the WATER HAULER'S BULLETIN

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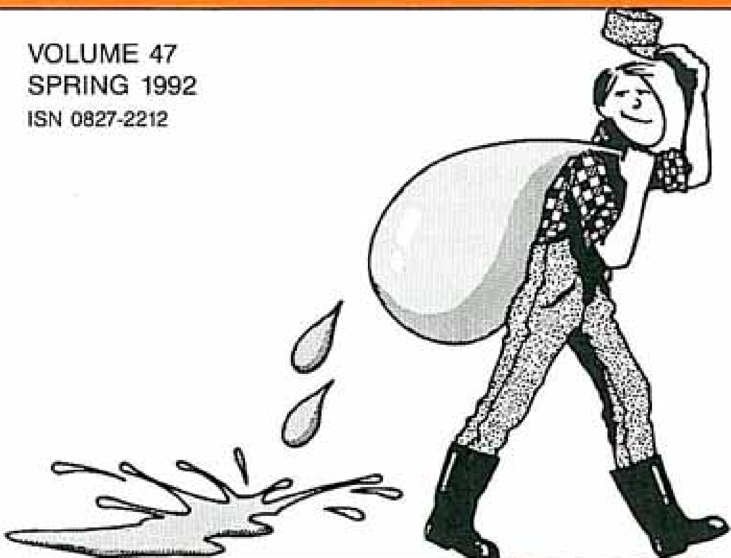

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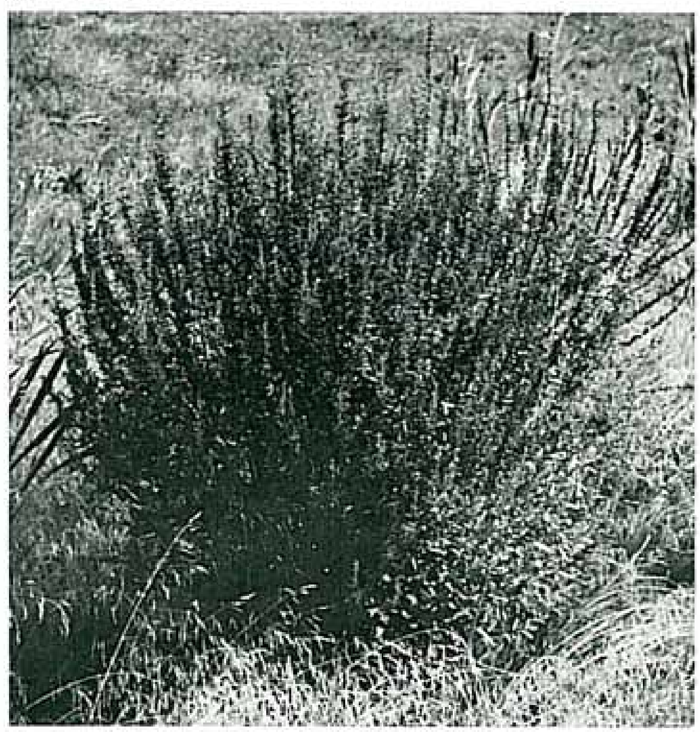
THE GOOD, BAD AND UGLY

Are You Aware Of Purple Loosestrife?

Purple loosestrife or Lythrum saliciaria has become a serious weed pest in several regions of Canada and the United States, causing severe problems in wetlands, drainage ditches, canals, wet meadows, stream and river margins, and periodically flooded impoundments.

Purple loosestrife is a perennial flowering plant that can grow up to 1.5 metres tall. It has squarish stems, lance shaped leaves that are 3 to 10 cm long, and purple to purple-pink flowers that form a 10 to 40 cm long spike. The brilliant flowers which are present from July to September, allow Purple loosestrife to be recognized from long distances away. A single plant can produce up to 30 or more stems, giving it a bushy appearance.

Although they appear identical, Purple loosestrife is not the same as its good ornamental cousin – Lythrum. The main difference is that Purple loosestrife is able to produce seeds in large numbers. Ornamental varieties of Lythrum (Morden pink for example) are developed from crosses and are propagated vegetatively. They do not produce seed.



Purple Loosestrife growing east of Lethbridge along Highway #3.

Purple loosestrife grows well where there is an abundance of moisture – areas such as marshes, wetlands, ditches, streambanks, stormwater retention ponds, canals, etc. The problem lies in the fact that Purple loosestrife has characteristics which allow it to displace almost all native vegetation – it is a strong competitor, it is not eaten or used by most wildlife, and it has an extremely high reproductive potential. The result is that once established in an area, says Robert Burland, biologist with the pesticide management branch of Alberta Environment, Purple loosestrife can eventually become the dominant, if not the sole type of plant present. Wet areas dominated by Purple loosestrife cannot be easily used by either man or wildlife. Ditches and canals can become choked by encroaching Purple loosestrife, preventing drainage or conveyance of water to downstream users. Purple loosestrife is a concern to wetland managers, irrigation and drainage system managers, naturalists, hunters and fishermen, park managers and people in general, who enjoy nature, he adds.

Germination of Purple loosestrife seeds begins in late spring as the soil warms up. The plant undertakes rapid growth (up to 1 cm per day) until flowering occurs. In fall, the above-ground portion of the plant dies, however the rootstalk remains viable. The rootstalk produces buds during the next spring from which new stems will arise.

Seeds are the prime means of Purple loosestrife's propagation. It is a very prolific seed producer. Each stem of a single plant can produce upwards of 90,000 seeds. Given that a single plant can produce 30 stems or more, it is easy to see how spread to new areas can be readily accomplished.

The seeds can be carried in the water, or can be disseminated by wind, waterfowl or other wildlife. All a seed needs to begin germination is to come into contact with wet soils. Intermittently filled ditches or impoundments, or waterbodies subject to fluctuating water levels, provide a prime mechanism for the establishment of Purple loosestrife.

Purple loosestrife can spread locally by vegetative fragments. Plants that are cut down by wildlife or disrupted by other environmental factors, can float to a suitable location, produce roots and grow.

"Almost every conceivable approach has been tried in efforts to bring the growth of Purple loosestrife under control, says Burland. No single method by itself has proven to be a solution to the problem."

Subjecting the plant to flooding or desiccation by altering water depth, is not effective in preventing the plant from becoming established.

Cutting the plant may temporarily relieve problems with drainage and water delivery and will delay seed production, however it does nothing to prevent further growth of the plant. Cutting may actually cause an infestation to spread by releasing viable plant fragments into the water where they can begin to produce new plants. It is necessary for any cutting operation to be followed by clean-up of all cut plant material.

Hand-pulling has basically the same results as cutting unless all of the root matter is removed with the plant. Getting the root mass out by pulling is very difficult unless the plant is in the seedling stage, says Burland.

Digging the plant out, along with its roots, is probably the best available approach when one is dealing with an infestation consisting of only a few plants. When this is done, one must be certain that disturbance to the site is minimal, otherwise new weed species will quickly invade. Vigilance is required after the treatment is made to control any plants that may regrow, says Burland.

The use of herbicides is very restricted at this time as no products are approved for use when the plants are growing in water. Work is underway, however, to obtain the necessary approvals so that effective herbicides can be used in an environmentally safe manner in aquatic situations.

Purple loosestrife growing on dry shoreline areas or in dry drainage ditches can be treated successfully with certain herbicides, however special approvals from Alberta Environment are required before this can be done.

Experiments are being conducted to determine successful insect species that will feed on and effectively control Purple loosestrife (biological control). These insects, which originate in the plant's native land, need to be carefully screened to ensure that they will not cause damage to native or ornamental plants, however they provide hope for a successful long-term solution to the problem.

We, in Alberta, are lucky so far, says Burland. "Although Purple loosestrife is present in some areas of the province, its level of infestation is still comparatively low and there is still an opportunity to bring it under control. This is not the case in Ontario where at least 2000 hectares of wetlands, meadows and ditches are infested. The same situation exists in Manitoba and Saskatchewan where over 500 hectares in each province have been infested," he states.

Currently there have been 15 infestations reported in Alberta ranging from the Lethbridge/Medicine Hat area to the Edmonton area. All of these infestations are small and therefore can be dealt with effectively.

Purple loosestrife has recently been added to the Alberta Weed Control Act as a Noxious Weed. This means that a weed inspector may issue a notice to a landowner or lessee, to take measures to control it.

The Canadian Wildlife Service, along with several cooperators, has produced a pamphlet entitled "Beautiful Killer" which describes Purple loosestrife and what it does. The pamphlet, along with media coverage, was implemented in an awareness program last year. Efforts to raise awareness will continue in this coming season.

Alberta has recently formed a coordinating/advisory committee (The Purple Loosestrife Action Committee). This committee will act as a central resource group and will devise a strategy on how to control and monitor Purple loosestrife infestations in the province. The group is chaired by Mr. Shafeek Ali of Alberta Agriculture's crop protection branch.

What if I find Purple Loosestrife?

If Purple loosestrife is found in any wetland area, stream, ditch or other water body, its occurrence should be reported immediately to the local agricultural fieldman, says Burland. He will provide advice on control measures and will inform the Purple Loosestrife Action Committee. The reporting of sightings is important, as this will allow the location to be documented and monitored. It may also provide clues as to the location of other new infestations, he concludes.

For more information please contact Robert Burland, Biologist, Pesticide Management Branch, Alberta Environment, Provincial Building, 200 - 5 Avenue South, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-4015. ■

CONDITION EVALUATION OF REHABILITATED PROJECTS

In 1990, at the request of Irrigation Council, the staff of the irrigation branch, Alberta Agriculture started to evaluate the present condition of all rehabilitated projects built since 1969, under the Irrigation Rehabilitation and Expansion Program (IREP). Since this time, the Alberta government and the thirteen irrigation districts have invested approximately 400 million dollars to rehabilitate the existing distribution systems in southern Alberta. This program is cost shared, with the province paying 86% and the irrigation districts paying 14%.

Since the fall of 1990, final reports have been completed and presented to seven irrigation districts (Aetna, Leavitt, Mountain View, Ross Creek, Magrath, United and Taber). The field work for two districts (Raymond and Lethbridge Northern) has been completed to date and the reports should be finished this summer after tabulation and analysis of the field data.

The present condition of the rehabilitated projects within the above mentioned districts is rated as "fair" to "very good" with a few isolated problems. Some of the problems typical to each district are firstly, a never-ending problem of erosion, siltation and vegetative growth in canals and around irrigation structures; secondly, poor or no vehicle access. Better access along canals in some districts would alert district personnel to potential problems developing within their systems and thirdly, the trampling of canal systems by livestock.

For more information please contact Mr. Zafar Iqbal, P. Eng., or Mr. Brian Taylor, Irrigation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5173. ■

Arrows point to buried polyethlyene lining that has been exposed due to cattle trampling earth bank when coming to drink.

THERMALLY ACTIVATED VALVE FOR FROST PROTECTION

First Permanent Solution

The St. Mary River Irrigation District (SMRID) is using a new method for frost protection of air valves on irrigation pipeline turnouts. Thermally activated valves (TAV) are being installed on new air valve installations to prevent damage from early spring or late fall frosts.

In the fall of 1988 the SMRID began experimenting with various methods to find a solution. Miles Kasun, irrigation technologist with the district and Ron Renwick, district engineer, felt that some type of insulation may be the answer. "We tried wrapping the valves with insulation but this didn't work very well. Next we tried insulated jackets similar to those used in the oil fields but again they weren't the answer," says Kasun.

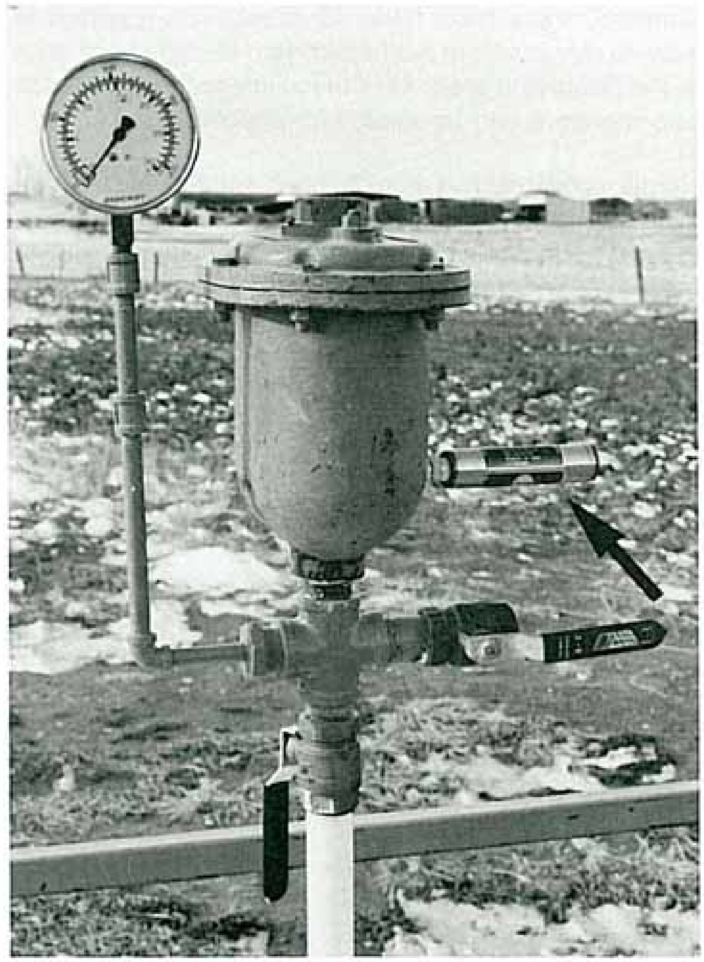
Our engineering staff designed, built and used a steel insulated canister that fit tightly over the valve. These work well, says Kasun, but must be taken on and off for inspection.

Thermally activated valves or "TAV's" respond to temperature differentials by means of a thermal actuator placed in the fluid stream. When the ambient air temperature drops, the glycerin piston begins to expand and water dribbles from the "TAV." As water seeps through the air valve and "TAV," warmer water is drawn from the buried pipeline and warms the piston causing the valve to modulate closed. Full flow through the "TAV" is seldom reached. The "TAV" constantly modulates between ambient and fluid temperatures.

"TAV's" are available in several set points, says Kasun. The St. Mary River Irrigation District is using "TAV's" with a -1°C set point. This allows the valve to start opening at approximately +3°C and continue to open and be fully open only if the fluid temperature reaches -1°C.

Warren Bridge, supervisor of the eastern block of the district, began installing the "TAV's" in 1990. He has 18 of the valves in operation now and has experienced no problems. "This past year I opened up all 18 air valves to see if any damage had occurred to any of the mechanisms. None was evident," he concludes.

The district has installed 55 of the TAV's and plans on more.



Arrow points to TAV installed on air valve. Preferred location of TAV is now off the top of valve to ensure flow through entire air valve.

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

A DATE TO REMEMBER

AIPA Annual Conference

Date: November 16 & 17, 1992

Place: Lethbridge Lodge Hotel

Theme: Irrigation – The Future in Farming

SEEPAGE PROBLEM ALONG THE CHIN 1 PIPELINE

The Chin 1 canal, located about 5 km southest of Lethbridge, was replaced by a closed polyethylene pipeline in 1984. This pipeline improved operations and removed the source of seepage which was previously occurring. However, it created another type of seepage problem. Water was flowing along the gravel bedding around the pipeline, and causing high water-table problems in low areas. In 1987 the St. Mary River Irrigation District (SMRID) received complaints from adjacent landowners of a high water table along the Chin 1-A pipeline, in sections 18 and 19-8-20-W4. In response to these complaints, clay plugs were installed in three locations along the pipeline on April 24, 1988 (Figure 1).

In addition, the SMRID requested that the land evaluation and reclamation branch of Alberta Agriculture investigate the source of the high water table, and recommend measures to correct the problem. In response to this request, Alberta Agriculture installed water-table wells along the filled-in earth canal, and piezometers along the pipeline (Figure 1). At each site, one piezometer was installed within the gravel bedding, and two piezometers were installed in the till on either side of the pipeline. Piezometers in section 19-8-20-W4 were installed in depressional areas. Well and piezometer depths ranged from 2 to 4 m. Tests were done to determine the rate of water movement through the gravel bedding around the pipeline, and through the surrounding till material. Water levels were monitored between November 1987 and September 1988.

Water-level monitoring indicated that the shallow groundwater flowed in a northwesterly direction, parallel to the pipeline. Water-levels rose sharply by about 0.5 m in response to irrigation events on adjacent fields, causing the water table to be within 1.5 m of ground surface throughout section 19-8-20-W4. At breaks in the slope of the pipeline, such as at sites 7 and 10, the water-table rose to within 0.5 m of ground surface, and the water pressure was greater within the gravel bedding around the pipeline than in the surrounding till. Hydraulic testing indicated that the gravel bedding was 100 times more conductive to water than the surrounding till material. Water flowed preferentially along the pipeline as a result of this difference in conductivity, with the surrounding

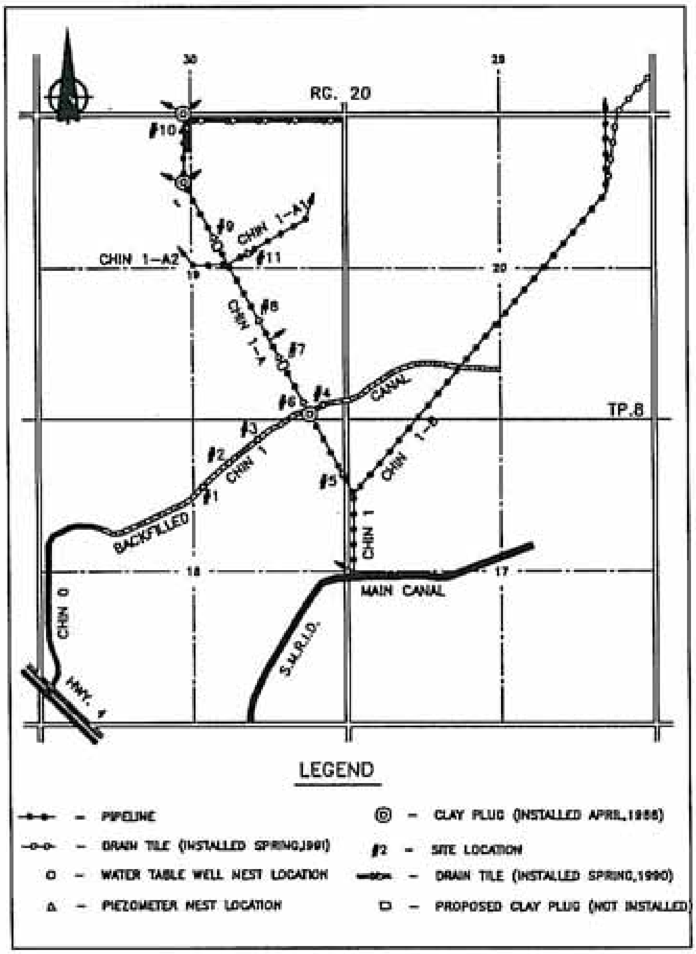
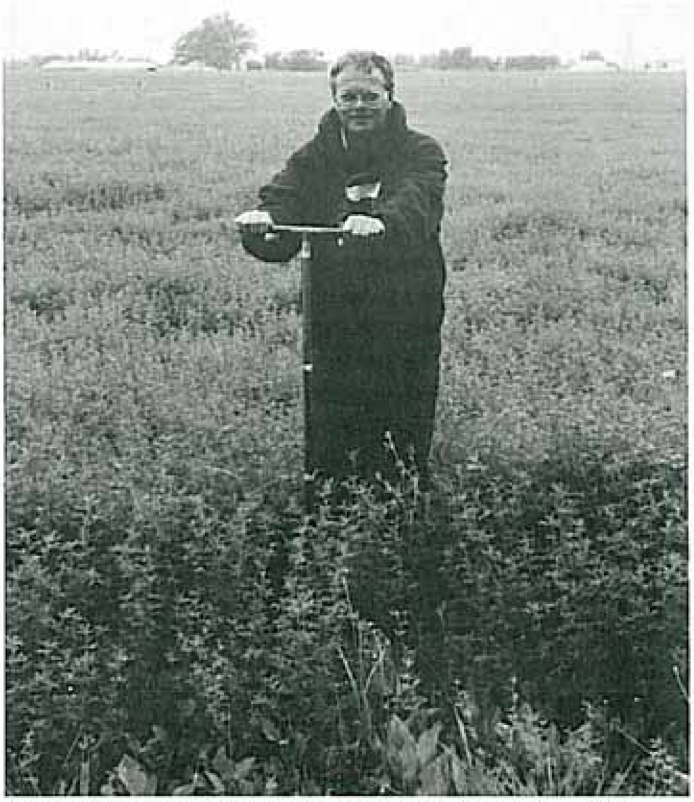


Figure 1.

till acting as a partial barrier to flow. In contrast to the pipeline, the hydraulic conductivity of the back-filled canal was similar to that of the surrounding material.

Based on the results of the groundwater investigation the installation of clay plugs and subsurface drainage was recommended. The SMRID opted to install drainage tile at the southern end of the pipeline, and to wait for one year to see if clay plugs would also be required. Subsurface drainage, which was installed in the spring of 1990 (Figure 1), effectively lowered the water table, and therefore, the installation of clay plugs was not necessary.

A high water-table problem also occurred at the northern end of the eastern leg of the Chin 1 pipeline, known as Chin 1-B. In 1991 perforated drain tile was installed for 400 m in the most severely affected area, to drain water away from the gravel bedding. The drainage tile was connected to non-perforated corrugated polyethylene pipe to carry water away from the area. Since the pipeline was installed in 1991, the high water-table problem at the northern end of the pipeline has disappeared.



Senior Technologist Wayne Ulmer checks elevation of water table.

There are numerous potential causes of high water-table problems. Such problems can arise from natural groundwater flow, exacerbated by topography, conditions in the subsoil, or irrigation practices. Abandoned canals can sometimes act as conduits for groundwater flow if they are improperly backfilled. The SMRID has recently been taking measures to correct groundwater problems when they have been encountered during pipeline installation. This has been done by changing the granular haunch specifications or installing tile drains during construction, so that groundwater can drain away.

The Chin 1 experience underscores the need to take a thoughtful approach to canal rehabilitation and pipeline construction. The causes of high water-table problems should be determined before remedial measures are carried out. Where a groundwater problem is suspected, a groundwater investigation should be done before construction. This would increase the cost-effectiveness of seepage control measures.

For more information please contact Joan Rodvang, Land Evaluation and Reclamation Branch, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7 at telephone (403) 381-5883; or Ron Renwick, P. Eng., St. Mary River Irrigation District, P.O. Box 278, Lethbridge, Alberta T1J 3Y7 at telephone (403) 328-4401. ■

FROM THE FARM PERSPECTIVE

Pipeline Laterals: Bane or Blessing?

Connecting a pump suction intake directly into a pipeline can have its problems says Wally Chinn, P. Eng., head of the irrigation development section, Alberta Agriculture. Of the more than 2,600 kilometres of canal rehabilitated under the Irrigation Rehabilitation and Expansion Program, one third (or almost 850 km) are reconstructed utilizing some form of pipeline. This is not to mention those additional pipeline works developed within the districts outside of the program.

The opportunities and operating circumstances that pipeline deliveries provide both the district and the irrigator are varied. However, when irrigators eliminate their pumping ponds or sumps and connect their pump suction intakes directly to the lateral pipeline, circumstances can arise. These are often overlooked and can impact the successful operation of the pumping unit. This is particularly true where electric pumping units are used.

Often, says Chinn, a previously adequately sized pumping power unit, (withdrawing water from an open sump), is then connected to the pipeline lateral with "free pressure" available. On the other hand, a new pumping unit can be installed without full knowledge of the pipeline operating pressures. In these cases motor overload, nuisance trips or premature burnout can occur.

Figure 1, says Chinn, may help explain why this "free energy or pressure" causes motor overload. The curves presented are typical and unique to both a pumping unit and the system the pump delivers water to. Curve "A" is the Performance Curve for the pump in question. Curve "B" is the System Curve for the sprinkler system it is supplying. Both curves reflect their hydraulic relationships to flow rate (Q) and pressure (H). Where the two curves cross (pt. "X"), that is where the whole system will operate (eg. 60 ℓ/s at 43 metres of head). Curves "M1", "M2" and "M3" are another part of the pump performance rating graphs which combine the specific pump efficiencies to yield the size of the required power unit (motor). In the case of pt. "X", the pump will have to be connected to a minimum of a 50 hp motor as the real power demand is approximately 48 hp.

In addition, Figure 1 includes the System Curve "C" for the lateral supply pipeline to be installed. It indicates a "maximum" operating pressure available to the pump of approximately 8 metres of head. Because of this

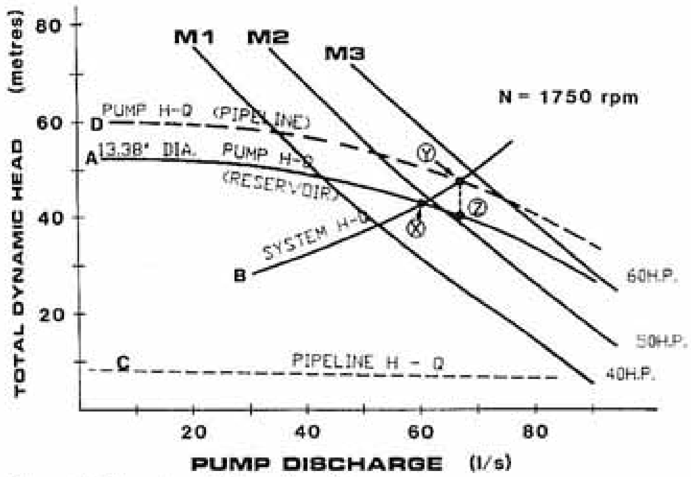


Figure 1: Pump head (H) vs flow (Q) curves

"bonus" pressure into the pump, the pipeline system curve represents a "booster" situation and as a result is additive to the pump performance curve. This means that the actual output from the pumping unit is now as indicated by pt. "Y", where the System Curve "B" crosses the boosted Pump Curve "D" (eg. 67 ℓ/s at 47 metres of head).

This means, says Chinn, that the pump is now operating along its performance curve at pt. "Z", which is a vertical projection down from the cumulative boost Curve "D". As can be seen, surprisingly, the power requirement from

Electric pump site.

the motor unit is now approximately 52 hp. With the thermostatic protectors on the motor units set to trip for overload amperage draws, the additional power demand will cause the pumping unit to shut-down. This nuisance tripping for the irrigator is sometimes overcome by installing higher settings on the thermostats or removing them entirely! However, this usually results in premature motor failure and significant repair costs and is even more frustrating than the nuisance trips, he adds.

Chinn says, this type of problem does not normally occur where internal combustion engines are used. The pump power unit can be throttled to adjust its speed, where electric motors are basically constant in their rotation (either 1750 rpm or 3500 rpm).

An estimated 35% of all irrigation pumping units in Alberta are now being powered by electric motors and quite often connected directly to an irrigation pipeline. However, pumping units do not have to be directly coupled. Many irrigators prefer to retain their pumping sumps to avoid trash problems and other nuisance characteristics as mentioned above. Where relatively clean water is available, an irrigator may wish to eliminate these dugouts, sumps or associated drains by direct connection to the pipeline. However, taking advantage of in-line connections and inherent pressures available means motor selection becomes more critical.

This basically requires the irrigation district to define BOTH the minimum, as well as the maximum operating pressures that could be realized under certain circumstances at a given turnout. In that way, on-farm system designers could then select the appropriate power unit for the range of conditions. Generally, the irrigation districts have played it safe by "guaranteeing" only the minimum head available with the thought that the irrigator will then acquire a large enough pump to meet the on-farm requirements. Ironically, this philosophy may occasionally be counter-productive, as the pump selected could be over-sized under pressurized supply conditions.

When it comes to electric motors, a slight oversizing of the unit will cost negligibly more to operate. When a pump requires 48 hp input power, that is all there is for power consumption regardless of whether a 50 hp or a 60 hp unit is used. This is another case where it is important that both the district and the water user have all the facts to facilitate effective irrigation development.

For more information, contact Wally Chinn, P. Eng., Head, Irrigation Development Section, Alberta Agriculture, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5864. ■

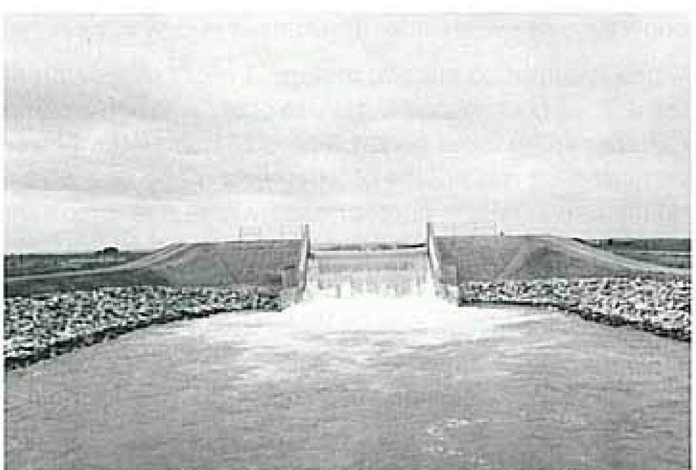
A PROJECT OF COOPERATION

283 km Main Canal Officially Opened

Alberta Environment Minister Ralph Klein officially opened, on June 5, 1992 the $198 million St. Mary River Main Canal Reconstruction Project as water was released down the Raymond Chute. The reconstruction of the 283 km long canal from Milk River Ridge Reservoir to Medicine Hat began 10 years ago. The operation of the canal from Ridge Reservoir to Horsefly Reservoir is the joint responsibility of the Raymond, Taber and St. Mary River Irrigation Districts. Below Horsefly Reservoir, it becomes solely the responsibility of the St. Mary River Irrigation District (SMRID).

The original canal, completed in 1954, says Jim Brown manager of the SMRID, was eroded and not large enough to meet today's demands. It was the good foresight of our provincial government, that former Alberta Environment Minister Jack Cookson and Agriculture Minister Dallas Schmidt announced Alberta's major water policy in Lethbridge, that lead to this rehabilitation.

Shirley McClellan, Alberta Associate Minister of Agriculture, in addressing the 150 in attendance, said the project was one of total cooperation between all levels of government and industry. She went on to state that when many people discuss irrigation rehabilitation or expansion, they talk in terms of a few farmers. "Just look at the 50 communities which benefit, and of crop and industry diversification in southern Alberta." People who haven't had to contend with an unstable water supply cannot understand the need for good sound water management.



Main Canal Drop-line.

Official Opening: Plaque unveiled by The Honorable Ralph Klein. Pictured above left to right: MLA Jack Ady, MLA Allan Hyland, SMRID Board Chairman Peter Langemann, RID Board Chairman Bob Wilde, Honorable Ralph Klein, Honorable Shirley McClellan, TID Board Chairman Keith Francis.

The reconstruction of the man-made ribbon of life generated some very impressive figures: excavation of all classes - 17.5 million cubic metres; embankment - 6.5 million cubic metres; gravel armour - 1.7 million tonnes; new check/drop structures - 28; new turnouts - 236; plus many other appurtenances. In economic terms, the ten years of construction was a real boom to contractors and the neighboring communities, says Brown. ■

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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Alberta AGRICULTURE