



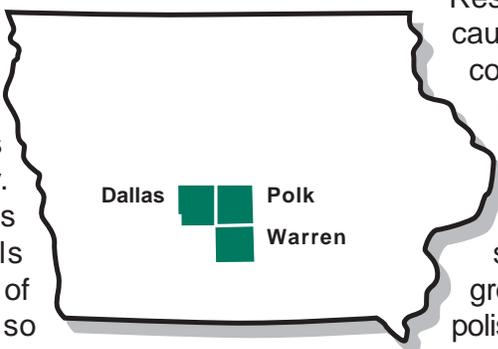
***“Many existing management programs are inadequate or too narrow in focus, allowing premature system failures to occur.”
(USEPA Voluntary National Guidelines for Management of Decentralized Wastewater Treatment Systems)***

Thinking Outside The Box

When the third set of results came back from the lab, sanitarians in three Iowa county health departments knew they had a problem. Effluent samples from the box-like sand filters were significantly out of compliance. The standard approach was to replace the failed sand filter with a new one, even though it was obvious the same problem would occur in a few years. To find a permanent solution, it was apparent to everyone involved that they must find a new approach.

Background Information

Dallas, Polk and Warren Counties encompass a large portion of Iowa’s farming community. The majority of this rural farmland falls outside the reaches of municipal sewers, so local residents must rely on innovative and alternative technologies for sewage treatment and disposal. For generations, much of the area’s livelihood has been dependent upon land use and conservation. To preserve this valuable resource and protect public health, the Iowa Department of Natural Resources instituted a general permit program. All onsite treatment systems installed under the requirements of Iowa’s statewide



general permit must be maintained by a county authorized service provider. In addition, the effluent from each system must be routinely sampled and analyzed by a state approved laboratory to establish permit compliance. In the early Spring of 2000, Kathy Witkovski, an Environmental Health Specialist with Dallas County Environmental Health, began receiving unacceptable performance data from a number of onsite wastewater treatment systems. Dallas County and the Iowa Department of Natural Resources conducted a study to pinpoint the cause of the problem. Their study included a complete review of maintenance and service records and visual inspections. Approximately forty percent of the systems surveyed were failing. Sanitarians observed wastewater seeping out of the top of several single-pass sand filters and ponding on the surface of the ground. The sand filters, originally designed to polish effluent, were being overloaded organically and hydraulically. This condition caused the filters to overflow and bypass. Once Ms. Witkovski consulted sanitarians from nearby Polk and Warren Counties, it became obvious that the problem wasn’t limited to Dallas County. Polk and Warren County sanitarians were experiencing a similar situation. Hundreds of sand filters were malfunctioning and they knew something had to be done to protect the area’s water quality.

Iowa's Requirements

Under Iowa's state code, Chapter 69, any wastewater discharge from onsite wastewater treatment and disposal systems is prohibited except under an NPDES general permit. Individual systems discharging effluent to the surface of the ground, into surface waters or into an underground drainage tile must adhere to the requirements of NPDES General Permit No. 4. This permit requires continuous monitoring of each system's performance, including parameters for CBOD₅ and TSS effluent concentrations. Neither result can exceed 25 mg/L. Sampling must be conducted by a "qualified sampler," defined as: a member of the county environmental health staff, an Iowa certified wastewater treatment plant operator or an individual who received training approved by the Department of Natural Resources.

The NPDES General Permit requires the system owner to sign and file a Notice of Intent which certifies that the owner agrees to comply with the terms and conditions of the permit. Under those terms and conditions, all systems must be sampled at least twice per year to insure they are functioning properly and effluent quality is meeting permit limits. The system owner is responsible for making sure all required test results are on file with the Department of Natural Resources, the local administrative authority and the authorized service provider.

If an individual test result exceeds the general permit limits, an investigation into the causes of the problem must be conducted. Within thirty days, an additional sample must be taken and analyzed. If three consecutive test results exceed permit limits, corrective action must be taken to bring the system into compliance. If at any time the system does not comply, the local Environmental Health Specialist has the authority to issue a Notice of Violation. This notice alerts

the system owner that they are out of compliance with the Clean Water Act and Iowa code. Failure to seek corrective action as outlined in the Notice of Violation could result in steep monetary penalties. Legal fees and fines can reach \$790 for each day the system owner is non-compliant.

Corrective Action

Each of the failing systems in Dallas, Polk and Warren Counties had to be analyzed to determine the exact cause of failure before corrective action could begin. In the past, the corrective action was to evaluate and service or repair all existing system components. Sand filter media was either replaced or a new sand filter was installed. Any filtration system, whether biological or physical, can eventually become filled with solids. In the case of the Iowa single-pass sand filters, wastewater was bypassing the filtration process and being discharged directly into the environment. To correct these

malfunctioning sand filters, it is required that the media is removed and properly disposed of before replacement media is installed. In many parts of North America, the proper disposal of this contaminated media is a costly problem because sanitary landfills or wastewater treatment plants will not accept it. The cost of removing, disposing and replacing contaminated media often exceeds the cost of installing a new onsite treatment system.

In central Iowa, an extensive list of difficult site conditions made renovating the sand filters nearly impossible. Roots from nearby trees had penetrated the box-like housings for many of the filters, rendering them useless. Numerous home sites lacked enough usable area to install a replacement filter. Even if the lots had been large enough for the installation of a new filter, the organic or hydraulic overloading problems would not have been addressed.

"If three consecutive samples do not meet the effluent limits, corrective action must be taken to bring the system into compliance."

After careful consideration, the health departments were convinced they needed to find a more manageable method of treatment to solve their problems. Their priorities were to meet general permit limits, provide long-term treatment and not create a hardship for system owners.

It Just Makes Sense

Capital City Septic, a Des Moines based service and monitoring company, was familiar with the sand filter problems. They had been directly involved in the installation, maintenance and effluent sampling for hundreds of systems in the three county area. They offered the health departments an alternative solution, which included a means to treat and polish effluent. The critical component proposed to replace the sand filters was Norweco's Bio-Kinetic wastewater management system (Model BK 2000). The counties accepted the solution and worked with Capital City Septic to develop a plan for each system's upgrade.

Capital City Septic contacted the system owners to arrange for maintenance on the primary treatment tank to insure all components were in proper working order. Additional treatment tank capacity was added where necessary.

The next step was to install a Bio-Kinetic wastewater management system. Requiring only a 3½ foot diameter, 6 foot deep excavation, the BK 2000 was easy to install on small lots with limited space available. The non-mechanical flow equalization provided by the BK 2000 allows the upstream tank to achieve design retention time and settle more solids. Flow equalization eliminates tank turbulence, even during periods of peak hydraulic loading.

The settling and retention zones within the BK 2000 allow BOD and solids to be trapped for

removal during routine service. Unlike sand filters, the BK 2000 cannot be bypassed. If the filter is not serviced regularly, the homeowner will begin experiencing sluggish drainage from sinks and toilets, indicating service is necessary. A complete lack of service would eventually cause flow to backup into the facility and not allow overflow onto the ground surface. During service, solids are automatically returned to the primary treatment system. Off site disposal of contaminated filter media is eliminated.

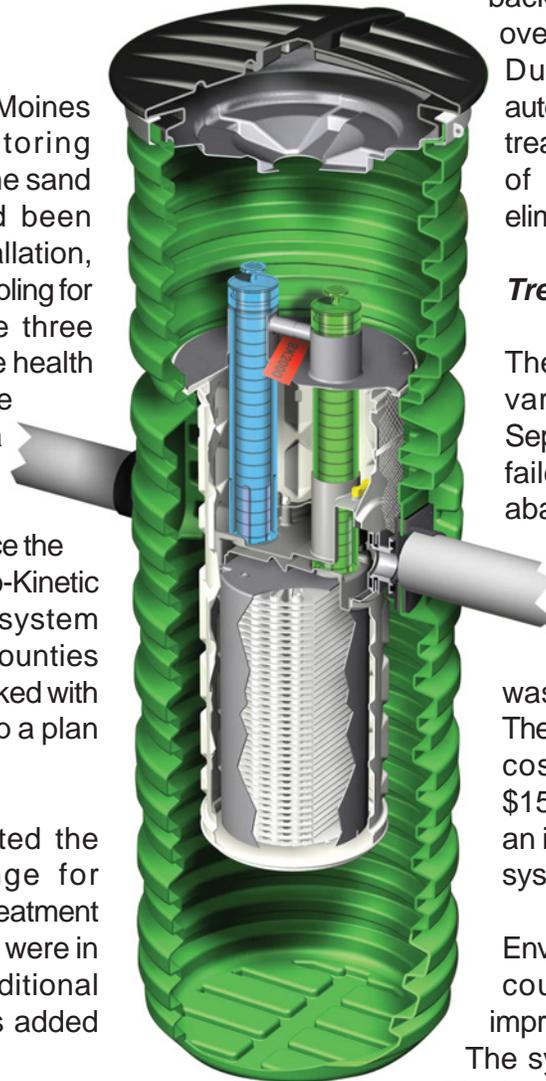
Treatment Efficiency

The agencies issued county level variances allowing Capital City Septic to upgrade the systems. The failed sand filters were filled and abandoned because the existing media posed a health hazard. System piping was rearranged to bypass the failed filter and redirected to the Bio-Kinetic wastewater management system. The sand filter problem, which usually cost homeowners as much as \$15,000 to solve, was eliminated at an installed cost of only \$3,000 per system by using the BK 2000.

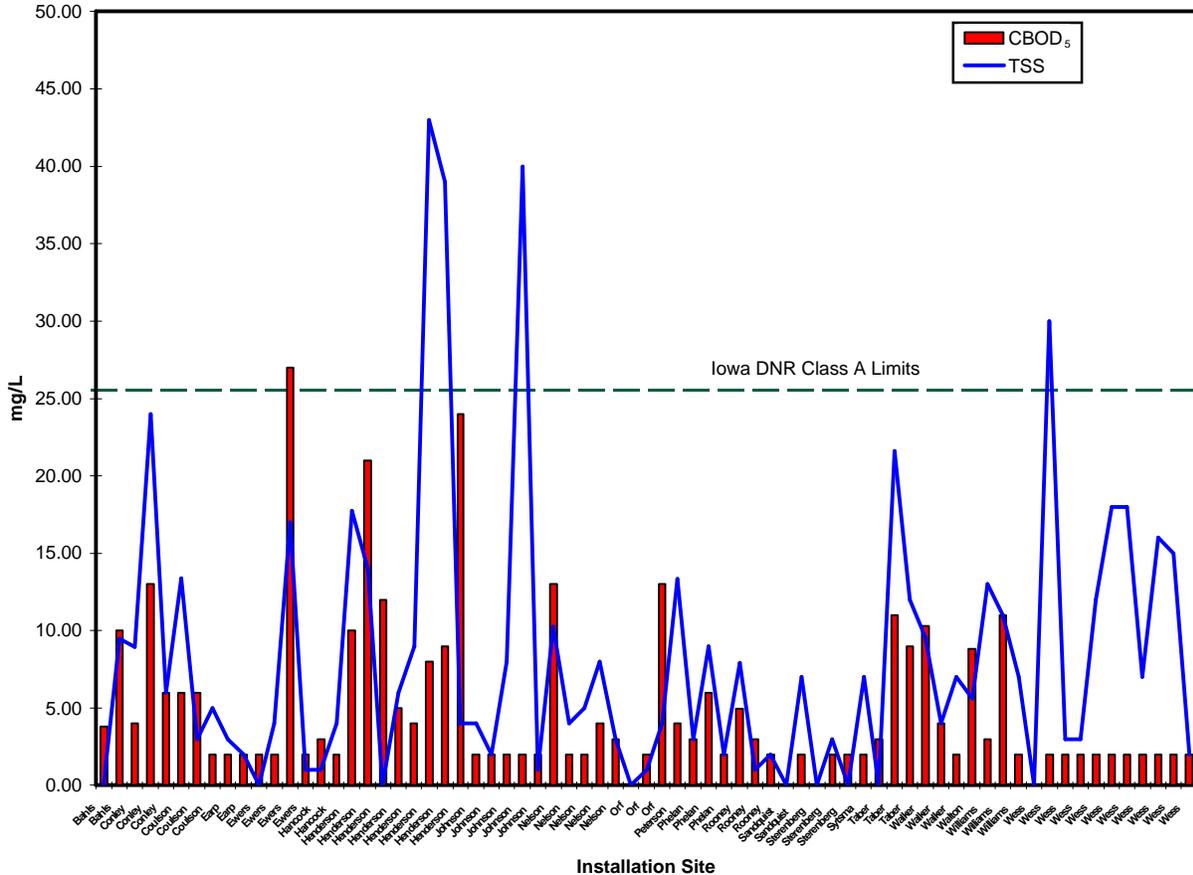
Environmental conditions in the three county area have significantly improved as a result of the upgrades.

The systems are now in compliance with the Iowa Department of Natural Resources' general permit requirements. Effluent quality samples collected as part of the monitoring requirement indicate an average CBOD₅ concentration of 4.4 mg/L and an average TSS of 9.6 mg/L.

Iowa Department of Natural Resources and University of Iowa have also sponsored additional testing to determine the long-term effectiveness of the BK 2000 as a corrective option. The study's collection of effluent quality samples show a CBOD₅ average concentration of 5.8 mg/L and a TSS average concentration of 15.6 mg/L.



Effluent Sample Analysis Summary



A Solution for Long-Term Success

The decision to utilize alternative technologies for onsite treatment and disposal must be evaluated on an individual basis. Sanitarians with the Dallas, Polk and Warren County Environmental Health Departments and the Iowa Department of Natural Resources recognized that there isn't always a single solution for every problem. Their willingness to think outside the box and expand their treatment options allowed them to overcome one of the primary problems identified by the USEPA in the Voluntary National Guidelines, which states "many

existing management programs are inadequate or too narrow in focus, allowing premature system failures to occur." The development of advanced onsite treatment technologies, such as the Bio-Kinetic wastewater management system, provides regulators and citizens with the tools they need to solve environmental problems.

For additional information on the BK 2000 or Norweco's full line of advanced onsite treatment technologies please call: (419) 668-4471, send a fax: (419) 663-5440, email: email@norweco.com or visit us on the web at www.norweco.com.



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