Washington State's continuous emissions monitoring system (CEMS) experience and enforcement guidance

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The Washington State Department of Ecology, with the cooperation of industry, developed and adopted enforcement guidance for CEMS. After almost two years, sources have complied with the emissions limits most of the time.

The goal of the Washington CEMS is to provide for the systematic control of air pollution by limiting adverse environmental impacts, identifying potential problems, and demonstrating compliance with the emission standards. The information generated is used to improve the performance of emission control systems. It also gives a basis for making judgments on whether good operation and maintenance procedures are used by the source to protect ambient air quality.

Washington State has required the use of continuous emissions monitors since the early 1970s. We originally required monitors for odorous emissions of reduced sulfur compounds (TRS) from kraft pulp mills and SO_2 from sulfite mills. At the time, an instrumented method was the best way to measure the pollutants of interest. As we developed regulations for other sources, we continued to rely on monitors to help evaluate compliance with the emission standards. Today, CEMS data is an important element of Washington's continuing compliance program.

A basic element of Washington's approach to air pollution control is that sources should comply with emission limits all the time. To ensure this, we require many major sources, such as pulp mills and primary aluminum smelters, to measure emissions regularly. Where emissions monitors are available, we require them. For other pollutants, we require monitoring operating parameters and regular stack tests (monthly). Each month the major source must report its emissions. We use these reports in determining if the source has complied with the emission limits for that month.

Washington's rules, the Washington Administrative Code, do not exempt any periods where emissions exceed the standard. We do not recognize startup, upsets, or shutdowns as allowable exceptions. However, we developed these rules based primarily on manual stack tests or a relatively short monitoring period. These tests only included normal operation and did not include startups and upsets. Because the standards were based on tests done only during normal operational conditions, many industry representatives feel that special consideration should be given to abnormal conditions.

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Enforcement guidance

The Washington State Department of Ecology divides violations of air regulations into four categories. They are:

1. Violations with health implications. These include violations of ambient air quality standards and always receive the maximum fine possible. The current limit is $5000 per day.
2. Emission violations that are aggravated or from recalcitrant violators. Aggravated emissions are well above the standard or are a result of a failure to maintain the control equipment. A recalcitrant violator is a source that repeatedly fails to correct similar problems. Repeated Category 2 violations can be treated as Category 1 violations.
3. Emission violations that are not aggravated. These emissions are a result of some uncontrollable condition such as a pump failure or an unanticipated startup problem.
4. Administrative violations. Administrative violations include failure to report or follow a procedure that does not result in increased emissions. Generally, administrative violations result in warning letters and no penalties. Repeated Category 4 violations can be treated as higher-category violations.

It is easy to see how several small or insignificant monitor violations could result in escalation to aggravated emission violations and finally to the maximum penalty. A facility could even find itself on the Environmental Protection Agency's (EPA) significant violations list for just starting up and shutting down. As with the regulations, the enforcement guides were not developed with the full consequences of CEMS in mind. Traditional enforcement guidance reflects violations detected in periodic

inspections or as the result of a specific complaint or action. Hence, an emission violation would become an aggravated violation if the source did not correct the problem between inspections. At Ecology, as with most agencies, the staff was given considerable discretion if penalties were warranted during inspections for unusual conditions such as an upset or startup. In considering penalties, Ecology staff considered both the cause of the problem and the impact on the environment.

Like other states, Washington is requiring more CEMS. Often, at a complex source like a pulp mill, there may be a dozen or more monitoring systems. In reviewing the data from each monitoring system, it is not unusual to find at least some period in a month that a source had emissions above the limit.

The traditional approach to determining compliance for most sources is an annual inspection or a less-frequent emission test. With monthly reports based on CEMS, it is not uncommon for a facility to report several periods above the standard in a year. Because we use monthly CEMS reports in determining compliance, sources are no longer subject to just a year. They are subject to the equivalent of continuous inspection and citations daily.

About four years ago, Ecology's policy on enforcement changed. The new policy gave less discretion to the staff and required escalation of penalties for each repeated violation. Under this escalation policy, a company could face the strongest sanctions for three violations in a year. The policy removed the discretion from the staff and gave only limited discretion to management. Faced with this much high-resolution data, we took a new look at how to determine compliance.

To help examine this question, the Washington State Department of Ecology set up a technical advisory committee. The committee consisted of both regulators and industrial representatives. This committee worked out a framework for CEMS enforcement guides.

Washington's CEMS enforcement guidance

Washington's CEMS enforcement guidance classifies excess emissions as determined by CEMS into two types: major and minor.

Major excess

Major excess emissions occur when a source exceeds the standard more than 5% of the time. In general, if a source exceeds the standard more than 5% of the time, it is an aggravated excess emission requiring enforcement action. Major excess emissions should be Category 2 violations. High emissions levels should be studied for possible ambient air violations.

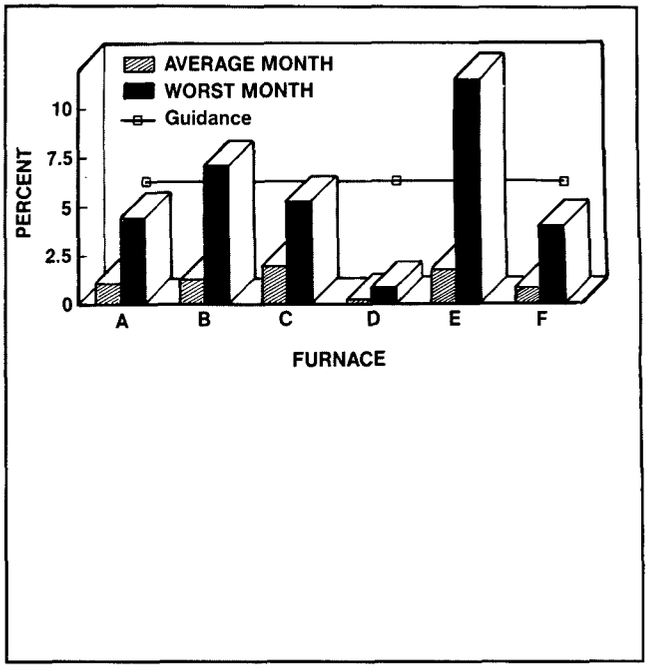
Examples of major excesses include continued high-opacity emissions while a portion of an electrostatic precipitator (ESP) has failed or reduced scrubber pressure drop due to clogged nozzles.

Minor excess

Minor excess emissions occur when a source exceeds the emission standard on an infrequent basis, typically less than 5% of the operating time.

Engineering judgment must be used in considering if the excess emissions were a result of improper operation or maintenance practices and if any enforcement action is necessary. The nature of the emission, the complexity of the source, and any environmental impacts are factors worth considering. A pattern of avoidable excess emissions should result in an enforcement action. Unavoidable excess emissions need not result in enforcement actions. Enforcement action need not be taken if the operator demonstrates that the excess emissions could not have been avoided without the loss of life, personal injury, or severe property damage, and that there is not a consistent pattern of operational problems.

1. Percent of month above 35% opacity for recovery furnaces (1988 and 1989 data)



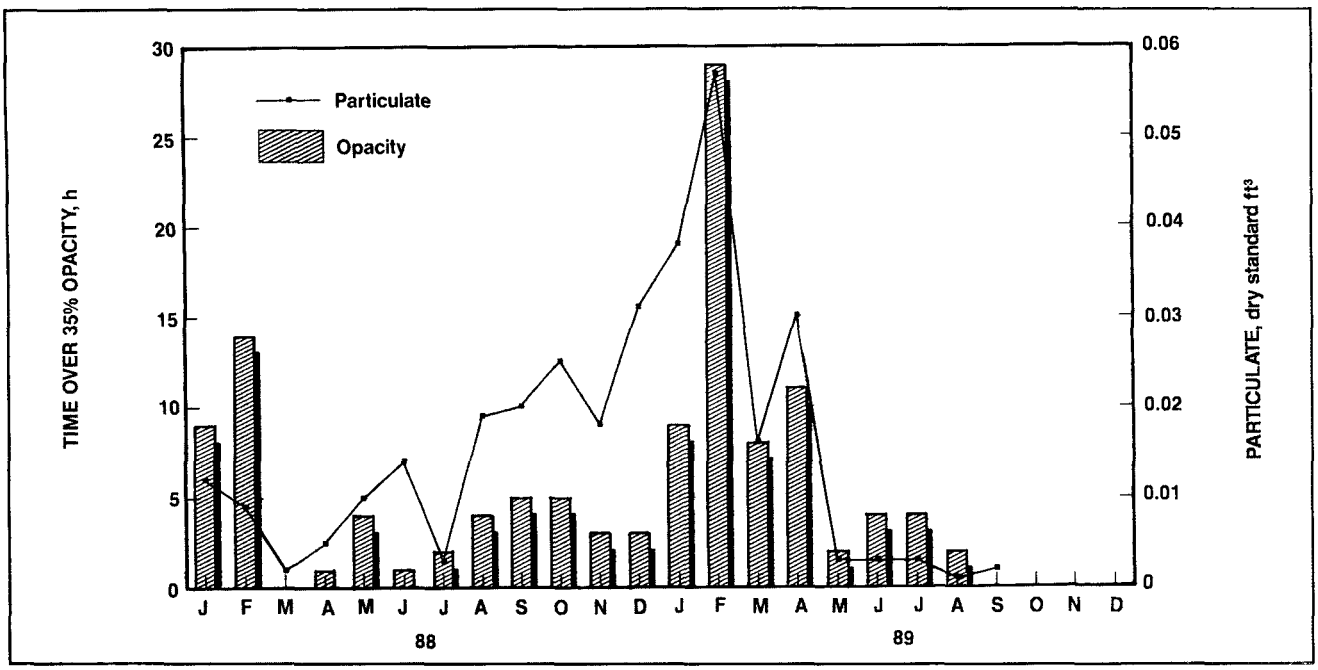
Minor excess emissions might occur while a facility is maintaining its equipment or while the facility is bypassing the air pollution control equipment during startup to prevent damage to equipment. Such activities do not result in enforcement actions if they do not result in adverse environmental impact and if the operator has taken all reasonable precautions to minimize emissions. Long-term or routine bypassing of control equipment is not acceptable.

Shutting down one pass of a dual-pass electrostatic precipitator to remove a broken wire may not warrant enforcement action. Enforcement action is warranted if the shutdown lasts for several days or if the company does not take reasonable precautions to minimize emissions during the period.

Consider also a pump failure on a scrubber. If the pump failure is a random event, Ecology should not take action. If it becomes a frequent event resulting from improper operation or maintenance, enforcement action is necessary.

Finally, if an event is frequent or predictable, Ecology will require the company to study the problem. For example, if the opacity exceeds the limit at five o'clock every Friday afternoon or whenever a certain product is made, we will take enforcement action.

2. Opacity and particulate for furnace No. 1



Administrative infraction

Failure to meet the reporting requirements or failure to maintain the monitoring equipment properly are administrative infractions. Monitoring equipment should operate correctly at least 90% of the time on an annual average. The agency should acknowledge administrative infractions which may be Category 4 violations. Chronic or repeated inattention to proper operation and maintenance requires enforcement action to prevent or deter recurrences.

Reporting

Reporting should be at least monthly and in a format approved by the agency. The report should include:

1. The daily maximum and average concentration, in the units of the standard, of each pollutant monitored
2. The duration and nature of any monitor downtime
3. Results of any monitor audits or accuracy checks
4. Results of any additional stack tests.

For each excess emission the report should include the following:

1. The time of the occurrence
2. The magnitude of the emissions
3. The duration of the infraction
4. The probable cause
5. Any corrective actions taken or planned
6. Any other agency contacted.

The source also may wish to make a preliminary determination, for agency review, of the type of infraction (major, minor, etc.).

Quality assurance plan

Each facility operator is responsible for a quality assurance plan which should be subject to agency approval. As guidelines for approving the quality assurance plans, the agency should use 40CFR60 Appendix F[1] and "Recommended Quality Assurance Procedures for Opacity Continuous Emission Monitoring Systems" (EPA340/1-86-010)[2].

All new monitoring systems should conform to EPA's performance specifications where EPA has adopted appropriate specifications. Where EPA has not adopted appropriate specifications, the source should submit a suggested monitoring system and specifications for the agency to review.

Problem areas

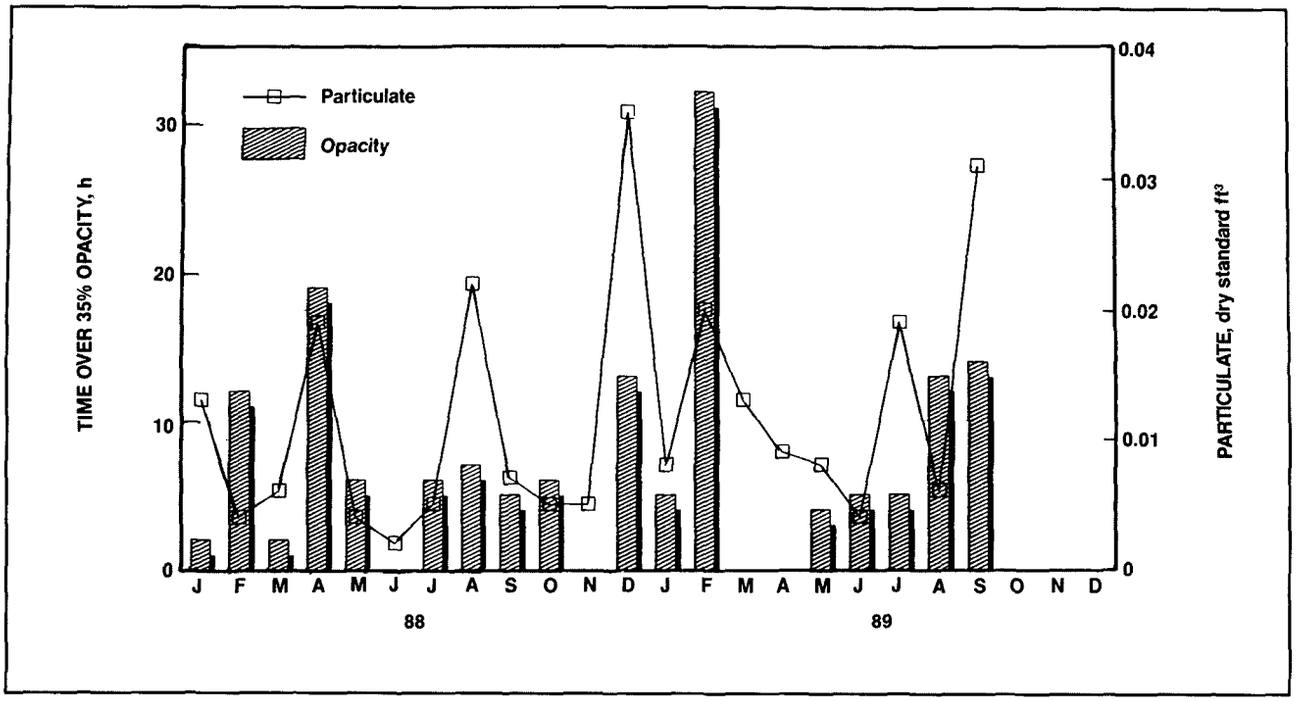
Discretionary periods

In developing the enforcement guides, the committee agreed on most issues. Notable exceptions are abnormal operation, such as startup and upsets, and the meaning of the term "5% of the time." Some contended that periods of startup, shutdown, and upset should be excused. Washington regulations do not allow for such exclusions. One reason that our regulations do not exclude such conditions is that we cannot define them. Some people believe that a source may claim to be in a continuous state of startup, upset, or shutdown. Such claims would make the regulation ineffective. The industries pointed out that some periods of excess emissions during startup and

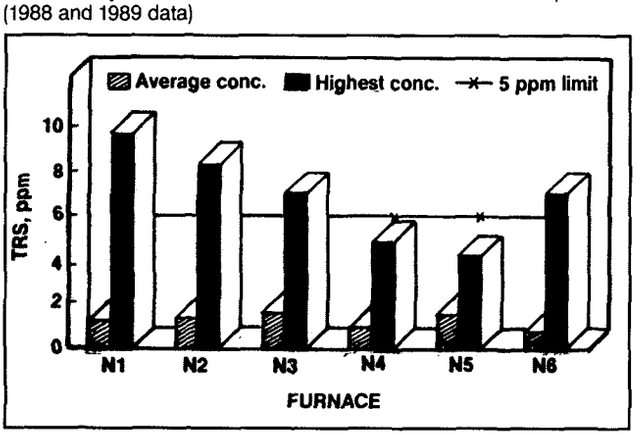
[1]U.S. Environmental Protection Agency, Code of Federal Regulations 40 CFR 60 Appendix F, 52 FR 21008 June 4, 1987; 52 FR 27612, July 22, 1987.

[2]U.S. Environmental Protection Agency, Recommended Quality Assurance Procedures for Opacity Continuous Emissions Monitoring Systems, EPA 340/1-86-010, Feb., 1986.

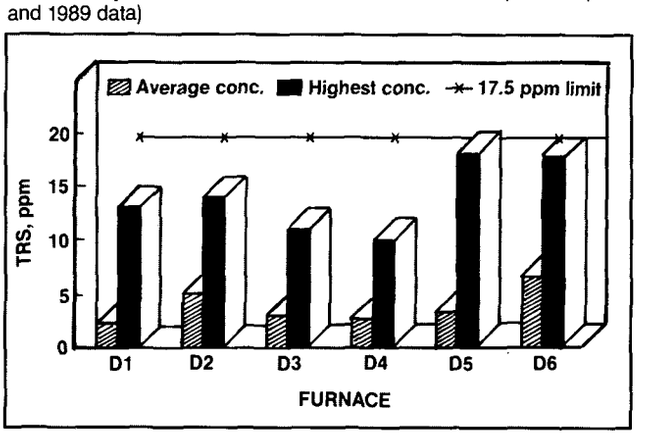
3. Opacity and particulate for furnace No. 2



4. Recovery furnace TRS levels without direct contact evaporators (1988 and 1989 data)



5. Recovery furnace TRS levels with direct contact evaporators (1988 and 1989 data)



shutdown are unavoidable. Ecology decided to include all events like startups and upsets in a discretionary period of 5% of the time.

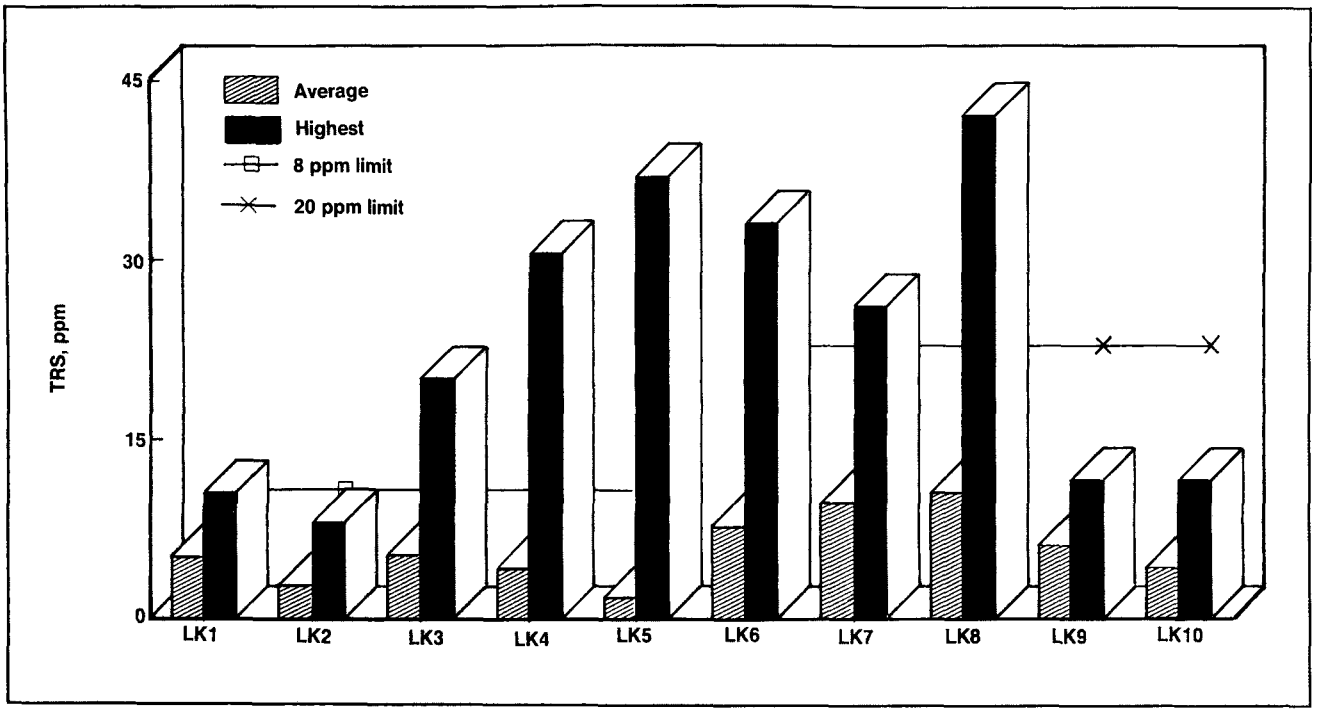
This presented a problem of defining the basis for "5% of the time." A relatively short period such as a day or a week would help ensure that even minor upsets or breakdowns received immediate attention. Some facilities need a long period such as a quarter or a year because startup and shutdown could take as much as a day. Under such conditions, the shutdown and startup necessary to repair a failed air pollution control device could consume five percent of a month. It is not Ecology's goal to penalize a source for fixing its air pollution control equipment.

On the other hand, sources should not emit unregulated emissions 5% of the time. Obviously some discretion is needed. The enforcement guidance allows for such judgment. It recognizes that unavoidable emissions should not result in enforcement actions and that avoidable emissions should be discouraged. The enforcement guidance also leaves to agency discretion the definition of "5% of the time." In general, repeated problems of the same nature will be subject to enforcement actions even if they occur over a short period such as a week. Random events, even if they persist over long periods, may not be penalized if the operator has made efforts to correct the problem and minimize the emissions.

Alternative parameters

One area not covered is alternative monitoring parameters. Several sources in Washington monitor an alternative parameter, such as temperature and flow rate, to demonstrate compliance. EPA has not adopted performance specifications for such monitors. We must evaluate these systems on a case-by-case basis. Any alternative

6. Lime kiln TRS emissions (1988 and 1989 data)



monitoring system must provide the same level of assurance and compliance as a primary emission monitoring system.

Opacity monitors are not an accurate indicator of emissions following a wet scrubber. However, parameters such as scrubber pressure drop and flow rate are good indicators of the scrubber's performance. For alternative monitoring parameters, the company must show that the operating parameters achieve compliance. Any operations outside those parameters are subject to the same enforcement interpretations as primary monitoring information.

For example, one company proposed to monitor scrubber pH instead of sulfur dioxide; Ecology agreed. The scrubber was designed to maintain the SO_2 below the limit as long as the pH was above 5.6. The company reported the hourly average scrubber pH monthly, as it would SO_2. After several periods of low pH, we cited the source for a SO_2 violation. The source appealed, claiming there was no proof that it exceeded the SO_2 limit. Ecology contended that the plant did not operate the scrubber correctly and that the design indicates that the emissions were above the limit at the reported pH. Ecology agreed to drop the fines if the operator could demonstrate by a source test that at the reported pH it was below the SO_2 limit. Furthermore, Ecology agreed to set a new pH limit pending the results of the source test. The test showed excess emissions below a pH of 5.6, and the penalties were sustained.

Monitor performance standards

The first CEMS that Washington required were for TRS. At the time, there was no EPA reference method for TRS or performance standards for any pollutant. Instead of a reference method, we required that pulp mills use a specific type of monitor. This is similar to what EPA does for ambient monitors. The regulations stated that the sources must install, operate, and maintain a monitoring system in accordance with a plan approved by the Department of Ecology. All the pulp mills installed monitors following these requirements. After EPA adopted performance standards for some pollutants, we adopted guidelines for new and existing CEMS. These guidelines were based on EPA's Performance Specification 2. It set an accuracy limit of ±20% based on an audit and a minimum response time of 15 minutes.

Washington followed these guides in approving other CEMS. For example, New Source Performance Standards for oil refineries required monitoring of SO_2 emissions or fuel gas H_2S but exempted sources until a monitoring method is adopted. In Washington, we required monitors that met the basic requirement of 20% relative accuracy despite the lack of EPA guidance. At least two sources met the requirement before EPA adopted Performance Specification 7.

Evaluation of the guidance

The CEMS enforcement guidance has been in place for over one year. Most sources that exceed the standard less than 5% of the time have not been cited for emissions violations, and no serious problems have resulted from the policy. To evaluate the guidance for opacity monitors, we examined six recovery furnaces. Each was built after 1965 and has an ESP. As shown in **Fig. 1**, three of the six had at least one month where the opacity exceeded 35% more than 5% of the time. Only one furnace exceeded the opacity limit for more than 5% of a quarter in the last two years (this was during a research period). Averaged over the two year period, each of the furnaces exceeded the standard less than 2% of the time.

Figures 2 and 3 show the relationship between the

number of hours above the standard and particulate tests taken that month for two recovery furnaces. At least in some cases it appeared that periods of high opacity and high particulate are related. The figures suggest that some of the periods of high opacity are the result of a gradual deterioration of the equipment or process. The sources were able to correct the problem, and the levels of both particulate and opacity dropped.

Washington has TRS emission limits for recovery furnaces depending on whether they have direct-contact evaporators or not. **Figures 4 and 5** show the average and highest TRS levels for recovery furnaces over the last two years. While many of the furnaces exceeded the TRS limit at least once, only one furnace exceeded its limit for more than 5% of a month. In general, recovery furnaces were able to meet the TRS limit.

Lime kilns have had a bigger problem meeting the TRS limits. **Figure 6** shows the highest reported levels for 1988 and 1989. For the 10 lime kilns, the respective limits were exceeded more than 5% of a month 11 times. Five of the times were between March and August 1989 on one kiln. This was an unusual problem which was corrected. Even including this source, less than 5% of the over 200 lime kiln reporting periods were above the emission limit for more than 5% of the month.

For all periods where the emissions exceeded the standard for more than 5% of the time, Ecology took enforcement action. Fines were collected in most instances, and none were appealed.

Although we developed the guide independently, it is similar to EPA's SO_2 Continuous Compliance Strategy (July 5, 1988). EPA's guide allows for excess emissions only 1% of the quarter but allows malfunctions and bypasses 5% of a quarter. EPA also requires monitors to be running 95% of a quarter, compared to Washington's 90% in a month.

Summary

Continuous emission monitoring systems are a key part of Washington's air pollution control program. The Washington Department of Ecology, with the cooperation of industry, developed and adopted enforcement guidance for CEMS. The guidance helps limit adverse environmental impacts. It sets up a structure to identify potential problems with sources and encourages correcting the problems before they become serious or chronic. Routine reporting of emissions as measured by CEMS do not put a source in an unnecessary enforcement situation when regulatory discretion is used. Finally, the guidance clearly establishes CEMS as tools used to demonstrate compliance with emission limits.□

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