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 **IHC** Dredging



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Royal  **IHC**
Creating the maritime future

Beaver[®]
cutter suction
dredgers



A total solution for your challenges

Whatever challenge you face, IHC Dredging will help you to find the optimal solution. Offering a wide range of dedicated vessels, equipment and services, we can improve efficiency across your entire operation and will work together with you to achieve a more sustainable performance.

Among our extensive portfolio of standard modular products and services, you'll find the

ideal solution for your project. In addition to the Beaver® dredger, we can also provide a unique and total solution, combining suitable standard modular products and a wide range of services, customised to your particular needs.

You can select options for your Beaver® dredger, such as spud carriage or dredging depth extension, choose additional equipment

(e.g., boosters and floating pipelines), and workboats to support your operation.

You can also take advantage of our after-sales services. Included are Operations Monitoring and commission support. Depending your needs, we can provide optional services too, such as training opportunities for operators and engineers, project consultancy or the possibility to work with an experienced dredge master for a month.

Whatever you choose, you can rely on our support throughout the life cycle of your equipment, and our expertise to help you find the optimal solution for your project, so that you can achieve the full potential of your operation.

Our solutions: the key to your project's success

Beaver® cutter suction dredgers can be used for a wide range of dredging projects. They reclaim land from the sea, dredge entrance channels, and create or extend harbours by removing soil from land. They are also used to clean up pollution and silt from rivers, lakes and canals.

Projects

Suitable for dredging compacted soil types and materials, such as clay and rock, our Beaver® vessels can be relied on delivering high levels of accuracy and a continuous rate of production at many dredging jobs:

- port construction
- maintenance dredging
- land reclamation
- environmental dredging
- lakes and reservoirs dredging
- sand and gravel dredging
- wet mining.

Customised for you

Case 1

Dredge Masters - A total solution in Africa

Dredge Masters aim to become the leading provider of dredging, marine and related services in Africa. To help them achieve this goal, we have provided a total solution for their dredging needs and access to the latest technology: two Beaver® 50 dredgers, two Delta Multi Craft workboats to perform all supporting operations, critical spare parts and training packages, a planned maintenance programme and two discharge pipeline systems.



Case 1 - Dredge Masters



Case 2

DACINCO - Developing dredging capabilities in Vietnam

DACINCO Investment Construction Company Limited in Vietnam is developing their dredging capabilities, and the delivery of the DACINCO 07 (a Beaver® 65 DDSP cutter suction dredger) marked the start of a long-term partnership with IHC Dredging.

In addition to commissioning the dredger and transporting it to the first project location, we organised the training of staff and crew. Strengthening the partnership, we later agreed on the delivery of an additional Beaver® 65 DDSP cutter suction dredger. The leader of DACINCO believes our Beaver® dredgers are “one of the most innovative, advanced and ideal cutter suction dredgers currently in the world”.

Find more cases at
royalihc.com/beaverstories

Why choose a Beaver® CSD?

The Beaver® is well known for its robust construction, reliability and high performance, resulting in excellent value for money. Beaver® CSDs are equipped with state-of-the-art technology, are fuel-efficient, have low maintenance costs and are extremely productive at all dredging depths.

Benefits

- lowest cost per cubic metre
- available from stock, ensuring a short delivery time
- maximum uptime
- financing options available
- simple to disassemble and transport over land
- suitable for single-person operations.

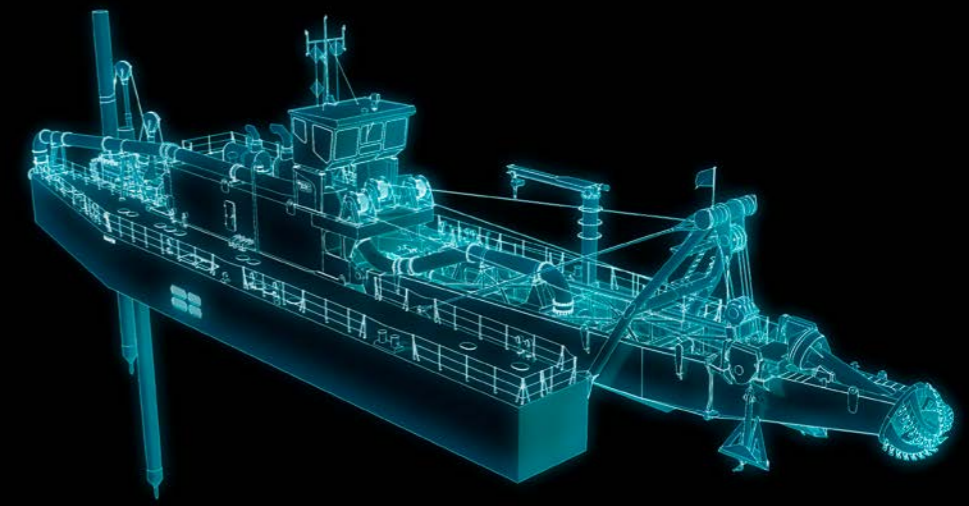
Options to suit your requirements

The standard Beaver® series offers a high-quality Royal IHC dredge installation and is already preconfigured for your dredging project. You can add other functionality by choosing from a wide range of optional extras, including:

- anchor booms
- spud-carriage installation
- cutting equipment (cutter heads, dredging wheels)
- increased dredging depth
- swivel bend, non-return valve and vacuum-relieve valve
- production measurement, automation & positioning system
- harbour generator set
- comfort and safety packages.

A sustainable future: Beaver® E

With zero emissions the Beaver® E fully complies with the latest environmental regulations, and is suitable for all common dredging projects. It also provides lower running costs than conventional vessels, because it is more energy-efficient and has low-maintenance electrical components. With an identical dredging and hydraulic installation, the diesel-powered main pontoon can be exchanged for an electrical one.



Specifications

| | Beaver® 30 | Beaver® 40 | Beaver® 45 | Beaver® 50 | Beaver® 65 |
|---|--------------------|-----------------|------------------------|--|--|
| General | | | | | |
| Length overall (ladder raised), approx. | 16.50m | 20.50m | 26.60m | 33.00m | 58.00m |
| Length over pontoons | 12.40m | 13.41m | 16.96m | 22.65m | 43.50m |
| Breadth | 4.50m | 5.72m | 6.99m | 7.87m | 12.44m |
| Depth | 1.35m | 1.51m | 2.01m | 2.44m | 2.97m |
| Draught average | 0.85m | 1.05m | 1.25m | 1.50m | 1.90m |
| Draught max | 0.9m | 1.10m | 1.40m | 1.65m | 2.02m |
| Total transport weight, approx. | 30,6 ton | 48,2 ton | 77,4 ton | 142 ton | 483,2 ton |
| Air draft without spuds, approx. | 2,9m | 4,1m | 4,9m | 6,9m | 8,9m |
| Classification | - | - | - | Class I, X HULL, * MACH, Dredger - no propulsion, Coastal Area | Class I, X HULL, * MACH, Dredger - no propulsion, Coastal Area |
| Total installed power | 294kW | 483kW | 895kW | 1,350kW | 2,819kW |
| Dredging installation | | | | | |
| Suction pipe diameter | 300mm | 390mm | 450mm | 550mm | 650mm |
| Discharge pipe diameter | 300mm | 390mm | 450mm | 500mm | 650mm |
| Standard dredging depth | 6m | 8m | 10m | 14m | 18m |
| Swing width at max. dredging depth | 14.50m | 18.00m | 23.50m | 29.50m | 48.50m |
| Swing width at min. dredging depth | 18.00m | 22.50m | 29.00m | 36.50m | 59.50m |
| Cutter type | Edge 830-50 | Lancelot 955-50 | Lancelot 1330-120-10CB | MP 10-CB-AL | MP 20-CB-ACR |
| Cutter power at shaft | 30kW | 55kW | 110kW | 170kW | 700 kW |
| Pump type | 600-1520-240 EasyX | 900-175-350 | HRC52 108-23-45 | HRC52 1200-250-500 | HR/MD121-26-60 |
| Dredging auxiliaries | | | | | |
| Swing winch, pull at first layer | 25kN | 40kN | 57kN | 90kN | 240kN |
| Anchor weight | 160kg | 240kg | 360kg | 500kg | 1,500kg |
| Spud carriage (stroke) | - | - | - | - | 4.5m |
| Machinery and equipment | | | | | |
| Main engine type | Scania DI13 | Caterpillar C18 | Caterpillar C32 | Caterpillar 3512C | Caterpillar 3516C |
| Main engine power | 294kW | 483kW | 895kW | 1,350kW | 1,825kW |
| Auxiliary engine type | - | - | - | - | Caterpillar C32 |
| Auxiliary engine power | - | - | - | - | 994kW |
| Deck crane max load | 7.5kN | 15kN | 20kN | 30kN | 50kN |
| Deck crane outreach | 1.6m | 2.8m | 2.8m | 3.25m | 5.10m |
| Matching products | | | | | |
| Workboat | DMC1050 | DMC1050 | DMC1050 | DMC1050 / DMC1450 | DMC1450 |
| Booster station | - | 895kW | 895kW | 895kW | 1,825kW |
| Operations Monitoring | | | | | |
| 3 year subscription | standard | standard | standard | standard | standard |

Every current standard Beaver® model is available as an electrical version

The full package

To complement the Beaver® dredgers, we can provide a total solution – combining suitable standard modular products and a wide range of services – customised to meet your needs.

Boosters - Improve production

Improve the slurry transport capacity over longer distances by adding extra pumping power with a standard self-supporting containerised booster station. This is an additional high-efficiency dredge pump placed along the discharge line.

| Booster station | 895kW | 1,825kW |
|-----------------|------------------|-------------------|
| Dimensions | 6.7 x 2.8 x 3.4m | 12.2 x 2.5 x 5.2m |
| Weight | 28 ton | 52 ton |
| Pump type | HRCS 108-23-45 | HR/MD 121-26-60 |
| Diameter | 400/450/500mm | 650mm |

Why choose our booster stations?

- proven pump technology
- flexible to deploy and easy to transport
- identical spare parts for dredger and booster
- local and remote-controlled monitoring process.

Delta Multi Craft (DMC) - Optimise your operation

Designed to optimise the operation of our Beaver® cutter suction dredgers, our multipurpose heavy-duty workboats perform a wide range of dredging support activities in shallow inland waters. These include pushing and towing, the handling of buoys, anchors and floating pipelines, hoisting cutter head and pump parts, and transporting fuel, goods and personnel.

Benefits of our workboats

- available from stock
- enables high uptime on your dredging site
- can be transported by road
- deck crane and other advanced equipment come as standard.

Delta Multi Craft and Beaver®: the perfect match

| DMC workboat | DMC1050 | DMC1450 |
|------------------------|-------------|-------------|
| Length x Breadth | 10.5 x 4.5m | 14.7 x 6.0m |
| Installed power | 195kW | 2x 207kW |
| Sailing speed | 7 knots | 7 knots |
| Bollard pull (approx.) | 20kN | 55kN |
| Deck crane SWL | 81kNm | 410kNm |



Dredge pipes - Efficiency from ship to shore

Dredge pipes are a vital part of the discharge process. We offer high-performance floating, submerged or land dredge pipes, either standard or custom-designed, depending on local requirements and the specific needs of your project.

Services - Lifelong support

To help you operate your Beaver® efficiently and achieve optimum levels of productivity, we can assist you in dredging consultancy, maintenance support, repairs, spare parts and logistics to increase uptime and reducing total cost of ownership. Our experienced consultants, service engineers and dredge masters can advise on and analyse the operation, as well as the performance of dredging equipment on site.

Training - Sharing knowledge to enhance performance

To further enhance the skills and knowledge needed to maintain your dredge equipment and operate it efficiently, we provide project-specific, operational and maintenance training (locally and on site). Simulator training enables operators to learn in a safe environment, and

the IHC Training Institute offers an exclusive Beaver® maintenance training programme covering all aspects of dredging equipment, such as electric installations and hydraulic systems.

Financing - Banking on success

Our experienced and knowledgeable financing team liaises with you and lenders to create a suitable financing structure, managing any potential risks. Financing institutions have separate funds to invest in sustainable 'green' solutions and financing is done against a lower interest rate than brown solutions. This in turn lowers the cost for asset owners.

Operations Monitoring - Insight is the essence of efficiency

Every new-built Beaver® comes with three-year access to the Operation Monitoring module in My IHC. Operations Monitoring gives you a clear overview of your fleet and its performance. You can anticipate operational downtime or fix any issues quickly. The operational data is presented in an easy-to-understand dashboard, available on both desktop and mobile. Existing Beaver® dredgers can be retrofitted with a hardware package for a one-time fee.



Find the right Beaver® for your project

To help you select the right Beaver® for your project, please use these graphs as a guide. A first selection can be made based on the pumping capacity of the dredger. The output of the various Beaver® dredgers for different types of sand is shown in the graphs that follow. This can then be matched with the required output and distance to be pumped. The theoretical output graphs are based on the information as indicated below.

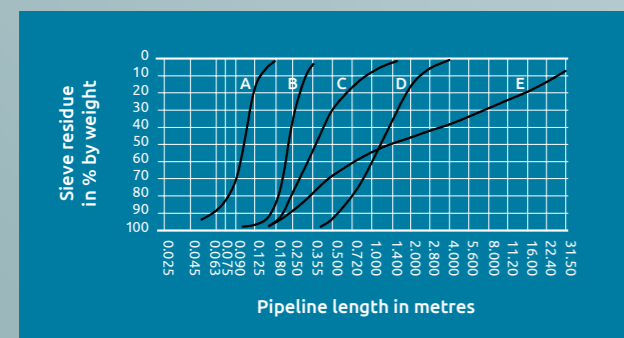
| Type of dredger | Available pump power | Discharge diameter | Maximum dredging depth | Maximum volumetric concentration |
|-----------------|----------------------|--------------------|------------------------|----------------------------------|
| Beaver® 30 | 250kW | 300mm | 6m | 20% |
| Beaver® 40 | 409kW | 400mm | 8m | 20% |
| Beaver® 45 | 764kW | 450mm | 10m | 25% |
| Beaver® 50 | 1,258kW | 500mm | 14m | 25% |
| Beaver® 65 | 1,706kW | 650mm | 18m | 30% |

The graphs are based on

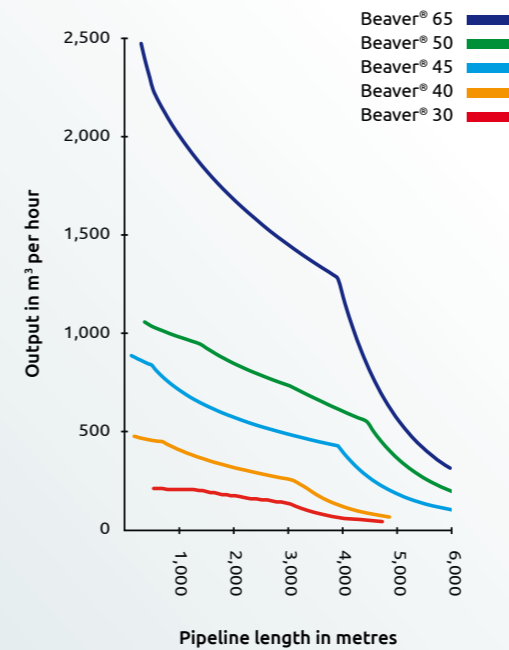
- output expressed in cubic meters of in-situ solids per effective pump hour
- elevation at the end of the pipeline of 4 metres.

The sand types as indicated in the production graphs are defined as follows:

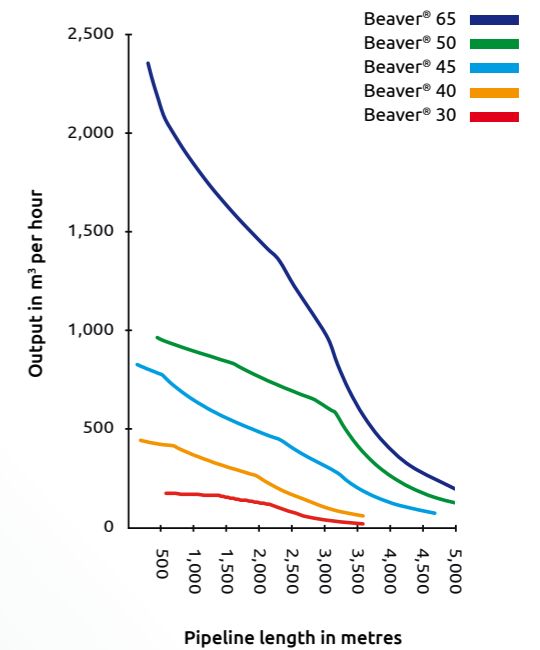
| Sand type | Decisive grain size | Situ density |
|--------------------------|---------------------|------------------------|
| A Fine sand | 100µm | 1,900kg/m ³ |
| B Medium Fine sand | 235µm | 1,950kg/m ³ |
| C Coarse sand | 440µm | 2,000kg/m ³ |
| D Coarse sand and gravel | 1.3mm | 2,100kg/m ³ |
| E Gravel | 7mm | 2,200kg/m ³ |



Medium fine sand



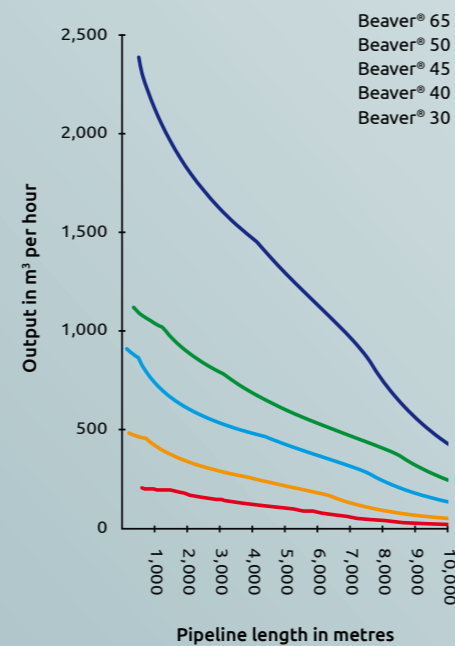
Coarse sand



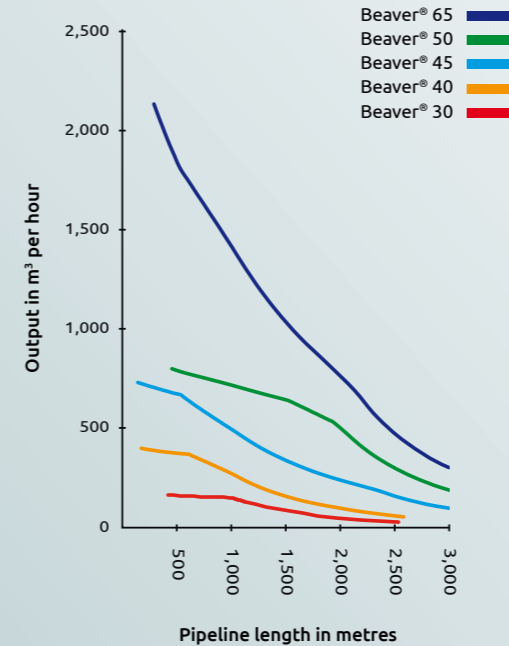
Note

The calculated output curves only indicate pumping capacity, based on free-flowing material. In practice soil properties may vary from free-flowing to hard-to-excavate material. When used for estimation actual outputs, the nature of the material to be dredged and project conditions should be considered.

Fine sand



Coarse sand and gravel



Gravel

