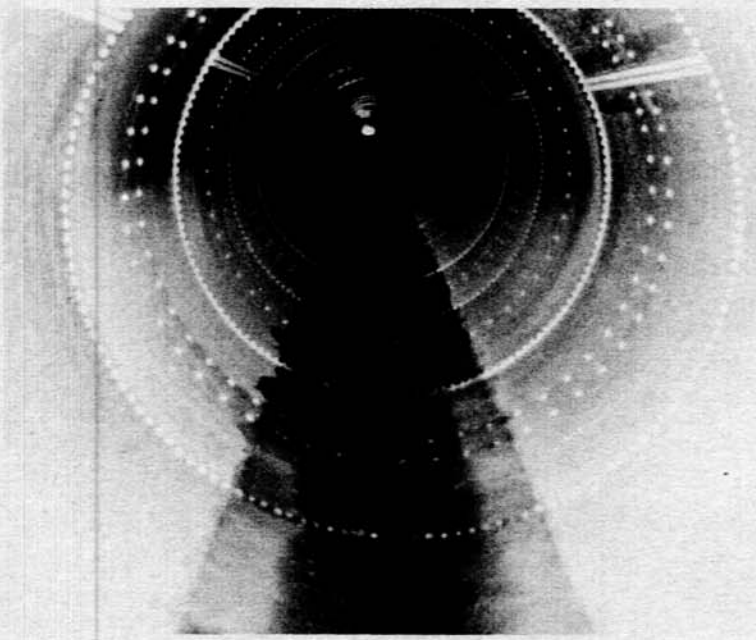
WATER OPERATION AND MAINTENANCE

BULLETIN NO. 130

December 1984



IN THIS ISSUE

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

The Water Operation and Maintenance Bulletin is published quarterly for the benefit of those operating water supply systems. Its principal purpose is to serve as a medium of exchanging operation and maintenance information. It is hoped that the reports herein concerning labor-saving devices and less costly equipment and procedures will result in improved efficiency and reduced costs of the systems for those operators adapting these ideas to their needs.

To assure proper recognition of those individuals whose suggestions are published in the bulletins, the suggestion number as well as the person's name is given. All Bureau offices are reminded to notify their Suggestions Award Committee when a suggestion is adopted.

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Division of Water and
Land Technical Services
Engineering and Research Center
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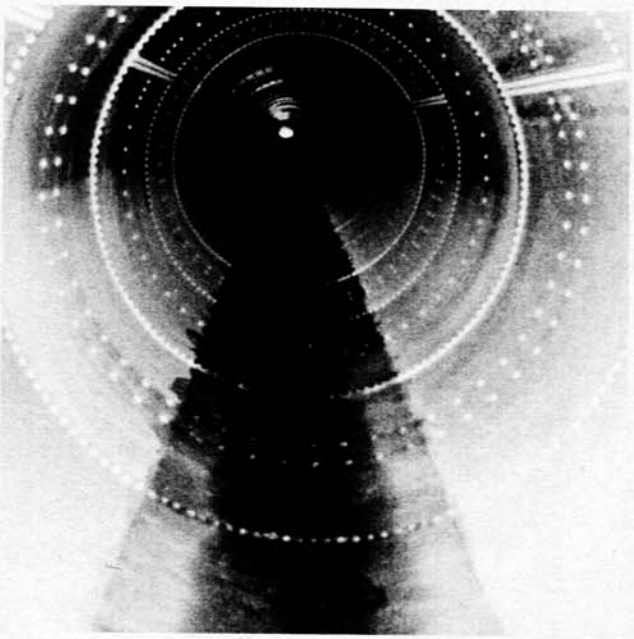

Cover photograph:

A rehabilitated interior section of the Bully Creek Siphon, which is operated by the Vale Oregon Irrigation District.

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WATER OPERATION AND MAINTENANCE
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INTRODUCTION

Did you know that pipe moss, if left unchecked in open surface water systems and in closed water pipes and conduits, can inhibit water flow and possibly, in more extreme cases, clog up closed pipes and conduits? See the article on page 1 for more information on these invertebrates and how to control them.

The article beginning on page 3 tells how one man reduced the pumping costs on his 700-acre irrigated farm.

Laser leveling of farm land makes irrigation more efficient. For more information, see page 5.

Having problems with troublesome birds? The article on page 6 describes how the San Luis Water District is controlling their problem.

Improvements on the 74-year old Yakima-Tieton Irrigation District are described in the article beginning on page 7.

A unique valve lifting device constructed by the Pleasant Valley Water District is described and shown in the article beginning on page 11.

The article on page 14 tells how several water districts in the Pacific Northwest solved maintenance problems caused by water with abrasive silts flowing through their pipelines.

Good housekeeping is a basic requirement for effective accident prevention and effective production. See the good housekeeping tips beginning on page 19.

PIPE MOSS IN WATER SYSTEMS

by

Gary W. Hansen

In recent years, water system managers in the Western States have become more aware of and increasingly concerned about undesirable biological growths in open surface water systems and in closed water pipes and conduits. Such growths can inhibit water flow and possibly, in more extreme cases, clog up closed pipes and conduits. Algae have often been blamed for the problem in closed pipes and conduits, and in some instances, bluegreen algae may be responsible. However, algae are lower plants and photosynthesize as higher plants do. Photosynthesis cannot occur in the complete absence of light. Algae cannot live and grow in a closed pipe or conduit in the total absence of light. Sometimes algae growths are washed or carried into closed pipes or conduit systems, but did not originate inside of them.

Certain species of bacteria can produce slimes and other kinds of organic byproducts that can foul closed pipes and conduits. However, the biggest culprit may be freshwater bryozoa or "pipe moss."

Pipe moss are a group of invertebrate aquatic animals that are often mistaken for a mat of dead moss. Colonies of these animals are plantlike in appearance except for their coloration, which is brownish-white. Bryozoa attach to logs, rocks, and other submerged objects, usually where the light is relatively dim. They have been found on a number of irrigation systems growing in profusion on concrete canal linings, submerged inlet screens, louvers, trashracks, and on the inside of pipes.

The individual animal is microscopic, more or less cylindrical with a thin body wall. These animals secrete a thin protective layer about the body wall. Many of the individual animals grow in close association with one another to produce a connected, highly branched, antler-like colony. The protective coatings of these colonies of animals are the most conspicuous feature, being massive and tough, or delicate and gelatinuous, depending on the species. Oftentimes, young colonies continue to grow on the remaining protective layers of the dead animals, thus producing a thick mat on a solid substrate.

The individual animals feed on various microscopic plants and animals that are swept into the animal's digestive system by a crown of tentacles. The tentacles when extended have the appearance of tiny delicate flowers. A slight disturbance in the proximity of the animal will cause it to retract the tentacles in a flash. Most bryozoan colonies are stationary, but a few species are capable of sluggish movements. The colony can grow asexually where a portion of the body wall grows outward to produce a new animal.

A unique feature of the bryozoa is their ability to produce a highly resistant body called a statoblast or sessoblast. This seedlike body develops from asexual budding. This structure provides for the species to be carried over during unfavorable environmental conditions and for geographical disseminations.

Gary W. Hansen, formerly a Pest Management Scientist in the Division of Water and Land Technical Services, Bureau of Reclamation, E&R Center, Denver, Colorado.

Bryozoa growing on submerged water structures and in conduits have been known to create serious hydraulic problems for water distribution structures. Two bryozoan species known to infest irrigation systems sufficiently to become problems are Plumatella repens L. and Fredericella sultana Blumenback.

There are some control methods available for pipe moss. For submerged structures such as concrete canal linings, flumes and louvers, a copper antifouling paint ("Pettit marine paint Specialty, Flume Red Copper") manufactured by Pettit Paint Co., Inc., is registered and available. This paint is applied to the surfaces of submerged structures to prevent attachment and growth of antifouling organisms, including pipe moss. A single coat of paint is generally effective for about 1 year. There is an effort to register additional copper antifouling paints that are known to be effective for up to 3 years.

A well designed and functioning chlorine injection system will adequately control attachment and growth of pipe moss in closed pipes and conduits. Currently, no pesticides are registered and available for pipe moss control in closed pipes and conduits.

* * * * *

POLYETHYLENE TUBING CUTS IRRIGATION COST

by

Jess F. Blair

Don Edwards of Reagan County, Texas, has come up with several ideas to reduce pumping costs on his 700-acre (283-ha) irrigated farm. One that has paid off the last 4 years was in replacing steel well pipe with polyethylene tubing.

When one of his 14 well pumps needed to be replaced, he measured the exact depth of the well, then had a dealer cut the tubing to length and vulcanize a threaded collar onto each end of the tube.

"We loop the tubing over an old tractor wheel atop a 13-foot (4-m) steel tower," says Edwards, "and start it down the hole. Meanwhile the far end of the tube is tied to a small tractor that inches forward as the pump descends in the well.

"We also strap the oblong wiring onto the tube at 50-foot (15-m) intervals, but in the future we'll use round wire, which does not need to be attached."

A small, hand windlass is used to help lower the pump for a short distance, then the weight increases to allow gravity descent.

Two men can replace a pump in 2 hours time, whereas with steel pipe, they had to pay a service company $175 just to make the trip from town. Often it took 2 weeks to get the service company out to the farm because of a heavy backlog of work.

"Other advantages are that polyethylene costs 65 cents per linear foot ($0.20/m) at present, while 2-inch (50-mm) steel pipe is $1.30," says Edwards. "We were told by factory people that the jerking motion of starting and stopping would cause the tubing to break off. After 4 years of hard usage on some wells, we have had no trouble with it."

Two other advantages are less friction and no lightning damage. Edwards says the inside of the tubing remains smooth and slick, whereas steel pipe becomes crusted after a few years, which increases friction.

Lowering tubing Into a well

"We haven't run any tests, but it seems our polyethylene wells cost a few dollars less in electricity per month. This can be a saving when one 10-hp submersible pump may cost up to $350 per month to operate."

Usually when lightning strikes a well the pump has to be replaced along with all the high labor costs it formerly entailed. Since no lightning damage has occured on the nine wells now on polyethylene, Edwards thinks the tubing is a poor conductor of electricity.

The water on his farm is quite deep, averaging from 350 to 450 feet (107-137 m), and the water output is usually less than 100 gallons per minute (0.38 m^3/min.) for each well. Practically all the 700 (283 ha) irrigated acres were planted to cotton in 1984.

* * * * *

LASER LEVELING SAVES ARIZONA WATER

by

Lorraine B. Kingdon

"Star Wars" technology down on the Arizona farm is saving 10 times as much water in a year as the city of Tucson pumps.

Farmers started using laser leveling about 7 years ago in Yuma; this year the Soil Conservation Service estimates 700,000 acres (283 300 hectares) of farmland are leveled this way. According to Dr. Harry Ayer, economic policy specialist at the University of Arizona, "That amounts to nearly half the irrigated acreage in Arizona."

Conservative calculations show water savings averaging 800,000 acre-feet of water per year (10^9 m^3/acre), Ayer says. "Tucson's total pumpage is only 80,000 acre-feet per year (10^8 m^3/acre)."

Walt Hinz and Allen Halderman, former UA irrigation experts, described laser leveling as a laser beam sent from a rotating command post; the beam is set at whatever level the field is to be graded. A receiver is mounted on a mast attached to a scraper; the signal automatically keeps the scraper at the desired grade.

Farmers can simply smooth the slope of their existing furrow irrigation system, which is called lasering to slope. Or, they can make their fields dead level at zero slope. Currently, 400,000 acres (162 000 hectares) are lasered dead level and 300,000 acres (121 000 hectares) are lasered to slope.

Both techniques save water by making irrigation more efficient because they reduce runoff and prevent water percolation beyond the root zone. Ayer says farmers save on cost of water, but they may also increase crop yields from 10 to 30 percent because the water is distributed better over the fields.

"Farmers who dead level their fields can increase irrigation efficiency from the 50-65 percent expected for traditional slope furrow systems up to 85-90 percent. Lasering to slope only improves efficiency to 60-70 percent," Ayer says.

Using a laser to level fields is not cheap, although the cost is less than half that of another water-saving technique, drip irrigation. Leveling to zero slope costs between $400 and $600 per acre ($1,000 to $1,500 per hectare); lasering to slope costs $100 to $200 per acre ($250 to $500 per hectare). The biggest share of laser leveling costs is for moving the soil.

Lorraine B. Kingdon is a Communications Specialist at the University of Arizona in Tucson. This article is reprinted as it appeared in the September 1984 issue of the Arizona Farmer-Ranchman.

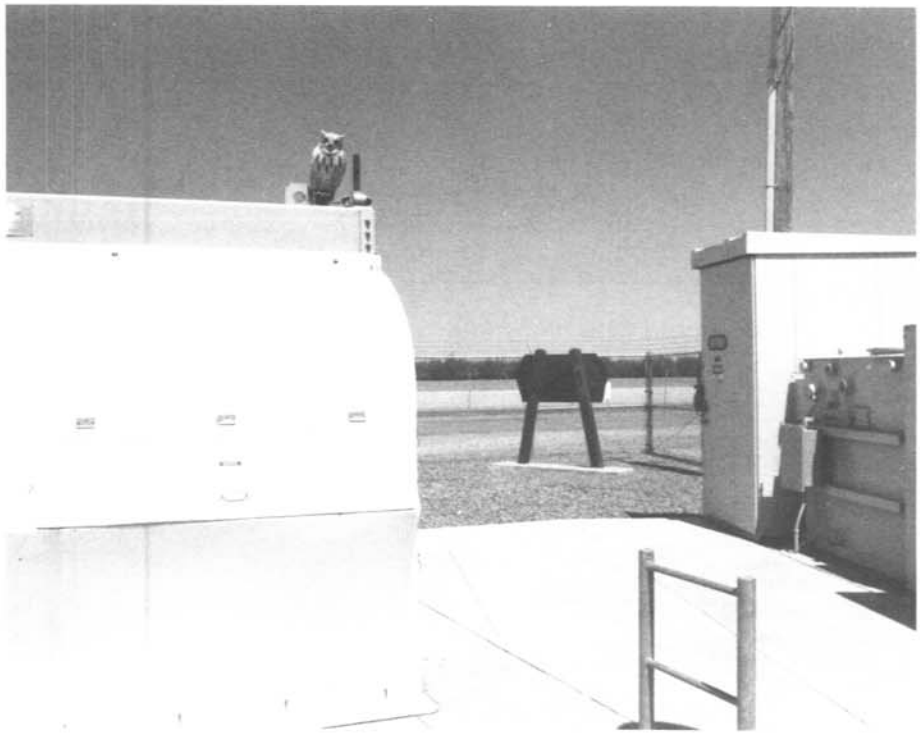
OWLS DISCOURAGE TROUBLESOME BIRDS

by

Stuart Hirai

On a recent Review of Operation and Maintenance examination of the San Luis Water District facilities late this summer, the examination team observed "owls" roosting at selected locations on the District's pumping facilities. Closer inspection of these "owls" revealed that they were composed of molded vinyl approximately 17 inches (43 centimeters) high and painted to resemble the Great Horned Owl. These life-like "owls" apparently scare smaller birds away and reduce the District's housekeeping chores and O&M costs. In fact, during the examination, evidence of bird activity was absent from facilities that had these "owls" installed.

According to District management, the effectiveness of these "owls" are enhanced if they are moved occasionally to promote a more effective menace to troublesome birds.



These "owls" can be purchased at most nurseries for approximately $12.95. If you have further questions about this product, feel free to contact the San Luis Water District, P O Box 2135, Los Banos CA 93635.

Stuart Hirai was a Civil Engineer in the Division of Water and Power Resources Management, MP Regional Office, Sacramento, California. Mr. Hirai is now employed in the Lower Colorado Regional office, Boulder City, Nevada.

YAKIMA-TIETON DISTRICT UPGRADING DELIVERY SYSTEM

by

Mike Wohld

A pressure irrigation system that will serve 24,000 acres (9700 hectares), and which may save as much as 15 million kilowatt hours of electricity annually and reduce water delivery losses by 25 percent, is taking shape in the Yakima-Tieton Irrigation district in the upper Yakima Valley.

Construction on the improvements to the 74-year old irrigation system began last fall. It is to be completed by the spring of 1986, according to irrigation district sources interviewed in February. About one-half of the district will be on the new water system as early as the spring of 1985, said Rick Dieker, assistant manager.

Total cost of rehabilitating and pressurizing the system could exceed $70 million. The Bureau of Reclamation has loaned the district $62.1 million interest free for the improvements. It is to be repaid over 40 years. The Washington Department of Ecology has provided a grant of $4.1 million for the project. Additionally, a $4.2 million loan from the DOE is available to the district, said Richard W. Keller of Route 1, Cowiche, vice president of the irrigation district board of directors and one of the prime movers for the project. And the district has applied for another $4.5 million grant from DOE to pay about that much in sales tax which has been assigned to the construction, if that becomes necessary, he said. The sales tax matter is being challenged by the district in court, he said. Total cost of the project could be in the realm of $72 million, Keller said. Repayment cost to the grower will probably be right at $40 to $45 per "share" annually, Dieker said. Current operation and maintenance charges are between $30 and $40 per share.

The payoffs, according to the irrigation district will be elimination of on-farm pumping costs and elimination of evaporation and seepage losses which have wasted about 25 percent of the water on its journey from the Cascade Mountain to the fruit orchards in the Tieton, Cowiche, and Naches area. And the construction of a new dam and reservoir on the Tieton River will make it possible for orchardists to sprinkler irrigate for frost control in the spring, Dieker and Keller pointed out.

The present system includes a small diversion dam on the Tieton, a 12-mile (19 km) conveyance system from the mountains and a distribution system of about 325 miles (840 km) of open canals and low-head pipe. Parts of the distribution system are about as old as the Tieton Division of the Yakima Project.

Reprinted by special permission from the March 15, 1984, issue of the Washington Farmer-Stockman.

Richard W. Keller, Vice President of the irrigation district board of directors.

The improvements, according to the Yakima-Tieton Irrigation District, will include: "A new dam" and 540 acre-foot (666 000 m^3) regulating reservoir, 11.3 miles (18 km) of 90- to 48-inch (2275- to 1200-mm) diameter transmission pipeline, 218 miles (350 km) of 48- to 2-inch (2275- to 50-mm) diameter distribution pipeline. Five pump stations and two hydroelectric stations. The system will be pressurized by gravity flow except in a few high-elevation areas where pump stations will be constructed. Excess pressures in other areas will generate enough electricity to more than offset the new pumping demand. In addition, the need for individual on-farm pumping will be eliminated, reducing the area's current demand by at least 15 million kilowatt hours each year."

The present old system diverts about 100,000 acre-feet 123 X 10^6 m^3 of water, but actually only delivers about 74,000 to 75,000 acre-feet of water, 91 to 93 X 10^6 m^3 said Keller. The new system is supposed to be about 98 percent efficient, he said. Thus, even if the district should be limited to its "nonproratable" water right during a dry year, the new system will allow them to get it all, he indicated. The district's "nonproratable" water right is about 75,000 acre-feet.

On farm pumping will be eliminated, since all of the water will be delivered to the farms at sufficient pressure for sprinkler irrigation. Over 80 percent of the land in the district is sprinkler irrigated, he estimated. Pumps are required in most cases, although there is sufficient gravity flow pressure on some farms to permit sprinkler irrigation without pumps. Keller, a third-generation orchardist, estimated that his pumping energy costs are currently about $25 to $30 per acre ($62 to $74 per hectare).

Power savings will pay for the new system, Keller predicted. "Within 5 years after we start repayment, I don't think the system will cost us one thing," he said.

The ability to sprinkle for frost control is also important. Oil heating costs are prohibitive, he said. Keller estimates it would cost $35 to $40 per acre per hour ($85 to $100 per ha/h) for oil to heat an orchard.

Currently, border heating and wind machines are the primary weapons for frost control in the irrigation district.

The Yakima-Tieton Irrigation District dates back to 1906, when the Tieton Water Users Association was organized. The first water was delivered in 1910. Construction cost of the original system was $3,540,559, according to a sign at the irrigation headquarters of the district. This was repaid in 1947. It was the first Bureau of Reclamation project to repay construction costs. About 80 percent of the irrigation district's 24,000 acres (9700 ha) is in fruit–mostly apples and pears and some cherries.

"The soil, climate, and physical characteristics of the area make it one of the leading apple producing regions in the nation," according to the district.

A view of main pipeline construction west of Yakima along the Tieton branch of the Burlington-Northern Railroad.

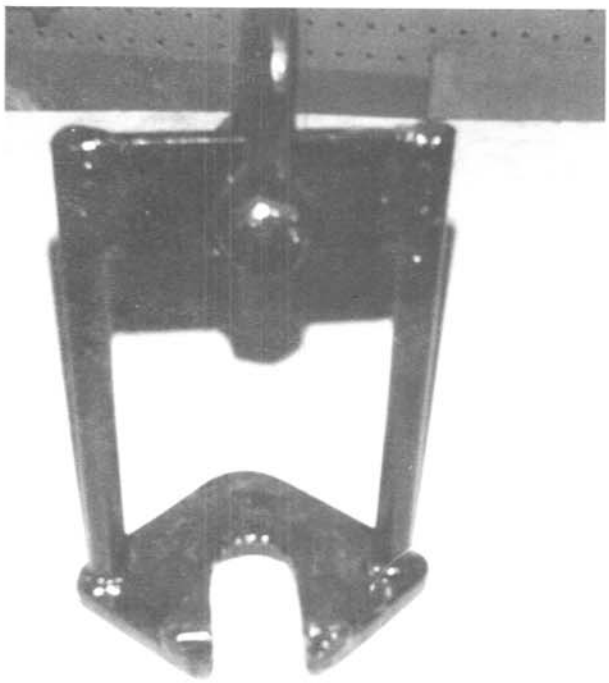
Two views of main pipeline construction west of Yakima along the Tieton branch of the Burlington-Northern Railroad in late February. Improvements on the 70-plus-year old Yakima-Tieton Irrigation District system should be completed by the spring of 1986.

VALVE LIFTING DEVICE

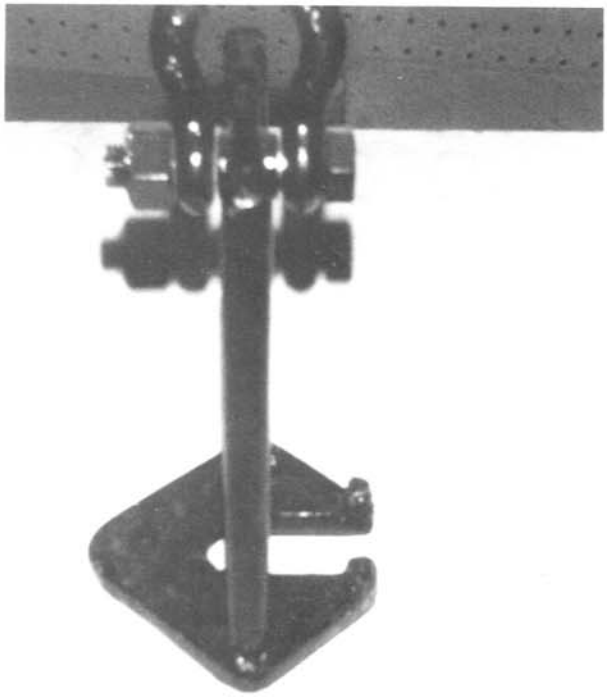
As the gate valves in the Pleasant Valley County Water District System got older, their valve maintenance and repair program was becoming more important and more demanding.

To remove the valve bonnets and discs or complete valve assemblies and replace them, the district had been using a set of tongs and the backhoe to handle them. The tongs were hard to handle and tended to slip when moving the valve bonnets or assemblies.

The district constructed the valve lifting device described here and shown in the accompanying photographs.



Front view–valve lifting device.



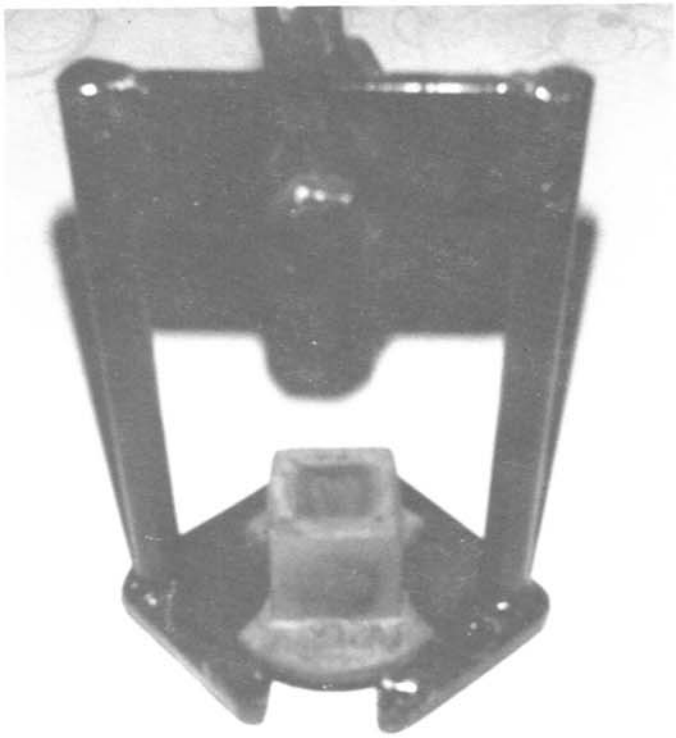
Side view–valve lifting device.

The cost of the materials for the device was very minimal, as everything except the shackle and bolt and nut was scrap material. A rough estimate of the material cost would be $15, and it took about 1-1/2 hours to construct the device.

The material used was:

One each–steel plate 5 by 5 by 1/2 inch
Two each–steel rods 3/4 by 9-1/2 inches
One each–steel flat bar 3/8 by 2 by 5 inches
One each–grade 5 steel bolt 3/4 by 3-1/2 inches
One each–steel nut 3/4 inch
One each–pipe 3/4 by 1 inch
One each–shackle 5/8 inch
Two each–round stock 1/2 and 3/4 inch

The 1/2-inch steel plate is drilled on diagonal corners with 3/4-inch diameter holes. A 1-5/8-inch-wide slot is cut from an undrilled corner to 1 inch past the center line of the two 3/4-inch drilled holes. At the outer end of the slot, a short piece of 1/2- by 3/4-inch round stock is welded on each side. This is to prevent the valve operating nut from slipping out. The 3/8-inch flat bar is drilled on center vertically and horizontally for the 3/4- by 1-inch pipe. The pipe is then centered and welded. The two 3/4- by 9-1/2-inch rods are inserted into the holes in the plate and the 3/8-inch flat bar is clamped between the top ends of the 3/4-inch rods. The assembly is then squared up and tack welded. Final welding is three pass welds with 3/32-inch 7018 electrode. The shackle is then fitted over the 3/4- by 1-inch pipe with the 3/4-inch bolt and locked with the 3/4-inch nut. All corners and edges are rounded and ground for safety. Note: 1 inch= 25.4 millimeters.



Valve operating nut in lifting position.

The district reports they have found it to be much safer than other methods, plus it has the advantage of suspending the valve or valve bonnet perfectly vertical for ease of removal and installation without binding.

If you have futher questions, feel free to contact:

LeRoy A. Miller
General Manager
Pleasant Valley County Water District
154 Las Posas Road
Camarillo CA 93010

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INSTALLATION OF FIBERGLASS IN THE BOTTOM OF STEEL PIPELINES TO PROVIDE A WEAR SURFACE

On March 15, 1984, personnel from the Pacific Northwest Regional Office and the Central Snake Projects Office traveled to the Vale Oregon Irrigation District to inspect the interior of the Bully Creek Siphon.

The Vale Oregon Irrigation District contracted with a private firm to rehabilitate sections of the Bully Creek and Feirman Coulee Siphons. The interior of the siphons were sandblasted to remove all the old paint down to the bare metal. A coat of resin was painted on the bottom of the pipeline, and a 50-inch (1.27-m) strip of woven fabric consisting of fine filaments of fiberglass was placed over the top of the resin. A top coat of resin was then applied over the top of the fabric. An additional layer of fabric 6 inches (150 mm) wide was placed over the rivet head, and an additional coat of resin was applied. The remaining portion of the pipeline was then painted with six coats of vinyl resin paint.

Photo No. 1 is a picture showing the interior of the Bully Creek Siphon. The dark strip in the bottom of the pipeline is where the most rusting and pitting had occurred.

This article was submitted by Virgil Temple, Irrigation Systems Specialist, Pacific Northwest Regional Office, Boise, Idaho.

Photo No. 2 shows where the extra strip of fabric was applied over the rivet heads.

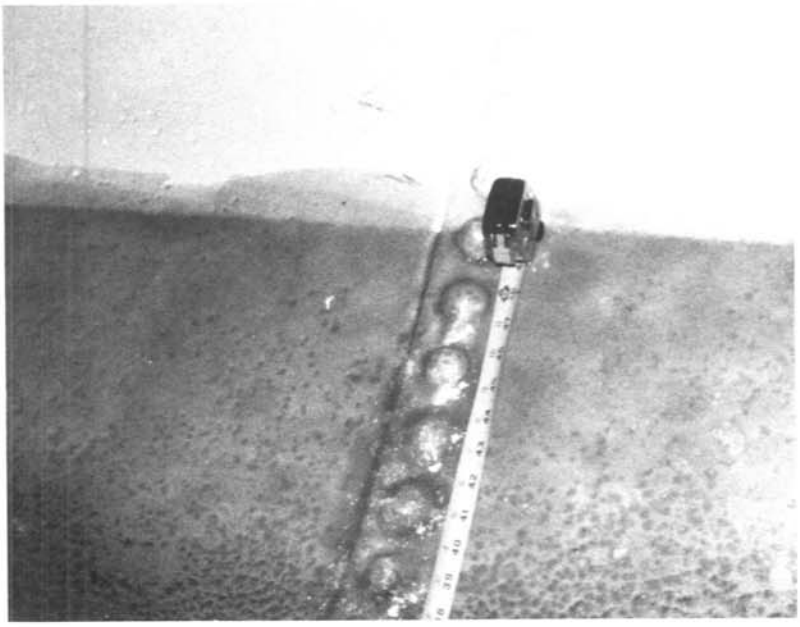


Photo No. 3 shows an area where the vinyl resin paint was applied. Notice the rust pits that are in the pipeline.

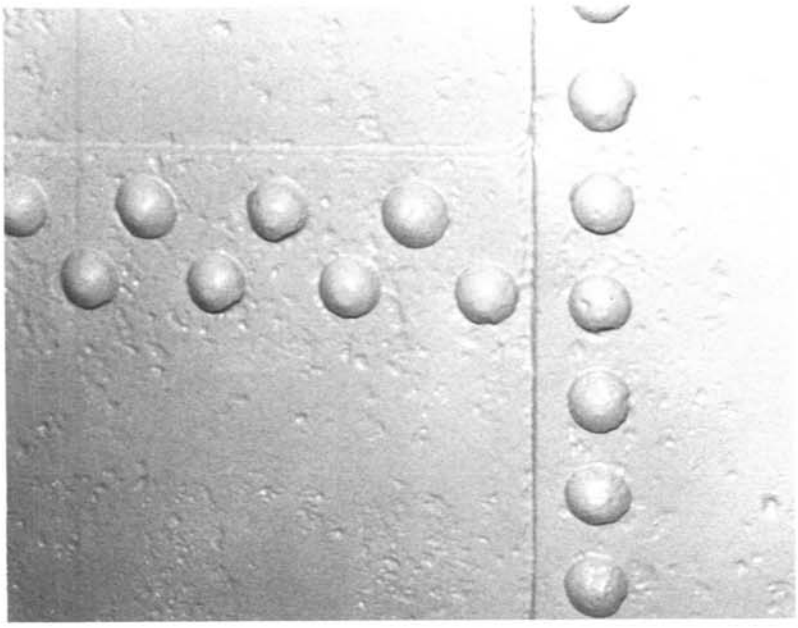
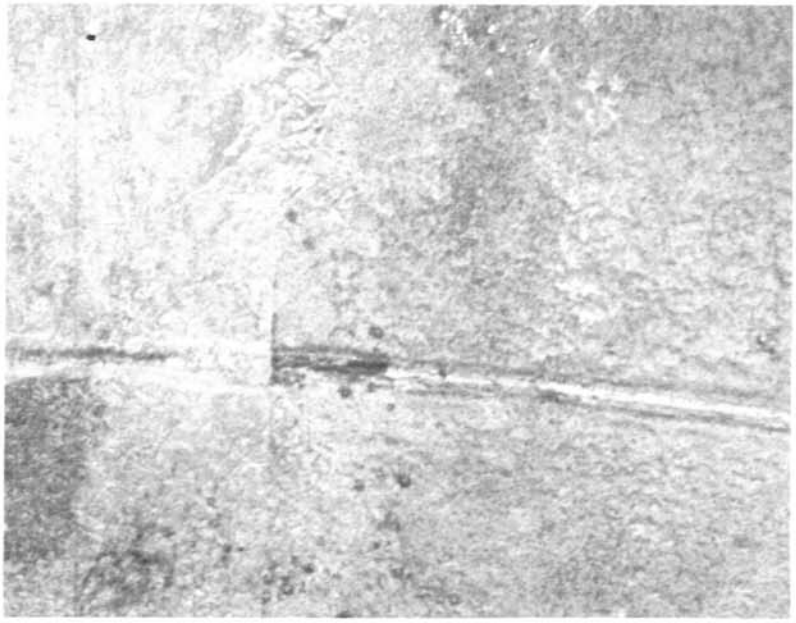


Photo No. 4 shows the condition of the pipeline prior to sandblasting and painting.

After inspecting the Vale siphons, the examination team journeyed to the Malheur Siphon which is operated and maintained by the Owyhee North Board of Control. Starting in 1968, the district began installing a layer of fiberglass material in the bottom of the Malheur Siphon. The area where the material was first installed in 1968 was inspected. The material looked good, and there were only a few rust pits showing in the area painted with vinyl resin. Prior to the installation of the fiberglass material, frequent painting was required. The paint on the bottom of the pipeline would wear off in a short period of time and rusting would occur.

Photo No. 5 was taken looking down from the manhole. The fiberglass installation is visible. The dark strip is water flowing through the siphon.

The right side of photo No. 6 shows the fiberglass. Note the rusty area along the seam in the painted area and the lack of rust under the fiberglass.



Water with abrasive silt flowing through a pipeline scours the paint off the bottom of the pipe in a very short period of time. A fiberglass strip placed in the bottom of the pipe will provide a wear surface that will last as long as the painted portion of the pipeline.

If additional information is desired, feel free to contact Virgil Temple, Attn PN-430, Bureau of Reclamation, Pacific Northwest Region, Federal Building and U.S. Courthouse, Box 043-550 West Fort Street, Boise ID 83724.

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GOOD HOUSEKEEPING AT WORK

It can't be overemphasized: Good housekeeping is a basic requirement for effective accident prevention and efficient production. An effective housekeeping program is not just a casual effort. It's an orderly arrangement of operations, tooling, equipment, storage equipment, and supplies. A good housekeeping program depends on planning and scheduling the housekeeping function along with all other operations.

Here is a list of some of the practices that may help you secure full cooperation from your people in maintaining the maximum degree of orderly housekeeping:

1. Set a good example in your own area. Do not hesitate to pick up unused odds and ends or litter from the floor and put them in the trash can. This impresses people who work for you.

2. Appeal to people's pride. Point out how attractive neat work areas look. Show employees how they can benefit by keeping their work space free from dirt and congestion. Make your program as interesting as possible by giving people a chance to participate, by recognizing efforts, and by conducting an understandable program.

3. Explain specific employee housekeeping responsibilities, why such assignments are necessary, and how they can be carried out.

4. Make sure your instructions are complete and understood.

5. Develop a routine procedure for inspecting the areas in your jurisdiction regularly each week, or a minimum of once a month.

6. Check closely on general working conditions. It is that first piece of trash on the window sill or under the bench that invites people to add to it. Act immediately when necessary to keep heat, light, ventilation, and sanitation satisfactory.

7. Keep aisles clear and clean. If storage areas are full, have truckers check with you before unloading.

8. Cooperate with materials handling crews by seeing that temporary storage areas are positively identified and easy to use.

9. Make it easy for people to keep trash off the floor. Make sure trash containers are provided in strategic locations. They must be plainly marked and emptied when full.

10. Make sure proper receptacles are provided for empty milk or beverage cartons or bottles–and require employees to use them. Make sure they cooperate with the cleaning crew and with toolroom and stock employees.

This article is from August 1984 Today's Supervisor, published by the National Safety Council.

11. Permit nothing to be stored on window ledges or hung from walls, even temporarily.

12. Provide adequate seats or benches where needed. Do not permit makeshift seating (such as kegs or boxes) to be used.

13. Check equipment that uses coolants to make sure that oil, coolant, or water does not leak on the floor. See that absorbents are handy for soaking up spilled liquids.

14. Eliminate the practice of keeping excess materials at workplaces. This is one of the most prevalent poor work habits.

15. Be sure flammable solvents are kept in approval containers and are used only when needed. Do not permit more than one day's supply to be kept in the department at any time.

16. Encourage employees to report conditions that contribute to disorder.

17. Discourage employee exhibits of distracting pictures and art that sometimes adorn walls and cabinets in work areas. If their removal leaves obvious marks, you can substitute safety posters of equivalent size.

18. When investigating accidents or reviewing accident records, determine if faulty housekeeping was a contributing factor.

19. Do not allow exits to be blocked or fire protection equipment to become inoperable.

20. Keep all electrical control boxes (disconnects, circuit breakers, and distribution cabinets) free of stored items. Be sure they are properly identified as to their function.

If you have special housekeeping problems that you cannot control by yourself, you should have higher management's active support in seeking help from service departments.

Maintenance has direct responsibility for proper functioning of equipment and for the physical condition of building and grounds. When surveying equipment and facilities, you should note all repairs needed and then work out a schedule with maintenance. Often the supervisor requisitions small maintenance jobs, and requests approval of his or her superintendent for major work.

The best maintenance is preventive maintenance. Preventive maintenance should be scheduled as far in advance as possible. The wise supervisor has equipment clean and ready for maintenance by the time the crew arrives.

Janitor service, often a maintenance or plant engineering function, should also be scheduled.

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The purpose of this Bulletin is to serve as a medium of exchanging operation and maintenance information. Its success depends upon your help in obtaining and submitting new and useful O&M ideas.

Advertise your district's or project's resourcefulness by having an article published in the Bulletin! So let us hear from you soon.

Prospective material should be submitted through your Bureau of Reclamation Regional Office.

Mission of the Bureau of Reclamation

The Bureau of Reclamation of the U.S. Department of the Interior is responsible for the development and conservation of the Nation's water resources in the Western United States.

The Bureau's original purpose "to provide for the reclamation of arid and semiarid lands in the West" today covers a wide range of interrelated functions. These include providing municipal and industrial water supplies; hydroelectric power generation; irrigation water for agriculture; water quality improvement; flood control; river navigation; river regulation and control; fish and wildlife enhancement; outdoor recreation; and research on water-related design, construction, materials, atmospheric management, and wind and solar power.

Bureau programs most frequently are the result of close cooperation with the U.S. Congress, other Federal agencies, States, local governments, academic institutions, water-user organizations, and other concerned groups.

A free pamphlet is available from the Bureau entitled "Publications for Sale." It describes some of the technical publications currently available, their cost, and how to order them. The pamphlet can be obtained upon request from the Bureau of Reclamation, Attn D-922, P O Box 25007, Denver Federal Center, Denver CO 80225-0007.