgrading of our twin semi-submersible crane vessels Balder and Hermod. With their increased capacity of 9000 t they are able to cope with the heaviest lifts conceivable within economic limits.

Through tactical investments and initiatives, we look forward eagerly to tackle the challenges of the future.

We continue to develop new technology and techniques, put them to work effectively at competitive prices, and persist in our efforts to serve the industry in the Heerema tradition.



Pieter S. Heerema (1908-1981)
Founder of the Heerema Group



Pieter H. Heerema Hugo J. Heerema Larry J. Bump

L.J. Bump
Chairman and Chief Executive Officer

P.H. Heerema
President

H.J. Heerema
Executive Vice-President

Design, Engineering and Management



1. Heerema are involved in all aspects of offshore engineering and operate worldwide.

As offshore technology evolves, operators, regulatory authorities and international standards make increasing demands upon an engineering capability, requiring high standards of performance, safety and quality. Heerema can and will meet these demands with expertise.

1. The Quality Assurance system is one of the major tools to achieve the goals set: delivery of goods and services in accordance with agreed specifications, statutory requirements and time frames.

2. The design and engineering of installation procedures cover all the phases of a project.

3. The installation engineering for numerous projects has been performed within our engineering organization.

4. Continuous control throughout a project safeguards its execution.



2.



3.



4.

A solid base of experience

The installation engineering of hundreds of projects has provided Heerema with a solid base of experience.

The company has used this experience to continuously develop its equipment and procedures in order to shorten the duration of offshore work.

Heerema engineers, combining flair with expertise, have always overcome what appeared to be insurmountable difficulties by producing inventive and economical ideas - sound ideas which, however progressive, are

based on continuous feedback from all Heerema projects and are firmly rooted in current technology. This expertise, accumulated over years of operations, is made available through strategically located offices, which can function autonomously or collectively, being supported by an international task force. Rational manning levels, short communication lines and direct methods of project control ensure optimum results.



5.

Optimum feedback

Heerema engineers spend time not only at fabrication and installation sites but also with clients and regulatory bodies, ensuring maximum feedback to the design office. It also enables offshore personnel to be regularly consulted in the evaluation of new solutions and the practical assessment of projects under way.



6.



7.



5/6. The involvement of Heerema engineers throughout an offshore construction project enables implementation of practical solutions, thus maximizing feedback to the design office.

7. Sophisticated installation engineering; the design of flare boom installation procedures.

Early involvement

Heerema's extensive design experience and its own specialized computer services provide the means to approach engineering problems in the most efficient way. Input of engineers at the earliest stages of an offshore projects ensures that each design incorporates fabrication,



9.



Structural design

Heerema's design engineers have designed numerous platforms for waterdepths ranging from 2.5 metres to 340 metres for a Tripod Tower Platform. The availability of recognized external and specialized in-house developed software allows efficient and reliable analyses of structures.



8. transportation and installation requirements from concept to completion, thereby preventing the need for costly and time consuming alterations during the later stages.

8. Heerema engineers have designed many platforms and offshore structures, all incorporating requirements for fabrication, load-out, transportation, installation and hook-up to ensure maximum project efficiency.

9. The engineering activities are supported by in-house developed specialized computer programmes and externally available software.

Tripod Tower Platform

A highly sophisticated engineering project has been the development of the patented Tripod Tower Platform (TTP) concept designed to support large oil and gas production facilities in deep waters.

A detailed design has been made of a TTP for 334 metres waterdepth in the North Sea, carrying a topside weight of 60,000 tons. Extensive model, material and welding tests have served to verify the viability of this unique platform concept.



10.

10. A TTP designed for application in 340 metres of water, of which the technical feasibility has been satisfactorily proven.

11. The mating and hook-up of the deck and TTP, for shallow water applications, can be performed prior to the offshore installation.

12. The world's first Tripod Tower Platform now operational offshore Holland in 27 metres waterdepth. This field could not be economically developed with a conventional structure.



11.

The TTP concept is suitable for the widest range of waterdepths and topside weights. As compared to conventional platforms it exhibits significant savings in structural steel and piling requirements, making it also highly attractive for shallow and medium waterdepths (25-180 metres).

A number of assembly and installation procedures have been developed that are based on waterdepth, local conditions and facilities available.



12.

Subsea engineering

Heerema's subsea experience has enabled the company to make significant contributions in this field. Efficient installation procedures for subsea templates and manifolds have been developed, as have remotely operated underwater systems such as hydraulic hammers, trenching and inspection equipment.

Consequently Heerema came to play a major role in the development and installation of the template and foundations of the Hutton TLP.



14.



13.

The company's engineering capabilities further extend to installation design of subsea flowlines and connections, and to laying methods, including submerged pipeline towing.



15.

Naval architecture

Heerema's marine engineers, naval architects and structural specialists have developed and designed specialized vessels ranging from launch barges and derrick ships to SSCVs.

The computer simulation of SSCV and barge motion behaviour has resulted in the capability to perform full structural analyses of vessels and structures subjected to loadings imposed during the various phases of installation and launching.

13/14. A Heerema specialty, engineering of subsea templates, risers and spoolpieces.

15. Computer facilities include full analyses of jackets during load out, transportation and launch.







Foundation Analysis & Piling Prediction

Although fully driven piles were for a long time considered an impossibility in the dense sands and glacial clays of many North Sea fields, Heerema undertook to combine the results of extensive theoretical and practical research programmes with the development of equipment that were required to overcome this obstacle.



16.

Reliable predictions

From an extensive data base with soil data from all over the world, Heerema developed its own pile driveability theory which has provided the most reliable pile driving predictions in the industry. Continuing post-analysis of field data has enabled Heerema to correlate the theory with performance and make accurate pile driving predictions for almost every platform in the North Sea and for many other offshore areas in the world.



17.

Economical pile installation

The results of hundreds of driveability studies ensure that Heerema can offer the best recommendations for safe and cost effective pile installations.



18.



19.

16. The Heerema soil survey vessels Mariner and Surveyor have taken soil samples in nearly all offshore development areas around the world.

17. The d.b. Thor installing piles off the U.S. West Coast.

18. Pile installation engineering and equipment development have led to significant time reductions for pile installation and driving.

19. Conventional steam hammers are still effectively used on the installation of shallow and medium waterdepth platforms.



Fabrication

When Heerema reduced the time required for offshore installation, the consequences of fabrication delays became clearly evident. In response, it became a logical step for Heerema to acquire fabrication sites at strategic locations in Europe, with the objective of delivering structures on time.



20. The fabrication of the innovative Texaco Highlander template and slugcatcher by Lewis Offshore, has clearly proved the yard's capabilities.

21/23. Large construction halls on the Heerema yards allow for year-round fabrication.

22. The construction facilities on the Isle of Lewis.

Facing page:
The Flushing construction facilities hold an impressive track record of project execution in the minimum of time.



The yards

The fabrication facilities are located in Flushing, the Netherlands and at Lewis in the Outer Hebrides of Scotland.



With long deepwater quays and huge construction halls for year round fabrication, both yards are able to fabricate major offshore structures.

The services offered by these yards include design, procurement, planning, management, fabrication, load-out and seafastening.

Since their acquisition, both yards have executed an impressive number of projects ranging from jackets, piles and spaceframes to fully commissioned topsides and subsea wellhead templates. The efficiency with which these projects have been executed has helped the Heerema yards to gain the reputation they have today.





Hook-up

Heerema carried out the first Northern North Sea hook-up project. The company's total hook-up experience, now some 14 million man hours, has proved to be invaluable in adding speed, reliability, efficiency and cost effectiveness to each of the projects executed by Heerema.



24.

24. Heerema hook-up starts as soon as access to the platform is given.

25/26. Multi-disciplined and specialized personnel are part of Heerema's hook-up work force.



26.

The management and control of Heerema hook-up projects are based on the Artemis critical path analysis software package.

When fabrication is carried out within our own fabrication yards, the hook-up planning team has full access to all yard information during fabrication and is thus able to prepare the offshore work to the fullest possible extent.

When platform installation is also performed by Heerema, optimum use of resources results in hook-up beginning the moment access can be gained to the platform, thus providing early life support while the installation is still being completed.

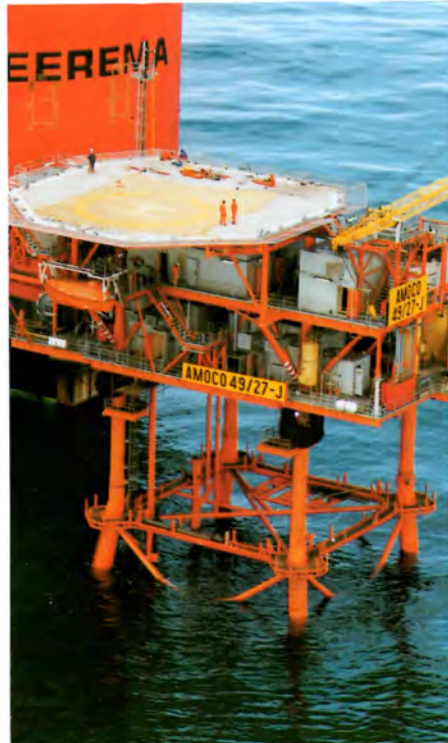


25.

Turnkey

The combination of Heerema's services - design, fabrication, installation and hook-up - allows operators to avoid interface problems between contractors that can cause costly disruption of critical production schedules.

Heerema have executed a number of turnkey projects, in which the total platform construction has been performed while employing strict project management and control procedures in accordance



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with client's standards and material selection procedures. The result is a fully commissioned platform delivered on schedule and within budget.



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27.

27. A typical turnkey project; design, procurement, fabrication, transport, installation and hook-up performed by Heerema.

28/29 An essential aspect in offering turnkey projects is the capability to build fully commissioned topsides.

Overleaf: The installation of the 6100 t central production deck of Hamilton Brothers' Esmond platform.



BALDER

HEEREMA

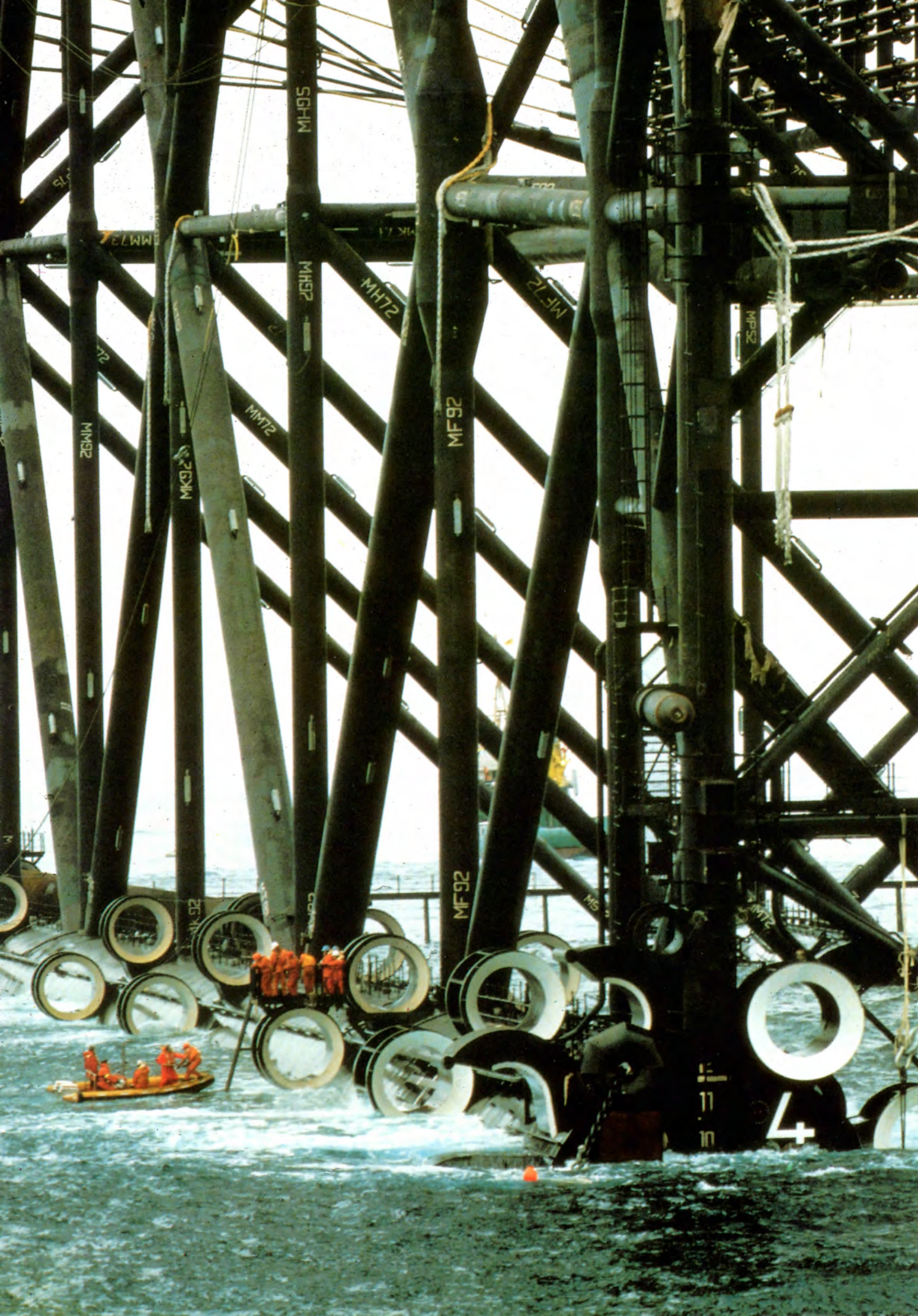


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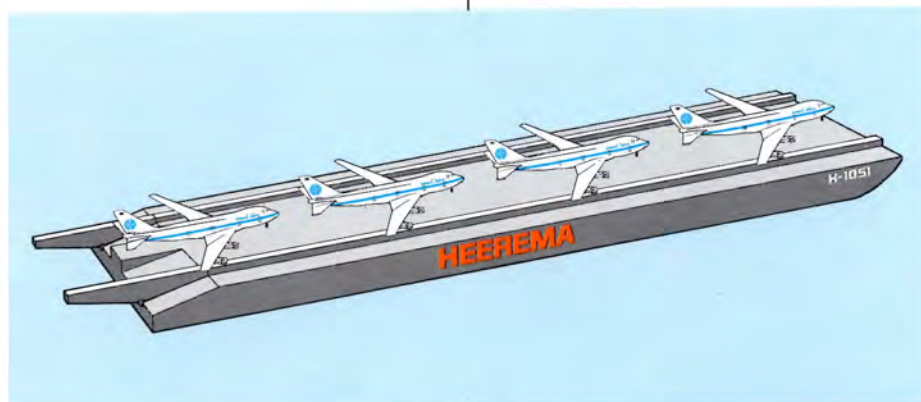
WALDER
PANAMA R.P.



Offshore Construction

Transportation

Today's major installation projects involve complex marine logistics. Heerema's logistics team has simultaneously handled a fleet of over 100 floating units. The company owns the largest transportation fleet in the North Sea, which includes large barges for jacket launching and deck mating operations.



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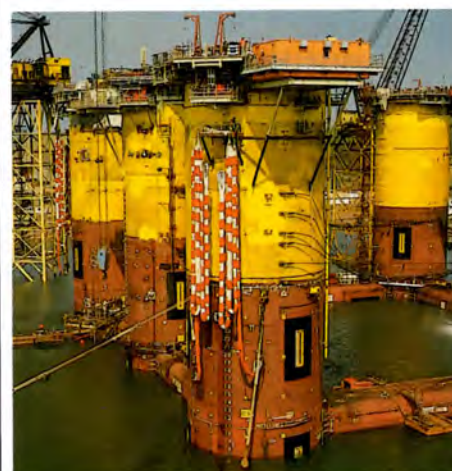
30.

30. Our two SSCVs were commissioned by Conoco to allow the safe running of tethers during the installation of the TLP.

31. This Heerema super launch barge accommodates the launching of deepwater jackets with weights of over 75000 t.

32. Apart from assisting the Heerema construction barges, the Heerema tugs perform a wide range of towing and supplying services.

33. Heerema marine crews prepare the hull of the world's first TLP for the mating with its deck.



33.

Heerema's experienced marine crews expertly performed outfitting, transportation and mating of the world's first TLP and have proved effective on many other major North Sea marine operations.



32.

Heerema's new super launch barges will meet the future demand for launching deepwater jackets over 1300 ft long, with launch weights of over 75,000 t, anywhere in the world.

Pile driving

One of Heerema's principal activities has been the driving of increasingly larger foundation piles.



Super steam hammers

Through Heerema's extensive knowledge of soil behaviour, the company's foundation engineers were instrumental in developing new generations of piling hammers - a series of superhammers which increased energy rating ten-fold in six years. These hammers have proved their ability to cope with the most adverse driving conditions in the North Sea, driving piles into the most difficult strata and have allowed designers to use the larger pile sizes being installed today.

Underwater piling

To reduce pile installation time, hammers were required that could function at increased depths underwater. Heerema initiated the development of the slender hydraulic hammer which can drive piles at almost unlimited water depths. Its sophisticated design gives it a net energy output in



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34. Our range of pile driving hammers includes the mrrbs' 8000 & 12500.

35. The slender underwater hammer put to work for the installation of the BP Ula platforms in the North Sea.

36. The hydraulic underwater hammer also allows for the driving of piles in a free-riding position on, for example, templates.

excess of even the heaviest steam hammers, although it is contained in a housing of only 72 inches diameter. The hammer passes through pile guides and thus eliminates the need for pile followers, resulting in tremendous savings in steel and handling time. Heerema has used these hammers extensively on large and medium sized jackets. An adapted version allows efficient pile driving of subsea templates and anchoring systems.



Installation



37.

Crane Vessels

At a decisive moment in the development of North Sea oil fields, Heerema introduced their ship-shaped crane vessels. As intrinsically seaworthy vessels they consistently outperformed conventional flat bottomed derrick barges.

The Heerema crane ships Challenger (800 t), Champion (1100 t), and the 3000 t Thor and Odin dominated the construction industry in the North Sea in the 1970s.



38.

Worldwide availability

Heerema's interest does not only lie in the North Sea. Challenger and Champion have performed more than four hundred projects in the Gulf of Mexico; Heerema's second main working area. Our vessels have also been deployed in other parts of the world on major developments in Australia, Japan, Brazil and the U.S. West Coast, West Africa, Brunei, Thailand, Saudi Arabia, Qatar, Iran, Gulf of Suez, India, Tunisia and Spain.



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37. The crane vessel Challenger installs a deck on the African West Coast.

38. The d.b. Champion working in the Gulf of Mexico.

39. The d.b. Thor after installation of Woodside's North Rankin complex off North West Australia.

40. The d.b. Odin installing a North Sea platform deck in far from ideal conditions.

Semi-Submersible Crane Vessels

A dramatic change in offshore construction began in 1978 with the introduction of Heerema's two giant semi-submersibles Balder and Hermod. These vessels have now lifted nearly one million tons into place.



41. The two-crane configuration, a fully computerized dynamic ballasting system and a large deck capable of carrying a load of up to 8,000 T. make for an ideal combination. It has improved workability, lifting power and performance, and has enabled Heerema to offer installation on a weather inclusive lump sum basis.



Major offshore installation projects, which used to take a complete season, were completed in six weeks. The large lifting capacity also provided the means for significant savings in hook-up man hours.



42.



43.

41. Heavy single crane lifts of up to 5000 t are now a reality.

42. Balder and Hermod are the only semi-submersible crane vessels capable of lifting loads in the revolving mode while fully de-ballasted, making them ideally suitable for lifts in shallow water. The SSCV Balder performing the inshore installation of the Gullfaks A Platform.

43. The essence of the Heerema SSCVs. The patented computerized dynamic ballast system regulates instantly the draft, trim and heel during the pick up, revolving and set down of loads.





Dual crane lifts

The SSCV's heavy lift capacity was further increased when Heerema engineers conceived the dual crane lift.

Although this procedure is in principle more weather sensitive, this tendency is greatly reduced by the operational characteristics of the patented dynamic ballasting system. When a load is hoisted this system decreases draft while maintaining a level SSCV, whereas when setting a load, the draft is



9000 t. capacity for Balder and Hermod

The trend towards limiting offshore hook-up man hours has led to a continued increase in topside weights. Heerema is therefore upgrading its SSCVs to provide the industry with ample lifting capacity and all the dual crane lift experience in the world.



A revolving capacity of 5000 t enables the starboard crane to handle heavy single lifts.

The portside crane, having a revolving capacity of 3000 t, maintains the advantage of speed for piling operations. In the guyed mode, its capacity of 4000 t will complement the starboard crane for dual crane lifts up to 9000 t.

similarly increased. Thus the dual crane operations are greatly enhanced by the SSCV's capability of getting the load free from the transportation barge in a short time. Likewise, the setting of the load can also be accomplished rather quickly.

Heerema's SSCVs have performed dual crane lifts ranging from 3250 t in 1981 to over 6000 t in 1985.



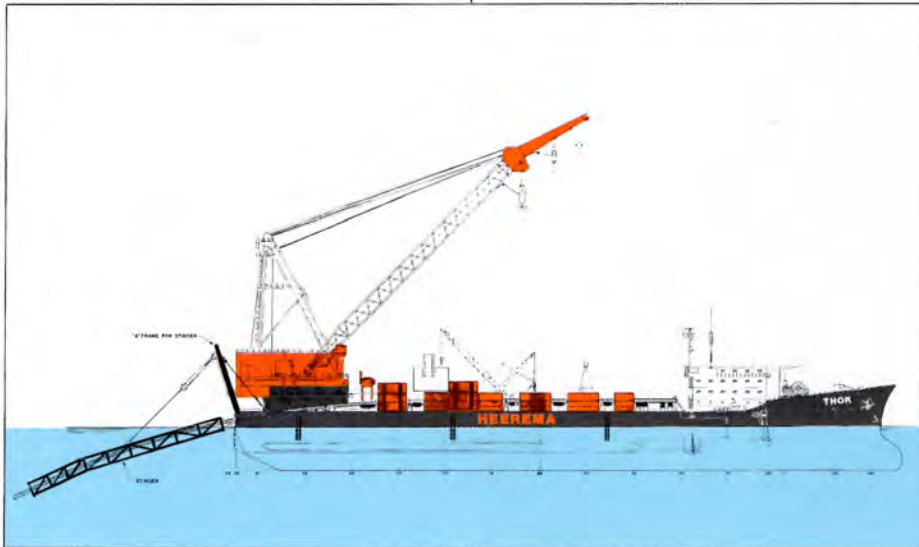
44. The Heerema SSCVs and the crews who operate them have all the dual crane lift experience available in the industry.



Subsea Pipelines

Pipelaying

To complete the range of services offered by Heerema, the Thor has been converted to a 3000 t derrick/lay barge. The pipelay system installed is modular and can be installed on any of the Heerema derrick barges. The system can handle pipelines of up to 60 inches outside diameter in water depths of up to 150 metres.



45.

45. A schematic impression of the modular pipelay system on board the d.b. Thor. This system can be installed on any of the Heerema derrick barges.

46. The d.b. Thor at the Iwaki platform location off Japan.



46.

47. Eager Beaver excavates a V-shaped trench which provides immediate protection to the pipeline.

Eager Beaver Trenching

The need to trench subsea pipelines called for a tool able to trench in prevalent soil conditions encountered along the pipeline route; something conventional jetting and the more recent ploughing systems cannot do.



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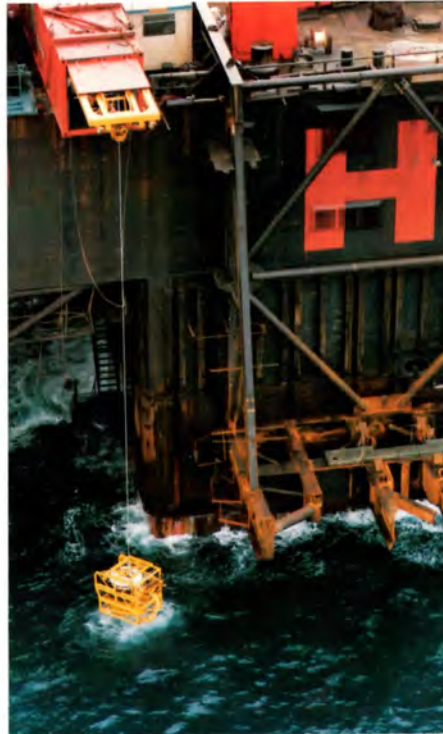
Heerema initiated a research programme which resulted in the unique mechanical trencher, Eager Beaver. With its sophisticated electronic safety system, pilot and pipe tracking devices - all developed in house - Eager Beaver completed a series of successful projects and proved capable of burying pipelines in all kinds of soils, from soft silty soils to hard clays with stiffness in excess of 200 kN/m².

Sub 300 - the survey unit

To give maximum trenching operation efficiency, Heerema developed a dedicated ROV inspection unit - the SUB 300. Its underwater observation capability makes it the best performing unit available for monitoring of trenching projects. Ideally, SUB 300 and Eager Beaver are deployed from Heerema's own d.p. multi-purpose vessel, Explorer II.



48.



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Explorer II

As well as providing surface support to the Eager Beaver and SUB 300, Explorer II was also designed to provide a wide range of services including anchor handling, towing, diving support, seismic and soil surveys, well servicing and platform service/standby.



50.



48. The Eager Beaver being lowered from the Explorer.

49. The SUB 300 deployed from the SSCV during a subsea installation project.

50. The Explorer on d.p. during trenching and subsea operations on the North Sea.

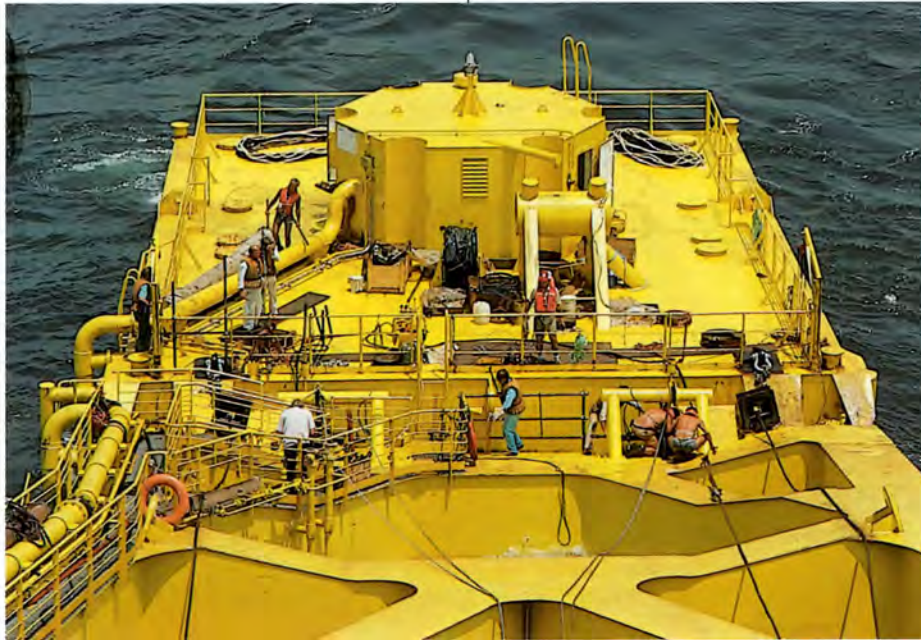
bluewater

Single Point Mooring and Floating Production Systems

Bluewater specializes in the design, supply and installation of all types of Single Point Mooring systems (SPMs) and Floating Production and Storage systems on a turnkey basis.



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51.

Improved design of SPMs

Bluewater has developed a range of single point moorings based on advanced but proven technology and field experience. They are safer and easier to maintain than earlier generations of SPM systems, and have achieved an excellent reputation throughout the oil industry.



53.

All permanent mooring systems designed by Bluewater have a distinct advantage: in case the tanker needs servicing in a yard the SPM remains on location and can be operated with hawsers and floating hoses, thus reducing the loss of production to the absolute minimum.



54

The Bluewater CALRAM and CALM Wishbone Mooring are the ideal solution for floating production/storage systems.

In either system the buoy can be installed first, with the tanker being hooked up later, allowing maximum schedule flexibility.

51. The offshore hook-up of a CALRAM system on the Ivory coast.

52. A soft mooring head designed as back-up system for a North Sea SALM buoy.

53. A CALM loading buoy with integrated surge system.

54. Assembly of turret and buoy body.

New SPM developments

Bluewater has used its specialist technology to develop new concepts of mooring systems, ensuring reliability and economy of operation.

The Tower Wishbone Mooring is an effective and inexpensive method of mooring storage tankers or floating production systems in shallow to medium water depths and in areas with arctic conditions. On this system all mechanical parts are installed above the waterline to reduce maintenance costs.



55.

Floating production systems

The company has developed tanker-based production systems (FPS) for the economic production of oil from marginal fields. It provides these systems complete with all production equipment, oil metering and gas flare systems, including operation and maintenance crews.



56.

Floating storage systems

Bluewater is experienced in the conversion of tankers to floating storage systems.

The engineering package, conversion yard supervision, project management and expediting services for the equipment, are provided on a turnkey basis.

Since its foundation in 1978, Bluewater has achieved a leading position in its field. Projects testifying to this success can be found from the calm seas of the Far East and Africa to the hostile environment of the North Sea.



57.

55. An offloading operation.

56. A Tower Wishbone Mooring system operational off Indonesia.

57. A Floating Production System installed offshore Sicily and operated by Bluewater.





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HEEREMA

First in performance.