the
# WATER HAULER'S BULLETIN

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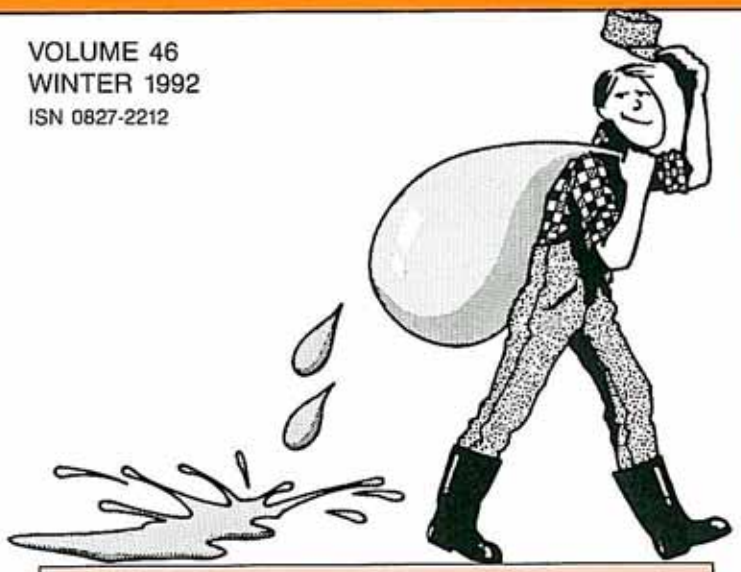


## IN THIS ISSUE:



# WATER QUALITY IN IRRIGATION RETURN FLOW CHANNELS

Irrigation return flow is often perceived as being a major source of pollution for receiving streams in southern Alberta. A recent report prepared by the Bow River Water Quality Task Force titled "The Bow River: Preserving Our Lifeline" identifies irrigation return flow as a source of pollution to the Bow River. Reports such as this, combined with public opinion polls which show increasing concern with water quality, underscore the need for accurate information on water quality in the irrigation return flow channels.

In 1990, the land evaluation and reclamation branch initiated a study to monitor water quality in selected return flow channels within a number of irrigation districts. This study was carried out in conjunction with the irrigation branch as part of their water flow monitoring program. Between June 1990 and August 1991, 28 return flow channels were sampled on a "one time only" basis within six irrigation districts (Figure 1). Collected water samples were analyzed for pH, electrical conductivity (EC), nitrates and standard cations and anions.

The data from this preliminary study indicates that the water quality in all of the return flow channels is very good. Nearly all water samples were well within the guidelines for human consumption and were very similar to

*Dennis Laurin collects water sample.*

the river water quality. The one exception was a slightly saline sample which was collected from a channel which had no perceptible flow.

The results of this preliminary study concur with the findings of previous investigations carried out by Alberta Environment and Agriculture Canada. Since irrigation return flows in southern Alberta usually consist of "surplus" irrigation water in an irrigation canal and are not the result of runoff from irrigated fields, it is not surprising that the quality of this water is generally good.

The information from this study, because of the "one time only" nature of the sampling, may not reflect potential fluctuations which can occur in the water quality over time. Factors such as weather events, runoff, irrigation practices, seepage and groundwater discharge may all impact water quality. The land evaluation and reclamation branch is therefore looking at a more intensive monitoring program which will include some continuous or "event oriented" monitoring. In addition, other potential contaminants such as trace elements and agrichemicals (herbicides and pesticides) will also be monitored.

If you would like further information on this project, or have suggestions for future monitoring, please contact Murray Riddell, Land Evaluation and Reclamation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5884. ■

FIGURE #1

# AIPA UNDERTAKES MAJOR STUDY

The Alberta Irrigation Projects Association (AIPA) has embarked on a major study "Impact of Irrigation Study." "It's the biggest single undertaking in the association's 46 year history" says Stan Klassen, executive director. The work has been contracted out to U.M.A. Engineering Ltd. for $335,000.00. It will be completed in the spring of 1993.

The study, says Klassen, will seek to demonstrate the benefits of irrigated agriculture in economic terms, including direct and indirect benefits. We will review and quantify the previously noted "unquantified benefits." This later listing includes: recreation, tourism, wildlife and waterfowl habitats, sport and commercial fisheries, primary and secondary industries that exist as a direct result of the irrigation system, historical and cultural resources related to irrigation development, domestic, municipal and industrial water supplies serviced from the irrigation systems.

In addition, states Klassen, the study will provide a database of information which will form the basis to increase the awareness of interest groups and the public regarding the benefits of irrigated agriculture. Emphasis will be added to the concept that continued attention to irrigation development in southern Alberta is an investment that benefits all Albertans.

The AIPA's "Governmental Affairs Committee" will direct the study. However, the AIPA has also requested representation on an "Advisory Committee" from: Alberta Fish and Game Association, Ducks Unlimited, Water Resources Commission and Alberta departments of Agriculture, Forestry Lands and Wildlife, and Environment. "Upon completion," says Klassen, "the report will provide legislators with scientifically developed data and analysis of the economic benefits relative to irrigation for future long-range planning and participation in irrigation."

For more information please contact Stan Klassen, Executive Director, Alberta Irrigation Projects Association, P.O. Box 278, Lethbridge, Alberta T1J 3Y7. Telephone (403) 328-3063. ■

# CRACK REPAIRS IN CONCRETE STRUCTURES

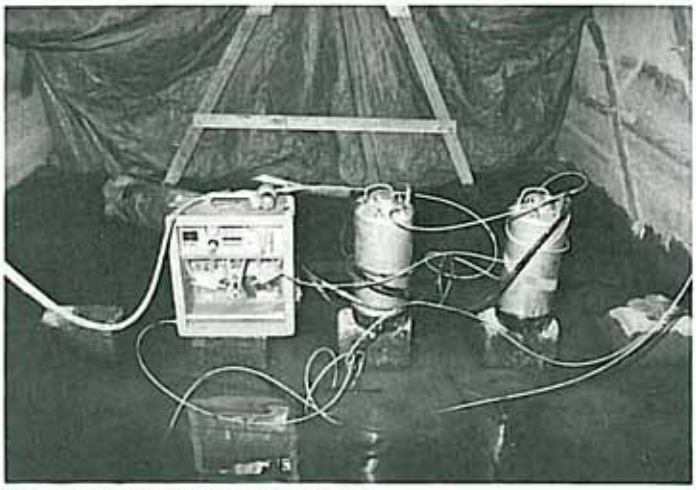
*Economic Times Dictate Change*

Concrete irrigation structures, unlike fine wine, do not get better with age. Usually it's the opposite, with age, cracks begin to appear and must be repaired if deterioration is to be slowed. For ten years the Bow River Irrigation District (BRID) has been contracting out to private industry to have cracks in their structures injected with Sika Canada Inc. epoxy. Results have been good.

Now, in what district engineer Steve Topping calls a "cost-saving venture," they have gone ahead and purchased their own epoxy injection equipment and had their ditchrider staff trained in injection practices and safety. Total cost for equipment and training was $9885.00. Since shut-down of the irrigation system in October, Topping says their three-man crew has been repairing three to four structures a week.

Repair begins by sand-blasting the area around repairable cracks. Cracks that are larger than the width of a pencil cannot be sealed using Sikadur 35 Hi-Mod LV® resin, says Topping (large cracks must be routed out and filled with Sika-flex 1a®). If a crack appears to go right through the wall of a structure, the district often removes the earth backfill to expose the crack from both sides. The repair crew hoards the structure by draping plastic tarps over the walls and a portable propane heater is installed.

Next, says Topping, the repair crew applies a gel paste (Sikadur 31®) on the wall and over the crack. When this hardens overnight, it prevents the epoxy from leaking from the crack. During this process, injection ports are installed every 300 mm along the crack.



*Injection Pump with resin cannisters.*

*Dave Nolan of the BRID points to resin beginning to bleed from crack.*

Pressure-injection begins at the bottom of the crack. The epoxy resin is pumped through a special pump (made by Lily Corporation) and is injected until it begins to bleed out of the next injection port immediately above. Two or three cracks can be simultaneously injected. Curing, says Frank Iaquinta, technical representative with Sika Canada Inc., should take place for twenty-four hours at 10°C. After curing, the hardened gel paste is ground off for esthetic purposes.

In addition to the crack repair, says Topping, two steel struts are fabricated and installed between the walls (above the water level) to reduce tension. We also pour a new basin and blocks if the structure requires it, he adds.

Costs to repair a structure are running between $4100.00 and $5500.00. These include: fabrication and installation of the steel struts, labor, materials, machine time, and miscellaneous appurtenances. Topping estimates the district savings are about 50%. A substantial saving comes from the fact that the repair crew lives in the area and doesn't need to charge out travel and accommodation. Another economic benefit to the three ditchriders is that they have year-round employment.

The BRID feels that by yearly inspection and maintenance of their concrete structures and repairing any visible cracks that appear, will pay big dividends in years to come when many extra years of service are gained. We estimate we can get an additional 20 year's life out of a structure for an investment in maintenance of about 10% of its capital cost, concludes Topping.

For more information please contact Steve Topping, P.Eng., District Engineer, Bow River Irrigation District, P.O. Box 140, Vauxhall, Alberta T0K 2K0. Telephone (403) 654-2111. ■

# WHERE DO YOU PUT THAT FENCE?

*Placement Varies Between Districts*

Editor's Note:
In this article, the districts are referring only to fencing required to protect rehabilitated works from livestock. A canal in a fill section was used as an example.

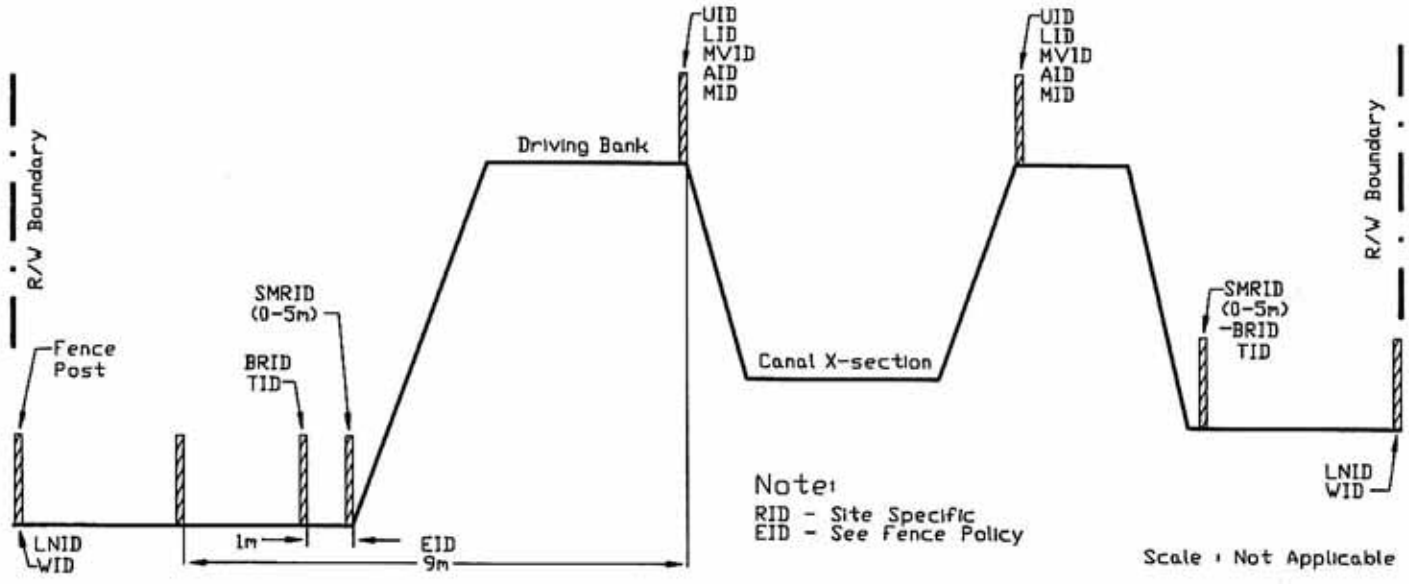
Fencing with barbed wire to keep livestock out of irrigation works is as old and motherhood to irrigation districts as is cattle to the western Canadian farmer. It's not that cattle intentionally damage things, but with the animals' continual need to rub and with all that weight and sharp hooves, things soon get damaged.

In order to protect the investment under the Irrigation Rehabilitation and Expansion Program, says Gerhardt Hartman, P. Eng., manager of the Irrigation Secretariat, the Irrigation Council of Alberta has a policy in place today that requires irrigation districts to protect rehabilitated works. The policy states that "All rehabilitated works that may be damaged by livestock shall be fenced if they are likely to be in the proximity of livestock." This would apply, says Hartman, to open canals, lined or unlined, and structures. Fencing would not likely be required for pipelines except for those above ground appurtenances which might be damaged by livestock rubbing. To encourage acceptance of fencing, Council has determined that livestock crossings, dugouts, stockwatering turnouts and the like are fundable under the program if required.

*SMRID fencing along Coaldale Lateral.*

The location of the fence is left up to the individual districts and placements do vary considerably. In past, adjacent landowners often used the entire grassed canal banks for additional pasture. After rehabilitation, district boards were often faced with adjacent landowners who still wanted the use of at least some of the right-of-way or easement. This has led to individual districts varying placement of their fences.

The Lethbridge Northern Irrigation District (LNID) and the Western Irrigation District (WID) usually fence along surveyed right-of-way lines. Craig Gordon, manager of the WID says, "This usually eliminates any problems with the farmers and makes future canal maintenance easier." Lawrence McCune of the LNID agrees and adds that "landowners or renters, over the years, may begin to think that because they have used some part of a district's right-of-way for many years, they may have forgotten or



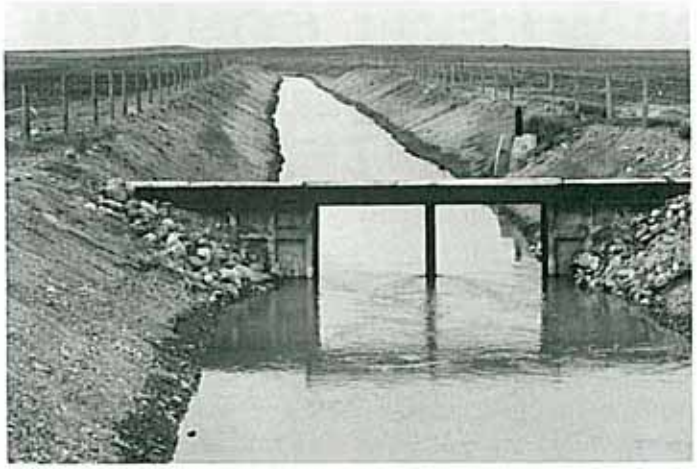
not realized or never known that they don't own it and when the district finds it must do maintenance, it often becomes difficult.''

*Rick Ross, manager of the LNID says, ''We tried fencing on top of the bank to give farmers the maximum grazing use but it was a nightmare when district staff tried to do maintenance.''*

Five of the more westerly districts, Aetna (AID), Leavitt (LID), Magrath (MID), Mountain View (MVID) and United (UID) Irrigation Districts all place their fences on the top of the inside bank. This allows, says Kirt Woolf, manager of the UID, the landowner to graze their cattle over all but the trapezoidal canal section itself. It keeps the weeds under control and hasn't posed a problem to the outside slope by cattle trampling it. Woolf feels with today's large equipment, cleaning their fenced canals will be no problem as the operator will simply reach over the fence, excavate the material, swing and deposit the spoil in the adjacent field – to be later spread when dry. Magrath's manager, Dean Anderson says their district does not build driving banks, thus farmers are allowed to farm or graze cattle right up to the canal section. The MID has only easement agreements and doesn't purchase right-of-way, so access is sometimes difficult during growing seasons as farmers get pretty upset if you drive along the canals where their crops are growing.

The Bow River (BRID) and Taber (TID) Irrigation Districts try and locate their fences on the driving-bank side at a distance determined by the farthest outside toe, putting the fence in a straight line at a minimum of one metre from the outside toe. Both districts place the opposite-side fence anywhere from zero to five metres from the outside toe. The BRID used to fence on top of the embankment, but Steve Topping, P. Eng., district engineer, says their policy was changed about one year ago because maintenance was too difficult.

The St. Mary River Irrigation District (SMRID) fences both sides of their canals that need protection. The fence location, depending upon the height of fill, can be from zero to five metres from the outside toe. Ron Renwick, P. Eng., district engineer, says when cleaning becomes necessary, there is a good possibility that the material will have to be hauled away or the fence removed.



*Fencing along MID's Highline Canal.*

In the Eastern Irrigation District (EID), there is a ten-page ''Fencing Policy'' in place which goes into great detail on all aspects of fencing: location, maintenance, construction standards, etc. Earl Wilson, P. Eng., district engineer says, on most irrigation rehabilitated projects that require protection from livestock, the EID likes to maintain both fences about nine metres from the inside shoulder. If a district canal parallels a municipal road, they usually don't bother fencing the road side.

Gordon Zobell, manager of the Raymond Irrigation District (RID) says, the district has no set guidelines but is site specific. If fencing is required, then it would likely be placed on top of the bank, he adds.

In conclusion, there seems no utopian place to construct a fence along a canal. If it's located on top of the banks, more grazing is available and weed problems may be reduced but maintenance is likely to be more difficult. In very wet weather the banks and slopes may suffer damage from the hooves of the heavy animals as they sink in. When fences are located on legal boundary lines they certainly provide for the best protection to the works and make maintenance operations easier but weed mowing and spraying becomes necessary. ■

# CONGRATULATIONS

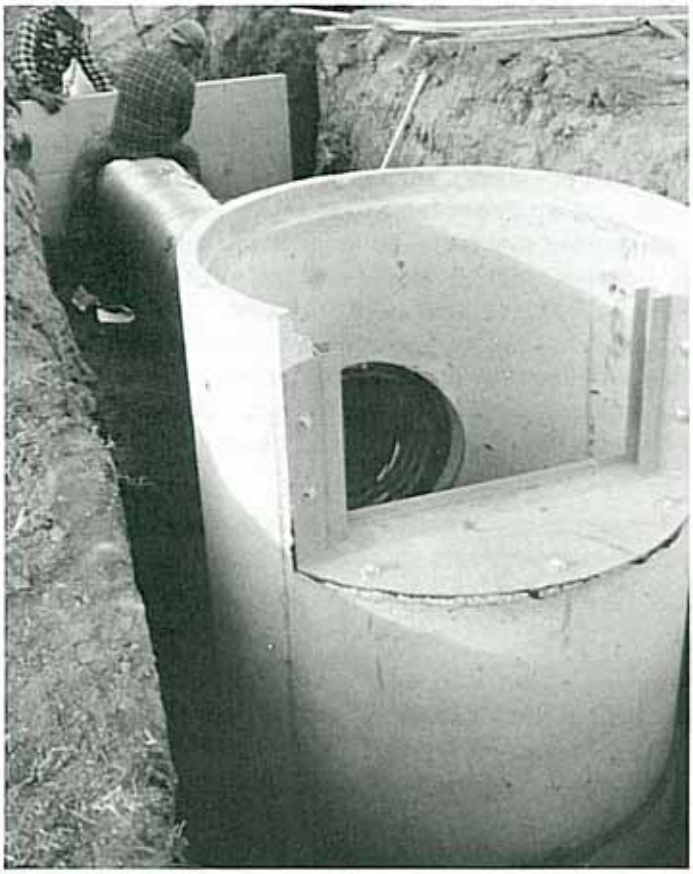
Congratulations are extended to Mr. Earl Wilson, P. Eng. on your appointment as EID's assistance manager. Mr. Wilson will maintain his position of district engineer, as well.

# NEW LEVEL CONTROL STRUCTURE FOR SMALL LATERALS

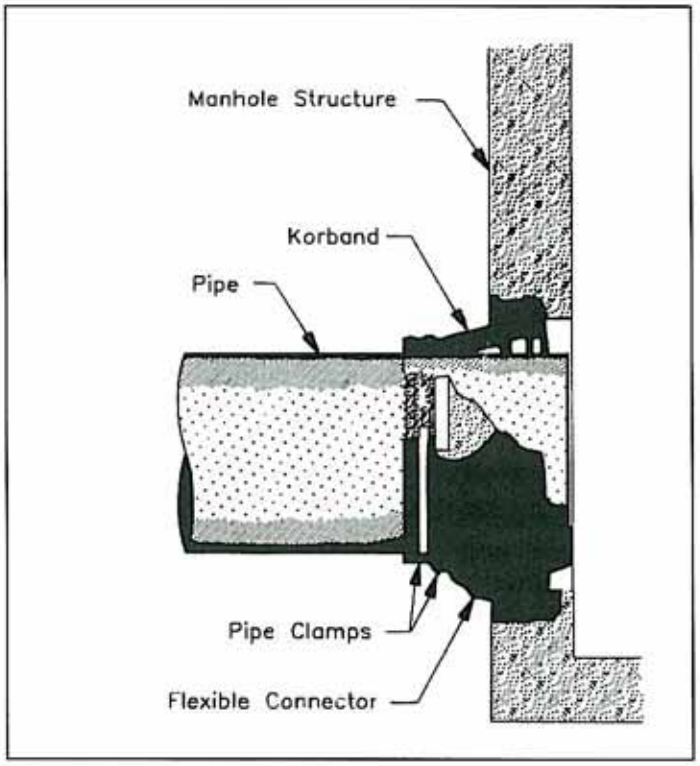
Ducks Unlimited (DU) and the Eastern Irrigation District (EID) for years have been utilizing a fabricated steel box on the end of a corrugated steel pipe to control water levels in small canals and other water retention projects. However, the metal structures have not had a very long life span. In fact, many of the structures suffered failures after only a couple of years. It is believed that corrosion was the culprit.

The search was on for a more durable low-priced product yet simple to install says DU area manager Archie Balaski. The answer came in a precast concrete product from Precon Manufacturing Ltd. in Lethbridge. The company, in conjunction with MPE Engineering, designed and built a unit based on the already popular municipal manhole. By utilizing the popular manhole, says Robin Timmerman of Precon Manufacturing Ltd., our company can manufacture a durable structure at a very low cost because we already have the steel forms.

Simply put, says Timmerman, a block-out is put in the form before casting to provide for later bolt attachment of the prefabricated steel entry unit with stop-log guides.



*Installation of precast concrete level control structure.*




A Kor-n-seal® connector is cast-in at the designed elevation to provide a flexible, watertight pipe-to-manhole connection.

The one limiting factor in use of the structure, says Dale Tulloch, a technologist with the EID, is its size. Because manhole barrels come in one standard diameter size (1200 mm) a 600 mm outlet pipe becomes the maximum size that can be utilized. Maximum flow through the structure is 10-12 cfs.

The structure has become even more versatile in that we have found more uses for the basic manhole structure with the Kor-n-seal® connector, says Tulloch. Our district is now using it on pressure pipeline turnouts. It works like this says Tulloch – "Water leaves the pressure pipeline through the butterfly valve and stub pipe; enters the manhole where it rises up the barrel and out through the Kor-n-seal® attached corrugated steel pipe. The top barrel can be rotated so that the outlet pipe aligns up with the head ditch," adds Tulloch.

Balaski concludes that the structure is far superior to the old steel one, is easy to install, costs less and has a far longer life-span.

For more information please contact: Ducks Unlimited's Archie Balaski, P.O. Box 818, Brooks, Alberta T1R 1B7 at telephone (403) 362-3825; Eastern Irrigation District's Dale Tulloch, P.O. Box 8, Brooks, Alberta T1R 1B2 at telephone (403) 362-3161; Precon Manufacturing Ltd.'s Robin Timmerman, 3603 - 8 Avenue North, Lethbridge, Alberta T1H 5C8 at telephone (403) 327-2711. ■

# FROM THE FARM PERSPECTIVE:

*Irrigation Water Management and Infrared Thermometry*

The use of infrared thermometry for irrigation management is currently under evaluation in southern Alberta. As a tool to measure crop moisture stress, it may serve many functions at the various levels of water resource management: at the provincial, basin, district and on-farm levels. Infrared satellite imagery can be used for crop identification and moisture analyses of a district while the use of a hand-held infrared measuring device can be used at the farm level to promote informed farm management decisions . . . management decisions that enhance irrigation water use efficiency.

During the 1991 crop season, the irrigation branch of Alberta Agriculture, in conjunction with the Irrigated Alfalfa Seed Producers Association of Alberta and the Alberta Special Crops and Horticulture Research Centre, initiated a research project to evaluate infrared thermometry for the irrigation scheduling of alfalfa seed production. An infrared gun, an Everest Interscience product which determines and records levels of crop stress for a variety of common crops, was used for this research. It measures ambient air temperature, crop canopy temperature, relative humidity and solar radiation. Based upon known parameters of a crop and this climatic information, a value for crop stress is derived. The "gun" stores this climatic information as well as site information and the calculated crop water stress values in its electronic memory. These values can be downloaded into a spreadsheet format such as Lotus 1-2-3. The gun also has the flexibility to be programmed to include other crops by uploading information from a computer or manually recording crop parameters in the field.

The measurement of the crop canopy temperature is the most significant of all the measurements this instrument makes. The difference between the crop canopy temperature and the temperature of the surrounding ambient air is the value which is correlated to a level of plant stress. The less moisture available to the plant for its transpiration physiology, the warmer the plant becomes. This monitoring technique is based upon the infrared indicator.

A direct measurement of plant stress as opposed to measuring soil moisture which "implies" a level of plant stress is significant, for example, to alfalfa seed production. The management of alfalfa for seed requires plant stress to induce and maintain flowering, limit excessive

*Hand-held infrared gun obtaining crop canopy temperature.*

plant growth, and to provide hot and dry conditions for bee activity. As the crop dries down and the plants begin to stress, excessive top growth is reduced and maximum bloom is obtained. This stress also creates warm, dry conditions which bees require to maintain maximum activity. An irrigation is then required after this stress period to ensure setting of the seed. This is contrary to the management of alfalfa forage where bloom is to be minimized and maximum vegetative growth is desired.

The infrared gun makes a direct measurement of plant stress. It can be used to make more accurate decisions for the purpose of irrigation scheduling for all crops. However, this instrument is limited to use under specific climatic conditions; hot and dry. If the relative humidity is too high or there is not enough sunlight, or there is too much exposed soil, readings are inaccurate. There is a window of time, daily from approximately eleven a.m. until two p.m. where readings are the most reliable.

The information derived from this on-going research is used to accurately schedule irrigations. Instead of trying to maintain a minimal level of crop stress, it can be used to stretch plant stress to the point where maximum production is made with the least amount of applied water; for deficit irrigation. There is potential for a reduction in water use by using this method of scheduling.

As the need for increased water efficiency becomes more acute to the irrigation industry, this tool may become invaluable to maximize the use of available water. By making irrigation scheduling "plant-oriented" instead of soil or climate oriented, unnecessary irrigation can be reduced. This could be important to water management systems as a basis to distribute water over a much wider land base.

For further information/discussion, contact Joanne Bakker, Irrigation Branch, Alberta Agriculture, Brooks, Alberta T0J 0J0. Telephone (403) 362-1212. ■

# SUCCESS WITH GRAVELLING CANAL DRIVING BANKS

*New Spreader Saves Money*

Regularly travelled canal driving banks need maintenance every year. It's not that the total travelling surface needs regravelling, but usually it's just the wheel ruts, as lots of gravel remains in the center. They get deeper and deeper as the gravel gets spread or pushed into the soil. To save gravel and make every dollar stretch a little further, Ron Lloyd, superintendent of the Taber Irrigation District (TID) with the assistance of his staff, designed and built a unique gravel spreader to fill the wheel ruts.

The "V" shaped spreader made of plate steel, bolts inside the truck gravel box just ahead of the end-gate. Two side panels bolt onto the end-gate. With the unit in place, says Lloyd, a 600 mm opening is left on each side of the spreader to allow gravel to fall into the ruts. The truck's end-gate is chained to open to a maximum of 200 mm. The whole unit can be attached or removed within minutes says Lloyd.

The truck driver determines the amount of gravel that is laid down by the speed at which he travels down the bank. Usually, says Lloyd, a swathe about 750 mm wide by 150 mm deep is sufficient to fill most ruts. A nine cubic metre load of gravel will usually fill in about 200 lineal metres of driving bank. This is about double what we obtained doing it by conventional methods. No smoothing or grading is necessary with our method, he states.

Lloyd says "On canal banks that haven't been rehabilitated, our spreader still seems to work well. For one thing, there is no need to go in and grade down or disturb the grassed center ridge that is prevalent on most older driving banks. One pass with the spreader and in most circumstances the ruts are filled in and that's all there is to do," he concludes.

For more information please contact Ron Lloyd, Superintendent, Taber Irrigation District, P.O. Box 129, Taber, Alberta T0K 2G0. Telephone (403) 223-2148. ■

*Spreading gravel to fill in wheel ruts on old driving bank.*

**THE WATER HAULER'S BULLETIN**

Designed to provide the operation and management personnel of Irrigation Districts with items of interest in their line of work. Comments are welcome. Please contact Duncan Lloyd, editor, at Area Code (403) 381-5539, Lethbridge.



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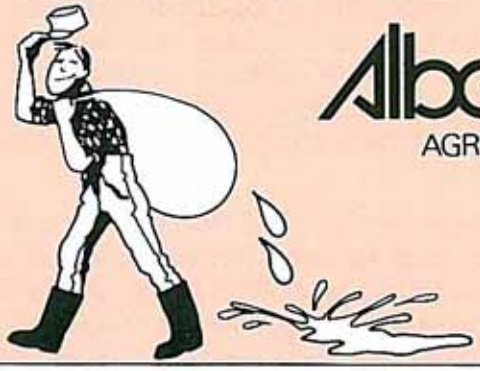

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