



St. Lawrence TECHNOLOGIES

ABSTRACT

In response to the aging of certain dredges currently in use and to the lack of adequate equipment for small and medium-scale work, *Normrock Industries Inc.* launched a project to design and build, in Canada, a multi-functional amphibious excavator for use in lakes, streams, swamps and intertidal zones. Conventional equipment generally does not adapt itself to such conditions. Fitted with modern and efficient equipment, the *Amphibex* facilitates not only the dredging and safe recovery of material not eligible for open-water disposal, but also its secure on-shore or on-land containment. *Amphibex* may also be used for preservation, restoration and development work in natural environments.



Environnement
Canada

Environnement
Canada

Protection

Protection

Québec Region

Région du Québec



CONTAMINATED SEDIMENT

**AMPHIBEX:
A MULTIFUNCTIONAL
EXCAVATION
EQUIPMENT
FOR USE
IN THE AQUATIC
ENVIRONMENT**



HIGHLIGHTS

- **Technology**
 - Rapid overland transport; access to water bodies with no wharves;
 - Access to shallow areas and those difficult to reach by water;
 - Numerous accessories for dredging, pumping, digging, piercing, lifting and scraping.
- **Environment**
 - Diversity of uses: dredging, habitat creation, vegetation control, ice-jam breakup, outfall installation;
 - Precision control over dredging volume prevents overdredging and reduces losses during dredging and transport;
 - Hydraulic system uses biodegradable vegetable oils.
- **Cost**
 - Low equipment commissioning/ decommissioning costs and requires less personnel;
 - Functional year-round.



Gouvernement du Québec
Ministère de l'Environnement
et de la Faune



Federal Office of
Regional Development
(Québec)

Bureau fédéral de
développement régional
(Québec)

PROJECT OBJECTIVES

The aim of the project developed by Normrock Industries was to design and build, in Canada, an excavator that was

- amphibious;
- multifunctional;
- small;
- easy to dismantle and move;
- inexpensive to use;
- able to access shallow water;
- and, that could perform a variety of functions in lakes, streams, water courses, swamps and intertidal areas.

This new equipment must also be capable of dredging and safely recovering materials ineligible for open-water disposal, while facilitating their safe on-shore or on-land containment.

Lastly, the excavator had to lend itself to uses other than dredging including, most notably, port development work, islet construction, underwater pipeline installation, bank protection, ice breakup, and even accidental oil spill cleanup operations.

BACKGROUND

Protection and restoration projects are increasing in number and in kind and, as a result, new technologies are needed for work in aquatic and wetland environments. Existing equipment is not multifunctional enough to meet the recent needs of sediment excavation and dredging operations, infrastructure development or ice-jam breakup. Multifunctional equipment must be developed that can be used for purposes other than dredging, that can maneuver easily in very shallow water and that is easier to commission/ decommission and transport than existing equipment. *Amphibex* meets the needs of fields of activity and markets that differ from those of conventional equipment.

TECHNOLOGY

Amphibex is a multifunctional, amphibious dredger-excavator capable of functioning in very shallow waters, whether directly from the banks of a waterbody or to a depth of over 6.5 m. Its articulated arm has a reach of 7.8 m. The unit is self-propelling, both on land and in water. The main technological design innovations are the

improved hydraulic suction bucket and hydraulic anchoring system. Also planned is an underwater positioning system for the articulated arm and a system to measure continually the volumes of sediment dredged.



RESULTS

Technical and environmental demonstrations of the *Amphibex* were intended to show the multifunctional nature of the equipment, as well as its capacity to protect the environment adequately during dredging and ice breakup operations:

- An environmental assessment demonstrated the capacity of the *Amphibex* to reduce and control the rate of sediment resuspended thanks to its

hydraulic suction bucket. The precision and uniformity with which surfaces were dredged under different conditions were also assessed, taking into account the constraints inherent to each. Tests conducted in the Welland River convinced project leaders there to replace their original equipment with the *Amphibex*, citing its multifunctionality and technical and environmental performance.

- The novel amphibious characteristics of the equipment were demonstrated as part of ice-jam breakup operations over more than 1 km of the Rideau River. Compared to conventional dynamiting, *Amphibex* eliminates the risk of disturbance to aquatic animals and neighbouring human communities alike. What little sediments are stirred up in a very localized fashion by move-

ment of the *Amphibex* doesn't compare to the effects of sudden natural flooding.



POTENTIAL AND LIMITATIONS

Amphibex is unique in its ability to undertake small and medium-scale operations and in its applicability beyond simple dredging work. Its multifunctional nature means that the *Amphibex* has no real competitors at the present time. The unit's advantages are undeniable, particularly where site access is limited and the use of conventional equipment may have major impacts on sensitive riparian and littoral environments.



INFORMATION

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