the WATER HAULER'S BULLETIN

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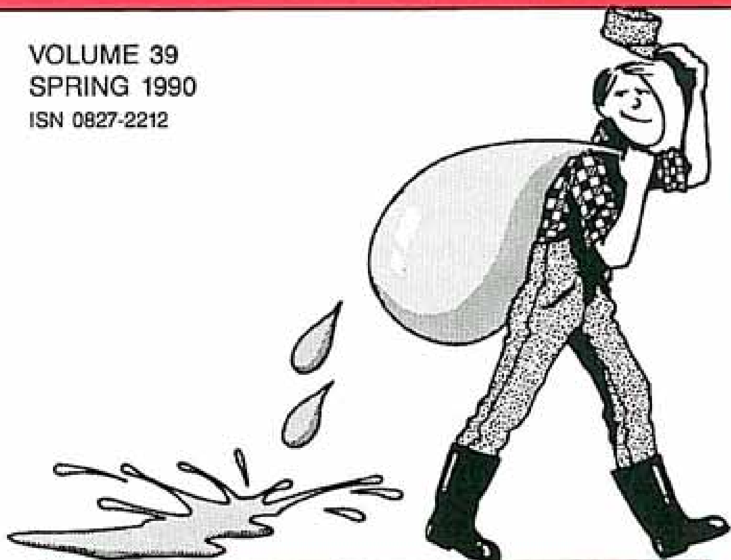

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ALBERTA AGRICULTURE TO INITIATE WATER QUALITY PROGRAM

Southern Alberta is blessed with limited but good quality surface water. Effective management of both water quantity and quality is critical to the survival and well being of the irrigation industry. Water quantity and its impact on water users received considerable attention during the 1980's but during this same period water quality issues received little attention. The quality of water governs the potential end use of water, whether it be for irrigation, domestic or livestock consumption, fisheries, wildlife or recreation.

Public awareness and concern about agriculturally related environmental and health issues is increasing. This concern has largely resulted from incidents in the United States

Technologist Bonnie Hofer takes flow measurement and sample for water quality analysis.

and central Canada where more intensive irrigation or agricultural practices have contributed to contamination of surface and groundwaters.

In response to these concerns the Land Evaluation and Reclamation Branch has initiated a water quality program.

The program objective is to evaluate the present and potential effect of irrigation and irrigation development on surface and groundwater quality to ensure the long-term sustainability of irrigation, soil and water resources and the environment.

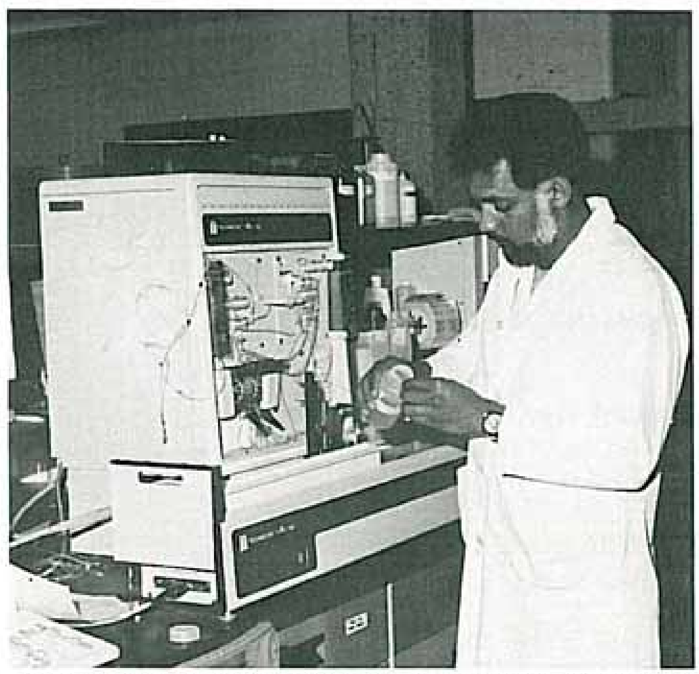
Water quality monitoring is not new to the branch. Since the mid-1970's, irrigation impact studies have been carried out to examine the effect of regional irrigation development on groundwater recharge and groundwater quality. Some of these studies also examined the effect of groundwater return flow on water quality in rivers and streams. In most instances these studies have found no detrimental effect of irrigation development (present or future) on the groundwater resource. In the late 1970's and early 1980's, the branch monitored on-farm subsurface drainage outlets to determine salt loadings to surface waters. This work indicated that the current level of drainage development had only a minimal impact on the water quality in receiving streams. The branch also conducted cooperative work with Alberta Environment to address pesticide contamination of shallow groundwater under irrigation. Pesticides were not detected in groundwater, even though the pivot irrigated site was sandy and groundwater was shallow.

Work in the area of water quality is now being expanded. The main short-term objective of the program is to establish databases to determine the existing quality of water in irrigation distribution systems, groundwater and drainage effluent. These databases will serve as guideposts for examining contaminant levels in future years. Sampling of waters in selected irrigation canals was initiated in 1989 in conjunction with hydrometric monitoring being conducted by the irrigation branch and this sampling will continue.

Groundwater monitoring will be implemented in the Bow River and Taber Irrigation Districts in 1990 using existing groundwater instrumentation. Drainage effluent will be sampled from the same locations used in the 1978-1982 study to determine changes in water quality with time. The impact of salt loading from subsurface drains will also be examined in selected small receiving streams. The above activities will concentrate on inorganic contaminants including salts, trace elements and nutrients.

Long-term goals of the program will address non-point source pollution of surface water by runoff from irrigated agricultural land. Gary Buckland says they will also examine soil and water quality interactions to evaluate the current guidelines for irrigation water quality. This aspect of water quality is becoming increasingly important as small irrigation developments often rely on water sources of marginal quality and often intermittent quantity. The databases established in the short term will also be updated to determine if changes in water quality occur with time. In the long term more emphasis will be placed on specialized instrumentation for examining pesticides in surface and groundwater, he adds.

If you would like further information on the water quality program, or have suggestions on water quality aspects which should be pursued, please contact Gary Buckland, Land Evaluation and Reclamation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5882. ■



Water sample being run by Gyan Mankee in Agriculture's soil and water laboratory.

QUALITY GEOMEMBRANES – WHAT ARE THEY AND HOW ARE THEY OBTAINED

Geomembranes, sometimes referred to as canal lining materials, are a family of synthetic products used by the irrigation industry for seepage control. The most widely used geomembranes are manufactured from plastic roll goods fabricated into panels of suitable size for convenient use during installation, says Bob Ransom of Quality Monitoring Services Ltd. Each type of geomembrane has a specific set of properties derived from the plastic material from which it is manufactured, upon which are superimposed characteristics specific to the manufacturing processes used to produce the roll goods and fabricate the panels, he says. Some geomembrane products such as flexible PVC are multicomponent materials, the formulation of which tends to vary somewhat from one supplier to another. A great variety of geomembrane products are available to the consumer each with specific strengths and weaknesses relative to a particular set of facility requirements. With a variety of products available and usually several suppliers of each, how does the discriminating geomembrane consumer optimize his purchase and obtain a "quality product"?

It should be recognized at the outset that quality is not synonymous with excellence, says Ransom. Excellence is a relative ranking of product properties based on the state of the art within an industry. Product quality is a measure of the degree of fit between the properties requested by the consumer and those supplied by the manufacturer. There is a direct relationship between the level of excellence selected by the consumer in his purchase specifications and the difficulties encountered in obtaining the product requested from the marketplace.

The first step in obtaining a quality product is deciding what it is that the product is expected to do. For a geomembrane, the primary function is normally fluid containment. The expectation of the consumer is that the product will be capable of being installed in a serviceable condition and perform a containment function for the design life of the facility. The installation conditions, the service environment and the level of containment desired will dictate the choice of material and the level of excellence required from that material. To achieve a successful design at a reasonable cost there must be a good match between the project conditions and the basic capabilities of the material selected.

PVC canal liner being prepared for gravel armor.

The second step in obtaining a quality product is the selection of the material and the performance criteria with which to assess the material. The performance criteria should be related to project specific requirements and if possible supported by functional test methods that can be related to the project requirements. The performance criteria must be adequately defined in the purchase specifications so that the marketplace is aware of the product expectations during a tendering process.

The third step towards achieving a quality product is the development of a "Quality Assurance Program", says Ransom. Quality Assurance is the group of activities undertaken by the consumer of a product to assure that the product received meets the requirements of the purchase specifications. This should not be confused with quality control which is the actions undertaken by a product supplier to control the manufacturing process. In some instances there will be an overlap in the information generated by the quality assurance and quality control programs.

Quality Assurance Programs are usually designed to develop very specific information to protect the interests of the product consumer.

A good quality assurance program normally requires that the manufacturer engage in quality control to improve the likelihood of product consistency. The quality assurance program should be outlined in the purchase specification in order to alert the supplier to any sampling and inspection requirements.

The final step in obtaining a quality product is to select a material supplier and implement the quality assurance program. In order to optimize the value of the product received, an assessment should be made of the typical properties of the product offered by each supplier versus the minimum requirements of the purchase specifications. The lowest priced product is not necessarily the best value.

Potential quality problems specific to one supplier can often be identified by comparing the margin of safety between the material specification and the typical product properties. For a project with a tight delivery schedule selecting a supplier based on likelihood of first time success can be expedient.

The basic objective when using geomembrane products is to optimize the use of material and manpower to achieve a functional facility that meets the level of excellence desired at a reasonable cost.

Woven polyethylene lining being covered directly by gravel armor.

"Experience has demonstrated that a well designed, well managed, properly monitored construction project will achieve optimal performance at a minimum total cost," says Ransom.

For more information please contact Bob Ransom, Quality Monitoring Services Ltd., 33 Rolling Heights Drive, P. O. Box 43, Site 12, R.R. 1, Spruce Grove, Alberta T7X 2T4. Telephone (403) 963-8293. ■

PROGRESS ON IRRIGATION REHABILITATION STANDARDS NEARING COMPLETION

Developing irrigation rehabilitation standards which started in early 1989 is now nearing completion. The committee, which consists of representatives from irrigation districts, an irrigation consultant, Irrigation Secretariat and the irrigation branch have completed drafts for all five chapters. All the irrigation districts and all of the irrigation consultants in Alberta have had an opportunity to review and provide input into the next to final drafts.

Topics covered in the five chapters include:

1. ***Canals***
2. ***Pipelines***
3. ***Structures***
4. ***Seepage Control***
5. ***Open Surface Drains***

Final review and approval will be carried out by Irrigation Council. The Irrigation Secretariat will then advise irrigation districts of the schedule for implementation.

The intent of these standards is to provide an acceptable design guideline for projects to be funded under the Irrigation Rehabilitation and Expansion Program. They have been purposely written to allow for prerogative and innovation with good engineering practice. As experience and technology warrant, they will be expanded and revised.

For further information please contact Larry Spiess, P. Eng., Chairman, Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7 at telephone (403) 381-5152 or Gerhardt Hartman, Manager, Irrigation Secretariat, Alberta Agriculture, Provincial Building, Lethbridge, Alberta T1J 4C7 at telephone (403) 381-5176. ■

FROM THE FARM PERSPECTIVE

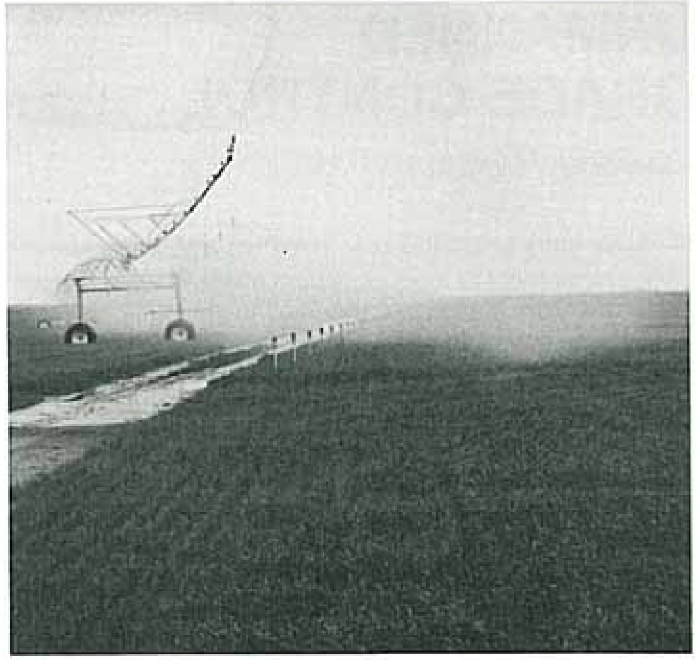
On-Farm Water Requirements

In the debate over the allocation of water resources, irrigation is always identified as the glutton. Critics often comment that irrigation farmers are wasteful and inefficient users of water and that more can be done with less. To address some of this criticism, several of the factors affecting on-farm irrigation efficiency, as well as irrigation water requirements, will be explained below.

Application efficiency can be defined as the relationship between water pumped through a sprinkler system and the water that is actually stored in the soil for crop use. Factors which reduce application efficiency can involve losses such as evaporation, deep percolation, runoff, and variable application distribution. A well designed sprinkler system tries to balance the application rate and volume with the soil and topography to minimize all of the loss factors. The design of the system needs also to ensure that the irrigation water is being applied as evenly as possible along its length. In tests conducted last summer by personnel from the irrigation branch's Taber office, application efficiencies were determined over an entire season for a centre pivot irrigation system. Application efficiencies ranged from a high of 99% to a low of 50%, with the season long average being 77%. The equipment evaluated was new, well designed, on flat terrain, and was not operated in extremely adverse weather conditions.

With the sprinkler irrigation equipment available today, season long application efficiencies of 75% are obtainable. Extreme weather conditions during the periods of peak irrigation demand can quite easily put a strain on system efficiency rates, however, good management coupled with good system design can and should minimize these effects.

If a farmer is doing his utmost, through system design and management, to maximize his application efficiency, will this also result in a lower on-farm irrigation requirement? The years 1988 and 1989 were two very different years as far as irrigation water consumption on a district basis was concerned. In 1989, the Taber Irrigation District (TID), for example, consumed 36% less water than it did in 1988. This was mainly due to the fact that there was 135 mm more growing season precipitation in 1989 than in 1988. Farm records obtained from the irrigation branch's Taber office show that participants in the Irrigation Management Program applied only 20% less water in 1989 than they did in 1988. This statistic seems to show that as farmers become better and more knowledgeable managers of irrigation, the amount of irrigation water applied, as compared to the rest of the irrigators in a district, actually increases.



Application efficiencies were determined over an entire season for the centre-pivot system.

What then should we expect to see in the 1990's as far as on-farm irrigation efficiency and water use are concerned? Application efficiency for sprinkler irrigation should reach a level of approximately 75%, as an across-the-board average, since equipment or methods necessary to increase this figure will remain prohibitively costly. The greatest gains in application efficiency will be made in surface or gravity irrigation, where adoption of such techniques as surge irrigation practices, as well as re-use pits, will reduce tail-water and deep percolation amounts. As illustrated above, however, on-farm irrigation water demand will increase, not decrease, as farmers become better managers of their water resources and require high production for today's economic picture. The most striking trend however, is that on-farm irrigation systems will be designed or modified to provide the farmer with more flexibility in the timing and volume of his irrigations. Therefore, from a district standpoint, the level and extent of service expected by the water users is bound to increase.

For more information, contact Gord Cook, P. Eng., Irrigation Specialist, Irrigation Branch, Alberta Agriculture, Box 64, Taber, Alberta T0K 2G0. Telephone (403) 223-7908. ■

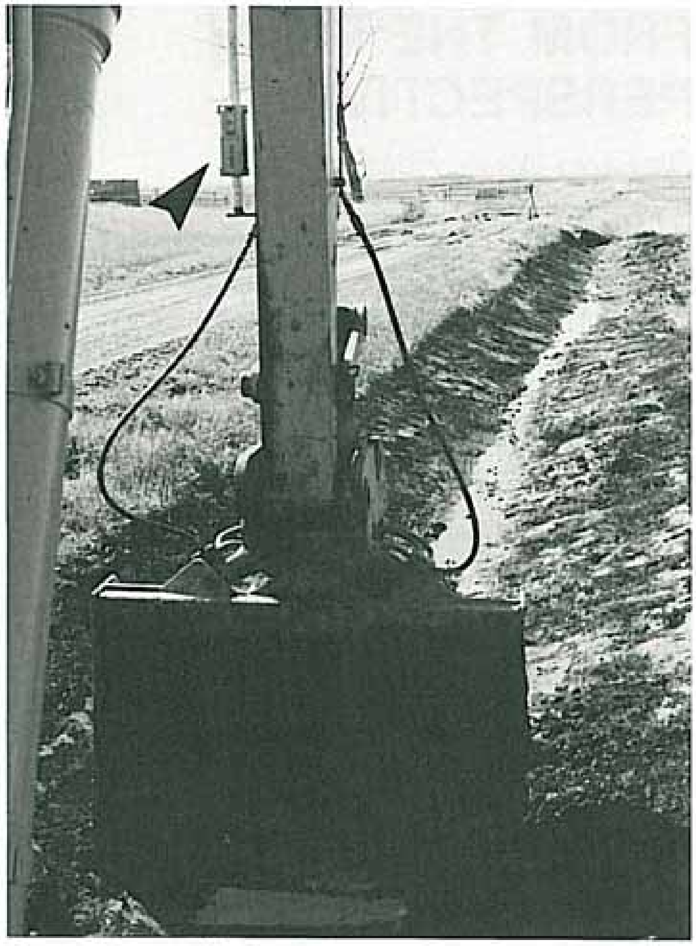
UNMANNED GRADE CONTROL

Assuring Maximum Productivity

Ever think about the cost of setting out grade control stakes and the amount of time spent by the machine operator jumping in and out of his machine to check grade? The Raymond Irrigation District (RID) has and did something about it with the purchase of laser mounted survey equipment. Adapting Laserplane® technology to their survey needs has meant dollars saved, says RID manager, Gordon Zobell.

The system is simple adds Rick Lowry, district foreman. A laser transmitter is programmed to emit a thin rotating beam along the ditch excavation. A receiving box is mounted on the dipper of the hydraulic hoe. When operator Brian Rarik wants to check grade, he says, I simply put my bucket on the bottom of the excavation making sure the dipper is vertical. The mounted receiver box detects the laser signal and the visual scale signals Rarik whether he is high, low or "on grade". To ensure the dipper is near vertical, the RID has a simple gadget attached to the dipper that lets the operator know at a glance whether he is on or off.

The "out-dated" rod and hand-level method.



Arrow points to receiving box that lets operator know at a glance whether he is "on or off grade". Note: Laser Transmitter in background.

Operator Rarik adds, "I used to get off my machine every 10 or 15 minutes to check grade or wait for the grade checker or a surveyor to tell me." This time might add up to a couple of hours a day where my machine was just sitting idle. He estimates he has increased his excavation volume by about 30% and grade accuracy by 80% over the rod and eye-level method.

A recent convert to the Laserplane® grade control system is Kirt Woolf, manager of the United Irrigation District. He was skeptical after seeing Raymond's, but decided it was worth a month's trial. Now he says "I'd fight to keep it."

One area we do not use the laser receiver on the hydraulic hoe is for laying pipe. It's just not practical says foreman Lowry, when we already have pipelayers in the trench.

We save our money by greater efficiency says Zobell. There is no more undercutting or need for an on-site surveyor nor a need to climb down to take grade shots.

For more information please contact Gordon Zobell, Manager, Raymond Irrigation District, P. O. Box 538, Raymond, Alberta T0K 2S0. Telephone (403) 752-3511. ■

MORE NEWS ON BROKEN AIR & ISOLATION VALVES

While the insulation canister, as discussed in Volume 37, Fall 1989, of the Water Hauler's Bulletin, affords good protection against frost damage, it is not always practical to install on some pipeline turnouts, says St. Mary River Irrigation District's (SMRID) Ron Renwick, P. Eng., district engineer. Most of the old style turnouts have the air valve located on top of the turnout. Although this is the ideal location to release any trapped air, it is not the ideal location for a canister. This would require that the canister be braced against Lethbridge winds plus the turnout would become unsightly.

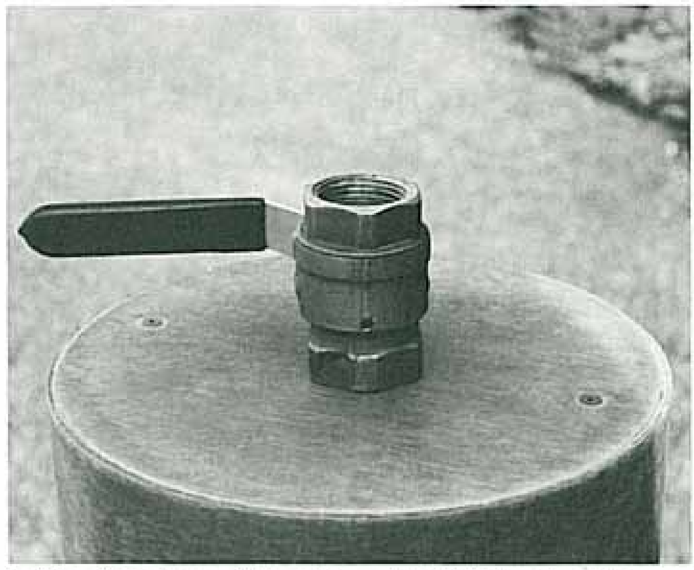
One solution would be to completely relocate the air valve and canister to a lower position. This would require field cutting and welding and with hundreds of valves requiring this modification costs would be high.

Most of these old style turnouts and air valves were equipped with small isolation valves. This was intended to allow service to the air valve without draining the pipeline. Regrettably the small isolation valve is very susceptible to frost damage. One solution, as shown, was developed by SMRID water district supervisor, Larry Burr. This involves drilling a 4 mm hole in the valve body and filing a V-notch in the ball portion of the valve. When the valve is closed, the V-notch aligns with the hole and the water drains from isolation valve and the air valve. The idea is patterned after commercially available self-draining valves.

This scheme has the advantage of draining the valves yet leaving the pipeline charged, says Renwick. While there is water against the low side of the isolation valve, it is somewhat protected against frost damage. The air valve is definitely protected against frost damage, he adds.

The disadvantage is that the water supervisor must forecast the weather and determine whether or not to close and thereby drain valves, he says. This decision must be made far enough in advance to allow time to close all valves. It must be recognized that the pipeline is out of service until valves can be opened, usually the next day. If a number of valves are involved, this process is time consuming.

Now when we use insulated canisters we don't consider isolation valves necessary. Anyone installing unprotected isolation valves, subject to frost damage should consider the self-draining type, says Renwick.



Isolation Valve shown with small 4 mm hole drilled to allow draining.

For more information please contact Ron Renwick, P. Eng., St. Mary River Irrigation District, P. O. Box 278, Lethbridge, Alberta T1J 3Y7. Telephone (403) 328-4401. ■

IRMAA BULLETIN BOARD UPDATE

The IRMAA BBS (Irrigation and Resource Management division Alberta Agriculture Bulletin Board System) current hours of operation are 24 hours/day, 7 days/week. The access telephone number is (403) 381-5796.

The bulletin board is targeted for the general irrigation community with Alberta Agriculture staff, farmers, irrigation district staff, agribusiness, and consulting firms as potential users.

Starting June 1, 1990 a USER OPEN FORUM category will be added to the BBS. The USER OPEN FORUM will be the users' chance to contribute articles (i.e. bulletins) relating to the users' knowledge and experiences to the IRMAA BBS.

If you would like further information on how to contribute to the USER OPEN FORUM, would like a copy of the IRMAA BBS User Guide, or if you have any questions, comments, or suggestions on the IRMAA BBS; please contact Pat McIlhargey, Information Systems Analyst, Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5855 (voice); or send a message to the IRMAA BBS SYSOP. ■

WHAT'S THE STATE-OF-THE-ART IN PORTABLE FLOW METERS?

Regardless of the make, model, or size of magnetic flow meters, they all work on the same principle. Faraday's law states that "when a conductor moves through a magnetic field a voltage proportional to and linear to the conductors velocity through that field is generated." The sensor generates a magnetic field within the liquid (the conductor) to be measured and the resultant voltage induced at the sensor electrodes is processed within the system to provide the desired flow information, e.g. velocity of flowing liquid.

There are basically two types of magnetic flow meters: full bore meters and the insertion type. Full bore meters have no probe protruding into the pipe (this type is very accurate but costly). The insertion type as the name implies must protrude into the pipe approximately 11% of the inside pipe diameter.

Alberta Agriculture, irrigation branch, has purchased the first prototype of a new magmeter developed by MSR Magmeter Manufacturing Ltd. (MSR) in Edmonton. What is so unique about this instrument? It is portable and battery operated. It can measure flow in pipelines from 50 mm to 900 mm. "Because it is an insertion meter, a 50 mm ball valve on the pipeline is necessary," says irrigation branch research engineer, Svat Jonas.

The magmeter will provide the user with flow information in metric or imperial units, flow rates in US or Imperial gallons, cubic feet or cubic metres per second. It will indicate the highest or lowest flow rate in a given period, as well as accumulated flow, says Jones.

Last summer a few trials were conducted in the Bow River Irrigation District in order to "debug" the instrument. Several deficiencies were found and MSR are in the process of correcting them. Improvements were suggested to MSR and they have agreed to try and incorporate these innovations into the prototype. Because the unit will have a built-in clock and sufficient memory capacity, a down-load of the collected data through an RS 232 to a datalogger or a PC computer will be possible. An averaging function over the period of time will be also available as the addition to an instantaneous flow measurement, he adds.

The branch's research unit will be testing the MSR Magmeter during this year's irrigation season. If an irrigation district is interested to try out this unit, please contact Svat Jonas, P. Eng., Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5870. ■

MSR Magmeter Demo.

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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