

CHAPTER 9: Travellers Spray Booms irrigation systems

INTRODUCTION

The Traveller Spray Boom is a complete mechanized automated spraying irrigation system, easy to transport from one field to another (Figure 9.1). The spray boom-irrigating lateral, placed on a wheel trolley 1.3 to 2.5 m above the ground, is towed at the far end of the field up to 400 m apart from the machine main body, which stays near the hydrant. They are connected to each other with a long PE pipe laid on ground. When operated, the pipe is re-winded on a reel (dram) attached to the machine main body and the spray boom on the trolley is dragged backwards irrigating a strip until the full length of the field is covered. The traveller spray booms are compact irrigation systems of low – medium operating pressure (3.0–4.5 Bars). The area irrigated per shift (setting) ranges from 0.4 to 2.0 ha depending on the size of the unit. The Spray booms are used for the irrigation of forage, grain, potatoes, groundnuts and most agro-industrial field crops. They have a large application in supplementary irrigation of cereals (wheat and barley) during the winter months.

FIGURE 9.1 - Spray boom on trolley in operation.



SYSTEM LAYOUT AND COMPONENTS

In this system a boom, equipped with low-pressure rotary spray nozzles, applies the irrigation water to the plants overhead in the form of fine sprays. The boom is a single travelling irrigation sprayer pipeline hanging above ground. It is mounted on a trolley and fed from a long flexible PE hose/pipe connected to a large reel (drum). The reel is placed on a swivel-base mounted on a wheeled cart (Figure 9.2). It is equipped with a controller and other optional devices for the proper functioning of the system. For operation the whole compact unit is transferred (towed), with aid of a small agricultural tractor, and connected to the hydrant or other pressurized source of water. The trolley with the spray boom folded (or unfolded) is towed to the length of the hose up to 400 m at the far end of the field area to be irrigated.

The system operates with the water pressure. The power is transmitted from the machine's turbine drive system on to the reel over a gearbox and a chain drive. During operation the water turbine driven reel pulls automatically the boom across a large strip area irrigated and rewinds the hose/pipe back on the drum. The retraction speed is regulated from 2 to 60 m/h. When the hose is completely retracted the reel stops winding automatically. The swivel base can be turned up to 180° and the boom and hose are towed to another direction of the field, where the irrigation operation is repeated to a new area of the same field. Then the whole compact unit can be towed to another field or stored.

FIGURE 9.2 - The boom, the PR pipe and the reel machine.



The Boom with the water emitters (sprayers) and the trolley

The boom pipeline consists of 2–3 inches (50–80 mm) hot dip zinc galvanized steel pipes in approximate lengths of 4 m, foldable, with reduced diameters at both ends. It is mounted on a two or four wheels cart/trolley for bigger booms, made of high quality steel and aluminium with swivelling turntable with supports and safety device for transporting on the traveller. The boom is hanging above ground at 1.3 m to 2.5 m hydraulically adjustable height achieved by means of special mechanism on the trolley. Burdening weights continuously balance the boom parallel to the ground. The boom is quickly and easily folded and unfolded by one operator and its full length (width) varies according to the model from 15 m to 50 m. End spray nozzles or impact-rotating sprinklers at both boom arms can increase the effective wetting width (irrigation strip width) significantly (Figure 9.3).

The sprayers are mostly the deflector type and with grooved plates stationary or rotating for longer effective water throw radius up to 6 m, as in the Center Pivots. The size of nozzles varies from 2 mm up to 5 mm and the operating pressure ranges from 0.7 Bars to 2.5 Bars with flow discharges from 100 l/h to 4.5 m³/h. They are the full circle (360°) and half circle (180°) and they are placed along the boom line on the lower part facing the ground at frequent spacing of around 1.5–2 m apart for efficient overlapping. Near the trolley half-circle sprayers of deflector type with reduced throw radius are placed to direct the water in front of the boom, away from the wheels and to preventing the trolley from being dug into the wet soil, thus enable backwards move on dry soil.

FIGURE 9.3 - The full-circle and the half-circle Sprayers.



The Flexible polyethylene pipe

This is made from reinforced special virgin HDPE and it is high pressure PN 10 Bars minimum. It is specially developed for reel machines and its size varies according to the system from 75 to 110 mm in lengths of 300 to 500 m. One end is connector to the reel machine and the other to the boom line. It is the irrigation water conveyance and the boom line feeding-pipeline.

The Reel machine

According to the model and the size there are two, three or four wheel, heavy structural frame undercarriages, with turntable base on which the pipe revolving reel (drum) can be swivelled mechanical or hydraulic through 270° and turned to any desired position. The whole machine stays fixed immovable even at high pulling forces during operation. The reel drum is about 2 m diameters. It is equipped with a full-flow turbine drive system and a four stage gearbox, a controller (electronic or mechanical) an over-pressure shut-off valve, a tachometer and a feeler bar for the exact regulation of retraction speed. The reel is safe during operation, start-up and shut-off. It stops automatically after the pipe pull-off (Figure 9.4). The winding mechanism guides the PE pipe precisely and evenly through all windings and layers without bends or bruises on the rolled inner drum. The system can be interrupted at any time of the operation with the use of a gearshift lever. When needed the PE pipe can be rolled up quickly. A blow out system empties the water left in the pipe with the completion of irrigation. At the end of the operation the boom is easily folded and the trolley is lifted hydraulically into the transport position and loaded on the reel carriage. The whole structure is made of hot dip galvanised steel.

FIGURE 9.4 - The reel machine with the PE pipe.

