THE CABLE/HOSE IRRIGATOR

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Summary

As a concept, the cable/hose irrigation system holds much promise for the sugar industry and a dozen units have been operating in the cane fields of Hawaii for over twelve months. From all reports, the results are quite pleasing. There is substantial reason to believe that the concept will be accepted widely in the Australian sugar industry.

The cable/hose concept is particularly attractive because of its labour saving features. The labour saving comes about through the simplification of a number of chores associated with irrigation. The machine needs to be moved only once in every 24 hours and each move represents 10 acres. Moving the machine only takes about 30 minutes and is free of physical effort and discomfort. The operator works at all times on headlands and therefore does not need to walk into the cane or attempt to carry equipment over the cane. Even the hose is moved by a reel trailer thus eliminating the necessity to pick up and carry anything.

The pitfalls of cable/hose systems result from a new concept being undertaken by a number of companies moving into a new field. One must be certain that a machine being contemplated has been subjected to adequate background experience and field trials. In the early stages, new designs are often the victims of cut corners. Until the manufacturer has properly provided for a host of detailed considerations, the machines are often unreliable, more difficult to handle in practice than in theory, and prone to self-damage due to inadequate provision for protection of the various parts.

The cable/hose concept offers a significant promise of savings to the farmer, but he must be very careful in his shopping to avoid selection on price alone. He could easily find that a cheap machine will cost him dearly.

Introduction

The cable/hose irrigation concept is an old and well known principle. Traditionally, it has been confined to small areas such as playing fields and has seldom exceeded an output of 50 gal/min. The simplicity of these small units has long intrigued irrigation equipment manufacturers, but whenever an attempt was made to build larger versions, a number of problems cropped up.

In recent years, break-throughs have been achieved and a number of different types of cable/hose irrigation units have been made available with outputs up to 25,000 gal/h. This makes it an attractive proposition to full scale farming operations. Several machines have recently been introduced to Australia. The first delivery of a unit of this sort to the sugar industry was made to the Gibson and Howes Bingera Plantation.

The various manufacturers of this type of equipment generally conform to a certain basic set of dimensions which were originally dictated by American farming conditions. This has resulted in making a discussion on the concept easier as the sizes are roughly the same.
Description

A typical cable/hose irrigator is designed to operate along pathways 20 chains long and spaced 5 chains apart. This is shown in Figures 1 and 2. A water supply main is laid perpendicular to these lanes through the centre of the field with a hydrant at each lane. A hose is then connected to the hydrant and laid out alongside the path to one end where it is coupled to the unit. A cable is pulled out from the unit along the pathway and anchored at the far end. The unit winches up the cable, and since this is anchored at one end, pulls itself along the pathway dragging the supply hose behind. As the hose is connected to a hydrant at the mid-point of the pathway, a 10 chain hose can supply a 20 chain run. Although there is a range of sizes manufactured, the most popular is the size using a 10 chain length of 4 inch hose. Because of the 4 inch diameter of the hose, 25,000 gal/h was considered to be the maximum economic flow. Each run of the unit then makes it possible to irrigate 10 acres.

The travel speed of the unit is set for the desired application. For example, with an output of 25,000 gal/h, a travel speed of 1 foot per minute will give a 2 inch application. At this speed, it would complete a 20 chain run irrigating 10 acres in 22 hours.

When the unit reaches the end of the run, it stops its forward travel automatically. This can be done by different methods, but is best accomplished by stopping the powering mechanism completely. Moving the equipment to the next run takes about 30 minutes. The cable/hose irrigator is merely towed by tractor. The hose at this juncture is still lying in the pathway full of water. The most common method of moving the hose is to use a hose reel powered by a tractor PTO. It is recommended that the hose be purged before reeling up because of the considerable weight involved. Some reels incorporate a small compressor to do this.

As may be realized, the hose must be capable of standing a good deal

![Fig. 1—Layout diagram for a cable/hose irrigator.](image-url)
of tension, pressure and just plain rough handling. The early problems have now been overcome by a special process and all of the manufacturers of the cable/hose equipment in Australia are using this.

Another part of the system which underwent prolonged testing was the sprinkler itself. The sprinkler now used as standard by all the manufacturers in the trade was selected after prolonged testing of many makes and models. It is a simple rugged unit offering the feature of quick return and part circle irrigation. Early model part-circle units rotated slowly in both directions which resulted in a scalloped effect on the crop.

The one facet of the development of this type of equipment which has received more attention than any other is the actual source of power for the machine. Making a unit which could pull the hose from one end of the field to the other was not too difficult. Making it perform satisfactorily, however, was another matter altogether. A very important consideration is to make the unit maintain a constant rate of travel from one end to the other. Unless it can travel at the same speed from start to finish, there will be an uneven application.

Several important factors come into play here. As the machine proceeds down the path, the length of hose that is being dragged progressively increases. This weight varies with various soil and ground cover conditions. This increasing weight tends to slow the machine down. Another obvious factor is the increase in cable drum diameter. As more cable is wound on to the drum, the diameter increases and therefore the machine has a tendency to accelerate. A basic principle used in establishing constant speed is to balance the tendency to lose speed, because of the increased weight of the hose, against the tendency to increase speed because of the increased cable drum diameter.

A number of approaches have been taken in meeting this problem. The most successful of these has been the L.P. gas powered machine. It

Fig. 2—A typical cable/hose irrigator operating on sugar cane at Bundaberg. The hose is seen along the left side of the path and looped behind the machine.
has the most exacting controls and is of particular value when country is undulating. To date, it is the only unit that can successfully maintain a constant travel speed over irregular ground. This unit is not yet available in Australia but will undoubtedly follow once the principle has been established with the most simplified water powered versions.

Several different types of water powered units have been developed. The most popular is a drive incorporating a water cylinder. There should be sufficient provision to be able to adjust the power input to the system to suit varying field conditions. It is imperative that a unit of this sort has a means of compensating for the varying load conditions.

Filtration of the water used to operate the power mechanism is another problem. This type of unit relies on a pilot operated main valve and if this water is not adequately filtered, the fine particles can jam the valve spool and stop the machine. Any new equipment on the market which has not been thoroughly tested and is therefore barely more than a prototype can cause serious inconvenience in this regard. Inadequately equipped machines have been observed operating in conditions where two hours was the longest period of time that the unit could be left unattended. Problems of this sort, of course, eliminate the labour free aspect of the equipment and therefore defeat the whole purpose.

A third approach is the turbine powered unit. This concept is still very new in the field and as yet is not fully developed. As the turbine is a load sensitive power source, the various load changes cause too much change in travel speed to provide an even application of water. The principle still needs some more work on controls but has potential when these problems are overcome.

It is important that the lane spacings be calculated so as to allow enough overlap to give a uniform distribution. As with any other sprinkler, wind always causes problems. A feature which offers significant advantage when incorporated in cable/hose irrigation units is a special tilt mechanism to reduce the distortion of spray patterns caused by wind. This feature, however, is patented and can only be incorporated under licence from the patentee.