

Continuous Emission Monitor to Comply with Federal Register 40 CFR part 60 Proposed Rules 27181 / Subpart J(a) for New Sulfur Recovery Plants (SRP)

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What's "new" in the 40 CFR Part 60 subpart J(a) ?

- ▶ In terms of the process, not much. The SRP and tail gas treater (TGT) will be designed to operate in the same way, with perhaps more emphasis on incineration optimization. What is new is the requirement to account (analyze) for reduced sulfur compounds after the incineration step (TGT).
- ▶ It is well known there are equilibrium values of reduced sulfur compounds after incineration and the assumption has been these are negligible if the incinerator is operated according to design. Even before the NSPS J(a), some local jurisdictions did not accept this assumption (primarily at gas processing SRP) making operators account for residual H₂S. The NSPS J(a) now makes this a requirement for all new refinery SRPs.
- ▶ AMETEK has considerable experience in measuring total sulfur emissions, residual H₂S and mass emission from SRP incinerators. Before promulgation of the NSPS J(a), some local jurisdictions required SRPs to make these measurements and AMETEK supplied CEMs

for this purpose (primarily gas plant SRPs in Alabama, USVI, Alberta and Mexico). Measuring requirements vary, but, in general, the expertise lies in delivering a sample to the analyzer without reaction and ensures total oxidation without formation of SO₃. As with any analytical technique, sample integrity is paramount, even more important for CEMs when working with trace values.

What are the requirements for new sulfur recovery plants (SRP) subpart J(a) regulations?

- ▶ The proposed standards include SO₂ emission limits for all SRPs. The proposed emission limit for new SRPs greater than 20 LTD is 250 ppmv or less of combined SO₂ and reduced sulfur compounds as discharged to the atmosphere (reported as SO₂ on a dry basis at 0% excess air).
- ▶ For a SRP with a capacity of 20 LTD or less, the proposed standard is mass emissions of combined SO₂ and reduced sulfur compounds equal to 1 weight% or less of sulfur recovered. In addition, the proposed standards include an H₂S concentration limit of 10 ppmv or less (dry basis at 0% excess air) for all new SRPs.

AMETEK's interpretation of the regulations

Both SO₂ and H₂S concentration limits would be determined hourly on a 12-hour rolling average basis. As in the amendments to subpart J, the proposed definition of a SRP includes the sulfur pit. Pit gas is typically recycled back to the front of the SRP, sometimes directly vented to the incinerator. Pit gas can be quantified with a separate analyzer which also serves the purpose of a safety monitor for LEL (of H₂S) and smoldering fire (SO₂).

Initial compliance with the emission limit for combined SO₂ and reduced sulfur compounds is demonstrated by conducting a performance evaluation for the SO₂ CEMs in accordance with Performance Specification 2 in appendix B to 40 CFR part 60, with Method 6, 6A, or 6C in 40 CFR part 60, appendix A as the Reference Method to determine the SO₂ concentration, and Method 15 in 40 CFR part 60, appendix A as the Reference Method to determine the SO₂ equivalent concentration of the reduced sulfur compounds. The results of the test using Method 15 are also used to demonstrate initial compliance with the H₂S concentration limit. Initial compliance with the mass sulfur

emission limit is demonstrated by conducting a performance test as described above to determine the combined SO₂ and SO₂ equivalent concentration, and then converting that concentration to a mass fraction using the volumetric flow rate of effluent gas and the mass rate of sulfur recovery during the performance test.

Ongoing compliance with the combined SO₂ and reduced sulfur compounds emission limit would be determined using a CEMS that uses an air or O₂ dilution and oxidation system to convert the reduced sulfur to SO₂ and then measures the total resultant SO₂ concentration. An O₂ monitor would also be required for converting the measured combined SO₂ concentration to the concentration at 0% O₂.

Ongoing compliance with the mass sulfur emission limit would be determined using the same types of CEMs. A flow monitor that continuously monitors the volumetric flow rate of gases released to the atmosphere would be required so that the mass emitted can be calculated. The hourly sulfur production rates would also have to be tracked so that mass fraction emitted can be calculated and compared with the proposed 1% emission limit.

Ongoing compliance with the H₂S concentration limit would be

determined using either an H₂S CEMs or, if the SRP is equipped with an oxidation control system or followed by incineration, by continuous monitoring of the operating temperature and O₂ concentration. Minimum operating limits for the operating temperature and O₂ concentration would be established during the performance test.

CEMs System as proposed by AMETEK to comply with the NSPS J(a)

AMETEK has considerable experience in the area of measuring total sulfur emissions. There are three basic approaches to the type of CEMs selected and it is dependant on; process equipment, relative concentrations of SO₂/H₂S / RS compounds, local interpretation of the regulations and communication with the environmental, process and analyzer people at site.

- ▶ H₂S oxidized to SO₂ and measured as total S (predominant approach in our view)
- ▶ Measure H₂S in the presence of SO₂ (possible if the SO₂ is no more than 3x the H₂S value)
- ▶ Measure H₂S separate from the SO₂ by scrubbing the SO₂ after measurement

Summary

- ▶ **SRP greater than 20 LTD**
Oxidize all sulfur components to SO₂, measure SO₂ and O₂ dry, correct to 0% O₂.
- ▶ **SRP with a capacity of 20 LTD or less**
Oxidize all sulfur components to SO₂, measure SO₂ and O₂ dry, correct to 0% O₂. Measure flow, and calculated SO₂ mass emissions. H₂S needs to also be measured dry and corrected to 0% O₂.

NOTE: H₂S monitoring is not necessary if the SRP is equipped with an oxidation control system or followed by incineration. Operating temperature and O₂ concentration is all that is required.

This technical note is a synopsis of the new subpart J (a) regulations and not intended to be a complete treatment of the topic or construed as advice. Please contact AMETEK for details specific to your needs.

Useful links

- ▶ 40 CFR Part 60 - NSPS subpart J(a) document
<http://www.regulations.gov/fdmspublic/component/main?main=DocumentDetail&o=090000648023b8c8>



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