

What is an Amphibious Excavator



Amphibious Excavator is a type of excavator that can move and operate in places where the standard crawler excavator is unable to do. This unique machine **operates seamlessly on both water and on land** in keeping with its name - “Amphibious” means both land and water.

Amphibious Excavators specialize in moving and operating where the ground is not solid, in soft terrain and wet environments such as bayous, marsh lands, rivers and swamps while floating in a body of water.

As excavators trekking in soft terrain and wet environments are required to have very low ground pressure, the Amphibious Excavator uses pontoon style undercarriage system to achieve an **extremely low ground pressure** compare to a standard crawler excavator, which is pretty much restricted to operating on hard surfaces. The pontoon style undercarriage which is based on Archimedes principle is also designed **to float** in water as a safety feature.

Variations of the Amphibious Excavator

The Amphibious Excavator is also known by many names around the world – floating excavator, floating dredger, amphibious dredger, marsh excavator, marsh buggy, swamp excavator, and the like and come in many shapes, sizes and attachments.

Amphibious Excavator is versatile in the sense that the upper body is able to install with either a standard reach boom or long reach boom, coupled with various front attachments for example, bucket, clamshell, rake, grapple, and even a dredge pump.

Amphibious Excavator with Spud Systems

As Amphibious Excavator has proven its effectiveness in working on soft, swampy and wet environments and over shallow waters, there is a need to improve its buoyancy and flotation abilities over deeper waters and to operate in areas where the traditional spud barge is unable to access unless there is a deeper water. In comparison, an Amphibious Excavator can be easily assemble and disassemble for transportation from one place to another with ease. And to work on deeper waters effectively, **spuds can be used for additional flotation and stabilization** to counter the movements of the machine whilst floating.

The concept of using spud systems is well known in the dredging equipment industry. Early dredging equipment have utilized spuds since the 1900s. It was well established in 1980s with many publications explaining the usage of spuds and spud systems, one of which is from the US Army Corps of Engineers New Orleans District dated March 1983 – the article can be read [here](#) and the US Army Corps of Engineers Dredging Technical Report HL-83-4 dated March 1983 “The Survey of Portable Hydraulic Dredges” – the article can be read [here](#).

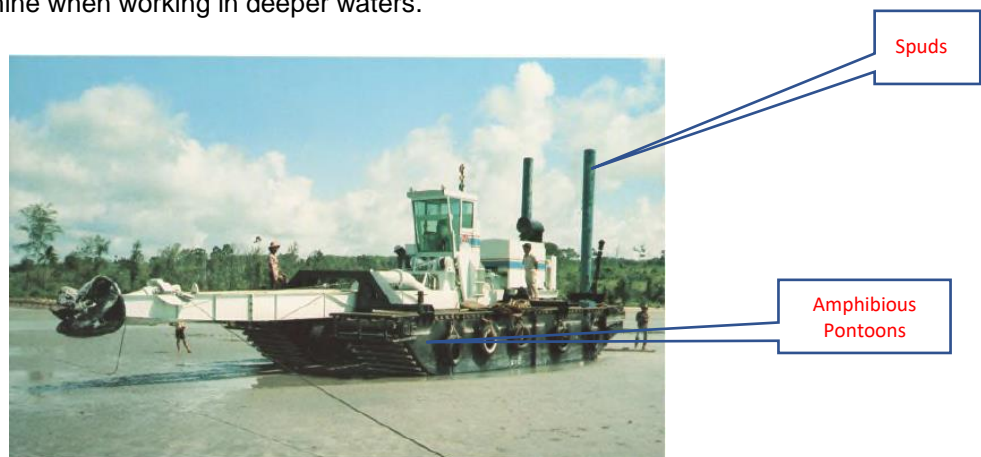
Due to the wide and ubiquitous usage of spuds and spud systems in the dredging industry, early Amphibious Excavator manufacturers adopted spuds and spud systems to stabilize their machines in

deeper waters. It is well known that the effectiveness of an Amphibious Excavator with spuds will depend on the length of the spuds used for anchoring into the water/river bed.

Amongst the early adopters of spud systems in Amphibious Excavators and amphibious dredgers were:

- a company called Dredgemasters International in Hendersonville, Tennessee (USA) manufactured and sold an Amphibious Excavator in the 1980s to Indonesia called Mudmaster in **Picture 1** with an amphibious pontoon and spuds.

The pontoon style undercarriage system was built by integrating the upper structure of a conventional dredger with a pontoon style undercarriage system with crawler tracks. It combines the functionality of a dredger with the maneuverability and functionality of the Amphibious Excavator to propel itself over soft terrain or while floating. A pair of hydraulic spuds were added to provide stability to the machine when working in deeper waters.



Picture 1

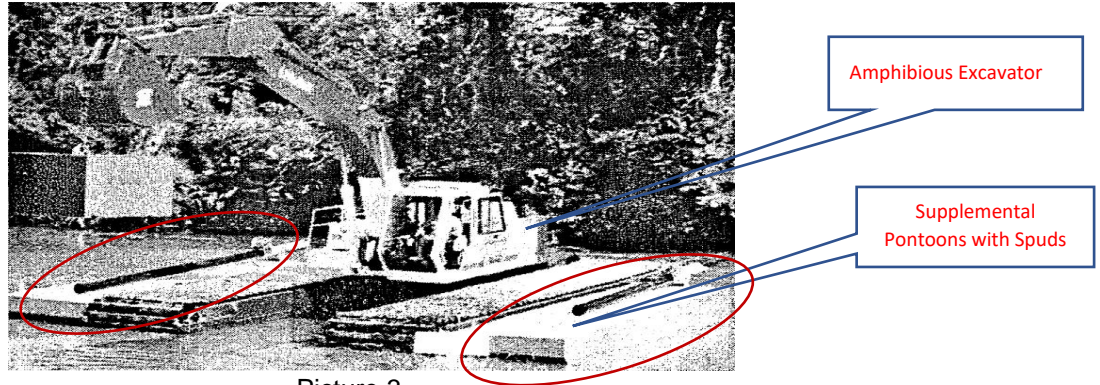
- a company called Machinefabriek De Hollandsche Yssel International BV (The Netherlands) manufactured and sold an amphibious excavator in the late 1970s to Egypt in **Picture 2** (a courtesy of Machinefabriek De Hollandsche Yssel International BV) with a cutterhead and spuds.



Picture 2

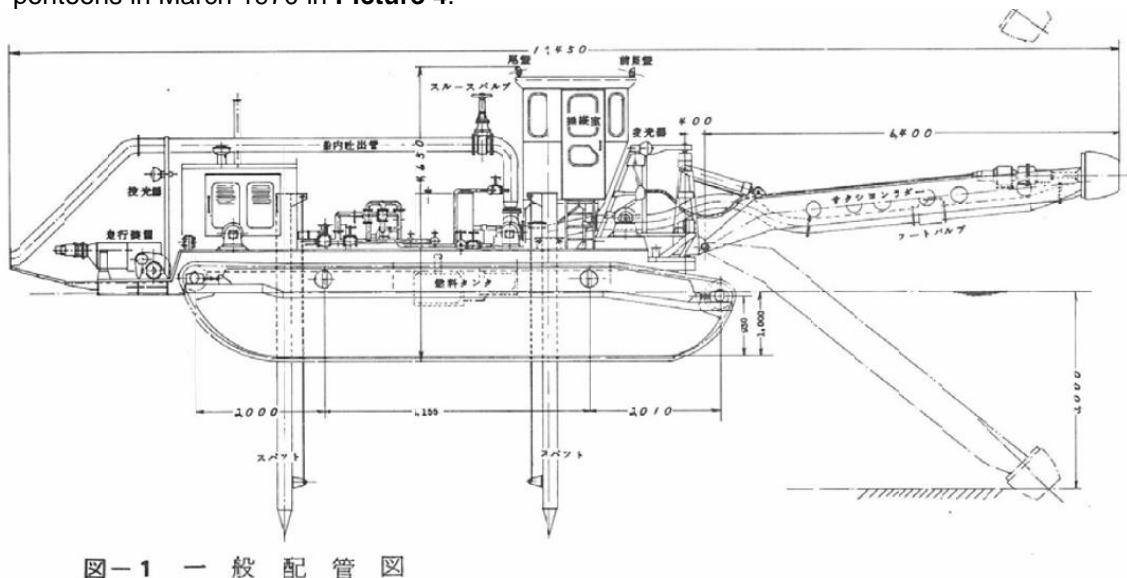
- a company called Quality Industries Inc. in Thibodaux, Louisiana (USA) manufactured and sold an Amphibious Excavator with supplemental pontoons and spuds by 2000 (**Picture 3**).

In the Restoration Alternatives Development and Evaluation Report dated December 2000 prepared by Foster Wheeler Environmental Corporation for the United States Fish and Wildlife Service, it was narrated that: "Quality Industries also produces a floating amphibious tracked excavator that makes use of outboard pontoons and spuds for floatation and mobility in deeper water".



Picture 3

- an [article](#) from the Civil Engineering Laboratory of the Hokkaido Development Bureau, a Japanese government body, explained the usage of an amphibious machine with spuds attached to the pontoons in March 1970 in **Picture 4**.



Picture 4

History of the Amphibious Excavator

The Amphibious Excavator is by no means a new creation. It has been around for a very long time – probably as early as 1940s in the United States of America. Over time, many manufacturers around the world converted different construction equipment that moved and operated on land (of varying types and sizes) into amphibious machinery. For example, the [amphibious tractor](#) used by US Army during war period of 1939 – 1945 in Japan and the amphibious bulldozer by Komatsu Ltd. in the 1970s.

The following is a quick history of the development of amphibious excavators and its various versions over the years until year 2000, and a tribute to the early companies that developed these amazing machines.

1940s and 1950s

- Wetland Equipment Company in Thibodaux, Louisiana (USA) originated in the 1940s and various early models of Amphibious Excavators manufactured by the company can be seen [here](#).
- In the 1955 publication titled “Offshore Operations February 1955 Vol. 1 Issue 6A” a company called D. T. Ritchie Marsh Buggy Co. in Lockport, La (USA) developed an amphibious caterpillar-type marsh buggy with a dragline called the “Big Creeper”.

The Big Creeper can float and cross canals and bayous under its own power, digging as it moves. In the same article, it was reported that the first successful caterpillar-type marsh buggy was built 6 years ago (circa 1949) by Mr D.T. Ritchie and “Creepers” was the trade name for marsh buggies of his own design – the article can be read [here](#).

1960s

- since 1969 till now, Marsh Buggies, Inc. in Belle Chasse, Louisiana (USA) is still manufacturing amphibious excavators. Their early models of amphibious excavators for year 2001 can be seen [here](#).

1970s

- an [article](#) from the Civil Engineering Laboratory of the Hokkaido Development Bureau, a Japanese government body, explained the usage of an amphibious machine with spuds attached to the pontoons in March 1970 – see *Picture 4 above*.
- the usage of **hydraulic systems in spuds** was well established with many references to spuds with winches and hydraulic systems, for example as mentioned in the publication “Dredging: An Annotated Bibliography on Operations, Equipment, and Processes” dated March 1982 in **Picture 5** where spuds with hydraulic system was used **to increase dredging productivity on a floating excavator / floating dredger to anchor and move it around**.

0626 HANCOCK, N. 1976 (Dec). “Floating Excavators Raise Productivity in Major Dredging Projects,” Engineering Contract Record, Vol 89, No. 12, pp 22-23.

Author reports on a new type of floating dredger which can be anchored and moved by hydraulically actuated spuds, that offers high productivity over tenacious soils due to its high crowd forces, large bucket and great working depth.

Picture 5

- an amphibious dredger (a form or version of amphibious excavator) was reported in the PetroMin Asia in **Picture 6** to have used spuds (used to be known as legs) for dredging or excavation works – the article can be found [here](#).

A0237 "Odd Looking Amphibian," PetroMin Asia, Sep 1979, p 54.

An amphibious dredger and excavator is described. This adaptable vehicle has legs for propulsion on water or over soft ground, and can carry out dredging or excavation work in deep water supported by its legs. Vehicle can be fitted with a wide variety of equipment, including a crane.

Picture 6

- in 1979 in USA, Hitachi Ltd. exhibited its Hitachi MA 100 amphibious excavator in **Picture 7**. It can be attached with a variety of attachments such as crane, clamshell or dragline and was designed to operate on marsh or water – the article can be found [here](#).

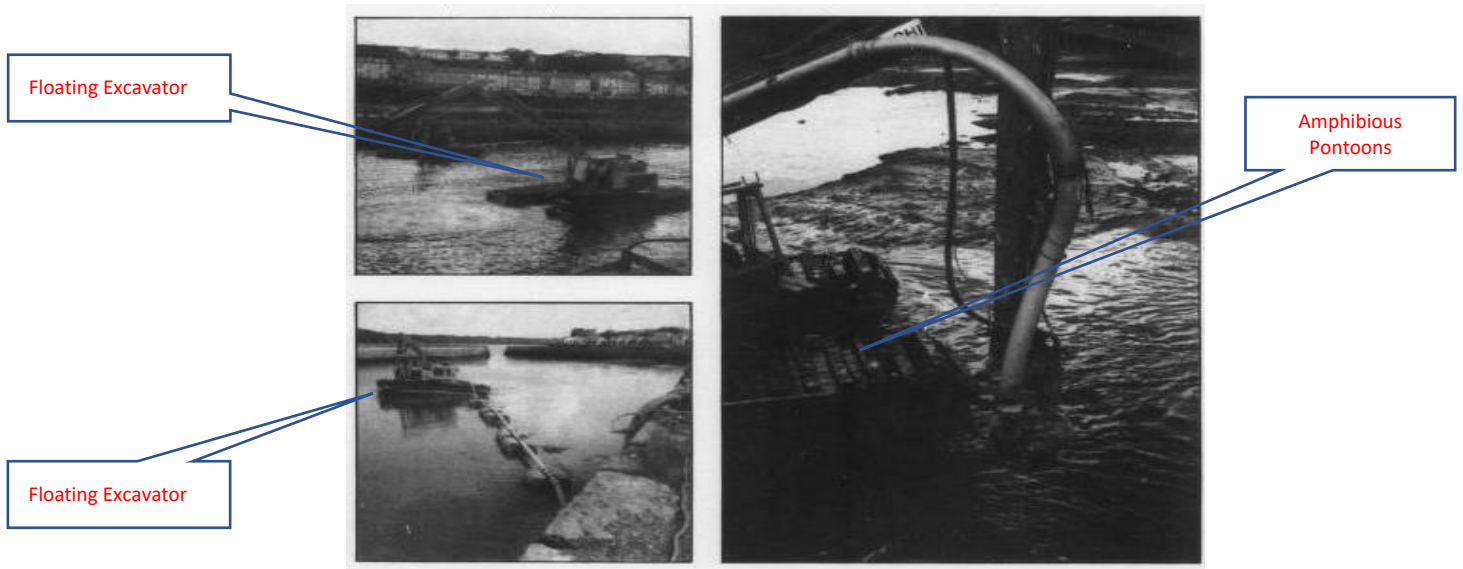


Picture 7

1980s

- a company called Dredgemasters International in Hendersonville, Tennessee (USA) manufactured an amphibious excavator with a spud system called Mudmaster – see *Picture 1* above.
- in the UK for the first time and as reported in Civil Engineering July 1986 edition that a floating excavator in **Picture 8** was created by a dredging contractor North West Plant Services Ltd. (UK) after successfully installed Toyo submersible pump (Toyo DP 30B) onto Hitachi MA100U for a major harbor re-development project at Port Dinorwic in North Wales.

It was also reported that this type of excavator was preferred and not the traditional dredging methods as the latter proved to be time consuming and expensive – the article can be found [here](#).

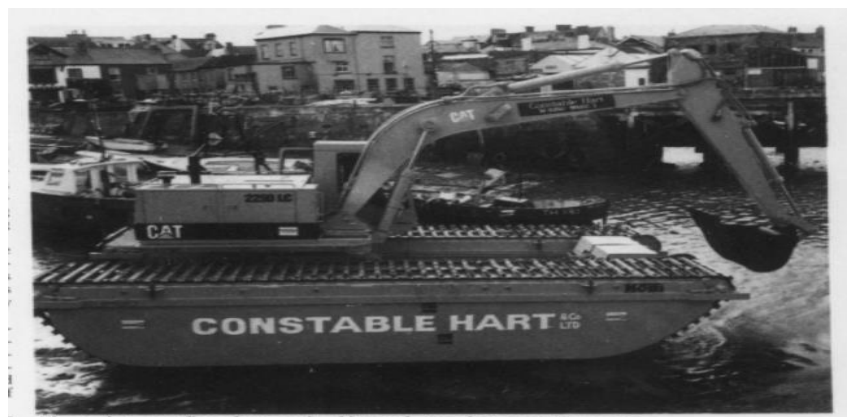


Picture 8

- A [publication](#) in August 1981 by the Japan Construction Machinery and Construction Association described the usage of amphibious excavators in Japan
1990s

- in the UK and as reported in Construction Weekly dated 21 August 1991 that Exeter (UK) based Constable Hart & Co. used Caterpillar excavators mounted on amphibious undercarriages from Kori Corporation (now known as Sunland-Kori Services, LLC in US) in **Picture 9** for a sewerage pipe contract work in River Teign, Devon, UK.

It was also mentioned that Caterpillar excavators fitted with amphibious undercarriages was the “first of their kind in Europe” and was used instead of excavators or draglines mounted on barges or pontoons as these could only move at high water to dig a 6-km long trench at River Teign (Devon, UK).



Picture 9

2000s

- a company called Quality Industries Inc. in Thibodaux, Louisiana (USA) manufactured an amphibious excavator with supplemental pontoons and spuds in the year 2000 – see *Picture 3* above.

EIK's Amphibious Excavators

We launched our Amphibious Excavator with a patented multi-synchronous direct drive system in the late 2000s. The innovation in implementing more than one hydraulic motor per pontoon was a novel concept. It's a paradigm shift for a modern high performance amphibious excavator where the technology offers superior trekking power with built - in redundancy in the drive system. In USA, our patent which is known as US 8,894,452 B2 was awarded on November 25, 2014 and our industrial design in Malaysia is known as MY 09-00955-0101 and was awarded on April 29, 2010.

We designed our spud solutions with a fresh approach. Our spuds are integrated with the supplementary pontoon (aka side pontoon). The side pontoon/spud system is sold as an option for customers who need the machine to work confidently in shallow water condition. Deployment of spuds are executed via a hydraulic cable winch system instead of the commonly seen spud systems with gear systems or hydraulic cylinders.

