THE TECH CORNER – LANDFILL GAS AND NEW SOURCE PERFORMANCE STANDARDS UNDER THE CLEAN AIR ACT

Mike McLaughlin

The U.S. Environmental Protection Agency (EPA) promulgated New Source Performance Standards (NSPS) for municipal solid waste (MSW) landfills on March 12, 1996. The NSPS, found at 40 CFR 60, Subpart WWW, require owners and operators of relatively large landfills to design, install, operate and monitor a landfill gas collection and control system (GCCS) on a specific time schedule, and to file a number of compliance reports with the appropriate regulatory agency.

Recent enforcement initiatives in EPA Region 3 and elsewhere have shown that compliance with the NSPS regulations is challenging for a number of sites. From EPA's perspective, NSPS inspections are "productive," in the sense that inspections have uncovered areas of noncompliance requiring enforcement orders and penalties. This article will summarize the NSPS regulations, and then discuss several areas of concern for landfill owners and operators based on recent enforcement actions, together with strategies for compliance.

As written, the NSPS for landfills is based on control of non-methane organic compounds (NMOCs) present in landfill gas. Methane and carbon dioxide are the predominant components of landfill gas, and NMOCs typically make up only a small fraction (a few hundred parts per million, or ppm) of landfill gas at a typical site. Older landfills that may have received significant amounts of solvents may have higher concentrations of NMOCs.

Applicability of NSPS

NSPS applies to active and closed landfill sites. In EPA's view, landfills that are affiliated in some way with nearby active or closed landfills may be aggregated for purposes of determining applicability of NSPS. All of the following criteria must be met for NSPS to apply:

1. The facility must be an MSW landfill, in part or in full. The rule does not apply to hazardous waste landfills, sludge landfills, industrial landfills, or construction and demolition debris landfills.

2. The facility must have received MSW waste on or after Nov. 8, 1987. Landfills that had ceased receiving MSW prior to that date are not captured by the NSPS rule.

3. The facility must have a design capacity at or above 2.5 million metric tons (Mg), and 2.5 million cubic meters of MSW. Design capacity is usually based on permits held with state solid waste regulatory agencies. Since a landfill containing 2.5 million Mg almost certainly will have a volume greater than 2.5 million cubic meters, the 2.5 million-Mg value will control NSPS applicability.

4. The facility must be shown to emit more than 50 Mg per year of NMOCs. This determination is made by applying any of several models established by EPA, using either default values or site-specific values. Use of site-specific values will almost certainly yield a lower NMOC emission rate than use of EPA's default values.

Compliance Schedule

Compliance with NSPS requires a sequence of activities, beginning with a determination of whether a given landfill meets the four criteria listed above. For large landfills that first received waste on or after May 30, 1991, (the date of the first draft publication of the NSPS rules in the Federal Register), or that increased their capacity to become a large landfill after that date, specific deadlines were included in the rule, as follows:

- 03/12/96 – NSPS rule promulgated.
- 06/10/96 – Design Capacity Report due.
- 06/10/96 – Tier 1 gas model due (if applicable).
- 12/07/96 – Tier 2 report due (if performed).
- 06/10/97 – Tier 3 report due (if performed).
- 06/10/97 – GCCS Design Plan due (if required).
- 12/10/98 – System construction complete (if applicable).
- 03/10/99 – Surface emissions monitoring, first round due (if applicable).
- 06/08/99 – Initial operations report due (if applicable).

For other landfills, the specific deadlines for NSPS compliance reporting are a function of state Emission Guideline (EG) program requirements and formal approvals (of the state programs) by EPA. The following schedule applies:

- 0 days – effective date of EG.
- 90 days from effective date above – Design Capacity Report due.
- 90 days from effective date above – Tier 1 gas model due (if applicable).
- 180 days from Tier 1 above – Tier 2 report due (if performed).
- 1 year from Tier 1 above – Tier 3 report due (if performed).
- 1 year from Tier 1 above - GCCS Design Plan due (if required).
- 18 months from Design Plan above – System construction complete (if applicable).
- 3 months from system construction above – Surface emissions monitoring, first round due (if applicable).
- 180 days from system construction above – Initial operations report due (if applicable).

Note that the EG program for older landfills includes interim deadlines not contained in the program for newer landfills. These deadlines follow submission of the GCCS Design Plan, and require awarding a contract for construction of the GCCS within four months of submitting the plan, and commencing construction no later than six months thereafter.

Testing for 50 Mg/Year NMOC Threshold: Trail of Tiers

The astute reader will note there are three tiers of testing and gas models provided in the NSPS rule for the purpose of determining whether the NSPS threshold of 50 Mg per year is triggered. The three different models require an increasing amount of site-specific information as Tier 1 yields to Tier 2 yields to Tier 3 testing. In summary:

- Tier 1 uses a gas production model that results in high NMOC emission rates. Assumes NMOC content of landfill gas is 4,000 ppm.

- Tier 2 uses actual NMOC concentration of landfill gas at the site is measured, and substituted for 4,000 ppm value used in Tier 1. Based on results collected by our firm from almost 200 landfills, NMOC concentrations in modern landfills range between about 50 and 1,000 ppm, with an average concentration of 340 ppm and a median concentration of about 290 ppm. Thus, typical NMOC concentrations are more than an order of magnitude below the 4,000 ppm default assumption used by EPA.

- Tier 3 uses actual NMOC concentrations for the site (based on sampling as in Tier 2), and site-specific gas generation characteristics (based on a pump test).

What this means is that many landfills that "fail" Tier 1 (and thus would be subject to NSPS) would "pass" under Tier 2 or Tier 3 testing (and thus not be subject to NSPS). Landfills that already had GCCS installed at their landfills in the mid-1990s were tempted to forego the small expense of conducting Tier 2 testing, for example, on the theory that since they already had a system installed that they were required to operate under a state permit, so there was no reason to try to escape regulation under NSPS.

However, many landfills that could have but did not perform Tier 2 testing and escape NSPS later realized that the burden of monitoring landfill gas systems and reporting under NSPS is substantial. Some such landfills performed a "late" Tier 2 test, and then approached either EPA or their state to obtain concurrence that NSPS does not apply to their landfill. EPA in some cases has accepted "late" Tier 2 test results (particularly where the testing was not "too late"), and in some cases has rejected them. Similarly, some states have accepted "late" Tier 2 results and incorporated them into a subsequent Title V permit ostensibly not subject to NSPS, and some states have rejected "late" Tier 2 tests.

Where they have been accepted "late," EPA has gone to great pains to say that the landfill will not gain an extension of the ultimate compliance schedule as a result of a "late" Tier 2 test that shows the landfill is over the 50 Mg NMOC threshold, and that other elements of compliance (*e.g.*, GCCS design plan) acts as a space saver for the Tier 2 test.

Some in the industry take the view that it should not matter when a Tier 2 test demonstrates that the landfill does not meet the 50 Mg NMOC threshold, and even a facility that already has installed a GCCS should be allowed as a policy matter to avoid the burden of operating the system pursuant to NSPS requirements if it clearly does not emit 50 Mg/year of NMOCs, no matter when that fact is uncovered.

GCCS Design Plans

Under the Design Plan requirements, a gas collection system must cover all areas of a landfill that are 2 years or older if closed to solid waste receipt, or 5 years or older if still active. These ages apply to waste appearing at any depth in a given area. For example, if the active working face rests atop trash that is 5 years old or older at depth, a gas system must be installed in this location, even if the shallower refuse is (obviously) much younger.

The above age criteria are used to delineate the portions of the landfill that must receive initial coverage from LFG collection. In addition, NSPS requires that an existing NSPS-compliant gas system regularly be expanded to accommodate on-going expansion of the landfill, as old cells are closed, or as active areas have refuse somewhere in the vertical column that passes 5 years in age.

There have been a number of points of discussion between EPA and the regulated community regarding the scope of GCCS system design and construction. For example, the GCCS is required to extend over the portion of the landfill site that contains waste. It is not required to extend to appurtenant structures outside the waste footprint (*e.g.*, a leachate collection tank outside the waste boundary that produces its own gas), unless these appurtenant structures convey landfill gas from an area requiring control.

Fundamentally, NSPS requires certain performance criteria to be met by the GCCS, including landfill surface emission monitoring (SEM) and GCCS wellhead monitoring. Any GCCS design that can achieve these performance criteria should be acceptable –

there is no requirement in the rule for specific numbers of extraction wells, blowers, etc.

System Monitoring and Reporting

SEM. NSPS requires that quarterly SEM be conducted over all portions of landfills that are to be NSPS-compliant (*i.e.*, areas containing wastes that meet the 2-year and 5-year rules discussed earlier), and that emissions from these areas be below 500 ppm methane. Testing is to be conducted with a hand-held gas monitoring device such as an organic vapor analyzer (OVA) or a flame ionization detector (FID). A monitoring technician is to hold this device with its inlet wand at an elevation of 5 to 10 cm above the ground surface. The technician is then to walk over the eligible area, in straight lines arranged in a serpentine fashion to provide complete landfill surface coverage. Lines in the serpentine pattern are to be placed 30 meters (100 feet) apart.

If a crack in the cover, distressed vegetation or other visual indication of a release of landfill gas is observed, the 30-meter serpentine pattern is to be supplemented with SEM measurements at the crack or distressed vegetation. However, SEM should not be required for appurtenant structures located outside the waste footprint.

Any exceedances of the 500 ppm standard are to be carefully marked in the field so they can be remediated. Remediation can involve well field adjustment, cover compaction, adding additional cover thickness or even just wetting the cover. After these actions are taken, all marked exceedances are to be re-tested within 10 days. If some locations fail again, another round of remediation and re-test is allowed 10 days after that. Eventually, compliance with the 500 ppm methane standard is usually achieved, and the remediation and 10-day re-testing is completed. One additional round is then required 30 days after the last exceedance for the remediated area, and if it passes again, then the quarterly round has been successfully completed.

If surface emission testing continues to fail at one or more locations, more drastic remediation is required. A physical upgrade to the LFG collection system must be performed within 120 days.

Wellhead Monitoring. Monthly monitoring for oxygen or nitrogen, temperature and pressure is required at each wellhead of the GCCS system. These parameters are useful in determining if a given well is under vacuum (a requirement), and if so whether there is too much vacuum on the well (which can lead to a subsurface fire). Too much oxygen (over 5 percent) or nitrogen (over 20 percent) indicates that air (as opposed to landfill gas) is being drawn into the well. Too much temperature (over 55 degrees Celsius) might indicate there is a subsurface fire near the well.

Under NSPS, if an exceedance of gas composition targets, temperature targets or pressure targets occur at any given well during any given round, the gas system owner/operator is given the opportunity to correct the situation. Alternatively, if it is believed that gas compositions and targets in excess of the value specified above are acceptable, and do not indicate an over-withdrawal of collected landfill gas or support of a subsurface fire, higher values are allowed on an ongoing basis. To achieve the acceptability of such higher values, a specific report must be submitted known as a "Higher Operating Value Demonstration."

Control System Monitoring. NSPS requires the control system (*e.g.*, blower and flare) to be monitored essentially on a continuous basis. The best way to accomplish this is the installation of strip chart recorders or electronic data recorders that track blower flow rate and flare combustion temperature.

NSPS specifically allow either utility flares or enclosed flares, calling both Best Demonstrated Technology (BDT). It should be noted that the use of enclosed flares physically allows the collection of post-combustion gas samples.

Such testing is required under NSPS, and local air regulators may add more testing requirements to the federal tests. Utility flares can not be physically sampled for post-combustion gas samples, and testing of such gases is therefore not required by NSPS. For enclosed flares, NSPS requires that the flare be operated at near the temperature used for any demonstration stack test, while there is no corresponding requirement for utility flares. Thus, where they are allowed, utility flares are easier to monitor and simpler to use for NSPS control purposes.

Start-up, Shut-down and Malfunction (SSM). NSPS provides that gas collection systems need not be operated in the event of SSM events, provided that SSM events may not last longer than 5 days for collection systems. In the event of a SSM incident involving a treatment or control device, then the gas collection system must be shut off within one hour, in order to limit the quantity of landfill gas vented to the atmosphere. In either event, the GCCS must be re-started within the five-day period caused by the SSM, or the landfill is out of compliance.

Compliance Reports. Periodic compliance reports are required under NSPS, to include certification of compliance together with any exceptions such as SEM exceedances, well head monitoring deviations, or control system monitoring problems and corrective measures taken.

Compliance Suggestions

Experience has shown that monitoring under NSPS can be difficult under some conditions, and that landfills seldom will "pass" in all locations during a quarterly or monthly monitoring round. A few practical suggestions:

- NSPS allow you to exclude from SEM testing all steep slopes and other "dangerous areas." Take advantage of this provision, and conduct testing where it is safe to do so. Interestingly, the NSPS rules do not explicitly exclude the active working face from SEM. Define the active working face as a dangerous area (it typically is), and exclude it from surface emission testing.

- As written, NSPS say that SEM testing should only be performed in typical weather conditions. Exclude times of heavy rain or unseasonably high winds. Also, a round in January may find your landfill covered with 2 feet of snow and ice. Some states have recognized the folly of surface emission monitoring in winter (when these conditions can be found). Minnesota (for example) has deleted the requirement for a winter round altogether, and requires only 3 annual testing rounds. Fortunately, a snow- and ice-covered landfill is unlikely to exceed the 500 ppm methane. Consider deleting the round at your own initiative if these conditions create "dangerous areas" atop the whole site.

- Most failures recorded at landfills come from leaks around well heads, and from obvious cracks in the surface cover. Visually observe the apparent cause of an exceedance, and plan remediation accordingly. Usually a landfill cover crack can be easily remediated with soil compaction, soil wetting, and/or additional cover soil application. Cracks around well heads can be remediated in a similar fashion, or by applying an apron around the well head and atop adjacent soil.

Conclusion

NSPS for MSW landfills have been in place for more than eight years. Recent enforcement actions by EPA and state agencies have uncovered a number of compliance problems, as well as areas in which the NSPS are unclear. Owners and operators of active and closed MSW landfills would be wise to review their landfill gas control practices in light of the

lessons learned following early enforcement activities.

Mike McLaughlin is an attorney and engineer at SCS Engineering in Reston, Virginia. He is a senior vice president for the firm's Environmental Services Practice. He serves as vice chair of the ABA Section of Environment, Energy, and Resources' Waste Management Committee and as its resident "Techie."

.

Defending Liberty
Pursuing Justice

SECTION OF ENVIRONMENT ENERGY AND RESOURCES

Waste Management Committee Newsletter

Vol. 6, No. 2 **August 2004**