



SUMMARY

A mid-western township is responsible for operating and maintaining a combined sewer collection system consisting of 150 miles of pipeline and 28 pumping stations. The township does not treat the wastewater, instead contracting with a neighboring city for this service.

The township has two final lift stations that transfer the collected wastewater to the neighboring system for treatment. One of these master pump stations is located adjacent to the sewer department's office and garage facility. The average daily flow rate through the station is 1.2 million gallons.



Figure 1: Master Lift Station



Figure 2: Maintenance Garage

PROBLEM

Nuisance odors, released from the pump station's wet well, adversely impact the health and the working environment of the maintenance and office workers at the facility. The problem is especially unpleasant during the hot summer months. Also, fats, oils and greases accumulate in the wet well, floating on the surface of the collected wastewater. The grease layer had to be removed every six weeks. The vacuum removal of the grease layer from the open manway of the wet well became a safety concern.



Figure 3: Grease Accumulation

SOLUTION

The township chose to use a proven technology: CARUSOL liquid permanganate. The strong oxidizing power of CARUSOL would, in one easy-to-use product, destroy unpleasant odors and break down common wastewater fats, oils and greases.

CARUSOL liquid permanganate is a concentrated, pre-mixed water solution of permanganate that is 20% active ingredient. CARUSOL solutions are dark purple in color and are very strong oxidizing agents. The chemical and physical characteristics are listed in Table I.



Formula	NaMnO ₄
Appearance	Dark purple solution
Solution Strength (as NaMnO ₄)	20%, by weight
Stability	Indefinite, when stored properly
Specific Gravity	1.15-1.17
pH	6.0–8.5

Table 1: Chemical and Physical Characteristics of CARUSOL Liquid Permanganate

Permanganate is used in both water and wastewater treatment and in many unique industrial applications. It is a strong chemical oxidizer used for many different wastewater odor control and drinking water treatment applications.

SOLVING A COLLECTION SYSTEM ODOR PROBLEM

Although odors are not a significant problem for the neighboring area, the office staff and maintenance workers at the facility are adversely impacted by unpleasant odors when the wind blows from certain directions. Hydrogen sulfide (H₂S) is the primary odor constituent.

In addition to the nuisance odors, fats and greases accumulate in the station wet well, floating on the surface of the wastewater. When the station went into operation, the maintenance crew cleaned the wet well using high pressure water washes every six weeks. The safety of the workers became a major concern and they decided that there had to be a better way to solve this problem.

STARTING CONDITIONS

Before any treatment program is started, the existing conditions should be understood and recorded. Reviewing the station's hourly flow rate data is an important first step. This information provides the picture of the low flow and the high flow profile. This helps to fit the chemical feed rate to the hours of the day when it is most needed.

Since nuisance odor was one of the concerns, the atmospheric H₂S concentration in the headspace of the lift station wet well was logged to be sure conditions haven't changed, both before the treatment began and by shutting down the treatment after a few weeks.



Figure 4: Suspending an OdaLog® H₂S Monitor in the Headspace of the Wet Well

The CARUSOL treatment was scheduled to start in late June. The data collected before starting the CARUSOL treatment showed a regular pattern of low H₂S readings (below one ppm) interrupted two times each day by spikes of H₂S. In June, the maximum amount recorded was 14 ppm.

Beyond just the odor control goal, it was important to prevent the formation of the grease layer that floats on the surface of the wastewater. A visual inspection of the wet well found that 75% of the surface was covered with a grease cap.



CONFIGURING THE CHEMICAL FEED SYSTEM

Using a peristaltic metering pump, CARUSOL is applied into the wastewater just up-stream of the lift station's wet well. Over two years the permanganate dosage averaged one mg/L. When necessary, by using a second metering pump on a timer, the dosage can be adjusted to match the early morning and mid-day peak flow rates that are typical of a collection system.

A simple treatment scheme was developed to solve the grease and odor problem. A base line, maintenance treatment of one mg/L was started using metering pumps. This treatment ran 24-hours per day. Controlling the peak H₂S releases was accomplished by an additional chemical treatment of two mg/L, running from 6 am to 12 midnight. The peak load chemical addition used the second metering pump controlled by a timer.

RESULTS

After one week of CARUSOL treatment, the H₂S concentration in the wet well was 0 ppm and the grease layer was diminished and thin. These positive results were also reported during the following month of July, 0 ppm H₂S was common with one daily maximum peak of less than 10 ppm. There was only small accumulation of grease in one corner of the wet well.

When one month of treatment was completed, the CARUSOL was shut off to see if the hydrogen sulfide was still present in the wastewater. With no treatment the headspace H₂S reading immediately rose to four ppm. CARUSOL treatment was started again.

CONFIRMATION

In August, the CARUSOL treatment was discontinued for a short time to reconfirm the untreated baseline conditions. As anticipated, late summer (hot and dry) conditions generated more H₂S than in June. When the treatment was stopped, the H₂S levels increased every day and the two daily peaks were still present. In the wet well, the atmospheric H₂S eventually hit a maximum concentration of greater than 80 ppm.

The full-scale treatment was re-started and has run continuously since then. During the winter months, as odors and grease formation decrease, the system dosages can be adjusted to lower settings.



Figure 5:
CARUSOL treatment

CONTINUED TREATMENT

The CARUSOL test program and the continuous treatment continues through today. The nuisance odors have been eliminated. The fats, oils, and greases, although minimized, still accumulate in the lift station wet well, but the clean out has been reduced to three times/year.

The cost of the CARUSOL odor control treatment is approximately \$ 0.035/1,000 gallons.