

Online Learning Academy August 2020

Troubleshooting Course Overview

No matter what our role is in the decentralized industry we are sometimes faced with systems experiencing problems or out of ordinary situations. This course walks through a typical treatment train starting with the flow coming from the structure and then walks through component troubleshooting including septic tanks, pumps and controls, soils, media filters, aerobic treatments units and finally soil treatment units.

This national training course with nine different instructors includes video recorded at the 2019 NOWRA mega-conference and contains various formats including video guided PowerPoint presentations, videos, technical documents and internet links to associated materials. The students set their own pace for training and can either take the 10-hour class in its entirety or break it into smaller sections based on how many hours they need or their interest. The hours assigned for each section are based on the time it took others who piloted the material to complete the course, and the theoretical time it should take to go through the materials. Even though everyone learns at a different pace, it should always take participants the amount of credit hours offered and may take longer.

The Troubleshooting curriculum is made up of the following courses which can be taken as an entire bundle, in smaller bundles or as individual courses.

1. Troubleshooting Bundle – 10 hours (contains all the modules)
 - a. Flows - <https://www.pathlms.com/nowra/courses/19985>
 - b. Tanks - <https://www.pathlms.com/nowra/courses/19986>
 - c. Pumps and Controls - <https://www.pathlms.com/nowra/courses/19987>
 - d. Soils Treatment Areas - <https://www.pathlms.com/nowra/courses/19988>
 - e. Media Filters - <https://www.pathlms.com/nowra/courses/19989>
 - f. Microbiology - <https://www.pathlms.com/nowra/courses/19990>
 - g. Aerobic Treatment Units - <https://www.pathlms.com/nowra/courses/19991>
 - h. Drainfield Malfunctions - <https://www.pathlms.com/nowra/courses/21478>
 - i. Case Studies - <https://www.pathlms.com/nowra/courses/21479>
2. NOWRA Troubleshooting Bundle – 3 hours – Focus on Flow and Tanks – contains a and b.
3. NOWRA Troubleshooting Bundle – 2 hours – Focus on Pretreatment Units – contains e and g.
4. NOWRA Troubleshooting Bundle – 3 hours – Focus on Soils – contains d, h and i.

Course Agenda

The details of each course are outlined below.

Course 1: Troubleshooting Flows (1.5 hours)

1. Reading: Presentation Slides.
2. Presentation: (60 minutes), Dr. Sara Heger. This presentation will focus on a study funded by the Water Research Foundation evaluating water use from over 23 utilities and over 1,000 homes. The average household hot water accounted for 33.2% of total indoor water use. Residential indoor water use in single-family homes has decreased. The average per household daily water use has decreased 22 percent, from 177 gphd in 1999 to 138 gphd in 2016. Per capita average water use has decreased 15 percent, from 69.3 gpcd to 58.6 gpcd. In 1999, a household averaged 2.77 people and in 2016, a household averaged 2.65 people so overall the number of people per home has remained the same. The primary sources for the reduction will be discussed along with implications with increased concentrations. Toilet flushing is the largest indoor use of water in single-family homes, followed by faucets, showers, clothes washers, leaks, bathtubs, other/miscellaneous, and dishwashers. Mandated reductions in toilet flush and clothes washer volumes and shower and faucet flow rates have contributed to the declines in residential water use. When water usage decreases the concentrations of contaminants included organic material and nitrogen increases. Septic system design and operation considerations will be highlighted.
3. Reading: Presentation Slides. Residential End Uses of Water, Version 2: Executive Report. Water Research Foundation. 16 pages.
4. Assessment: Fifteen questions with 70% passing rate required.
5. Course instructor:
Dr. Sara Heger is a researcher and instructor in the Onsite Sewage Treatment Program in the Water Resources Center and is an Adjunct Assistant Professor in the Bioproducts and Biosystems Engineering Department. For over 20 years, she has been providing education and technical assistance to homeowners, small communities, onsite professionals and local units of government regarding onsite wastewater treatment. She leads the research program at the UMN currently serving as the principal investigator on grants evaluating groundwater mounding and chemicals of emerging concern. She presents at many local and national training events regarding the design, installation, and management of septic systems and related research. Sara is a board member and President-Elect of the National Onsite Wastewater Recycling Association and has also served on the board of the Minnesota Onsite Wastewater Association. Sara serves on the NSF International Committee on Wastewater Treatment Systems. She is also the chair of the Minnesota State Advisory Committee on Decentralized Systems. She has BS in Biosystems & Agricultural Engineering and a MS and a PhD in Water Resource Science.

Course 2: Troubleshooting Septic Tanks (1.5 hours)

1. Reading: Presentation Slides.
2. Presentation: (82 minutes), Dennis Hallahan and Claude Goguen. This presentation will discuss aspects and methods for troubleshooting tanks of various materials. It will also discuss troubleshooting the performance of tanks, such as: system backing up into the home, then there could be clogging due to various factors: roots, poor slope on inlet piping, bends, or possibly the pipe has settled, field inspection methods will be discussed to check these possibilities. Other issues to review: Proper pumping intervals, sludge and scum depths, surface drainage, tank siting/location, backfill settlement, tank settlement. Observations of a proper and improper functioning tank: odors, scum buildup, or conversely lack of a proper scum layer, dead tanks, and wastewater color (strength observation).
3. Reading: *Troubleshooting Septic Tanks*, Onsite Installer, Jim Anderson June 14, 2018 accessed online at: https://www.onsiteinstaller.com/online_exclusives/2018/06/troubleshooting-septic-tanks
4. Assessment: Sixteen questions with 70% passing rate required.
5. Instructors:

Dennis Hallahan has thirty years of experience with the design and construction of on-site wastewater treatment systems. He has authored several articles for on-site industry magazines and has given numerous presentations nationally on the science and fundamentals of on-site wastewater treatment systems. Dennis also is responsible for product research and testing at Universities, test centers and private consultants. His department develops system sizing charts for national and international approvals and assists customers and field representatives in the planning and review of large commercial decentralized systems. Many of these systems are in excess of a million gallons per day. He received his MS in civil engineering from the University of Connecticut and his BS in civil engineering from the University of Vermont. Dennis is a registered professional engineer in Connecticut. He has been with Infiltrator Water Technologies for 19 years and holds the current position as Technical Director. Dennis also holds patents for on-site wastewater products and is a member of the Water Environment Federation and of the National Onsite Wastewater Recycling Association and currently serves as Chairman for the NOWRA Technical Practices Committee.

Claude Goguen is a licensed P.E. in Indiana and a licensed P. eng in Canada. As a LEED Accredited Professional, Claude stays up-to-date on relevant LEED related changes and developments that may affect NPCA members. Claude provides technical support to NPCA members and the specifying community by developing technical documentation, serving on codes and standards committees, working as the staff liaison to various product and board appointed committees and contributing to NPCA publications. He also represents the association by attending and/or presenting at various trade shows and conventions. In addition to overseeing the NPCA sustainability program, Claude also develops and teaches various NPCA education courses. Claude has been involved in the education and technical services departments at NPCA since 2008 and has 20 years of experience in the precast concrete and construction industry. Prior to working at NPCA, he was an operations manager at a precast concrete manufacturing plant for 10 years.

Course 3: Troubleshooting Pumps and Controls (1 hour)

1. Reading: PowerPoint slides.
2. Presentation: – Part 1 (44 minutes), Tom Fritts. This presentation will address issues when troubleshooting systems that incorporate pumps and controls. It will cover the 3 most used pumps in our industry, how they work and how they differ depending on their application. Pumps can fail for a variety of reasons including sizing the pump. It is important to know how pumps should be chosen to help determine the reason for failure. Some of the basic rules of troubleshooting will also be covered. There are many different types and styles of control panels on the market today and learning to troubleshoot all of them would be impossible in this short time but there are some basic practices and procedures that apply to all panels which we will cover.
3. Presentation: – Part 2 (14 minute), Tom Fritts
4. Assessment: Fifteen questions with 70% passing rate required.
5. Instructor:
Tom Fritts is the owner of Residential Sewage Treatment Company in Grandview, Missouri where they design, sell and service onsite systems. He is a past president and the chair of the Government Relation Committee of the National Onsite Wastewater Recycling Association. Tom teaches continuing education for onsite professionals across the country.

Course 4: Soils (1 hour)

1. Reading: PowerPoint slides.
2. Presentation: (60 minutes), Dr. Randy Miles. Troubleshooting soil treatment areas (STA) is a complex process as essentially all of the components of the STA are not visible and accessible for assessment or measurement. Principles for troubleshooting STA will be discussed. Essential initial inputs include: any permits for the system as well as the soil-site assessment; history of the home/business site development; surrounding and neighboring development that could influence the hydrology of the site; past and current use of the onsite wastewater system; troubleshooting of upstream components of the onsite wastewater system as well as the activities the home owner or business manager have placed on top of the STA. Once an assessment of current and past use status has been developed, intrusion into the STA through probing, coring, and/or digging will need to be performed to “ground truth” the problem. Examples will be provided to illustrate many of the common causes of poor performance of the STA of onsite wastewater systems that have been managed by one entity over a relatively long period of time as well as those managed by a relative new homeowner or business manager. In some instances, the STA may be able to be continued to be used at a lesser intensity with some renovation while in a many cases, new STA locations may need to be located and assessed if there is ample area to do so.
3. Assessment: Fifteen questions with 70% passing rate required.
4. Instructor:
Dr. Randy Miles is an Emeritus Faculty of the Soil Science program at the University of Missouri. He was Director of the Missouri Soil Health Assessment Center, Director of the Missouri SmallFlows Wastewater Education/Research Training Center, Director of Historical Sanborn Field, the third oldest continuous research field in the world, and curator of the Historical Duley-Miller soil erosion plots. He also worked in the soil genesis, morphology and soil survey area. He also is principle owner of Randall J. Miles, LLC which provides soil assessments for many different land uses plus educational workshops and seminars for professional certification and continuing education.

Course 5: Troubleshooting Media Filters (1 hour)

1. Reading: PowerPoint slides.
2. Presentation: (51 minutes), Dr. Kevin Sherman. This presentation will describe the design concepts of both natural and artificial media filters. Performance of media filters is both robust and resilient under normal conditions, but extra care should be taken to ensure toxic substances are kept out of the waste stream. A sequential inspection checklist (such as that provided by the CIDWT) prompts the operator to examine and collect all the information necessary to troubleshoot a media filter system. This protocol should be modified depending on whether the system recirculates a nitrified effluent, disinfects, etc. If media filters develop overly thick biomats, they can be physically or chemically cleared of excess biological growth. Some natural media filters have a finite predictable media lifespan. At some point the exhausted natural media will need to be removed and replaced with fresh natural media. Artificial media filters ordinarily are not subject to this step. A detailed examination of the mechanism for delivering effluent to the filter surface is usually a key inspection point during media filter troubleshooting. Various models use gravity or pressure to deliver an equal liquid dose to the filter surface.
3. Reading: *Alternative Disinfection Methods Fact Sheet: Peracetic Acid*. EPA, September 2012.
4. Assessment: Fifteen questions with 70% passing rate required.
5. Instructor:
Kevin Sherman has Bachelor's of Science degrees in Biology and Civil Engineering, Masters Degrees in Biology and Public Health and a Ph.D. in Biological Oceanography. Before becoming Director of Engineering and Regulatory Affairs at SeptiTech, Inc. he was a technical specialist for Presby Environmental, Inc and the Vice President of Engineering for Clearstream Wastewater Systems. Dr. Sherman was the Director of Engineering for Quanics, Inc, directed the Florida Onsite Wastewater Association for 6 years and before that worked for 14 years at the Florida Department of Health. Kevin is past president of the Florida Environmental Health Association and the National Onsite Wastewater Recycling Association. He is a professional engineer in seventeen states and a registered sanitarian. He has been awarded the distinction of being named a diplomat of Water Resources Engineering.

Course 6: Troubleshooting Microbiology (1 hour)

1. Reading: PowerPoint slides.
2. Presentation: (59 minutes), Dr. Sergio Abit. Advanced systems are usually installed in areas with significant soil and site limitations. Specifics of system design are usually proprietary but all involve the introduction of air to the wastewater to cause aerobic conditions that favor microbial action that causes enhanced decomposition of organic particulates, transformation of contaminants and even deactivation of some pathogens. This talk will start with a discussion of site and soil conditions that leads to the decision to install an advanced system. Detailed discussions on various processes that go on in a typical advanced system treatment train will then follow. Particular attention will be given to microbial processes that affect the fates of organic particulates and of contaminants nitrogen, phosphorus and pathogenic bacteria as they move through the system.
3. Assessment: Fifteen questions with 70% passing rate required.
4. Instructor:
Dr. Sergio Abit is the State Specialist for onsite wastewater treatment systems in the State of Oklahoma. He got his Masters and Doctoral degrees in Soil Science at the North Carolina State University where he specialized in environmental soil physics and hydrology. He has

conducted research and published scientific articles concerning the fates of nitrogen, phosphorus and bacteria in soil systems. As a State Specialist, he oversees the state-wide extension effort geared towards addressing the training and educational needs of various stakeholder groups in the onsite wastewater industry and organizes Oklahoma's annual onsite wastewater conference. He is also a faculty member of the Department of Plant and Soil Sciences at the Oklahoma State University where he teaches various undergraduate- and graduate-level soil science courses. Dr. Abit also serves as a member of the Board of Directors of the National Onsite Wastewater Recycling Association.

Course 7: Aerobic Treatment Units Microbiology (1 hour)

1. Reading: PowerPoint slides.
2. Presentation: (47 minutes), Ron Suchecki. This presentation will cover the basics of "Standard 40" rated systems and how they can be expected to perform in the field. We will discuss the test center protocol and the proper sizing and applications for these systems. The presentation will cover the common mechanical components (aerators, blowers, diffusers, pumps, etc.) and controls and how to troubleshoot them to ensure that these are in proper working order. Even though the system may be sized and "mechanically" sound, systems can still fail to perform. We will discuss the most common failures which include hydraulic & biological under and over loading, inhibitory chemicals/compounds, homeowner intentional and unintentional abuse/neglect and other topics.
3. Video: *Basics about Aerobic Systems*. Oklahoma Water Resources Center. Accessed online at: <https://www.youtube.com/watch?v=f5nIYwyMRIQ>
4. Assessment: Fifteen questions with 70% passing rate required.
5. Instructor:
Ron Suchecki is the General Manager for Hoot Systems, LLC. He also serves as the company's Director for Research. He has extensive experience on onsite wastewater treatment systems and serves on the NSF Joint Committee for Wastewater. He is also heavily involved in organizing the annual meeting for the Texas Onsite Wastewater Association. He has made presentation at regional and national meetings organized for stakeholders of the onsite wastewater industry.

Course 8: Troubleshooting Drainfield Malfunctions (1 hours)

1. Reading: PowerPoint slides.
2. Presentation: (47 minutes), Dennis Hallahan. The presentation will review methodologies to review and inspect problem site systems. The intention is to have the presentation serve as a learning tool on the potential causes, how to investigate, and once the problem is identified then recommending the proper solution. The presentation will review malfunction investigation basics, septic tank investigation, the function of the tank, drain field investigation, and malfunction issues and examples.
3. Reading: Identifying and Solving Common Drainfield Malfunctions. Infiltrator Water Technologies, 4 pages.
4. Assessment: Fifteen questions with 70% passing rate required.
5. Instructor: See Dennis Hallahan's bio under Troubleshooting Septic Tanks.

Course 9: Troubleshooting Case Studies (1 hours)

1. Reading: PowerPoint slides.
2. Presentation: (56 minutes), Jim King. This presentation will focus what is the definition of a failed system and what is needed to document that failed system. The class is broken into two distinct discussions. The first discussion is on the signs of failure to include drain field saturation, spongy soil, odors, frequent pumping, back-ups, system alarms and algae blooms in water sources. The second discussion is on the steps taken to conduct the system investigation. This includes the prep work, the onsite inspection and the results of that inspection. We will discuss typical investigation equipment to include, probes, augers, and other equipment. The investigation will focus on all portions of the field from the septic tank to the disposal field. The presentation includes some of the more interesting events seen in the field to include oil coming into a septic tank, pump chambers misdiagnoses, questionable electrical practices and more. The end result of this presentation is to document the reasons failure system investigation is so important and what the documentation of the failures means to our researchers. We will also work at highlighting where our industry has decent documentation of the waste strength from the facilities as to the places where documentation is lacking.
3. Assessment: Fifteen questions with 70% passing rate required.
4. Instructor Jim King is the President for Eljen Corporation. He finished his engineering degree at the University of Connecticut and joined the military. Mr. King was a Captain in the US Army, serving two tours in Iraq. After his military career, he returned to Connecticut where he finished his MBA at the University of Connecticut and found a home at Eljen. During his time at Eljen, Jim brought the company to new regions around the world by working with the local and state health departments. His work at Eljen focuses new technologies innovation and development. Based in East Hartford, CT, Eljen produces units which are installed throughout the world. They are currently celebrating over 40 years of innovation and success and look forward to being a part of your future septic projects.

Assessments

Within each course there is a pre-test where the learner must affirm and attest that they are the individual registered to take this course and that they will not seek out, nor accept, any assistance in the completion of this course. At the end of each course there is a quiz the participant must pass with a score of 70% or better to obtain credit. If the student passes, they may move on. If they do not pass, they have the opportunity to review materials and take the quiz as many times as they need to pass. The presentations must be watched start to finish (no fast forwarding) and the student must complete the sections in sequential order.

Course Completion

Upon completion, the student is provided a certificate of completion (example attached).

CERTIFICATE OF COMPLETION

NOWRA Troubleshooting Flows (1.5 hrs)

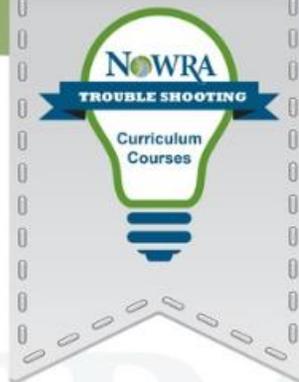
Sara Heger

July 22, 2020

CEUs/Credits:

1.5


Eric Casey, Executive Director, NOWRA



NOWRA
National Onshore Wastewater
Recycling Association