Spacing between sprinklers is an important factor in providing uniform irrigation applications. Spacings tend to be made as wide as possible to reduce application rates and overall system cost. However, if spacings between sprinklers or lateral sets are too large, application uniformity goes down, creating overly dry and excessively wet spots in the field.

Converting to low pressure

Uniformity of water distribution is an important factor in stationary sprinkler systems, particularly when reduced-pressure operation is considered. Converting sprinkler irrigation systems from high or intermediate pressure nozzles (50 to 65 psi) to low pressure nozzles (about 35 psi) is a proven method of reducing energy consumption. Generally, this practice can reduce that portion of energy required to pressurize the water at the sprinkler nozzle by 15 to 25%. The sprinkler manufacturing industry has responded to this opportunity by developing suitable low-pressure nozzles for impact sprinklers used on stationary sprinkler systems. These nozzles are designed to operate at reduced pressures without the distribution problems encountered with conventional sprinklers at low pressure as shown in figure 1.

Reducing sprinkler pressure, while maintaining constant sprinkler discharge, does not change the system capacity to deliver water but does result in a reduced sprinkler pattern diameter and increased peak application rate. Consequently, because of the reduced pattern diameter, stationary system application uniformities may be reduced to unacceptable levels when attempting to reduce energy costs by lowering system pressure and not adjusting sprinkler spacing. Because of this reduction in uniformity, irrigators have been hesitant to convert side-roll or hand-move sprinkler systems to low-pressure nozzles. This type of problem does not occur on low-pressure systems. These nozzles are designed to operate at reduced pressures without the distribution problems encountered with conventional sprinklers at low pressure as shown in figure 1.

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High Pressure 40’x60’

Figure 2.—Offset program alternates positioning of the lateral during every other irrigation. On odd-numbered irrigations (first, third, fifth, etc.), the lateral is placed directly out from the mainline valves as shown at left. On even-numbered settings (second, fourth, sixth, etc.), a swingline is used to position lateral midway between mainline valves as shown at right. Thus, the total of two successive irrigations gives a more uniform distribution of water on the field.

Low Pressure 40’x60’

Figure 3.—Water distribution with normal pressure (50 to 65 psi) on a 40 x 60 spacing. System delivers water with a coefficient of uniformity of 80, about the minimum acceptable.

Figure 4.—Water distribution with low pressure (30 to 35 psi) on a 40 x 60 spacing. System delivers water with a coefficient of uniformity of approximately 50, an unacceptably low figure.

Offset advantages

The offset or swingline practice, used in conjunction with conversion to low-pressure operations, enables the irrigator to properly control water application and maintain an acceptable coefficient of uniformity (figures 3, 4, and 5). So doing will maintain approximately the same crop yield while reducing energy use. The uniformity improvement in water distribution from offsets or swinglines will be most significant on the larger moves (for example, 60 feet or more between outlet valves on the mainline).

It should be noted that the offset or swingline practice is beneficial with any type of stationary sprinkler system—side roll, head, gun, or even big gun. It is a low-cost, low-labor method to substantially improve uniformity of water distribution and energy efficiency, but must be stringently followed if satisfactory results in crop yield and quality are to be expected.

Low Pressure Offset

Figure 5.—Water distribution with the same low pressure (30 to 35 psi) on a 40 x 60 spacing but using offset every other irrigation. System performs with a very acceptable coefficient of uniformity of over 90.

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