H2Oregon

Fall 2016
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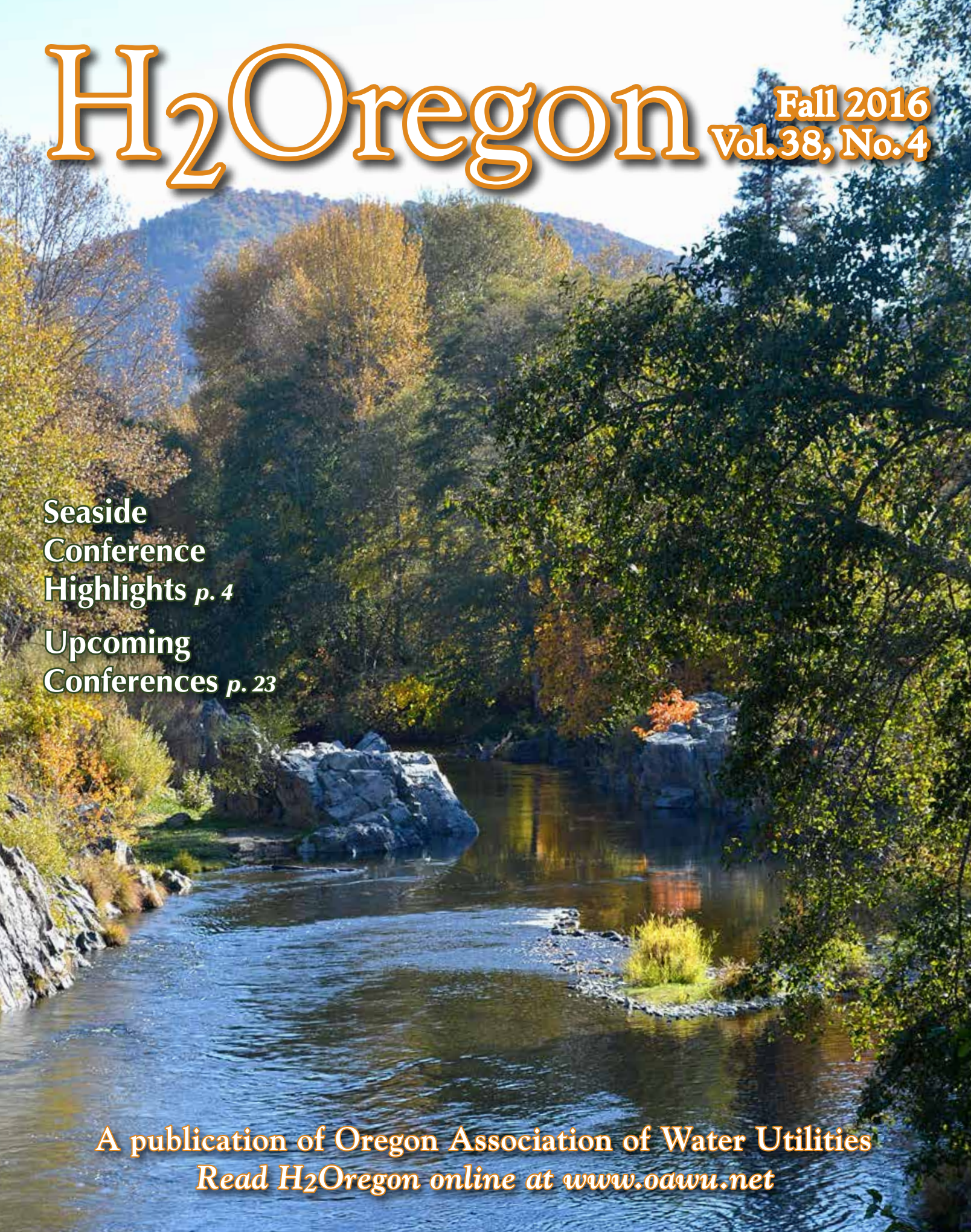

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A publication of Oregon Association of Water Utilities
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H2Oregon

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Your photos and articles for inclusion in H2Oregon. OAWU requests your best photos of Oregon water scenery for our magazine covers and artwork!

Please mail your photo to our office. If we use your photo on the cover you will receive an official OAWU shirt and hat.

We are also seeking articles, clean jokes, Oregon trivia, letters to the editor and interesting stories. Please send submissions (no more than two pages in length) to:

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OAWU's mission is to provide service, support and solutions for Oregon water & wastewater utilities to meet the challenges of today & tomorrow.

Mostly Diligent

by Jason Green, Executive Director

My father and I shot pool regularly each week, sometimes more often—I miss that. A dozen or maybe 20 games on one of those quality tables with good slate and fast felt in a room off from the garage and temperature kept pretty constant. If he was on, as was usual, I might have one turn to end the game. This was all fun competition, which meant it was serious and no interruptions and little small talk. Old Country Western on the radio and maybe a head nod or an occasional word, that's it—hours of winning and losing. Neither of us were considered great shots, let alone consistently great shots, but with regular practice, we were fair competitors. There were the occasional amazing shots, maybe a glance and grin, followed by the other's congratulatory snarky comment. Coming from a dairy farming upbringing and timber faller background, Pop had collected a number of interesting quips and congratulatory comments—capable of being instantaneously dropped at will. He was mostly pretty good at keeping these to himself around company, but just the two of us, all bets were off. You'd hear several, and some that momma would have used plenty of soap on too. His definition of competition included anything from who woke up first, finished breakfast first, first fish, buck, bird, best shot, who split the most wood—biggest armload, who got the least amount of sleep, cribbage, etc.- you get the picture. Life was about competition and you didn't get anywhere without a plan, hard work and competing—he was driven and shared that with whomever he came in contact with.

While recently watching a movie, these memories came to mind as I heard repeated one of Pop's back-handed compliments, "Even a blind sow finds a truffle (or an acorn) once in a while!" It must have been a good shot! The congratulatory comment suggesting it was pure sloppy luck, but as in most cases, diligent work, dedication and practice with a bit of attention to detail precedes most "luck." This then led me to think about the many water and wastewater utility operators and managers I have met over the past 30 years. A complimentary word, a head nod, a handshake, a vote of confidence from a co-worker, the boss or board. Encouragement along the way are little gems that give a bit of boost and most of us appreciate it as its generally rare to hear in any form. For those of us in the water and wastewater industry, whatever our position—15, 20, 30 years or more, is a long time to consistently keep sharp, learning, serving your utility or city customers. For those less crusty in our profession and just getting started, you must grapple with the fact that in order to be good in this business and build a solid reputation, it takes years of dedication, practice, application, sometimes fortitude and much diligence in every area. Learn where you can, be humble—watch and listen to others, learn people skills, attend classes and conferences, read! Hang in there and just maybe you will hear something like a backhanded compliment directed your way with a bit of grin and twinkle in the eye that suggested you're just a lucky buck, but underneath it all, you well know it was one of those gems of a compliment regarding a good job you did! Or, maybe its you that makes the back-handed compliment. Don't be shy about it, especially encourage those younger or less experienced. A person loses nothing in themselves by teaching, sharing, encouraging or shedding a bit of the limelight on others.

My best to you.

OAWU's Summer Classic 2016

The weather for this year was fantastic and the activities were great. Monday's pre-conference provided great classes and a few extra CEUs to those who attended. The conference was kicked off by an opening session given by OAWU's Executive Director, Jason Green, and a legislative update by Mark Landauer.

Tuesday held the evening outdoor barbecue with a meet and greet social, exhibitor prize give-away, followed by a bonfire on the beach.

Wednesday continued with a full day of classes; some took the afternoon off to participate in the annual Golf scramble at Gearhart Links.

Thursday concluded the conference at noon with some final words and the highly anticipated raffle drawings and cash prizes.

Thank you to this year's Silver sponsors, H.D. Fowler, M&H/Kennedy Valve, and EJ; and to our Bronze sponsors, RH2 Engineering Inc., BergerABAM, and CoBank.

- Bonfire beverages sponsored, again this year, by Ferguson Waterworks.
- The Annual golf scramble was at Gearhart Links, which hosted 15 teams (almost 60 golfers).
- Thursday, during closing session, OAWU gave away over $1500 in merchandise and $200 in cash prizes.
- This year's OAWU raffle for a 50" flat screen TV was won by Roy Bicknell, City of Hermiston.
- The Jeff Swanson Memorial Scholarship raffle for a Henry .357 went to Rory Martin, Oak Lodge Water.
- The winner of a full registration to the OAWU Sunriver Conference in March 2017 was won by Dave Davis, City of Warrenton.

Mark your calendars for next year's Summer Classic in Seaside, August 21-24, 2017. See you there!

in Seaside, Oregon

OAWU's Annual Golf Scramble

Seaside, Oregon – Gearhart Links Golf Course – August 24, 2016

The sun was out the entire day, it was pleasantly warm and we had very little wind throughout the day; it was a perfect day to hit the links for this year's scramble. The staff at the Gearhart Links Golf Course were accommodating, friendly, and professional helping to make the day even more enjoyable.

Fifteen teams challenged the course this year, making for a great competition. No one was safe from the errant drive, misjudged chip shot, or the mocking one received when their shot landed two fairways over; we must also admit that there were many great players and many awesome shots on the course again this year. The day was very pleasant and the banter helped build camaraderie throughout the scramble.

Special thanks to this year's sponsors: The Ford Meter Box, M&H/Kennedy Valve, EJ, HD Fowler, and Lakeside Industries for their support of the attendees and association.

The three winning teams were:

1st place: Bryon Boyd, Rob Jackson, Dan Bradley, and Dave Seifert

2nd place: Steve Wabschall, Greg Howells, and Chris Stark

3rd place: Scott Motsinger, Don Miller, Jeff Crowther, and Hans Schroeder

The winners of the golfing competition games were:

Longest Putt #1: Steve Wabschall

Longest Putt #2: Jeff Crowther

KP Men's #1: Bryon Boyd

KP #2: Don Lovas

KP Women's #1: Janice Chandler

Longest Drive Men's #1: Dan Bradley

Longest Drive Women's #1: DJ Ezell

Longest Drive #2: Bill Huntley

Special thanks go out to Jeff Crowther (Circuit Rider), Hans Schroeder (Circuit Rider), Mark Russell (Office Manager), and Mike Collier (Deputy Director), who helped make sure the scramble went off without a hitch.

Mark your calendars for OAWU's next Summer Classic at Seaside, August 21–24, 2017.

It is a great location to enjoy while you earn CEUs and network with the associate members and your peers.

Stormwater Alternatives

by Jeff Crowther, Wastewater Technician

As treatment plant operators in small cities and jurisdictions, we find that not only do we need to operate our water and wastewater systems, but we must also take care of the City's stormwater infrastructure. In doing so we may need to improve existing public stormwater systems and/or provide guidance to private developers to treat their runoff onsite or prior to discharging it to the publicly owned system.

Stormwater management has been a hot topic in public and private sectors for the last few years, and as such, you have probably heard many tips, warnings, and rumors about the subject. Each jurisdiction may have specific guidelines to help us decide what approach we should take for stormwater management on our projects, whether they are a public or private system. If you don't have criteria to follow check with your City Engineer or a neighboring system for what they require.

One of the things many of us assume is that we should collect stormwater in an underground piping system, as soon as possible, in order to convey the water to its ultimate destination of a creek or river. This isn't always the case, many jurisdictions are finding it is useful to utilize roadside stormwater swales to convey the water, while also treating that water for pollutants before discharging into the state waters. These roadside swales both treat and detain Stormwater. Since the stormwater is conveyed on the surface the installation can be done without trenching the roadway.

You may also have heard the term LIDA being used recently. This stands for Low Impact Design Approaches. These approaches are being used by many jurisdictions to reduce the impacts of stormwater treatment, as well as, guide designers in the most environmentally sensitive approach. LIDA guidelines can be found for many scenarios, but the basic idea is to send water in small amounts from an impervious area to treatment locations within a project site, and not utilize a large regional facility away from the site. Typically these facilities treat no more than 15,000 square feet, but multiple facilities can be included on every project. These treatment facilities can be swales, rain gardens, or a variety of other treatment types. The approach also highlights reducing the impervious area using products such as pervious concrete, pavers, or roof gardens.

As you can imagine, the specific approach we take will depend on our project and our jurisdictions capacity to accept and treat stormwater run-off. If you have a public project that you will need to fund, USDA has programs available. Contact your local USDA representative for more information.

Read H2Oregon *online* at OAWU.net!

Igniting the Spark

by Tim Tice, Projects Manager

Lo and behold, another proposition for operators of water and wastewater systems has come. With everything we are tasked to do throughout the day, week and month; keeping an eye on every pitch can be difficult. I am unsure if any of us can routinely say that we are ahead of schedule. Too much to do, without enough time to do it.

As an association, we have been assisting operators in areas of technical services, managerial options, and financial concepts. Much of our effort goes into providing a service that helps the operator at their job.

Starting this past July, the association received a program that will allow us to present "Energy Efficiency" for your consideration. A new Circuit Rider program, offered through USDA-RUS, will provide an opportunity for you to consider energy savings at your facilities. What does it involve?

Let's answer the question after some startling facts about electricity and utilities. Often accounting for 30-40 percent of total cost of operations, energy is one of the largest single budget line items. Of all the energy consumed in the USA, water and wastewater facilities account for approximately 3-4 percent of energy.[1] Equivalent to 56 billion kilowatts, or $4 billion dollars is consumed to provide drinking water and wastewater services.[2]

Having a new program such as this has the tendency to smack one in the head and make it seem overwhelming, but the program procedures provide the necessary items that will help us help you, and they are:

- Identifying current energy source and rate structures
- Identify the primary energy consuming devices
- Compare those devices with equipment upgrade options
- Pose alternative process methods
- Looking at the return on investment and available funding options

Our part will be to gather data from you through an on-site visit, review the energy bills for the past 12-24 months, determine if the efficiency ratings match with current devices and present a report outlining the findings. One key component is the comparison of cost to upgrade and the return on investment.

An unexpected benefit of this program, for you and your utility, is aligning your energy improvement goals to the overall management strategies in the operations and maintenance plan and policies.

To simply paint the picture for you, I encourage you to review the past few months of electrical billing for your utility. If you multiply the 3-month average by 15 percent, a figure emerges as "potential monthly savings", and for some it will be quite significant.

Another point of consideration is the return on investment, which can be as early as 12 months, but more than likely 3-5 years. Everything that will be learned from an energy efficiency

review it not yet known, but, like many of the rate studies we perform for utilities, some of the information can be enlightening.

As a pilot program just two years ago 240 energy assessments were completed, which identified a total of $2,615,809 worth of annual energy savings for those water/wastewater utilities. The energy efficiency assessment process has identified annual savings per utility ranging from $0 to $201,958, with an annual average savings of $10,899 per utility system.[3]

If you feel this is an opportunity you wish to benefit from, please call the office, get on the list and let us schedule a visit to your facility. We will not add an overwhelming number of tasks to your already busy schedule, but we *will* tell you the next pitch and place it in your wheelhouse for an easy home run.

The best that life has to offer!

References

1 https://www.epa.gov/sustainable-water-infrastructure/energy-efficiency-water-utilities

2 https://www.epa.gov/sustainable-water-infrastructure/water-and-energy-efficiency

3 http://www.rd.usda.gov/files/WEPAnnualProgressReport2015.pdf

System Survey

By Heath Cokeley, Programs Manager/Circuit Rider

I have found many people will get nervous when they find out they have a System Survey coming up. No, I don't blame them for that feeling, as I always had some anxiety when I had one coming up at my old system, but I think just taking some time before the survey to prepare the things that a State or County person will need makes this process a bit less painful. To try and help with that I have listed the main things they will want to see first.

The first 9 things on the list are for all water systems. Numbers 10 and 11 are only for community water systems. I have added a few notes after some of these items for extra help.

Remember, the things needed to complete this survey will change with system size and complexity, so if you have a surface water treatment plant you will want to review the Drinking Water Program web site for additional information at: public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Operations/Pages/osp.aspx.

1. **Written Coliform Sampling Plan** The new total coliform rule took effect April 1, 2016, so make sure yours is up to date.
2. **A map of the distribution system** You should have one with your Coliform sampling plan that shows all the test locations as well as repeat locations.
3. **Operation and Maintenance Manual** and other written procedures. If you don't have one of these or are looking to write a new one OAWU puts on a one-day training and provides an electronic template to help systems write their O&M Manuals.
4. **Emergency Response Plan** All systems should have an ERP and make sure it is up to date, especially the emergency contact list which may prove to be the most valuable part of this plan.
5. **Chemical dosage records** if treatment is applied.
6. **Proof of NSF Standard 60 certification** for each chemical added to the drinking water.
7. **Chlorine residual monitoring records** if the system is chlorinated. Even if you only apply chlorine for a residual maintenance program you still need to be taking at least two chlorine readings in the distribution system a week. With larger systems and surface water systems more frequent readings are required.
8. **Results of any tracer study** to verify disinfection contact time, if applicable.
9. Photos or other documents that provide enough detail to determine the **current condition of storage reservoir features** such as: access hatch in open and closed/locked positions, air vents that show all screening is secure with no gaps, and any other openings into the tank interior such as telemetry ports and cathodic protection. All of these items should be checked annually, which would be a good time to take pictures for the survey.
10. **Cross-connection control program plan, records, and latest Annual Summary Report.**

11. **Written protocols for under-certified operators** if applicable. If you do not have this form filled out the State has a very simple template on the Drinking Water Program web site under Written Protocol for Operators.

What I would always do before a survey is lay all these plans out on a table before the state or county staff came to the facility and number them with the corresponding number on their list. This would help to expedite the survey.

At least in my experience, the state and the county staff that come out to complete these surveys want to see the system do well. If everything is up-to-date and you meet all the requirements for the Outstanding Performer Criteria, then you won't need to do another system survey for 5 years. That will not only save the water system time and money, as these surveys cost based on the systems size and complexity, but it will save the state and county staff time as well.

Water Loss Control, Part II

by Scott Berry, Operations Manager

In the last issue of *H2Oregon,* we discussed why and how to start a water loss prevention program. In this issue, we're going to fill in the gaps and talk about what happens next.

Step number 1 was recognizing that there is a problem. We've read the production and customer meters and determined that the disparity between what is being produced and what is being consumed by metered usage is outside of the tolerances that we, our board or council, or the Water Resources Dept. are comfortable with.

Step 2 was embarking on a logical and methodical journey to locate the source, or sources, of leakage.

The next step is where some decisions need to be made. Is it a job we want to tackle with existing staff? Is it something we should hire a contractor to do? Are there concerns about safety or risk to property damage? Does it need to be resolved right now or is it stable enough to allow us time to better plan the logistics and resources that will be needed for a more controlled non-emergency repair? In the water industry, the word emergency is spelled with dollar signs, so any time we can plan and achieve the results we desire in an acceptable time frame, we should do it.

I always like to keep the history of a system in mind when making these decisions. Is this current leak in an area where there have been several problems over the years?

If so, perhaps it's time to stop reacting to and start resolving the problems. Plan a pipe replacement project that will eliminate the problem area altogether.

Deciding whether to emphasize detection and repair over replacement depends on site-specific leakage rates and cost. In general, detection and repair result in an immediate reduction in lost water; replacement will have a longer lasting impact because it eliminates the root cause of leaks.

One of the most important factors in a leak detection and repair program is the need for detailed and accurate records that are consistently completed and easy to analyze. There are three sets of records pertaining to water loss that I like to keep:

- Monthly reports on unaccounted-for water comparing cumulative consumption and production.
- Leak repair forms that detail the location, type of leak, all pertinent information regarding the pipe size and composition, and the cost of repair.
- Updated maps of the distribution system showing the location, type, and class of each leak.

Detecting and repairing leaks is only one water conservation strategy. A program for testing and repairing customer meters, as well as, production meters is another step toward ensuring that we are working with good numbers.

Life

by Hans Schroeder, Circuit Rider

As a man who wears many different hats, trying to be where and who I need to be at any particular moment, at times it feels like a juggling gig. However, when I sit down and really look at the truth of the matter, I realize that to do all these things well it all comes down to relationship.

I have to remember where my priorities stand and then hone in on those things first. I have to remember just who gave all to me in the first place, and that would be God. I must take the time to give my effort and time to a God who leads and directs me. Showing gratitude is one great way to do just that. Then, I have to focus on my wife for she is the one who stands by my side through life, then I have kids that I support, an extended family, and friends as well. I have a job that requires me to be and do certain things at certain times and it is important to do these tasks well. All of these things can be a bit overwhelming if I don't keep my priorities in order.

Relationship to me is loving well. *Love* is an action word. There are times when just saying it isn't enough if there is not action behind it. It may be as hard as getting into my bank account and taking funds, I wasn't planning on using, to do something I wasn't really counting on doing. But, it was a need and I had to show some action by helping. Sometimes, someone just needs an ear, sitting and listening is a huge tool that shows someone I care. Sometimes it is just meeting a need that someone simply cannot. To be available either by a good word thru a text, to pick up a phone and call, to sweat a little on someone else's behalf, to go sit and have coffee and listen, to show gratitude where it is deserved, to help out someone who's struggling, to go beyond what is asked of me in the work force, it all adds up to doing love well. I may not do it well all the time, but if I always go back to remembering what really is important then this is how I need to live.

I take pride in doing my job to the best of my ability and being a provider. I am learning that being authentic and meeting people right where they are, whether that is in my own home or on the job, makes me much more productive and makes what I do matter. To just stroll along and get by isn't enough, but I know that as I go along just showing up and being present right in the moment is where it is at and where I can be the most effective. I don't have to go looking, I just need to live in the moment of what comes my way and do it well. Love with action and, in return, create relationships.

I think to sum all my thoughts up in one phrase would be:
"Loving your neighbor as yourself" is the best way to describe a day in the life of a real man.

To Be An American

by Mike Collier, Deputy Director/Sourcewater Specialist

With the current election looming, I tried to take a moment to consider what it means to be an American. I quickly realized that it means many different things to each person, but maybe the idea that it can mean so many different things is actually the point of what being an American is. We have the ability here (in our country) to have our opinions and point of views, we can voice these things (if we do so in a legal manner) and know that we are safe from our government attempting to stop us.

After some more careful consideration I decided it would be best to look at what America's originators thought an American was, as seen in the Declaration of Independence. In the Declaration it basically states that to be an American we believe that all men are created equal, and that we have a creator (God) that gave us certain rights—life, liberty and the pursuit of happiness. These rights are for all and give the foundation for the American Dream, being able to pursue our goals and work without the government, or others trying to stop us—we all have an equal chance to become whatever we want to be (for some it may be easier than for others, but we can all pursue our goals).

It then goes on to say that to protect these rights we entrust a government that gets their power through the consent of the governed, the governmental system can be changed at any time by the people to protect and pursue our safety and happiness (but not for something transient or on a whim). Our Government is to listen to the people in order to pursue the public good; our government is to represent us as a whole; we are to protect ourselves from outside and from within our borders. We have the belief in a justice system with a trial by jury; we should be able to live without continual harassment; our military is ran/controlled/governed by the people. We, as a country, are only under our own jurisdiction – we don't answer to another power; we should not be inhabited by another military power without our consent; we believe in free trade; no taxes without consent (we as a group determine taxation); we live in the land area known as America and consider it our home. We will protect each other with our lives, fortunes, and our sacred honor (we take this respect for all seriously)—and we rely on the protection of divine providence (this is God's will for us—to be self-governed).

Through all the statements throughout the Declaration I think the most profound, or statement that should form what we consider to be an American more than any of the other statements, is "And for the support of this Declaration, with a firm reliance on the protection of divine Providence, we mutually pledge to each other our Lives, our Fortunes and our Sacred Honor." Let us review and take apart this statement some; as we, as Americans, can often take things too seriously, or use multiple small things to divide us as a people.

An American is willing to defend his/her people against others with everything we have and we respect other Americans—we take this respect of all others that live within our boarders seriously. So in other words, when push comes to shove, we will defend each other, kind of like a family would.

We can also consider another document that historically Americans cling to and that is our pledge of allegiance. We, Americans—have allegiance to our flag, one nation under God, Indivisible, with liberty and justice for all—it does very much-so give a synopsis of the Declaration of Independence. We believe our rights are non-deniable, as they come from something outside of this world—God. We can't be divided—we mutually respect each other. We are free to pursue our goals in life (as long as the overall group has determined they are legal goals).

And we believe in justice, through our mutual honor for one another, we will not do something to intentionally harm each other and if we do then we, as a people, will pursue justice.

As we continue toward the pursuit of a new President and other public offices, please remember that we are all Americans and it may be worth considering the words that our forefathers put down on paper to make this great nation and once again give each other our Sacred Honor.

Working With Submersible Pumps

Last month I introduced the first of a series of articles intended to help you and the service personnel on your staff recognize problems as well as suggested corrective actions for various types of pumps. The first article was oriented toward vertical turbine pumps. This month I continue this series with the most common problems and corrective measures associated with submersible pumps.

In future installments, I will outline the most common problems and solutions associated with centrifugal pumps, examine the intricacies of electrical troubleshooting, and explore enhanced methods of problem solving that may just help you save valuable time and energy when that next pump problem occurs.

Background and Types of Submersible Pumps

Submersible pumps, commonly referred to as submersibles or more simply as subs, basically refer to any pump designed for operation (continuous or intermittent) while partially or fully submerged in a fluid of some type, generally water. Submersible pumps are most commonly associated with dynamic pumps, specifically using a centrifugal type of pump, although positive displacement pumps have also occasionally been used as submersible pumps.

The history of submersible pumps coincides with the parallel development of electric motors designed to operate under submerged conditions. The original submersible pumps date back to the early decades of the 20th century, when they were developed and used primarily for deep oil well pumping. They were not very reliable but they offered an alternative, especially in very deep oil wells, to the pump jacks that were in common use back then.

Early submersible motors, in accordance with their initial use, were oil cooled and lubricated, but most submersible motors used today in water well applications are water cooled and lubricated. As motor technology gradually improved, submersibles gained rapid favor and popularity as well pumps used to pump water from deep water wells during the late 1940s through the 1950s. Continued improvements in submersible pump and motor technology and increased reliability during the late 1950s through the 1960s resulted in the virtual exclusive use of submersible pump units for deep water well applications that continues to this day.

In addition to their widespread use as well pumps, submersibles are also currently used as booster and dewatering pumps in many projects. Improvements in submersible motor and pump technology have increased the average life of a unit, under optimum conditions, from only three to five years in the 1950s up to 15 to 20 years today.

The term "submersible pump" can actually refer to several different types of pumps designed for distinct and specific jobs. The two most common types of submersible pumps have completely different applications, but many of the common problems and solutions apply to both styles.

A "submersible sump or sewage pump" is a type of pump designed to transfer raw sewage, storm water, or effluent from one location to another, while a "multi-stage submersible" is typically designed to deliver potable water at high heads from one location to another.

Multi-stage submersibles, like centrifugal pumps, are generally circular in construction in small enough dimensions that enable easy installation in circular sumps or wells. They are available in bowl (pump) diameters of 3 inches up to more than 18 inches. They are most commonly used in water wells and currently represent the most popular method of water pumping for domestic, irrigation, and commercial water systems. Multi-stage submersibles, also referred to as "deep well submersibles" are often associated with their nominal diameter when classifying a pump for a specific application (a 4-inch submersible pump refers to a deep well submersible pump with a nominal outside diameter of 4 inches). The most common motor diameters available today include 4 inches, 6 inches, 8 inches, and 10 inches, although larger slow-speed units are manufactured for industrial and municipal applications.

Typically, the diameter of the motor for a deep well submersible matches the diameter of the pump with the motor affixed to the pump directly below the inlet (Figure 1). The motor, like the pump, is designed for continuous operation in a totally submerged condition, with operational water heads often exceeding 1000 feet.

A submersible type of sewage or effluent pump resembles more of a conventional centrifugal pump and standard motor in its construction. This type of pump is also designed for continuous operation in a submerged environment. However, many

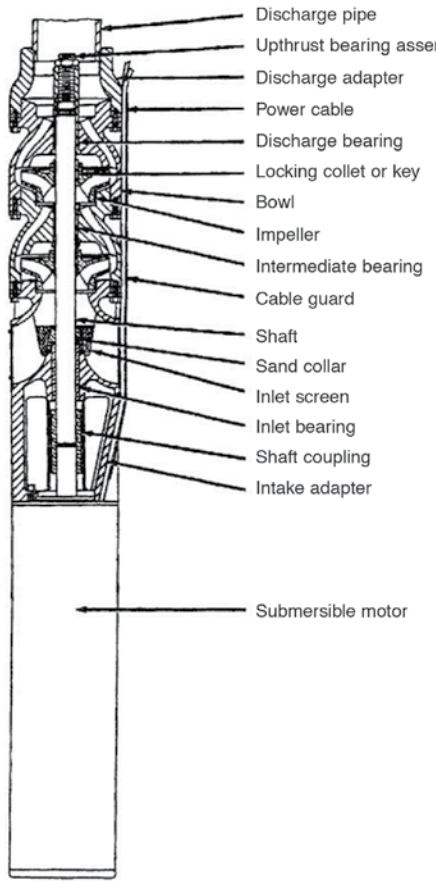

Fig. 1 *Typical submersible pump motor construction and terminology.*

submersible sewage pumps, due to motor construction using oil cooling and lubrication, can also operate in an open or partially submerged condition. This type of operation is never permitted for a deep well submersible pump because of its inherent water cooling and lubrication design.

Although the submersible style of pumps includes sewage and effluent pumps, I will limit my discussion to the multi-stage centrifugal type of submersible pumps. Remember, though, that much of the information that will be covered also applies to the sewage and effluent style of submersible pump. Many of the problems and solutions that were outlined in the table on vertical turbine pumps (VTPs) in last month's article will also apply to submersibles. In fact, many of the larger diameter deep well submersible pumps use the same bowls, impellers, and other items as a comparable vertical turbine pump. Indeed, larger (equal to or more than 6 inches diameter) submersible pumps are often referred to as submersible turbine pumps

because of this similarity. The basic difference between the units is the operating speed (submersibles generally operate at 3400 to 3600 rpm, while VTPs usually operate at 1800 rpm) and the fact that the driver (motor) is now located under and directly connected to the bowl assembly.

The current popularity and widespread use of submersible pumps is due to lower cost, easier and cheaper installation, elimination of a long lineshaft as required by a VTP, less noise, and the ability to pump higher volumes of water at higher heads from a smaller well casing size than a comparable size VTP. The real difference between the units is the potential problems and solutions related to the electric motor. Because submersibles use no other driver method than an electric motor, as well as the fact that the motor operates in such a hostile electrical environment, problems associated with electrical issues will be much more relevant and common with a submersible than a comparable VTP. Most submersible pumps smaller than and equal to a 4-inch diameter pump are used primarily for domestic and individual residential water supply while the majority of larger submersible turbine pumps are designed for irrigation, commercial, municipal, and industrial water systems.

Because the majority of problems with submersible pumps are with these larger applications, we will concentrate our troubleshooting techniques and recommendations on three-phase submersible turbine units, although most of the troubleshooting information also applies to smaller single phase submersible units as well. The following information, therefore, is intended to provide you with enough information to successfully diagnose most problems with just about any submersible pump unit.

Troubleshooting Submersible Pumps

A submersible turbine pump is really not any more of a complicated machine than a vertical turbine pump. Diagnosing problems related to this class of pump usually depends upon a troubleshooter with a common sense approach as well as adequate knowledge and experience with troubleshooting pumps and motors, especially electrical troubleshooting. As with a VTP, the cause of operational problems generally depends on the age of the pump. New pumps will exhibit problems usually due to installation or design errors, while service issues with older pumps will usually be the result of metal fatigue, wear due to sand or other abrasives, inadequate or unbalanced power supply, cyclic heating/ cooling of the motor, or extreme overheating. A problem with any random submersible pump, as with most pumps, will generally fall into one or more of three primary categories: (1) mechanical; (2) electrical (motor, drop cable, or starter); (3) hydraulic.

Mechanical Problems

Mechanical problems with submersible turbine pumps are typically related to conditions within the bowl assembly. The basic operational principle of a submersible turbine pump is based on a high-speed rotation (3600 rpm) of a multi-stage series of impellers driven via an internal and reasonably frictionless round or hex-shaped "bowl shaft" (usually manufactured from stainless steel). As long as the bowl shaft remains straight and without excessive wear at the bearing surfaces and the impeller/ wear ring assembly does not exhibit excessive wear, mechanically related problems from a submersible pump will be infrequent. Where problems will arise will be in cases of excessive abrasives (such as sand) in the pumped fluid or from extreme lateral wear of internal components due to operation in a crooked well or while in a bind.

Because most submersibles operate at speeds up to 3600 rpm, wear due to abrasives becomes a much greater factor than with most VTPs, resulting in failure in many cases at rates up to four times faster than a comparably sized VTP. Mechanical problems with submersibles occur most frequently with older pumps due to wear and fatigue. However, mechanical issues with new installations can also happen, usually due to improper install=ation procedures or incorrect design. Although abrasive conditions (such as sand in a water well) and material compatibility issues (corrosion or electrolysis) do not fit the strict definition of mechanical problems, the impact from these conditions often leads to mechanical problems.

Electrical Problems

The driver for a submersible pump is a specially built electric motor designed to operate continuously under water heads as much as 1000 feet, while at the same time producing and transmitting the required horsepower and speed needed to operate the pump. Although most submersible motors (Figure 2) in current production use water cooled and lubricated construction, oil cooled and lubricated motors are still available and are often preferred in conditions with warmer water (more than 80¬ƒF) or high levels of sand. Problems associated with the motor are usually related to the motor or electrical system itself, especially the bearings, seals, and windings; the cable used to power the motor; and the type and quality of energy source (i.e., electricity) used to operate the motor. In fact, the quality of the power supply alone often determines the life of the unit, especially the motor. Electrical problems when using an electric motor can be varied and usually affect the motor's ability to operate at all, rather than partially.

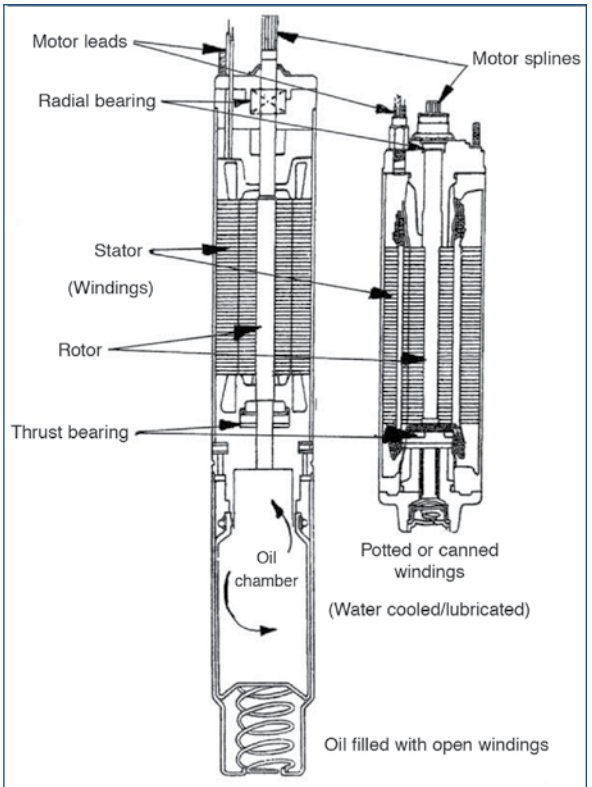

Fig. 2 *Submersible pump motor types (4" diameter shown).*

Hydraulic Problems

Hydraulic problems with submersible turbine pumps, as with vertical turbine pumps, can be subdivided into the inlet (suction) side and the outlet (discharge) side. Generally, problems with water supply on the inlet side are more problematic and crucial than issues associated with the discharge. Common problems related to the inlet side include inadequate suction pressure or head, inadequate submergence (for well pumps), and

improper sump/well casing configuration. Problems associated with inadequate inlet head, besides causing lower than expected capacity or head, can result in further pump problems such as cavitations and vibration. Hydraulic problems related to the discharge side of the pump are usually in the nature of improper (too high or low) discharge pressure or excessive friction loss.

Specific Problems and Solutions of Submersible Pumps

Toubleshooting submersible turbine pumps is mostly a process of logical elimination consisting of four steps.

- Identify the general problem.
- Subdivide the most likely problem into a mechanical, electric motor, hydraulic, or (in rare cases) a combination issue.
- Pin down the final diagnosis to the ultimate cause.
- Solve the problem.

When this procedure is followed, in the order indicated, the time and effort to identify and correct the problem can be significantly reduced. Typical problems, causes, and solutions associated with submersible turbine pumps (not necessarily in the order of frequency or likelihood) are outlined in Table 1 (next page).

Although the categories in Table 1 may appear to be redundant for some conditions and include many with a low frequency of occurrence or even some that may be very unlikely, I believe the list is comprehensive and includes most of the possible causes of problems that can occur with submersible turbine pumps.

Because submersibles are so dependent on an appropriate and adequate electrical service for proper operation, problems related to the electrical system are usually more frequent and critical than hydraulic and mechanical problems and require a higher level of service expertise and knowledge. Any person planning to regularly troubleshoot and repair submersible pumps must be adequately experienced in electrical troubleshooting and repair as well. It is also critical that this individual recognize and observe all potential safety concerns and use the appropriate judgment and safety precautions while working with electrical systems, particularly high voltage three-phase electricity.

All manufacturers of submersible pumps publish service and troubleshooting manuals that are an excellent resource when dealing with this type of pump/motor unit. Specific information necessary for troubleshooting such as values of winding resistance, allowable minimum insulation resistance, and general guidelines for troubleshooting are included in these manuals and every person working with submersibles should have access to one.

For example, adequate insulation resistance of the motor windings and drop cable represent one of the most critical elements of proper submersible pump operation. A motor can actually operate on resistance values that are seemingly much lower than logic would dictate. However, without access to a service manual, a troubleshooter may not have the knowledge of this allowable value, which could result in an unnecessary motor replacement. Always remember that a complete understanding of these variables as well as access to troubleshooting and service guidelines is the best tool you can have in your mental toolbox.

Until next time, work safe and smart.

Table 1: Submersible Turbine Pumps—Typical Problems, Possible Causes, and Solutions

1. Pump runs but will not deliver water.

MECHANICAL

Broken bowl shaft or pump/motor coupling	Repair/replace shaft or coupling
Excessively worn impellers	Replace/repair impellers/wear rings
Impellers loose from pump shaft	Reset impellers to shaft
Plugged inlet or impeller in bowl	Clean inlet or impeller/install screen
Wrong pump	Install correct pump
Hole/break in drop pipe	Replace defective pipe
Impellers pushed above wear ring by motor shaft	Correct impeller settings
Stripped motor spline	Replace motor
Defective riser check valve (blocking flow)	Replace defective check valve

ELECTRICAL

Inadequate speed (wrong motor speed)	Install correct motor
Improper electric motor speed (variable speed drives)	Correct motor speed
Wrong rotation of motor	Reverse rotation
Motor running on single phase power (three-phase motors)	Restore three-phase power

HYDRAULIC

Excessive lift (deep well pump)	Change bowl or lower lift
Inadequate inlet head (NPSH)	Increase inlet head or submergence
Bowl assembly not submerged	Lower pump setting

2. Pump delivers less water than desired.

MECHANICAL

Excessively worn impellers	Rebuild/replace impellers and wear rings
Partially plugged inlet/impeller	Clean or install inlet screen
Leak/break in drop pipe	Replace defective pipe
Broken bowl shaft (between stages)	Replace bowl shaft
Impeller(s) loose from bowl shaft	Reconnect impeller(s) to bowl shaft
Impellers pushed above wear rings by motor shaft	Correct impeller settings
Incorrect bowl assembly (new pump)	Install correct bowl assembly
Incorrect number of stages or impeller trim	Install correct bowl assembly
Defective riser check valve	Replace defective check valve
Inaccurate flowmeter	Verify/repair flowmeter

ELECTRICAL

Motor running on single phase power (three-phase motors)	Restore three-phase power
Inadequate electric motor speed (variable speed drives)	Correct motor speed
Wrong motor speed	Install motor with correct speed
Wrong rotation of motor	Reverse rotation
Low voltage to motor	Correct low voltage condition/increase drop cable size

HYDRAULIC

Excessive lift (deep well pump)	Change bowl or lower lift
Inadequate inlet head or throttled suction supply (NPSH)	Increase inlet head
Inadequate submergence (deep well or sump condition)	Increase submergence
Excessive discharge head (pressure)	Lower discharge head or modify bowl

3. Pump delivers less pressure than desired.

MECHANICAL

Excessively worn impellers and/or wear rings	Rebuild impellers/wear rings
Partially plugged inlet or impeller	Clean inlet/impellers
Leak or break in drop pipe or bowl assembly	Repair broken joint
Broken bowl shaft (between stages)	Replace bowl shaft
Impeller(s) loose from bowl shaft	Reconnect impeller(s) to bowl shaft
Impellers pushed above wear ring by motor shaft	Correct impeller settings
Incorrect bowl assembly (new pump)	Install correct bowl assembly
Incorrect number of stages or impeller trim	Install correct bowl assembly
Defective riser check valve	Replace defective check valve
Improper design conditions	Review head conditions and modify bowl if necessary
Defective pressure gauge	Replace pressure gauge

ELECTRICAL

Inadequate speed (variable frequency drives)	Raise motor speed
Wrong electric motor speed	Correct motor speed
Wrong rotation	Reverse rotation
Low voltage to motor	Correct low voltage condition/increase drop cable size

HYDRAULIC

Entrained air or gases in pumped fluid	Eliminate air/gas
Inadequate inlet (suction) head	Increase inlet head
Excessive lift (deep well pumps)	Change bowl, increase stages, or lower lift
Pre-rotation of fluid into pump	Install straightening vanes in inlet
Inadequate submergence (well pump or open sump)	Increase submergence

4. Pump vibrates or is noisy.

MECHANICAL

Bent bowl shaft	Straighten/replace shaft between .003 to .005 inch
Crooked well	Correct well misalignment, change pump setting, install smaller bowl or drop pipe
Misaligned or partially broken drop pipe threads	Rethread drop pipe
Worn bearing surfaces in bowl	Replace bearings/shaft sleeves
Discharge pipe strain	Relieve strain on discharge pipe
Partially plugged bowl or impeller	Clean obstruction
Pump operating within critical speed region (resonance)	Raise or lower flow
Impeller(s) not balanced	Balance impeller(s)

ELECTRICAL

Imbalance within motor (bearings, rotor, etc.)	Replace/repair motor
Electrical imbalance in motor due to power imbalance	Contact power company
Worn bearings in motor	Replace bearings
Motor operating on single phase power (three-phase motors)	Restore three-phase power
Defective motor starter or VFD	Repair/replace starter/VFD
Bent motor shaft	Replace motor

HYDRAULIC

Cascading water in well or vortex in sump	Lower pump or shroud bowl assembly
Inadequate inlet head	Increase inlet head
Pre-rotation of water into pump inlet	Install straightening vanes in pump inlet
Pump operating outside of normal flow boundaries	Correct operating condition
Pump cavitating (NPSH problems)	Lower lift, increase inlet head, etc.
Resonance in piping	Install flex couplings or pressure tank

5. Pump draws more power than intended.

MECHANICAL

Excessively tight bowl bearings	Replace/ream bearings
Inadequate lateral clearance between impellers/wear rings	Modify clearances
Bent bowl shaft	Straighten/replace bowl shaft
Crooked well (causing binding of bowl)	Correct well misalignment, change pump setting, install smaller bowl and/or column
Pumping sand or other abrasives	Raise pump setting, decrease flow, correct sand condition
Incorrect number of stages or impeller trimming	Install correct bowl
Wrong bowl assembly (new pump)	Install correct bowl
Incorrect design conditions	Verify conditions and modify as necessary

ELECTRICAL

Defective radial or thrust bearing in motor	Replace bearings or motor
Motor operating on single phase power (three-phase motors)	Restore three-phase power
Low or unbalanced voltage	Correct low voltage condition
Wrong motor rotation	Reverse motor rotation
Excessive or wrong speed	Correct motor speed
Loose rotor bars in motor	Repair/replace motor
Defective drop cable or splice	Repair/replace cable or splice
Inadequate size of drop cable	Increase wire size of drop cable as needed
Defective motor starter or VFD	Repair/replace starter/VFD

HYDRAULIC

Pre-rotation into pump inlet	Install straightening vanes in pump inlet
Lower operating head than designed	Increase head or modify bowl
Cascading water (causing air entrainment)	Increase submergence or correct cascading condition
Excessive flow rate	Restrict flow rate
Excessive inlet head (resulting in lower pump head)	Lower inlet head

6. Pump motor will not start.

ELECTRICAL

No power below main, blown fuse or tripped circuit breaker	Replace fuse, reset circuit breaker
No power above main, tripped line fuse	Contact power company
Tripped overload	Reset overload
Incomplete three-phase power (single phasing)	Contact power company
Loose or burned wire or connection	Repair bad connection
Control system failure	Ascertain cause and correct problem
Defective motor starter	Repair/replace starter
Defective motor	Repair/replace motor
Defective phase monitor or blown fuse to monitor	Replace/repair monitor
Open lead, splice, or wire in drop cable	Repair/replace drop cable

Submitted by Ed Butts. Originally published in *Water Well Journal*.

System O&M Manuals Required

Have you completed your state-required Operations & Maintenance Manual?

Oregon Association of Water Utilities has prepared a full day class to assist operators in outlining an operations and maintenance manual per the Oregon Administrative Rule 333-061-0065 which requires each water system to develop an operations and maintenance manual.

This class will assist the water and wastewater system operator in outlining the specific points in developing the draft of the O&M manual. Step by step, each attendee will create their draft as it relates to their utility system during class. The e-file may then be completed back at the system office.

Class cost is $155, or if you are unable to attend a class you may purchase a thumb drive with e-files for $155. To sign up for the class, or to have a thumb drive mailed to you, contact your Association for further information.

Need to Review Water or Sewer Rates? OAWU Can Help!

Take advantage of your Association's services!

OAWU has built a solid reputation for providing water and wastewater systems with factual, user-friendly, and defendable Rate Studies. Our rate studies, once implemented, have allowed many systems to obtain Capitol Improvement funding from various private and government lending agencies. An OAWU rate study can also provide a plan for systems to gain the capitol to "pay as you go" by outlining a strategy to maximize and streamline revenue and thereby allow water/wastewater system administrators to forecast projects that may be funded in-house. OAWU will provide you a professionally compiled rate study and supporting documentation that will allow you and your council or board to adopt new rates necessary to meet your system needs.

For bids or estimates, call OAWU: 503-837-1212.

MARK YOUR CALENDAR

Fall Operators Conference in Beaverton Nov. 8–10, 2016

UPCOMING CONFERENCES

18th Annual End of Year Conference
Hood River, December 5–8, 2016

39th Annual Management & Technical Conference
Sunriver, March 6–10, 2017

Jeff Swanson Memorial Scholarship

Jeff Swanson passed away on July 4, 2009, from esophageal cancer. Mr. Swanson was an accomplished and passionate Circuit Rider and Programs Manager for ten years at OAWU. He was a great water operator, manager, troubleshooter, treatment plant operator, instructor and a great friend.

Jeff had a warm and memorable personality, exceptional integrity, personal character and work ethic.

It is to Jeff Swanson's memory that this scholarship is named; he believed that obtaining education was paramount to a person's success and encouraged people to obtain it.

As Jeff would often say regarding one's attitude and actions, "Choose to make it a great day!"

An application with further details is available on the OAWU home page at www.oawu.net. The scholarship is

awarded at the Annual Management and Technical Conference in Sunriver.

Please submit application by December 5, 2016 to: OAWU Scholarship Committee, 935 N. Main St., Independence, OR 97351, Attn: Scholarship 2017.

DEQ Moves to NetDMR

DEQ is transitioning to electronic reporting of discharge monitoring report data. This system called NetDMR and it is used by several states to collect and manage data. All NPDES permit holders will need to open an account in NetDMR and eventually will use this system only to submit discharge monitoring data. DEQ and EPA will be providing training on how to set up an account in NetDMR and how to use the system. Please see DEQ's website for details: http://www.deq.state.or.us/wq/wqpermit/erep.htm

DEQ will be updating our website as new training opportunities as they get scheduled so please check this site often.

OAWU Expanded Services

Operations

Need a long-term or temporary operator for your system? We're here to help. OAWU now offers DRC, Operator of Record, Operations, and Management of water and wastewater systems. Our team of qualified professionals can assist your utility in day-to-day operations as well as provide stability and longevity in meeting regulatory requirements.

Projects

Let us bid your projects: smoke testing, valve exercising, installation of pipe, valve, service connections, hydrants and more.

Tailored Training

OAWU can provide training to meet your needs on specific topics. We offer onsite training, group facilitation, and board or council training. We can also help with public meetings and workshops!

Contact OAWU for more details: office@oawu.net or 503-837-1212.

www.oawu.net

QUIZ CORNER

1. **The MCL for Lead is?**
   A. 0.015 ppm
   B. 15 ppb
   C. 15 mg/L
   D. Both A and B

2. **The MCL for Arsenic is?**
   A. 0.010 ppm
   B. 10 ppb
   C. 10 mg/L
   D. Both A and B

3. **What is the difference between greywater and blackwater?**
   A. Nothing
   B. Blackwater has been in contact with feces and other bodily waste and may contain harmful bacteria.
   C. Blackwater is black and greywater is grey.
   D. Neither is allowed to dump into city sewer.

4. **What is the difference between blackwater and brown water?**
   A. Nothing
   B. Blackwater is black and brown water is brown.
   C. Brown water is wasted water from things other than the toilet (sinks, bathing, dishwashing, etc.).
   D. Blackwater can be discharged to streams.

5. **What device measures the flow rate of gases?**
   A. Parshall flume
   B. Rotameter
   C. Float
   D. Weir

6. **Which source of water has the greatest natural protection from bacterial contamination?**
   A. Shallow well
   B. Deep well in gravel
   C. Surface water
   D. Spring

7. **Dynamic head is best described as the**
   A. Velocity of water in a main at full pumping pressure
   B. Total energy that a pump must develop for pumping to take place
   C. Total pressure in feet of head, measured at the pump discharge during periods of rest in the system
   D. Pumping end of any device used to force water into a pressure system

8. **The BOD loading rate divided by the quantity of microorganisms present in the biological reactors (aeration tanks) is known as:**
   A. Organic loading
   B. Toxicity
   C. Hydraulic loading
   D. Food to microorganism ration F:M

9. **Which of the following is a typical piece of flow measuring equipment?**
   A. Parshall flume
   B. Nephelometer
   C. Downward looking acoustic sensor
   D. Counterweighted float-level indicator

10. **Conventional activated sludge systems typically operate with a DO range of:**
    A. 0-1 mg/L
    B. 2-5 mg/L
    C. 4-7 mg/L
    D. 7-9 mg/L

ANSWERS: 1-D, 2-D, 3-B, 4-A, 5-B, 6-B, 7-B, 8-D, 9-A, 10-B

NRWA Fleet Program

The National Rural Water Association has created partnerships with the Ford Motor Company and the Chrysler Group to offer special fleet discounts to State Rural Water Associations and their utility system members. This partnership combines the buying power of 31,000 individual utilities to provide reduced fleet pricing on utility vehicles.

The Rural Water Fleet Program is a valuable member benefit for water and wastewater utilities. State Rural Water Associations determine eligibility for their members, and provide a fleet code that allows access to substantial vehicle discounts to fill the need for reliable work vehicles.

Contact your State Rural Water Association to access the Rural Water Fleet Program. Vehicles may be purchased at your local dealer or through the national fleet auto group at www.nrwafleet.com. Incentive discount pricing is available on fuel efficient cars, vans, SUVs and trucks. Systems can save up to $6,750 off factory invoice per vehicle.

Happy shopping!

Program Details

- Entities must be current members of State Rural Water Associations to be eligible.
- There is no limit to the number of vehicles that can be purchased under the program.
- Incentive pricing is deducted off the factory invoice.
- Fleet vehicles must be in service for a minimum of 12 months or 20,000 miles.
- Vehicles must be registered and operated in the United States.
- Call OAWU today to get your Fleet Identification Number (FIN).

TRAINING & EVENTS SCHEDULE

Date	Class Title	Location	CEU Information	ESAC#	Fee/Free
2016					
October 5	SDWA Update	Salem	0.4 Water	2887	FREE
October 5	Confined Space	Salem	0.3 Water/Wastewater	3151	Fee
October 19	Control Valves	Newport	0.7 Water	2863	FREE
November 8-10	2016 Fall Operators Conference	Beaverton	2.0 Water or Wastewater	TBA	Fee
November 29	Water & Wastewater Field Operations & Safety	Salem	0.6 Water/Wastewater	2944	Fee
December 5	Effective Utility Management	Hood River	0.6 Water/Wastewater	TBA	FREE
December 5-8	18th Annual End of Year Operators Conference	Hood River	2.0 Water or Wastewater	TBA	Fee
2017					
March 6	Effective Utility Management	Sunriver	0.6 Water/Wastewater	TBA	FREE
March 7-10	39th Annual Management & Technical Conference	Sunriver	2.0 Water and/or Wastewater	TBA	Fee
July 11	2nd Annual Mini Expo	Independence	0.4 Water/Wastewater	TBA	FREE
August 21	Effective Utility Management	Seaside	0.6 Water/Wastewater	TBA	FREE
August 22-24	23rd Annual Summer Classic Conference	Seaside	1.8 Water or Wastewater	TBA	Fee
November 6	Effective Utility Management	Florence	2.0 Water/Wastewater	TBA	Fee
November 7-9	2017 Fall Operators Conference	Florence	2.0 Water or Wastewater	TBA	Fee
December 4	Effective Utility Management	Hood River	0.6 Water/Wastewater	TBA	FREE
December 5-7	19th Annual End of Year Operators Conference	Hood River	2.0 Water or Wastewater	TBA	Fee

Levels 1-4 Water Operator Exams

Trained and certified operators are necessary to ensure that the systems are managed in a manner that fully protects public health and the environment. The OARs for certification stipulate that the qualifying experience for applicants for certification as a water treatment plant operator must attain at least half the required operating experience at a public water purification plant that uses complex filtration technology and is not more than one classification lower than the level of certification they are seeking. In other words, if you have only worked for a Class 2 treatment plant, we allow you to apply for a Level 3 certification but not a Level 4 certification. If you move on to a Class 3 plant, then you must have ½ the qualifying experience (at the Level 3 plant) before applying for a Level 4 certification. Reciprocity from state-to-state ensures that operators have the operating experience for which they are certified.

For additional information, please visit http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/OperatorCertification/Levels1-4/Pages/exams.aspx

More Resources

Drinking Water Data Online	https://yourwater.oregon.gov
Center for Health Protection	http://public.health.oregon.gov/PHD/Directory/Pages/Program.aspx?pid=4
Drinking Water Services	http://public.health.oregon.gov/PHD/Directory/Pages/Program.aspx?pid=58

Training class dates, class topic and/or locations may be subject to change as needed.

For more information on any class by OAWU, please contact the office at 503-837-1212, office@oawu.net or visit www.oawu.net.

WHY AREN'T *YOU* A *MEMBER* OF OAWU?

Serving Water & Wastewater Utilities Since 1977

- We provide **onsite technical assistance and training**, meaning that we will come to you and help with any problems you may be encountering with water or wastewater.
- We provide water and sewer **rates** and **lagoon profiling**. Call OAWU at 503-837-1212 for a bid or estimate. We can save you money!

These are just a few facts about OAWU. The next time you are in need, pick up the phone and call us before hiring outside help. We are here to help. ***It's our industry. It's what we do.***

To join or for more information, visit www.oawu.net or call 503-837-1212.

Oregon Association of Water Utilities
935 N. Main Street
Independence, Oregon 97351
Phone (503) 837-1212
Fax (503) 837-1213 www.oawu.net

OAWU's mission is to provide service, support, and solutions for Oregon water and wastewater utilities to meet the challenges of today and tomorrow.

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Phone: _____ Fax: _____

Operator: _____

Contact Person: _____

Number of Hook-ups: _____

Were you referred? By whom _____

Type of System:

❑ Water ❑ Wastewater ❑ Both

Membership Category	Amount of Dues
❑ Regular Member	$_____ See schedule below
❑ Associate Member	$400.00
❑ Individual Member	$75.00

Regular Member Dues Schedule

1 to 100	$75 + 31 cents per hookup
101 to 500	$80 + 31 cents per hookup
501 to 1,000	$90 + 31 cents per hookup
1,000 and up	$100 + 31 cents per hookup
Maximum dues is	$940.00

Mail payment to: **OAWU**
935 N. Main Street
Independence, OR 97351

If paying by credit card, please call the OAWU office at 503-837-1212 for processing and receipt.

MB16

Membership Types

Regular Member

A Regular Member shall be any water or wastewater utility, public or private, engaged in the production, distribution or reclamation of water. A Regular Member shall have one vote.

Annual Dues - See Dues Schedule

Associate Member

An Associate Member shall be any organization individual or corporation, supplying services or equipment to water and wastewater utilities. An Associate Member shall have one vote. For Associate Member Benefits, please contact OAWU.

Annual Dues $400.00 per year

Individual Member

An Individual Member shall be an individual involved in the water/wastewater industry or a user of such utilities. The membership is informational in nature and shall be non-voting.

Annual Dues $75.00 per year

Benefits of Membership

- On-site technical assistance
- Various free training programs
- Discounts on training courses
- Discounts on Annual Conference registration
- Access to on-site training program
- Subscription to quarterly *H2Oregon* magazine
- Direct mailings in your area about upcoming training courses
- Summaries of legislative issues
- Legislative representation at state and federal level
- Associate Member Services and Products Guide
- Access to technical assistance library
- Access to technical and testing equipment for loan
- Voting rights in Association affairs (Regular & Associate Members)
- Positive contacts with other organizations
- Camaraderie with water and wastewater professionals
- Operator Of Record services
- Job referrals, announcements and searches
- Well testing
- Plan review
- System performance evaluation and options
- Additional programs and services
- Disaster response assistance and planning

Please return to OAWU:
935 N. Main St., Independence, OR 97351
or Fax: 503-837-1213 or email: office@oawu.net.

MEMBERS

62nd Court Mutual Water Company
Adair Village, City of
Adams, City of
Adrian, City of
Agate Water Company
Albany Rifle & Pistol Club
Alpine Crest Improvement Dist.
Amigo Villa Water Service, Inc.
Amity, City of
Ananda Center at Laurelwood, Inc.
Arch Cape Service District
Arlington, City of
Arrah Wanna Water Company
Arrowhead Mobile Home Park
Aspen Lakes Utility Company, L.L.C.
Athena, City of
Aumsville, City of
Aurora, City of
Avion Water Company
Baker City, City of
Bandon, City of
Bandon Dunes Resort
Banks, City of
Barlow Water Improvement District
Barlow, City of
Bay City, City of
Bay Hills Water Association
Beaver Water District
Beaverton, City of
Bend Research Inc.
Bend, City of
Benton County Service District
Berndt Creek Water Corp.
Biggs Service District
Black Butte Ranch
Black Mountain Water District
BLM Eugene
Blue River Water District
Blue Spruce Mobile Estates
Bly Water & Sanitary Dist.
Boardman, City of
Bonanza, Town of
Boring Water District #24
Bradley Lake Estates
Brandy Bar Landing, Inc.
Breitenbush Hot Springs
Bridge Water District
Brooks Community Service District
Brownsville, City of
Buell-Red Prairie Water District
Bunns Village Properties, LLC
Burns, City of
Burnside Water Association
Butte Falls, Town of
Camp Rilea
Canby Utility
Cannon Beach, City of
Canyon City, Town of
Canyonville, City of
Carlton, City of
Cascade Head Ranch Dist. Improv. Co.
Cascade Locks, City of
Cave Junction, City of
Cedarhurst Improvement Club, Inc.
Century Meadows Sanitary System, Inc
Century Meadows Water System, Inc.
Charles Tracts Water Company
Chehalem Mt. Sun Ridge Association
Chenowith Water PUD
Chiloquin, City of
Christmas Valley Domestic Water
Cimmarron City Water Co., Inc.
Circle C Improvement District
Clarks Branch Water Associatioin
Clatskanie, City of
Clayton Creek Water Association
Cline Butte Utility Company
Cline Falls Mobile Home Park
Cloverdale Sanitary District
Cloverdale Water District
Coburg, City of
Colton Water District
Columbia City, City of
Columbia Hills HOA
Columbia River PUD
Conagra Foods
Condon, City of
Confederated Tribes of Siletz Indians
Coquille, City of
Corbett Water District
Cornelius, City of
Country Club Water District
Country View Mobile Estates
Covanta Marion, Inc.
Cove Orchard Water Association
Cove, City of
Crater Lake National Park
Crescent Water Supply & Improvement District
Creswell, City of
Crooked River Ranch Water Company
Crystal Springs Water District
Culver, City of
Dallas, City of
Dayton, City of
Dayville, City of
Deception Creek Mobile Park
Deer Creek Estates Water Assn.
Deerhorn Community Water Association
Depoe Bay, City of
Deschutes Valley Water District
Detroit, City of
Dexter Oaks Mobile Home Park
Dexter Sanitary Service
Diamond Peaks Tract 1355
Diamond Summit Association
Dietz Airpark Water System
Donald, City of
Drain, City of
Drifters Mobile Home Park
Dufur, City of
Dundee, City of
Eagle Point, City of
East Yamhill Rural Water Company
Eastmont Water Company
Eastshore Water Improvement District
Echo, City of
Elkton, City of
Enterprise, City of
Estacada, City of
Eugene Mobile Village
Fairview Water District
Fairview, City of
Falcon Cove Beach Water District
Falcon Heights Water & Sewer District
Fall Creek Water District
Falls City, City of
Fern Ridge School Dist. 28J-10
Fern Valley Estates Improvement Dist
Fernridge Mobile Estates
Fir View Water Company
Fischer's Place Mobile Home Park
Fishhawk Lake Recreation Club, Inc.
Florence, City of
Forest Park MHP
Fossil, City of
Garden Valley Water Assn
Garibaldi, City of
Gaston, City of
Gates, City of
Gearhart, City of
Gervais, City of
Gilchrist Water Co., LLC
Gladstone, City of
Gleneden Sanitary District
Glenmorrie Co-op Association
Glide Water Association
Goble Water Association
Gold Beach, City of
Gold Hill, City of
Government Camp Water Company
Grand Prairie Water Supply Company
Grand Ronde Community Water Association
Grand Ronde Sanitary District
Grand View Mobile Home Park
Granite, City of
Grants Pass, City of
Green Oaks Mobile Ranch
Greenhoot Properties
Gresham, City of
Haines, City of
Halfway, City of
Hall's Trailer Court
Halsey, City of
Harbor Water PUD
Harrisburg, City of
Hebo Joint Water/Sanitary Authority
Heceta Water District
Helix, City of
Heppner, City of
Hidden Valley Improvement District
High Lostine Owners Association
Highland Subdivision Water District
Hiland Water Corporation
Hillsboro, City of
Hines, City of
Hood River, City of
Hopewell Water Company
Hubbard, City of
Hunnell Hills Water System
Huntington, City of
HWY 58 Trailer Park
Ice Fountain Water District
Idanha, City of
Idleway Improvement District, Inc.
Imbler, City of
Independence, City of
Indian Meadow Water Company
Interlachen Water PUD
Ione, City of
Irrigon, City of
Island City, City of
Jackson County Parks
Jacksonville, City of
Jasper Knolls Water District
Jewell School District
John Day Water District
John Day, City of
Johnson Creek Water Services Company
Junction City, City of
Juniper Mobile Home Park
Keizer, City of
Kelly's Brighton Marina LLC
Kelso Water Association
Keno Water Company, Inc.
K-GB-LB Water District
Kilchis Water District
Kingswood Heights Water Association
Klamath Falls, City of
Klippel Water, Inc.
Knappa Water Association
Knoll Terrace MHC
L.A. Water Cooperative
La Casa Mia
La Pine, City of
Lady Creek Water System
Lafayette, City of
Laidlaw Water District
Lake Grove Water District
Lakeshore Mobile Estates
Lakeside Water District
Lakeside, City of
Lakeview, Town of
Lakewood Utilities, LTD
Lamontai Improvement District
Lamplighter Water Association
Lane County Parks
Langlois Water District
Lark Meadows Water Association
Laurelwood Water User's Co-op
Lawrence Subdivision Water Association, Inc
Lebanon, City of
Lexington, Town of
Lincoln City, City of
Little Beavers Preschool
Long Creek, City of
Lostine, City of
Lowell, City of
Luckiamute Domestic Water Co-op
Lyons-Mehama Water District
Madras, City of

MEMBERS

Madrone Hill MHP
Malin, City of
Manzanita, City of
Mapleton Water District
Maupin, City of
McKay Acres Improvement District
McKenzie Palisades Water
McLain Village Water
McMinnville Water & Light
McNulty Water PUD
Merrill, City of
Metolius Meadows Prop. Owners Assn.
Metolius, City of
Midland Water Association
Mill City, City of
Milo Adventist Academy
Minikahda Water District, Inc.
Mitchell, City of
Modoc Point Sanitary District
Molalla, City of
Monmouth, City of
Monroe, City of
Monument, City of
Moran Water System Association
Moro, City of
Mosier, City of
Mossy Brae Water District
Mt. Angel Abbey
Mt. Angel, City of
Mt. Ashland
Mt. Bachelor, Inc.
Mt. Shadows Homeowners Association
Mt. Vernon, City of
Mulino Water Dist. #23
Myrtle Creek, City of
Myrtle Point, City of
Nantucket Shores Water Company
NeahKahNie Water District
Nehalem, City of
Nesika Beach-Ophir Water District
Neskowin Regional Sanitary Authority
Neskowin Regional Water District
Netarts Water District
Netarts-Oceanside Sanitary Dist.
Newberg, City of
Newport, City of
North Corvallis Mobile Home Park
North Hill Water Corporation
North Plains, City of
North Powder, City of
Northwest Newberg Water Association
Nyssa, City of
Oak Lodge Water District
Oakland, City of
Oakridge, City of
Oaks Mobile Home Park
Oceanside Water District
Ochoco West Water & Sanitary Authority
Odell Sanitary District
Odell Water Company
Olney-Walluski Water Association
OPRD Main Office- Salem
Orchard Heights Water Association
Orchard Point Mobile Homes
Oregon Shores Beach Club, Inc.
Oregon Water Wonderland II Sanitary District
Orient Drive Mobile Estates, LLC
Otter Rock Water District
Pacific High School
Paisley, City of
Paradise/ Rogue Meadow WS
Parkdale Water Company, Inc.
Parrett Mountain View Estates
Perrydale Domestic Water Association
Pete's Mt. Water Company, Inc.
Philomath, City of
Phoenix, City of
Pilot Rock, City of
Pine Grove Water Dist.
Pinecrest Water Company
Pioneer Park Water Co-op
Pioneer Village Water Company, Inc.
Pleasant Valley Water Company
Pleasant View Water Company
Polehn Heights Water Association, Inc.
Ponderosa Pines Water Company
Port of Morrow Commission
Port Orford, City of
Power City Water Co-op
Powers, City of
Prairie City, City of
Prineville, City of
Pristine Water Source, LLC
Quincy Water Association
Rainier, City of
Redmond, City of
Redwood Water Service, Inc.
Reeder Ranch, Inc.
Reedsport, City of
Rhododendron Water Association
Richland, City of
Rickreall Community Water Association
Riddle, City of
Rimrock West Improvement District
River Meadows Improvement District
River Point Farms, LLC
Riverbend-Riverbank Water District
Riverfront RV Park
Rivergrove Water District
Riverside Water District
Riverview Trailer Park
Riviera Mobile Park
Roats Water System, Inc.
Roberts Creek Water District
Rock Creek Water District
Rockaway Beach, City of
Rocky Pointe Marina
Rogue Community College
Rogue Lea Estates MHP LLC
Rogue River, City of
Rogue River-Siskiyou National Forest
Roseburg Forest Products Co.
Round Lake Water Utilities
Rufus, City of
Running Y Utility Company
Salem, City of
Salem Keizer School Dist.
Salmon River Mobile Village
Sandy, City of
Scappoose, City of
Scio, City of
Scotts Mills, City of
Scravel Hill Water Co-op
Seal Rock Water District
Seneca, City of
Shadow Hills Park Cooperative Water Association
Shangri-La Water District
Sheridan, City of
Sherwood, City of
Siletz, City of
Silver Falls School District 4J
Silverton, City of
Sisters, City of
Skylane Farm
Skyview Acres Water Co-op
Sleepy Hollow Phase 1 Water
Sodaville, City of
South Fork Ranch Homeowners, Inc.
South Fork Water Board
South Hills Water System, Inc.
Southwest Lincoln County Water District
Southwood Park Water District
Spirit Mountain Gaming, Inc.
Spray, City of
Springwater Estates
Squaw Creek Canyon Development
St. Paul, City of
Staffordshire Water System, Inc.
Stanfield, City of
Star Satellite Improvement District
Stayton, City of
Steeves Mobile City
Storlie Water Company Inc.
Sublimity, City of
Suburban East Salem Water District
Sumpter, City of
Sunridge Estates
Sunrise Water Authority
Sunriver Water LLC
Sunset Acres Water Improvement Co.
Sunset Lake RV Park
Sunset Water Systems, Inc.
Sunshine Village Water Association
Sutherlin,City of
Sweet Home, City of
Talent, City of
Terrace Mobile Plaza
Terrebonne Domestic Water District
The Dalles, City of
Three Rivers School District
Tierra Del Mar Water Company
Tigard, City of
Tillamook Bay, Port of
Tillamook County Creamary Association
Tillamook, City of
Timber Water Association
Toledo, City of
Tollgate Water Co.
Tone Water
Trappist Abbey
Tri City Water & Sanitary Authority
Troutdale, City of
Tualatin Valley Water District
Turner, City of
Twin Rocks Sanitary District
Tygh Valley Water District
Ukiah, City of
Umatilla, City of
Umpqua Basin Water Assn.
Union, City of
Vale, City of
Valley View Water Co-op
Valley View Water District
Veneta, City of
Vernonia, City of
Vida-Lea Community Cooperative
VMWID
Waldport, City of
Wallowa Lake Co. Service District
Wallowa, City of
Warm Springs, Conf. Tribes Reservation of OR
Warren Water Association
Warrenton, City of
Wasco, City of
Water Wonderland Improvement District
Wedderburn Sanitary District
Welches Water Company
Weldon Mobile Home Park
West Hills Water Company
West Linn, City of
West Slope Water Dist.
West Yamhill Water Company
Western Heights Water Association
Westfir, City of
Weston, City of
Westport Water Association
Wheeler, City of
Whispering Pines #4
Wickiup Water District
Willamette Water Company
Willamina, City of
Wilson River Water District
Wilsonville, City of
Winchester Bay Sanitary
Wi-Ne-Ma Christian Camp, Inc.
Winston-Dillard Water District
Wood Village, City of
Woodburn, City of
Yachats, City of
Yamhill, City of
Yoncalla, City of
Young Life's Washington Family Ranch
Young's River Lewis & Clark W.D.
Zig Zag Water Cooperative, Inc.

WELCOME, NEW MEMBERS!

Jeff Gosser
Roy Bicknell Jr.
Scott Dammeyer
David Estrada
Bobby Smith

Travis Hathaway
Joe Overstreet
Kevin Caldwell
Vernon Bathke
Carl Gifford II

Ron Harrod
Nathan Lyon
Johnny Leavy
Bret Bienerth
Hogan Barnes

Hanna Cox
Timothy Wainwright
Nathan Bartlett
Kevin Hanks
Pat Hodge

Somarakis Helix Elbow Piping, LLC
Northwest Pump & Equipment Co.

Black Mountain Water District

INDIVIDUAL MEMBERS

Alexander, Sandra
Anderson, Frank
Anson, James
Anthony, Joe
Ashenberner, Jacob
Ayres, Terri
Baker, Scott
Bain, James
Barnes, Hogan
Barnett, Brian
Bartlett, Nathan
Bathke, Vernon
Beauchemin, James
Bell, Ron
Biamont, Tony
Bicknell, Roy
Bienerth, Bret
Blake, Mike
Bock, Paul
Bogart, Austin
Bradshaw, Dave
Brenneman, Scott
Brown, Jeff
Buckley, John
Bull, Kendra
Burton, Howard
Buskirk, Jeff
Caldwell, Kevin
Calhoun, Richard
Carlton, Larry
Cass, Bradley
Clement, Tony
Close, Greg
Collentine, Mary Ellen
Cox, Hanna
Crook, Tyler
Dammeyer, Scott
Daniel, Morgan
Davis, Guy P.
Desroche, Ron
Dillard, Bob
Dolbow, Elizabeth
Durfee, Kenneth C.
Elder, Dave
Endicott, Philip
Eschler, Randall
Estes, Larry
Estrada, David
Evans, Peter
Foster, Rob
Fox, Donna J.
Free, Derek
Gammell, Pat
Gastineau, John
Geiman, Dave
Gibson, Travis
Gifford, Carl
Gill, Robert J.
Ginter, Brian
Goodpasture, Joe
Gosser, Jeff
Grell, Jack
Griffin, Beverly "Bev"
Halverson, Bruce
Hamilton, Howard
Handler, John
Hanks, Kevin
Hannen, Scot
Harrod, Ron
Hatcher, James
Hathaway, Travis
Hawkins, David
Hecox, Thomas
Heide, Tracy
Hensley, Darryl
Hildebrandt, Jamie
Hodge, Pat
Hubbard, Tom
Huff, Zach
Hume, John
Humphrey, Mark
Jauron, Scott
Johanson, Grady
Johansson, Leon
Kash, Stella
Katrena, Scott
Keenan, Pete
Keene, Tyson
Kelso, Josh
King, Andy
Klinger, Martin
Kneaper, Jason
Kuhnke, Joel
Kunders, Aaron
Lake, Ron
Lapierre, Josh
Larman, Dan
Lawson, Brian
Leavy, Johnny
Leeper, Clifford
Leon, Gary
Lewis, Mark
Lund, Darrell
Lund, James
Lyon, Nathan
Madsen, Darrell
Maine, Mike
Malley, Susan
Marshall, John
McClenathan, Mike
McFadden, Tim
McKevitt, John
McKinney, Donald
McManus, Peter
Mecham, Jade
Meigs, Gilbert
Mergel, Kyle
Merrell, Thomas
Moniz, Garrett
Mooney, Ronald
Morgan, Daniel
Morris, Brady S.
Myers, Tim
Neal, David
Norris, Rick
Odell, Mark
Ohman, Laura
O'Reilly, Mike
Overstreet, Joe
Parent, Kenny
Parks, Donita
Pendell, Keith
Perry, Richard
Phillips, Brandon
Pinson, James
Porter, James
Powers, Ron D.
Rader, Jonathan
Rettke, Tim
Risley, Michael
Schmidt, Lonny
Schmittle, William L.
Schnell, Kent T.
Schroeder, Michael
Scowden, Mark
Seelye, Shawn
Seleshanko, Alexei
Sellers, Ricky
Sheppeard, Neal F.
Sherlock, Christopher
Simenson, Donald J.
Simmons, Edward
Simpson, Steve
Smith, Bobby
Smith, Craig
Smith, Larry
Smith, Ryan
Sollee, James
Stark, Chris
Steele, Mark
Steidler, Matthew B.
Strassner, Bob
Tabrum, Walter
Thayer, Bradley
Thiramoke, Warampa
Thompson, Jake
Thompson, Kamen
Thompson, Matt
Trusty, Cole
Tupper, Sean
Turner, Keith
Turner, Susan
Uhrich, William
Violette, Jeff
Wabschall, Steve
Wainwright, Timothy
Wales, Matthew
Wanner, Ron
Warrick, Logan
Weber, Thomas
Wheatley, James
Whitlock, George
Wiley, Thomas
Williams, Benjamin
Winters, Robert
Wolford, Paul
Woodward, Steve
Woody, Max

ASSOCIATE MEMBERS

4B Engineering & Consulting
Abbey Systems, Inc.
Advanced Control Systems
American AVK Company
American Flow Control
American Leak Detection
Anderson Perry & Associates
Backflow Management, Inc. (BMI)
Badger Meter Inc.
Bainbridge Associates Inc.
Baker Water Systems
Bancorp Insurance
Bend Winsupply
BergerABAM
BioLynceus, LLC
BMS Technologies
Branom Instruments Co.
Cascade Columbia Distribution Co.
Ch2M Hill - Lebanon
Chlorinators Incorporated
CIMCO Sales and Marketing
Clean Water Services
CoBank
Consolidated Supply Co.
Corix Water Products
Correct Equipment, Inc.
CUES
Ditch Witch Northwest
DN Tanks
Edge Analytical Laboratories
EJ
Engineering America
Enviro-Clean Equipment, Inc.
Ferguson Enterprises
FloHawks
Frank J. Martin Company
Frost Engineering Service Co. - NW
Furrow Pump, Inc.
GC Systems, Inc.
General Pacific, Inc.
Georgia Pacific
HACH Company
HASA Inc.
HD Fowler Company, Inc.
HD Supply Waterworks
Ipex USA
Itron, Inc.
JBI Water & Wastewater
Jordan Ramis PC
Kennedy/Jenks Consultants
Kennedy/ M&H Valve
Lakeside Industries/EZ Street
League of Oregon Cities
Master Meter, Inc.
Mueller Company
MULTI FITTINGS
Nelson Environmental
Neptune Technology Group
Northwest Pump & Equipment Co.
Olson Engineering
Oregon Business Development Dept.
Oregon Meter Repair
Oregon Public Utility Commission
Owen Equipment Company
OXARC Inc.
PACE Engineers, Inc.
Pittsburg Tank & Tower Co.
PIXIS Laboratories, LLC
Pollardwater.com
Public Works Supply
PumpTech Inc
RH2 Engineering Inc.
Romac Industries, Inc.
Schneider Water Services
Schoen's Motors
Schroeder Law Offices, PC
Security Lines US
Sensus USA
Shearer & Associates
Somarakis Helix Elbow Piping, LLC
Special Districts Assn of Oregon
SUEZ Water Advanced Solutions (Utility Service Co.)
Taylor Made Pump Stations
The Automation Group
The Chlorine Div. of the American Chemistry Council
The Ford Meter Box Co., Inc.
The Sherwin-Willams Company
Thompson Pipe Group - Flowtite
TMG Services
Treatment Equipment Company
Tripac
True North Environmental
Umpqua Insurance Agency
Umpqua Research Co.
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Waterlab Corp
Whitney Equipment Company
Wonderware PacWest
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