

LASER AIDED CONTROL SYSTEMS

Introduction

Laser aided control systems, which have been widely used in the industrial sector for many years are now gaining popularity in agriculture. Laser technology has improved the accuracy and efficiency of many farm operations as well as reducing the labor requirements. Lasers are now widely used for surveying and depth control on land leveling and excavating machinery.

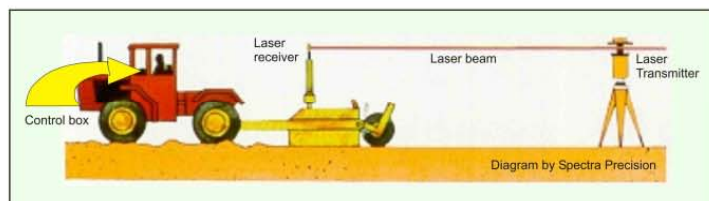
Laser Control System

The laser control system consists of a laser transmitter, a laser receiver, and an electrically controlled solenoid valve.



The laser transmitter transmits a laser beam which is intercepted by the laser receiver mounted on the leveling bucket. The control panel mounted on the tractor interprets the signal from the receiver and opens or closes the hydraulic control valve, which will raise or lower the bucket.

Some laser transmitters have the ability to operate over graded slopes ranging from 0.01% to 15% and apply dual graded slopes in the field.



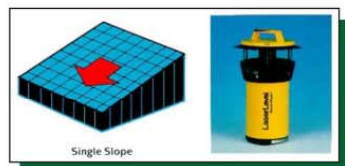
Laser Surveying System

Laser equipment is widely used for surveying in the construction industry. A zero-slope laser transmitter will cost approximately \$US1,000 and is a very effective and accurate means of surveying. The laser surveying system is made up of a laser transmitter, a tripod, a measuring rod and a small laser receiver.



The major advantages of laser surveying are:

- very accurate
- simple to use
- recording can be taken up to a radius of 300 meters and
- one person can operate a laser level.



Land Leveling

a Wet Land Leveling

Wet land leveling is undertaken in rice fields just prior to planting to leave a smooth level surface. The fields must be well prepared and have shallow



water coverage. The laser system controls a 3-point linkage mounted soil puddler by activating a ram connected to the lower link arm. In this system the puddler is controlled in two working planes - for and aft and side to side. In wet puddling the fields do not have any slope or grade.

b Dry Land Leveling

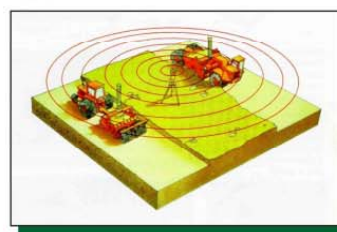
Dry leveling is normally undertaken using a drag bucket pulled by a tractor. A control valve connected to the hydraulic ram on the leveling bucket controls the system. The soil must be dry, well prepared and relatively free from crop residues.



High soil moisture and heavy crop residues restrict soil movement from the bucket. On average it will take 3-4 hours per hectare to level a field that has a variation of 100 mm from the high places to low places. When dry leveling it is also possible to put slope or grade in the field.

Limitations:

The error from the earth's curvature affects a laser transmitter the way it does a surveying instrument. Elevation readings at long distances will appear lower than they actually are. The following table shows the amount of error for a straight line of sight due to the curvature of the earth.



150 m - 1.5 mm

300 m - 6 mm

450 m - 15 mm

600 m - 24 mm

Advantages of using laser



Using a laser controlled leveling system will halve the time taken to level a field and double the accuracy. The actual time will depend on the skill of the operator, amount of soil that needs to be moved, the soil type and the field shape.

Laser control allow operators to level soil surfaces to within 10 mm.

While laser system are expensive the higher cost is offset by the improved accuracy and efficiency that can be attained.

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