The Use Of Machinery In The Control Of Aquatic Vegetation

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Many persons who become interested in aquatic weed control for one reason or another feel that machinery should be the answer to all of their problems. Too often one hears the familiar question, "Why don't someone invent a machine. . . .?" Now and again someone does invent a machine and this has happened in Louisiana on several occasions in the past 30 years when a special job had to be done and there were no tools available on the open market. From such experiences, let us look at some of the problems and the machines and equipment that were developed to handle these jobs.

First, it should be clearly understood by all that no one machine is suitable for all of the various jobs encountered in aquatic vegetation control and different types are necessary if the field is to be covered fully. The decision must be made as to whether the machines available will do the kind of a job that is expected in each particular case.

Having decided to use machinery for the control or destruction of the aquatic growths, it is necessary to determine whether the refuse has any commercial value and should be collected for further use or whether destruction is all that is desired. If commercial use of the material is contemplated, secondary handling is indicated and the operation becomes more complicated and costly. In Louisiana, the objective is total destruction of the aquatic vegetation. Tests up to this time indicate that the harvesting of the material is not warranted.

It is well to consider the end results of either operation and to be sure that the partial removal of the unwanted vegetation will satisfy the local interested parties. One of the principal limitations of all machinery mounted on floating plant is its inability to work successfully in shallow water or where there are many submerged obstructions. Unfortunately, these same conditions in no way affect the growth of the aquatic plants and those not destroyed by the initial operation promptly serve as a source of reinfestation of the waterway.

When the streams of Louisiana became clogged with the water hyacinth which had been introduced some 16 years earlier, the job of removing the plants was assigned to the U. S. Army Engineers. A pick-up conveyor and sugar cane type crusher was mounted on the bow of a steamboat in 1900 and became the first machinery used to combat the rapidly spreading water hyacinth. The equipment did a good job according to reports, but was just too big and slow to meet the needs of the day. After about 2 years, its use was discontinued in favor of the more rapid control by arsenic.

Some 35 years later, it was decided that arsenic was too dangerous and that it also had no lasting effect on a newcomer in the waterways which was indentified as "hog weed" and later became known as alligatorweed. The use of machinery was recommended and a mechanical engineer was assigned the job of developing something that could be used to open the many miles of stream in Louisiana that had become clogged with aquatic vegetation.

One of the problems encountered was the effective removal of the plants from the water by means of a conveyor. Many tests were conducted to determine the best type of conveyor. Tests were also made to determine the amount of work that had to be done to destroy the vegetation after it had been lifted from the water. The result of this investigative work was the Diesel-electric Crusher Boat KENNY designed for the special job by the U. S. Army Engineers and built for them in 1937 by a New Orleans shipyard. With this unit, the vegetation was lifted from the water by a 15-foot wide chain and slat conveyor with a maximum possible speed of 100 feet per minute. The lower end was designed to submerge about 3 feet, but it was later operated with the pickup point just at the water surface. This gave a clean and sharp action and prevented vegetation from piling up and then being picked up in large heaps. Uniform pick up of the vegetation was discovered to be a very important matter. The speed of the

conveyor could be controlled from "stop" to "full speed" by a suitable drum control at the operator's station. The conveyor was also reversible so that logs and debris too large to pass through the rollers could be unloaded.

Side wings were mounted from the forward corners of the barge with the intention of diverting large quantities of floating vegetation to the pickup point. Since these wings did not have chains to move the vegetation towards the conveyor, it simply bridged over between the wings most of the time and did not reach the conveyor. The wings were removed and 36-inch diameter cut-off saws were installed on outriggers at the side of the conveyor to trim the floating hyacinth mat into a uniform ribbon for handling. The results were satisfactory and increased the loading capacity of the conveyor.

The vegetation was discharged into a hopper from which it passed between 2 corrugated rollers 30 inches in diameter and operating under 40,000 pounds pressure. The refuse was dropped onto a cross conveyor for return over the side to the water. The speed of the rollers could be regulated through suitable controls and the direction of rotation could be reversed when necessary to disgorge vegetation or foreign matter.

The barge was propelled by two full-weedless propellers mounted in tunnels and had a working draft of about 30 inches aft. All equipment was driven by individual electric motors with power supplied by two main generators furnishing 220-v, DC power.

This crusher plant operated around the clock and, with a capacity of 1,000,000 square yards of surface vegetation per month, was responsible for the initial cleaning of many waterways in southern Louisiana. Within limitations, it was entirely satisfactory and handled the alligatorweed as well as the water hyacinth. It was taken out of use in 1951 and dismantled when the change to the control of aquatic vegetation by chemicals took place.

With the heavy work in mid-stream accomplished by the KENNY, the problem shifted to the control of the fringe vegetation along both banks of the waterway in an area too shallow to permit the big plant to operate effectively. Small floating conveyors were designed and built to meet this situation. They employed a 15-foot wide front pickup conveyor which delivered the material to a 3-foot wide side conveyor for deposit in windrows on the banks of the stream. A very high speed discharge conveyor was installed on one of these units to catapult the vegetation ashore. Saws on the front corners of the pickup conveyor served to cut the mat into the proper width for efficient handling.

A split paddle wheel was used to drive the conveyor into the vegetation, but this proved to unworkable and two full-weedless propellers were installed in tunnels to replace the paddle wheels. This improved the handling of the boat and increased its overall efficiency.

Small boats with rakes mounted on outriggers over the bow were developed and used to sweep the streams and assist in loading the conveyors when necessary. The rake was raised and lowered from the operator's station by means of a simple hand crank.

The conveyors were finally taken out of service when landowners protested the discharge of the vegetation on their property and dumping space became unavailable on many of the streams.

At this point the saw-boats which were in use in Florida were modified for use in the streams of Louisiana. Several small units with a cutting swath of 10 feet were built and one large unit with an effective cutting width of 40 feet was built and put into service. This unit was self-propelled. These units used the closely spaced, multi-saw design to accomplish their mission. The saw banks, revolving at from 800 to 1,000 revolutions per minute, were able to shred the vegetation in place and avoid the necessity of first lifting it from the stream with a conveyor. This was a marked improvement over other means of mechanical destruction of the water hyacinth and also proved to be satisfactory to a high degree in controlling the alligatorweed. It was found that a sharp bow on the boat was an absolute necessity to divide the cut vegetation and allow the unit to pass without a buildup of the vegetation with resulting blockage of the saws.

These saw-boats accounted for the clearing of many miles of waterway in Louisiana and enabled the Engineer crews to push the main work into the feeder streams. However, there always remained the fringes of hyacinths in the shallow water along the banks and return operations at frequent intervals were necessary in many cases to keep the streams open for ordinary use. With the water hyacinth doubling in area every 30 days and the alligatorweed growing at the rate of 6 feet per month, the battle to keep the streams open for normal use was an unending one. Only after the advent of 2,4-D was there any real control of the fringe growths. The high pressure used in the application of chemicals could throw streams of the herbicide on vegetation that was growing in water too shallow for the mechanical units to reach.

It is interesting to note at this point, that a modified saw-boat with collecting trough and a horizontal underwater cutter bar was developed by the Engineers to combat the water chestnut in the Potomac River in 1939. This unit gave way later to a fleet of Hockney Underwater Weed Cutters and these, in turn, were replaced by the use of chemicals.

As the chemicals improved and techniques were developed for their safe use they began to replace the mechanical units which had been used to control the water hyacinth and other aquatic vegetation. When the underwater growths began to spread after the surface vegetation was removed it became necessary to consider once more the use of suitable pieces of machinery to cope with the new problem. There are already some few machines on the market which can be used for the purpose and others are in the experimental stage and available for use on short notice. However, the fact must be faced that there will be areas in which the mechanical units simply cannot work.

Again, we are faced with the necessity of deciding whether the partial clearing of a body of water through the use of machinery and the need for frequent return trips to the same area will be considered satisfactory.

Machinery can and will destroy the aquatic vegetation in our waters, but it must be clearly recognized that all the mechanical devices to date have their individual limitations and no one machine will meet all of the requirements for a large scale operation.

There has been much discussion pro and con about the effects of aquatic vegetation destruction on the fish population in the affected area. Some argue that a fringe of aquatic vegetation is essential to good fishing while others maintain just as stoutly that this provides no advantage. The Engineers have not taken sides in such discussions in Louisiana and have operated on the assumption that they were to destroy all aquatic vegetation within reach. In most cases this includes all fringe growth along

the banks of the stream. Cleaning is usually complete in most cases.

There has been no evidence that the fish population has been disturbed to any great extent by the operations. The fish will leave the area while operations are under way, but return shortly in great numbers. Local fishermen have offered no objections nor made any unfavorable comments and the local users of the various streams usually try to persuade the operating crews to extend the work even beyond the limits initially scheduled.

Mechanical destruction of the aquatic vegetation has always been more costly than control through the use of the various chemical products available on the open market today. This is due to the fact that the initial cost of construction is greater for a mechanical unit and that the output is usually considerably less than that of a chemical unit. This, together with the increased maintenance costs, must be taken into consideration in planning the operations desired.

From the experience of the Engineers in Louisiana, it would appear that a well planned combined mechanical-chemical approach is the most satisfactory method of keeping our waterways open at a reasonable cost. Each type of control has its own advantages and the judicious use of both can lead to very satisfactory results over a long period of time. Caution is advised against the mistaken belief that either chemicals or machinery will produce a one-time cleanup operation that can be walked away from and forgotten.