WATER DEVELOPMENT AND DISTRIBUTION IN THE LOW DESERT

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Irrigation of the arid Imperial Valley was envisioned by the pioneers at the turn of the century and has been in the progress of development and improvement to the present day and will continue--but did they envision 1758 miles of canals and 1453 miles of drains to serve 500,000 acres of agriculture?

Many of you here have seen the change from uncertain muddy water in an open dirt ditch coming through a foreign country to the present day of desilted Colorado River water coming by way of a main canal entirely in the United States and through remote control gates, diverted through many concrete lined canals to be delivered to a precision sprinkler system.

Many hardships and adversities, both physical and political, were encountered from that first head of water to a present-day irrigation run.

In the early days of irrigation in the Imperial Valley there were uncertainties of receiving water from the then untamed Colorado River, to the present controlled river with ponded water behind dams that assure us a continuous supply of water for crops and cities.

This was brought home to the users of the Colorado River during the recent drought that was encountered throughout the rest of California.

The irrigation distribution system has been and is being improved since those early days. The design of the distribution was changed after clear water became a reality in the early 1940's. Prior to the All-American Canal and desilted water, the system flowed a steeper grade as required to keep the silt load in suspension.

The main maintenance in those days was done with the Ruth-dredge, a bucket-line excavator which was used to remove the silt and keep the channels clear. Then, clear water without silt, caused the bottom of the channel of the main canals to erode, requiring major control structures to control the degradation and to check the water to an elevation for diversion. These structures have been the large expensive type.

The brush work that was done was accomplished by hand with large crews of day-laborers. In recent years various herbicides have been applied along the canals, laterals and drains with modern motorized equipment with much improved technology.

The early gopher program consisted of trapping, with personnel involved in continual trap tending. Some carbon monoxide was used--using the exhaust from Model T Fords. This method gave way to the placing of gopher tablets directly into an active gopher burrow. This work was done by hand and with spray crews that could not spray herbicides because of wind or other reasons. This was more or less hit and miss with some employees not very effective in this approach.

The method used now is the gopher machine, which develops an artificial burrow and inserts poison grain. The burrowing gopher intercepts this burrow and seeks out this grain.

This method has proven successful and the irrigation system is covered with two machines working part-time.

When the irrigation system was first constructed, all structures were timber, with crews of carpenters constructing and continually maintaining checks, deliveries and bridges.

The system structures now have nearly all been replaced with concrete structures with reinforced concrete pipe, installed where required. A standard delivery to a farm account now is considered a 3' x 5' concrete delivery, with an aluminum side gate installed in rubber guides, with timber sill for seating the gate with 16 feet of 30-inch diameter concrete pipe through the canal bank to provide a maintenance road crossing.

Timber structure construction gave way to concrete block or rubble construction, then as transit concrete mix became more readily available, steel forms were designed to pour

structures in place in the canals and drains. The steel forms could then be stripped off and used at the next construction site. Steel forms were fabricated in all sizes to accommodate the wide variety of structures used throughout the system.

Improved equipment such as cranes and draglines made this type of construction very practical and efficient.

To further improve construction procedures, limited size concrete structures such as deliveries, small headwalls, etc., are precast in the yard for installation in the field, where practical. This cut the installation time for greater efficiency.

Throughout the system there are 10,780 structures in the canal system and 2,435 structures in the drainage system.

The canal and lateral concrete lining program has been ongoing since 1964 and 716 miles of 1,758 miles of canal have been concrete lined.

The District's concrete lining program is in participation with the landowner adjacent to that portion of canal being lined.

The landowner makes the request and pays 30 percent of the cost of placing the lining and provides any necessary fill dirt required. This normally (if required) comes from a strip parallel with the construction. The borrowed area is then releveled by the landowner.

The District pays the balance of the cost of placing the concrete lining, construction of the ditch pad and other work required to complete the job. This is a popular program with the landowners, resulting in a backlog of requests representing 18-24 months of construction.

The installation of these concrete linings is completed in five days. The canal section is dewatered and standing water is pumped from the channel. Draglines are then used to remove the mud and side slope from the channel and it is placed at the edge of the right of way. The banks are then folded into the construction ditch pad with reject material folded in to become the base of the new bank.

The concrete ditch contractor then makes channel excavation and places the concrete lining and the District seals the expansion joints with hot mastic. This completes the channel and water is turned back in.

We consider one-half mile as a minimum job and can do as much as 2-1/2 miles in the five-day period, depending on the ditch size and other factors.

After the ditch is "cured out", the banks are shaped and herbicide applied from concrete rail out to about four to six feet--then on to the next job.

It is quite a sight to see this equipment work in close quarters as the job gets started--as six to ten bulldozers plus two to three draglines are utilized because time is of the essence.

The landowners and water users have continually improved the supply and head ditches on their property. Many of the original dirt farm ditches were subject to seepage, weeds and rodents. These ditches occupied area that could be utilized for crops and required continual maintenance and constant attention during an irrigation.

Many of the early concrete farm ditches were one-foot bottom width and are now being replaced with two-foot bottom width ditches. This larger ditch is more efficient as increased labor costs and other factors result in larger water orders being required to shorten irrigation time on larger parcels.

Early water deliveries were made from the lateral system to the water user by the zanjero who lived on the ditch, using his personal horse and buggy to make his run, later using his personal motor vehicle.

The area of the zanjero was limited because of transportation and condition of the roads and canal banks.

Now the zanjero serves a larger run with an air-conditioned, two-way radio equipped, District furnished pickup over blacktopped roads and maintained canal banks. He also lives in town and works an equivalent of five days a week instead of seven days a week, 365 days a year.

This has been an improvement in service to the water user as he is just a phone call away from any necessary service. There are also patrol zanjeros assigned to give 24-hour service.

Water ordering has changed over the years also. Prior to controls and dams along the Colorado River, water in excess of requirement flowed in the river. This resulted in water being readily available at the time--except in dry years. Now water scheduled for use along the lower Colorado River is released from Parker Dam for diversion from the River at various points.

Our water is diverted at Imperial Dam into the All-American Canal. All agencies are required to submit to the USBR their estimated requirements by month for the calendar year These figures are refined on our weekly request which is submitted each Wednesday for the ensuing week commencing the following Monday, with option to revise up or down 72 hours before we receive the water. In other words, our water is in transit from Parker Dam 72 hours.

Our irrigation requirements are developed by weather forecasts, cropping pattern, previous week, previous year and a lot of praying

When an area like this goes from 60,000 acres of cotton to 140,000 acres in one year, we have fed our Watermaster lots of stomach tablets.

If we need a small amount of extra water, it is normally made available from Senator Wash Reservoir, upstream from Imperial Dam, but if we reject water in excess of their pumping or storage capacity at Senator Wash Reservoir, it is chargeable to our account and goes down the River, usually to Mexico.

The local water user is subject to a three-day (72 hours) carry over, this coincides with the River travel time. There is normally about 20 percent of our water carried over to level out the water flow. So some orders are carried over one day, but two- and three-day carry overs are rare, except in a lateral capacity situation.

Water conservation is a topic throughout the irrigation world and we are continuall· reminded of this at State and Federal levels.

There are laws at both levels that set forth that water must be used beneficially and they are authorized to enforce these laws.

There is wide opinion as to what is beneficial use. Other terms are being evaluated such as "waste", "spill", and "return flow".

The District in 1976 effected a thirteen-point water conservation program that dealt with several areas of water conservation.

Construction of No 8 Pond (J. M. Sheldon Reservoir);

Reconstruct, to the extent necessary, all waste boxes in system;

3. Recruitment and employment of an adequate number of water regulating personnel to schedule changes in water deliveries to water users as requested as the system will permit;

4. An inventory of surface field discharge water will be taken daily and an assessment may be levied against all discharges which equal 15 percent or more of the water being delivered and measurement thereof shall have been taken on two successive occasions not less than nine hours apart in a 24-hour period. The term assessment used herein shall mean the quantity of water ordered in second feet and reduced to acre-feet, times the scheduled water rate multiplied by three for the day in which the measurements were taken;

5 Surface pond development through evaporation;

6. Acquisition of land to construct reservoir on Central Main Canal in the vicinity of No. 4 Heading;

7. Study relating to water recovery lined paralleling the East Highline and West Side Main Canals for seepage recovery which is now going into drainage system and to Salton Sea;

8. Free drainage water to any person willing to pump and use same;

9. Continuation of concrete lining program;

10. The initiation of record to reflect accrued water use per acre per parcel through computerized billing process for period July 1 to June 30 each year;

11. Accelerated program to install radio equipment in all water conservation related mobil equipment for immediate exchange of information with supervision and Water Control Section;

12. Immediate initiation of irrigation management services program;

13. Delivery of water-off schedule when and wherever possible.

The area of future improvement will have to be continued refinement of the distribution system and improved service to the water user with water conservation being a big issue.

Pump backs and irrigation management are two items that are often discussed and are being utilized at other locations with water prices or water scarcity being the motivation

The drainage system has not been discussed, but it is a very necessary part of our system for the benefit of agriculture.

The irrigation system development and distribution has made many steps forward.

The water user must not stop and the irrigation district cannot stop for there is still room for improvement.