6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

[EPA-HQ-OAR-2021-0299; FRL-8193-01-OAR]

Notice of Final for Approval of Alternative Means of Emission Limitation

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice, final approval.

SUMMARY: This action announces the EPA approval of the request by Flint Hills Resources (FHR), under the Clean Air Act (CAA), for an alternative means of emission limitation (AMEL) to utilize a leak detection sensor network (LDSN) with a detection response framework (DRF) at its Meta-Xylene and Mid-Crude process units located at FHR's West Refinery in Corpus Christi, Texas. The EPA received 6 public comments on the October 13, 2021, initial notice for this AMEL. This approval document specifies the alternative leak detection and repair (LDAR) requirements that this facility must follow to demonstrate compliance with the approved AMEL. In addition, this notice finalizes a framework that facilities can follow to help expedite and streamline approval of future AMEL requests for similar systems.

DATES: The approval of the AMEL request from FHR to utilize a LDSN with a DRF at its Meta-Xylene and Mid-Crude process units located at FHR's West Refinery in Corpus Christi, Texas, as specified in this document, is effective on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].**

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA-HQ-

OAR-2021-0299. All documents in the docket are listed on the *https://www.regulations.gov/* website. Although listed, some information is not publicly available, *e.g.*, Confidential Business Information or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through *https://www.regulations.gov/.*

FOR FURTHER INFORMATION CONTACT: For questions about this action, contact Mr. Neil Feinberg, Sector Policies and Programs Division (E143-01), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711; telephone number: (919) 541-2214; fax number: (919) 541-0516; and email address: *feinberg.stephen@epa.gov*.

SUPPLEMENTARY INFORMATION:

Acronyms and abbreviations. We use multiple acronyms and terms in this document. While this list may not be exhaustive, to ease the reading of this document and for reference purposes, the EPA defines the following terms and acronyms here:

AMEL	alternative means of emission limitation
AVO	audio, visual, or olfactory
CAA	Clean Air Act
CDX	Central Data Exchange
CFR	Code of Federal Regulations
CRADA	Cooperative Research and Development Agreement
DRF	detection response framework
DTU	upper limit of the detection threshold band
EPA	Environmental Protection Agency
EST	eastern standard time
FHR	Flint Hills Resources
FID	flame ionization detector
FEMP	Fugitive Emissions Management Plan

GPS	Global Positioning System
HC	hydrocarbon
HON	National Emission Standards for Hazardous Air Pollutants for Organic Hazardous Air Pollutants From the Synthetic Organic Chemical Manufacturing Industry
LDAR	leak detection and repair
LDSN	leak detection sensor network
LDSN-DRF	leak detection sensor network-detection response framework
NC Leaker	non-compliant leaker
NSPS	new source performance standards
OGI	optical gas imaging
ppbe	parts per billion equivalent
ppm	parts per million
ppmv	parts per million by volume
PSL	potential source location
QA/QC	quality assurance/quality control
QIP	quality improvement program
VOC	volatile organic compounds
ZIC	zone of inadequate coverage

Organization of this document. The information in this document is organized as follows:

I. Background
II. Summary of Public Comments on FHR's AMEL Request and the Framework for Streamlining Approval of Future LDSN-DRF AMEL Requests
III. Framework for Streamlining Approval of Future LDSN-DRF AMEL Requests
IV. Final Notice of Approval for the Mid-Crude and Meta-Xylene Process Units at the FHR West Refinery AMEL Request and Required Operating Conditions

I. Background

On April 21, 2020, FHR requested an AMEL under the CAA to use a leak detection sensor network-detection response framework (LDSN-DRF) at its West and East Refineries located in Corpus Christi, Texas in lieu of the traditional LDAR program using Method 21 of appendix A-7 of part 60 (EPA Method 21) required by a number of applicable regulations in 40 CFR parts 60, 61, and 63. See Table 1 in section IV of this notice for a complete list of applicable regulations for this AMEL.

In the initial notice, the EPA solicited comment on all aspects of the AMEL request and alternative LDAR requirements that would be necessary to achieve a reduction in emissions of volatile organic compounds (VOC) and hazardous air pollutants (HAPs) at least equivalent to the reduction in emissions required by the applicable LDAR standards listed in Table 1 in section IV of this notice. The initial notice also presented and solicited comment on all aspects of a generic framework for future LDSN-DRF AMEL requests, which would afford the EPA the ability to evaluate those requests in a more efficient and streamlined manner.

FHR included in its AMEL application information to demonstrate that the LDSN-DRF will achieve a reduction in emissions at least equivalent to the reduction in emissions achieved by the requirements in the applicable standards summarized in Table 1 of section IV of this notice for the Meta-Xylene and Mid-Crude process units located at FHR's West Refinery in Corpus Christi, Texas. For FHR's AMEL request, including any supporting materials FHR submitted, see Docket ID No. EPA-HQ-OAR-2021-0299.

This action finalizes the EPA's approval of this AMEL request. Section II summarizes the comments received on the request and our responses thereto. Section III sets forth the final operating conditions EPA has established for the LDSN-DRF as part of this AMEL approval.

II. Summary of Public Comments on FHR's AMEL Request and the Framework for Streamlining Approval of Future LDSN-DRF AMEL Requests

This section contains a summary of all comments received on the October 13, 2021, initial notice,[1] and the EPA's responses to those comments. This section also contains rationale

[1] 86 FR 56934 (October 13, 2021).

for the alternative LDAR requirements that are approved in this notice. The EPA received six comments on the initial notice.[2]

A. Comments and Responses Related to General Framework for Future LDSN-DRF AMEL Requests

The EPA solicited comment on all aspects of the general framework proposed for future AMEL requests using a LDSN-DRF. Two comments were received specific to the proposed framework.[3]

Comment: In their comments, FHR and Molex, LLC requested that the general framework provide flexibility to apply the same Molex LDSN design and deployment processes to similar units without the need to conduct an additional pilot test. Both commenters stated that the science behind the technology is established, and "substantial" controlled gas release experiments, including the pilot test results[4] presented for this AMEL support their request for flexibility. Specifically, FHR and Molex suggested addition of the phrase "if necessary to demonstrate equivalency" to the language in paragraph III.D.(3) regarding submission of the results of the pilot study conducted for each unit in a LDSN-DRF AMEL application.

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[2] See Document ID Nos. EPA-HQ-OAR-2021-0299-0032 (TRICORD Consulting, LLC), EPA-HQ-OAR-2021-0299-0033 (Anonymous), EPA-HQ-OAR-2021-0299-0034 (ATLAS), EPA-HQ-OAR-2021-0299-0035 (Molex), EPA-HQ-OAR-2021-0299-0036 (FHR), EPA-HQ-OAR-2021-0299-0037 (Eastman Chemical Company).

[3] See Document ID Nos. EPA-HQ-OAR-2021-0299-0035 and EPA-HQ-OAR-2021-0299-0036.

[4] See "*Progress on LDAR Innovation, Report on Research Under CRADA #914-16*", EPA Publication Number EPA/600/R-20/422, revision 0.8, located at Document ID No. EPA-HQ-OAR-2021-0299-0014.

Response: The EPA disagrees with the commenters' recommendation that test studies are not necessary for each process unit for which an AMEL application is submitted. At this time, it is still appropriate to require test studies for LDSNs on additional process units in order to gather more information on how the networks perform in different types of process units. The EPA may reevaluate its position on the necessity of test studies in the future if it has more data with which to do so. The EPA is providing the framework as described in section III of this notice, with no changes from the initial notice. We anticipate this framework would enable the Agency to evaluate future AMEL requests for LDSN-DRF installations in a more expeditious timeframe because we anticipate that the information required by the framework would provide sufficient information to evaluate future AMEL requests on a case-by-case basis. We note that all aspects of future AMEL requests will still be subject to the notice and comment process.

B. Comments and Responses Related to the Equivalency Demonstration

Comment: One commenter[5] raised concerns with two of the assumptions made by FHR when performing simulation modeling to demonstrate equivalency of the LDSN-DRF to the applicable EPA Method 21 LDAR requirements: (1) Leaks would be repaired within 7 days of detection and (2) a leak would remain constant from the time it is detected until it is repaired. This commenter referenced a statement in the EPA's Best Practices Guide for LDAR[6] that notes a common problem related to the repair requirements is that sources fail to complete repairs within the specified timeline in the regulation. The commenter then states that it is, therefore,

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[5] See Document ID No. EPA-HQ-OAR-2021-0299-0033.

[6] EPA, *Leak Detection and Repair: A Best Practices Guide*, located at *https//www.epa.gov/sites/default/files/2014-02/documents-ldarguide.pdf*.

inappropriate to assume that a leak would be repaired in half the amount of time required by the applicable regulation, and instead suggests that FHR should perform new simulations assuming 10 to 15 days for repairs. Further, the commenter suggests that FHR should conduct more equivalency simulations that do not assume a constant leak rate because FHR's discussion on PSL closure acknowledges that a PSL cannot be closed if there is an increase in the detection level. In the commenter's opinion, this assumes that FHR knows that leak rates can change and not remain constant until repaired.

Response: The AMEL requires leaks to be repaired within 15 days of detection, with a first attempt within the first five days. During the pilot study, there was a median repair time of 2 and 3 days for the Mid-Crude and Meta-Xylene units, respectively. Based on this information, the EPA finds no reason that the average repair time would exceed 7 days. The commenter is correct that a leak can increase over time, but they fail to note that it could also decrease. The EPA has determined the assumption of a constant leak rate between detection and repair is appropriate for this AMEL.

Comment: One commenter noted that some leaks above the upper limit of the detection threshold (DTU) were found by EPA Method 21 and not by the LDSN and asked how realistic it was that the LDSN would detect leaks in a complex process unit.

Response: The EPA acknowledges that some leaks above the DTU were found with EPA Method 21 during the pilot test studies. However, during the pilot test studies, FHR continued to adapt and adjust the network. Additionally, FHR is adding additional sensors to the network in areas that previously had gaps in coverage. These changes should ensure the LDSN performs adequately and identifies all leaks above the DTU. The annual compliance demonstrations

provide added assurance of network performance by verifying there are no undetected leaks above the DTU. The EPA also notes that the results of the pilot study presented in the Cooperative Research and Development Agreement (CRADA) showed greater emission reductions using the LDSN than with EPA Method 21.

Comment: One commenter[7] stated that the sensor network only minimally outperformed EPA Method 21 by at most 2 percent. The commenter further stated that the size and scope of the study and the results suggest this technology still needs scrutiny and that the pilot study was performed in controlled conditions with a team of motivated researchers present.

Response: The EPA has found the performance of the LDSN to be equivalent or better than current work practice requirements for the Mid-Crude and Meta-Xylene process units at FHR's West Refinery in Corpus Christi, Texas. Thus, the EPA finds it appropriate to issue this AMEL for those process units. Any future approval of this technology would be evaluated based on the information provided in that specific application.

C. Comments and responses related to the LDSN

Comment: FHR and Molex commented that updating the sensor detection floor continuously on a 15-minute basis would result in erroneous sensor failure indications and requested the expansion of corrective action options to include other appropriate solutions. They stated that the sensor detection floor is based on raw sensor readings which are collected every second and provided an example where a sensor would be shown as failing when updating the sensor detection floor while detecting a continuous leak. They stated that no sensor would pass

[7] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

the detection floor update requirement once every 15 minutes, as currently included in the proposal. Both commenters requested a requirement for monthly review of the sensor detection floor, with corrections made if the sensor did not pass review. They claimed that a bump test is not a calibration, is not performed in a "clean" environment as calibrations are, and adjusting readings based on bump tests would create additional uncertainty in sensor readings. Additionally, FHR and Molex commented that adjusting the sensor detection floor based on a bump test is inappropriate as the sensor detection floor is a fixed number set by the manufacturer. Additionally, one commenter asked for clarification on how the baseline levels are continuously monitored, while another asked for clarification on the detection level that indicated emissions. Finally, one commenter asked how sensors would be calibrated and verified.

Response: The EPA is updating the requirements for the sensor detection floor. First, the EPA is revising the requirement for a continuously updated sensor detection floor such that the data must be reviewed each day to confirm each sensor detection floor remains below the established threshold of 10 parts-per-billion by volume isobutylene equivalent (ppbe) during at least one 10-minute period in the past 72-hour period. Further, the EPA agrees with FHR and Molex that adjusting the sensor detection floor based on a bump test is inappropriate due to the variable bump test responses observed during the pilot study, which are not related to the baseline noise of the instrument. An emissions anomaly is defined as any detection by the sensor network greater than the detection floor. Sensors must be calibrated by the manufacturer prior to deployment. Once installed, each sensor must be tested for responsivity and wireless

communication by challenging it with isobutylene gas or another appropriate standard. Sensors must pass a quarterly bump test or be recalibrated or replaced.

Comment: FHR and Molex stated in their comments that the collection of wind speed and wind direction data is critical to the operation of the LDSN. However, both commenters stated that the requirement to have a wind sensor located in each individual process unit is not necessary. To support their comments, FHR and Molex provided clarification that the pilot study conducted for this AMEL at their West Refinery was performed with one wind sensor that covered both process units. Further, the commenters stated that analysis of wind data from the West Refinery and the Corpus Christi airport showed no substantial differences between wind sensors at 450 feet apart and wind sensors at 4 miles apart. Therefore, the commenters recommended that the EPA revise the requirement to allow a minimum of one wind sensor covering up to a 2-mile radius.

Another commenter[8] requested clarification on the acceptance criterion for the comparison of the LDSN north orientation wind direction sensor with data from the meteorological station located at the FHR refinery. This same commenter also asked why wind speed information was not included in the LDSN since wind can affect the sensitivity of the sensor measurements.

Response: The EPA agrees with FHR and Molex that one meteorological station on the FHR site is sufficient for both process units and has made this change within the AMEL. As noted by both commenters, only one wind sensor was used during the pilot study, and the EPA

[8] See Document ID No. EPA-HQ-OAR-2021-0299-0032.

has determined that equivalent emission reductions were achieved based on that pilot study. See 86 FR 56941 (October 13, 2021). Regarding the use of wind speeds, the EPA notes that wind speeds are continuously collected at least once every 15 minutes (paragraph IV.A.(4)), recorded as part of the LDSN (paragraph IV.C.(8)), and are used for quality assurance checks of the network (paragraph IV.A.(5)(d)). The acceptance criteria are listed in the AMEL.

Comment: FHR requested additional flexibility in meeting quarterly quality assurance/quality control (QA/QC) requirements by allowing QA/QC tests to be within the same month of the quarter (or no more than 123 days apart) rather than the 100 days apart included in the initial notice. FHR commented that tracking by days would present an additional burden and reduce flexibility that the applicable LDAR regulations already afford. As an example, FHR stated that new source performance standards (NSPS) VV and NSPS VVa require quarterly activities within the same month of the quarter (*i.e.,* Month 1 (January/April/July/Oct)) and not within a specific number of days. FHR requested this same flexibility for the quarterly QA/QC requirements in the AMEL. Finally, FHR requests some flexibility if there is an outage of at least 3 weeks during the quarter such that either the "days apart" requirement does not apply for the quarter in which the outage occurs or the number of days in the outage are not counted in determining the 123-day requirement.

Response: The EPA agrees with FHR and has changed the requirements in paragraph IV.A.(5) to state quarterly QA/QC activities must be conducted no more than 123 days apart. EPA disagrees that additional flexibility is needed for a prolonged unit outage, as these QA/QC procedures are necessary to establish that the LDSN is working as intended.

Comment: FHR and Molex commented that requiring an ambient moisture adjustment for all sensors during every bump test is not necessary or practical. To support their comments, FHR stated that the Gulf Coast experiences significant day-to-day variation in ambient moisture levels, citing relative humidity data for Corpus Christi in October 2021.[9] Using the proximity of a sensor node to a steam letdown station as an example, FHR and Molex further explained that localized relative humidity conditions can vary significantly within a specific process unit, with moisture levels potentially changing with each steam plume that passes a sensor node. Additionally, Molex stated that even when a sensor has a response to humidity changes, using a higher gas concentration (*e.g.,* 1 part per million (ppm) instead of 0.5 ppm isobutylene) may be an appropriate step. Because these localized conditions may not affect all sensor nodes in the process unit, FHR and Molex recommended allowing ambient moisture adjustments as necessary, in place of requiring these adjustments for all sensors during each bump test. Finally, FHR requested revisions to the recordkeeping requirements related to the ambient moisture level during bump tests if the requested changes are made in the AMEL.

Response: There was not sufficient information provided to substantiate the removal of the requirement. The EPA is retaining the moisture adjustment requirement due to general sensitivities of sensors to humidity. The EPA has clarified the criteria for these adjustments in paragraph IV.A.(5)(b)(i). The EPA has not made any adjustments to the recordkeeping requirements as a result of this clarification.

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[9] See Document ID Nos. EPA-HQ-OAR-2021-0299-0035 and EPA-HQ-OAR-2021-0299-0036.

Comment: FHR and Molex requested a correction to the vertical sensor placement requirement in the AMEL. Specifically, both commenters noted that the initial notice required placement of sensors at least every 20 feet vertically. The commenters stated their concern that this was an error and that placement every 40 feet vertically was included in the LDSN design used for the pilot test study and equivalency demonstration. As such, the commenters requested clarification that sensor placement within 40 feet vertically is required. Another commenter[10] asked how the AMEL ensures all LDAR components are covered under the AMEL.

Response: The EPA is clarifying that sensors must be spaced no more than 40 feet apart vertically, such that no component is more than 20 feet vertically from a sensor. The data submitted by FHR demonstrates that this vertical spacing provides coverage for all applicable components. The LDSN-DRF requirements in this AMEL are designed to cover all LDAR components in the Mid-Crude and Meta-Xylene process units at FHR's West Refinery.
As part of the AMEL, FHR must document that all LDAR components covered by the AMEL are less than the required distances from a sensor node both vertically and horizontally. These distance limits are based on the pilot test study used in the equivalency demonstration.

Comment: FHR and Molex requested a change in the response factor requirement from 3 to 10. FHR stated that EPA Method 21 requires a response factor of 10, and FHR requested this same response factor for the LDSN because it is equivalent to the EPA Method 21 requirement. Further, FHR stated that the response factor for all streams within the process units covered by this AMEL is less than 3, which would meet their requested limit of 10. Additionally, FHR is

[10] See Document ID No. EPA-HQ-OAR-2021-0299-0032.

concerned that limiting the use of the LDSN to streams with a response factor of 3 or less will restrict the applicability of the AMEL and may affect the use of the AMEL in the Mid-Crude and Meta-Xylene process units should certain operational changes occur that result in those process units having process streams with response factors above 3. Similarly, Molex commented that this limit would potentially prevent other facilities from applying for an AMEL. Finally, both FHR and Molex commented that Molex has significantly improved the ability of their algorithm to detect leaks and requested that the allowable response factor limit be increased. Another commenter[11] noted that there was no data to support the system would perform adequately for response factors greater than 10 and noted that ethylene was particularly difficult to detect during the testing.

Response: In the initial AMEL application, FHR stated that the average response factor in the Meta-Xylene unit is 0.8, and that the response factor for some LDAR streams in the Mid-Crude unit can be as high as 3. While it is possible that the LDSN will perform adequately at response factors greater than 3, the data in the pilot test study and equivalency demonstration was limited to streams with response factors at or below 3. As such, without further data supporting the system's performance for streams with higher response factors for these process units, the EPA is retaining the response factor limit of 3 at the Mid-Crude and Meta-Xylene process units at FHR's West Refinery in Corpus Christi, Texas. Because each AMEL is site-specific, the EPA would evaluate any future AMEL requests, including the appropriate response factor limit, based on data provided for the site-specific application of the LDSN-DRF system.

[11] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

Comment: One commenter[12] noted that sensor maintenance may be extensive with the quarterly bump test requirements and replacements within 30 days if the sensor fails. Another commenter[13] asked why the passing criterion of a bump test is only 50 percent of the standard's nominal concentration, how initial calibration and set-up of sensors would be conducted and verified, and how sensor baseline levels are continuously monitored to ensure proper operation.

Response: Sensors must be calibrated by the manufacturer prior to deployment. Once installed, each sensor must be tested for responsivity and wireless communication by challenging it with isobutylene gas or another appropriate standard. Sensors must pass a quarterly bump test or be recalibrated or replaced. These bump tests are not calibrations, but simply tests for responsiveness.

Comment: One commenter noted that the LDSN was similar to a Continuous Emissions Monitoring System and asked what repercussions there would be for excessive downtime. The commenter noted that an appeal of the LDSN is the continuous monitoring, as opposed to intermittent EPA Method 21 monitoring, but noted that sensor failure is inevitable.

Response: Each individual sensor is limited to a downtime of no more than 10 percent on a rolling 12-month basis. Anything above this threshold is a deviation. These deviations must be included in the semiannual reports required under the AMEL. Deviations from any requirement or obligation established in this AMEL, including the individual sensor downtime limitation, are violations that may be subject to enforcement.

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[12] See Document ID No. EPA-HQ-OAR-2021-0299-0034.
[13] See Document ID No. EPA-HQ-OAR-2021-0299-0032.

D. Comments and Responses Related to the DRF

Comment: The EPA included a 30-day repair requirement for leaks on components not subject to LDAR requirements in the initial notice. FHR commented that non-LDAR component leaks are outside the scope of the regulations covered in this AMEL; therefore, repair should not be required under this AMEL. To support their comment, FHR noted these non-LDAR component leaks are regulated separately under programs such as CERCLA and TCEQ rules, with such leaks reported as title V deviations and subject to enforcement. In follow up discussions,[14] FHR requested that if the EPA were to require repair under this AMEL for non-LDAR component leaks, then these leaks should also have provisions for delay of repair consistent with the provisions for LDAR component leaks. Additionally, FHR requested that if a non-LDAR leak is identified during an investigation for a potential source location (PSL), then repair of that non-LDAR component leak should provide allowance to close the PSL. Another commenter[15] asked if these non-LDAR component leaks would be subject to a 15-day repair requirement.

Response: The EPA disagrees with FHR and has maintained a requirement in this AMEL to complete and verify repairs of leaks on non-LDAR components within 30 days of identification. The EPA included a 30-day repair requirement for leaks on components not subject to LDAR requirements in the initial notice both to require repair of leaks found (whether or not the leak is from an LDAR component) and to ensure that the LDSN is not confounded by

[14] See supporting materials from May 25, 2022, follow-up discussions with FHR located at Docket ID No. EPA-HQ-OAR-2021-0299.

[15] See Document ID No. EPA-HQ-OAR-2021-0299-0032.

the presence of these non-LDAR component leaks. 86 FR 56943 (October 13, 2021). The EPA still finds that these leaks have the potential to negatively impact the performance of the LDSN by potentially masking leaks from covered LDAR components which may occur in the same area as the non-LDAR component leak. Additionally, these non-LDAR component leaks would already require repair under the general duty to reduce emissions in each of the applicable subparts. However, the EPA does agree with FHR that delay of repair provisions should also apply to non-LDAR components; therefore, the AMEL approved in this notice allows for delay of repair of non-LDAR component leaks when repair cannot be completed within 30 days of identification and either: (1) The repair is technically infeasible without a process unit shutdown or (2) the non-LDAR component is isolated from the process and does not remain in contact with process fluids. We also note that these requirements will not supersede repair requirements in other regulations to which these non-LDAR components may be subject, and that leak sources outside the AMEL covered area are not included in this repair requirement.

Comment: FHR noted that the initial notice did not address their request to close a PSL if no emissions source is identified and there is no update to the PSL for 14 days (*i.e.,* there are no positive detections for more than five percent of the time over a 72-hour period). In their comments, FHR again requests the ability to close the PSL if, after complying with the initial and secondary surveys, there are no updates to the PSL for 14 days, instead of keeping the PSL open and conducting a final EPA Method 21 survey after 90 days, as required in paragraph IV.B.(4). FHR noted in their comments that the requested 14-day closure option would not apply to leaks that are ongoing and continuing to generate positive detection in the sensor network. They further state that if a PSL is closed and the leak reappears, the system would generate a

new PSL which is then subject to the investigation requirements of the DRF. FHR provided suggested revisions to paragraph IV.B.(4) of the AMEL to incorporate closure of the PSL at both 14 days and 90 days.

Another commenter[16] stated that a PSL should not be closed out if the leak is unable to be found. This commenter raised concerns that the AMEL appeared to allow operations/maintenance to "close out" a PSL when a leak is unable to be found even when the sensor is detecting a leak.

Finally, FHR recommended specific revisions to the recordkeeping and reporting requirements for PSL closures. First, they recommended adding records and reporting of a source outside the AMEL-covered process unit or a non-LDAR component leak source to paragraph IV.C.(11), as applicable. Second, FHR recommended adding records and reporting for PSL closures that occur where no cause of the PSL was determined after 14 days. Lastly, FHR recommended reporting the number of PSLs that are closed because the emissions were authorized, from a source outside the AMEL covered process unit, and from a non-LDAR component leak source.

Response: The EPA agrees that there is the potential to have a transient leak and it is reasonable to close a PSL if the sensor nodes are not showing any indication of leak after 14 days and the required investigations have been conducted following generation of the PSL. Further, the EPA agrees that if a persistent leak is present, or the leak reappears, the LDSN is expected to continue generating a new PSL or updates to an existing PSL, thus triggering new investigations

[16] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

for the emissions source. Therefore, the EPA has revised paragraph IV.B.(4) to include an allowance to close the PSL if the initial and secondary investigations failed to identify the leak source and there have been no updates to the PSL for 14 days as requested by FHR.

Further, the EPA is clarifying the requirements for PSL closure in situations where 90 days have passed since the original PSL notification, but the sensor nodes still indicate the presence of a leak. First, we are adding language to paragraph IV.B.(4)(b) to specify the requirements of that paragraph apply when 90 days have passed since the original PSL notification.[17] Second, we are clarifying that a full survey of all LDAR-applicable components must be conducted within 10 calendar days following the 90-day period following the original PSL notification to verify there are no detectable leaks within that PSL before closure of the PSL is allowed. Finally, the EPA is making the requested adjustments to the recordkeeping and reporting requirement.

Comment: FHR commented that the requirements around the accuracy and precision of the Global Positioning System (GPS) data collected during the 30-minute initial investigation are too narrow and limit the use of future technological advancements. Additionally, FHR raised a concern regarding how the exact path generated by the GPS tracking may be evaluated for compliance. Specifically, FHR noted that the process units included in this AMEL are multi-story with dense equipment areas. The specific path generated by the GPS tracking may indicate the technician was outside the PSL during the investigation or may indicate gaps in data. To

[17] Paragraph IV.B(3) requires initiating a new investigation within 3 calendar days when the detections increase by a factor of 2 since the original PSL notification.

address these concerns, FHR suggested revisions to the language in paragraph IV.B.(1)(g) that include: (1) Record of coordinates to an accuracy and precision of 5 or more decimals of a degree, and (2) using the North America Datum of 1983 or newer to document the path taken by or presence of the technician in the PSL.

Response: The EPA agrees with this comment and the suggested revisions provided by FHR because it is not our intent to limit the technology options to meet this GPS tracking requirement. As such, we have revised the AMEL to require records of the latitude and longitude coordinates in decimal degrees to an accuracy and precision of 5 or more decimals of a degree using the *North American Datum of 1983* or newer to document the path taken by or presence of the technician in the PSL during the screening investigation.

Comment: One commenter[18] raised concerns with the requirement to conduct an initial investigation within 3 days of a new PSL notification. This commenter stated that a first attempt at repair is required within 5 days of leak detection, but FHR would not begin looking for a leak source until 3 days after the LDSN has identified a potential leak. The commenter notes that waiting 3 days to investigate the PSL would allow for greater emissions and little time to make a good effort at a first attempt to repair the leaking component. Further, this commenter points to the requirements at 40 CFR 63.163(c)(1), which state repairs must be made "as soon as practicable," and states their belief that the 3-day gap between LDSN detection and PSL investigation does not meet this requirement.

[18] See Document ID No. EPA-HQ-OAR-2021-0299-0033.

Response: The EPA notes that the LDSN is a continuous system, and as such, PSLs can form at any time. It is reasonable to allow some timeframe for an investigation to begin to ensure that the appropriate personnel are onsite to conduct the investigation. Additionally, current work practices only require inspections of components on an infrequent basis. Allowing a short timeframe after PSL formation to begin an investigation still addresses issues much sooner than they would be under current work practices. As such, the EPA has found that the requirements of this AMEL result in equivalent or better emission reductions when compared to the current LDAR requirements.

Comment: One commenter[19] stated that FHR should have to monitor all LDAR applicable components in a PSL using EPA Method 21 to ensure that no leaks in the PSL are missed. This commenter correctly noted that the AMEL would require FHR to perform an investigation to identify the source of a leak in a PSL, and that once FHR identifies one component with a maximum concentration of 3,000 parts-per-million by volume (ppmv) they would not be required to monitor any more components in the PSL. The commenter stated their concern that leaking components would be missed, and this is counter to a common problem identified in the EPA's Best Practices Guide for LDAR,[20] failure to monitor all regulated components. Another commenter[21] noted that typical analyzers that would be used to obtain an EPA Method 21 concentration reading will lose 10 times a source concentration measurement

[19] See Document ID No. EPA-HQ-OAR-2021-0299-0033.
[20] EPA, *Leak Detection and Repair: A Best Practices Guide*, located at *https//www.epa.gov/sites/default/files/2014-02/documents-ldarguide.pdf*.
[21] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

for every one-inch the sensor or probe moves away from the emission source but did not provide additional information on this statement. This same commenter noted that the higher leak definition seems to contradict the efficacy of the system when compared to EPA Method 21 programs, especially where the EPA has lowered leak definitions for petroleum refineries.

Response: The EPA disagrees with the commenter. Requiring every component in every PSL to be monitored would be more stringent than the requirements summarized in Table 1. The design of the LDSN is such that it will continuously operate and continue to find any additional leaking components once a PSL is closed out. The results of the pilot test study and equivalence modeling demonstrate, to the Administrator's satisfaction, that the emission reductions achieved by the LDSN-DRF are equivalent or better than the emissions reductions achieved by the current LDAR requirements. While there may be some small leaks that go undetected, due to the continuous nature of the network, larger leaks, or even clusters of small leaks, can be found and fixed much faster.

Comment: One commenter[22] requested that the EPA define what facility information would be included or required to issue a PSL. This commenter also asked what concentration (in ppmv) defines "emission anomalies"[23] and whether this is a fixed concentration or if it varies by process unit.

Response: This LDSN uses a web-based analytics platform that automatically acquires and analyzes the real-time data from the sensor nodes, along with wind and facility component

[22] See Document ID No. EPA-HQ-OAR-2021-0299-0032.
[23] 86 FR 56939 (October 13, 2021).

locations, to issue a PSL. As stated in response to comment in section II.C, an emissions anomaly is defined as any detection by the sensor network greater than the detection floor.

Comment: One commenter asked if a leaking component placed on delay of repair will result in the continuous detection of that emission or if those sensors detecting the component will be shut down or adjusted.

Response: Placing a component on delay of repair does not require the sensors detecting those emissions to be shut down. Sensors will still detect emissions from the component, but a PSL is generated that isolates the emissions from that component and allows the system to still identify emissions from other nearby areas.

Comment: One commenter[24] raised concerns that the DRF is a protocol that facility operations will need to follow to support this new LDAR approach. The commenter stated that similar to the common stereotypes surrounding LDAR technicians/contractors failing to perform their duties, an argument can be made on the potential disconnect between facility operations and environmental staff. This commenter raised questions about incentives for operations to manage the system and what potential compliance gaps may occur for failure to report an emissions event, ignored sensor readings, failure to investigate a PSL, or failure to complete required documentation.

Response: This AMEL applies to the Mid-Crude and Meta-Xylene process units at FHR's West Refinery in Corpus Christi, Texas. FHR must comply with all of the conditions in the AMEL. The failure to comply with any condition in the AMEL, like the failure to comply

[24] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

with any of the work practice standards replaced by the AMEL, is a CAA violation subject to enforcement.

E. Comments and Responses Related to Recordkeeping and Reporting

Comment: FHR requested specific modifications to the requirements for documentation related to management of change (MOC) to clarify that this documentation requirement is only for MOC in the AMEL covered process units.[25] Another commenter[26] stated that evaluating sensor network MOC would likely require constant involvement with Molex.

Response: The EPA agrees with FHR's request and has made this change within the AMEL. The comment regarding Molex's involvement in MOC is outside the scope of this AMEL.

Comment: FHR and Molex requested revisions to paragraph IV.C.(7) of the AMEL related to the recordkeeping requirements for raw sensor data. The EPA included a requirement to maintain records of all raw sensor readings, in addition to, the percent of time positive detections were registered during the 72-hour lookback, and the minimum, average, and maximum detection floor. FHR and Molex commented that this amount of recordkeeping would create vast amounts of data that could be better managed as part of a batch, periodic evaluation. Further, the commenters noted that while the algorithm is constantly performing the calculations to provide this data, the data is not specifically recorded (*i.e.,* the data elements are not saved as defined in the requirement). Both commenters state that these calculations could be recreated at

[25] See Document ID No. EPA-HQ-OAR-2021-0299-0036.
[26] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

any time from the raw data that is saved and requests that the AMEL be modified to require records of the raw data, records of any notifications, and alerts from the algorithm and periodic validation of the algorithm. FHR and Molex suggested specific language for paragraph IV.C.(7) in their letters.[27]

Response: The EPA disagrees that these data are superfluous and finds that recording of these data is important to maintain in order to establish an enforceable record of performance. Additionally, if algorithms for generating alerts change over time, the EPA is concerned it would alter the ability of FHR to replicate those original records as they were generated. For these reasons, the EPA has not removed the requirement to retain these records.

Comment: FHR commented that some reporting requirements in the applicable subparts are no longer meaningful to components covered by the AMEL. For example, FHR noted the percent leaker calculation will no longer be meaningful because the number of components monitoring with EPA Method 21 will be minimal compared to the total population of equipment, thus, the percent leaker value is no longer a meaningful metric. FHR recommended a revision to paragraph IV.D.(1) to state that reporting of required information in the relevant subparts be limited to components not covered by the AMEL.

Response: The EPA has added language to clarify reporting requirements from relevant subparts that are no longer relevant and replaced by the LDSN.

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[27] See Document ID Nos. EPA-HQ-OAR-2021-0299-0035 and EPA-HQ-OAR-2021-0299-0036.

Comment: One commenter[28] stated that new reporting and recordkeeping requirements are potentially burdensome and would be prone to compliance gaps. This commenter further stated there would be confusion for the industry on how to properly report information, and confusion for the EPA on how to properly evaluate those reports.

Response: The EPA disagrees that the recordkeeping and reporting requirements within the AMEL are prone to compliance gaps. The requirements within the AMEL are necessary to ensure compliance with the AMEL and are stated clearly. Without more information on these potential gaps, we are not adjusting the reporting and recordkeeping requirements based on this comment.

F. Comments and responses related to additional annual compliance demonstration

Comment: FHR commented that the proposed method to determine which valves to monitor for the annual compliance verification would be complicated to execute and proposed an alternative or secondary option that would require monitoring all valves in light liquid/gas vapor (LL/GV) service every 2 years, with half monitored in the first year and half monitored in the second year of a 2-year cycle. This monitoring alternative would be in addition to monitoring all pumps in every annual compliance verification survey. FHR stated that implementing the proposed valve monitoring would be difficult to execute in practice, requiring field surveys to measure distances of valves both horizontally and vertically from individual sensor nodes.

In their proposed alternative, FHR would monitor 50 percent of the LL/GV valves each year (*e.g.,* odd numbered valves monitored in year 1 and even numbered valves in year 2). They

[28] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

stated that this would result in performing EPA Method 21 monitoring on more valves than the method proposed by the EPA, and it would provide for easier administration of the annual compliance verification as it is based on the current tagging system in place at the refinery. FHR further stated that any EPA Method 21 instrument readings greater than 18,000 ppmv would be plotted on a plot plan showing the sensors and active PSLs, and corrective action would be triggered as outlined in paragraph IV.E.(1)(e) of the initial notice (86 FR 56949; October 13, 2021). FHR also requested the removal of the phrase "under current investigation" as an investigation may not have been initiated when this compliance monitoring is conducted.

Response: The EPA recognizes that the proposed verification strategy in FHR's comments is easier to implement and will result in more components monitored with EPA Method 21 during the annual compliance demonstration of the LDSN. As such, we are revising the final AMEL to allow an alternative verification procedure based in part on FHR's comments. The final AMEL will allow FHR to monitor 50 percent of the LL/GV valves in the process unit at a time, as suggested in their comment.

Comment: FHR and Molex both commented that, as proposed, a single component with a reading of 18,000 ppmv or greater (excluding active PSLs or components on delay of repair) would result in noncompliance for the entire LDSN, with that noncompliance extending until the corrective actions are complete and FHR has re-monitored the process unit to demonstrate no components are leaking above 18,000 ppmv outside an active PSL. These commenters requested revisions to the AMEL that would allow FHR the opportunity to address small gaps in the LDSN without considering the entire LDSN out of compliance. FHR stated that as written, one single gap in coverage invalidates the entire network even if it is working as designed and detecting

leaks in the unit, and non-compliance with the AMEL would equate to non-compliance with all the underlying LDAR regulations. Further, FHR noted that the steps required to come back into compliance could extend beyond 120 days, especially since the EPA would have to review and approve any changes to the LDSN. Therefore, FHR also requested an avenue to come back into compliance in less than the 120-day cycle outlined by the EPA.

FHR provided a recommendation on how gaps they classified as "minor" could be addressed if the EPA were to accept their recommendation. FHR proposed using a threshold of 10 percent of monitored components above 18,000 ppmv to determine when the entire LDSN is out of compliance versus when a more targeted approach to addressing compliance issues may be appropriate. Specifically, FHR recommended that if less than 10 percent of the components monitored during the annual compliance verification were found leaking above 18,000 ppmv, and these components had not been identified by the LDSN (not in an active PSL and not on delay of repair), then FHR would conduct EPA Method 21 monitoring of all remaining LL/GV valves and pumps within a 15-foot radius of each 18,000 ppmv leaking component and repair any leaks identified. FHR would then modify the LDSN, and the non-compliance period would end after conducting the described EPA Method 21 monitoring and repairing all leaking components (or placing them on delay of repair, as applicable). FHR stated that all leaking components found above 18,000 ppmv would be considered deviations of the AMEL and reported as such. In addition, FHR stated they would conduct quarterly EPA Method 21 monitoring of all LL/GV valves and pumps within this 15-foot radius until the LDSN modification is completed and the modification has been tested through the required EPA Method 21 monitoring following the modification. FHR stated that any component found leaking

above 18,000 ppmv during these quarterly monitoring events would be considered a deviation and reported as such in the periodic AMEL report and applicable title V deviation report.

FHR also proposed that, if more than 10 percent of the components monitored during the annual compliance verification were leaking above 18,000 ppmv and these components had not been identified by the LDSN, then the LDSN is not working properly and in this circumstance, FHR stated that it is appropriate to consider the LDSN out of compliance with the AMEL. In this situation, FHR stated that EPA Method 21 monitoring would be conducted as required in the underlying LDAR regulations on all AMEL covered LL/GV valves and pumps until the LDSN system is redesigned, approved, implemented, and tested through the required EPA Method 21 monitoring following the modification.

Additionally, FHR requested the timeline for submitting proposed revisions to the LDSN be changed to either 45 calendar days or, alternatively, 30 business days because it would take 7 to 10 days to verify if any identified leaks are within an active PSL or on delay of repair. Engagement with Molex for the redesign would take 2 weeks, and FHR would need at least 2 weeks to develop the proposal prior to submitting the LDSN revisions to the EPA for approval.

FHR also proposed defining several keys terms related to their proposed approach to determining compliance through the annual verification discussed in these comments: (1) Active PSL, (2) non-compliant (NC) leaker, and (3) zone of inadequate coverage (ZIC). First, FHR proposed to define an active PSL as "a PSL where a detection or PSL update has occurred within the previous 14 days or a PSL that is generated up to 72 hours after the monitoring event, indicating that the LDSN algorithm was in the process of determining whether a leak had begun when the monitoring took place." Next, they proposed to define a non-compliant leaker (NC

leaker) as "a component exhibiting a 18,000 ppmv leak or greater during annual compliance verification monitoring that is outside an active PSL and/or is not a leaker currently on delay of repair." Finally, FHR proposed to define the ZIC as "a 15-foot radius horizontally and vertically around a component that is found to be leaking above 18,000 ppmv during any annual compliance verification monitoring conducted pursuant to paragraph IV.E.(1)(b)-(c)."

Response: The EPA agrees with FHR that it is not appropriate to consider the entire system out of compliance due to the LDSN failing to detect a single leak of 18,000 ppmv or greater. However, we do not agree with FHR's proposal that compliance of the entire LDSN is achieved until more than 10 percent of monitored components are found leaking above 18,000 ppmv during the additional annual compliance demonstration. The EPA has revised the additional annual compliance demonstration to: (1) define NC leakers, (2) define when a root cause analysis and corrective action must be conducted, and (3) define what steps must be taken to bring the system back into compliance. First, the EPA is requiring FHR to plot all components with leaks above 3,000 ppmv on a plot plan of the process unit. For any component not already identified in a PSL or placed on delay of repair, a NC leaker would be defined as either of the following: (1) a component with a leak above 3,000 ppmv that is within 18 feet of a sensor node or (2) a component included in the LDSN-DRF system with a leak equal to or greater than 18,000 ppmv, regardless of distance to a sensor node. Each NC leaker is a deviation of the AMEL and may be subject to enforcement. Each NC leaker should be reported as a deviation until repairs are made and verified and all other components in the ZIC are monitored with EPA Method 21 and repaired or placed on delay of repair as necessary. Additionally, FHR must perform a root cause analysis and take corrective action to address issues with the LDSN. If 2 or

more NC leakers are found, the LDSN is out of compliance unless corrective action is completed within 45 days.

Comment: FHR and Molex requested removal of the requirement for leak simulations using a controlled release of isobutylene after modifying the LDSN. Both commenters stated the 1.4 g/hr controlled release is not directly correlated to an 18,000-ppmv leak rate. Further, both commenters stated that conducting a controlled release is more appropriate for scientific experiments and requires a controlled environment with no other interfering gases. Further, both commenters noted that the 2-year annual compliance verification clock would reset with each non-compliant leaker found, which will ensure at least 2 additional EPA Method 21 surveys of the redesigned system. Both commenters agree with retaining the requirement to conduct a follow up survey with EPA Method 21 within 60 days after implementing any changes to the LDSN.

Response: The EPA agrees with the commenters and has made this change to remove the requirement to conduct a controlled gas release of isobutylene following LDSN modification. However, the EPA notes that FHR could utilize a controlled gas release of isobutylene as part of the root cause analysis/corrective action requirements in paragraph IV.E.(1)(i.

Comment: One commenter[29] expressed concerns that the requirements of the additional annual compliance demonstration are not more cost-effective than the EPA Method 21 requirements the AMEL would replace. They specifically stated that a compliance issue would be identified if a "statistically significant" number of EPA Method 21 readings are greater than

[29] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

1.2 times the DTU but noted that the term "statistically significant" was not clearly defined. Further, the commenter noted that random sampling does not seem like an acceptable performance metric or a safe mode of operation. Finally, the commenter noted the requirements to reevaluate the LDSN and perform additional EPA Method 21 upon redesign seems costly.

Response: The EPA notes that this comment applies to the verification proposed by FHR in its AMEL application. In the AMEL proposed by the EPA, the EPA did not propose that less than a statically significant number of leaks that were greater than 1.2 times the DTU would verify the system works. Instead, the EPA proposed that there should be no leaks above the DTU in order to verify that the system works. The potential cost effectiveness is not a factor in the EPA's determination of equivalency of this AMEL and is, therefore, out of scope.

Comment: One commenter[30] suggested performing 2 additional biennial (every other year) compliance demonstrations after FHR demonstrates no leaks above 18,000 ppmv during 2 consecutive annual demonstrations, before allowing the sunset clause on additional annual demonstrations to come into effect. This commenter also asked whether FHR or a third-party would be conducting the EPA Method 21 monitoring for these compliance demonstrations, stating that use of staff from another facility or a third-party may provide a more robust compliance demonstration.

Response: The commenter did not provide any additional information to support the necessity of additional biennial demonstrations after FHR finds no leaks above the specific thresholds defined in section IV.E of the AMEL. The EPA notes that revisions have been made

[30] See Document ID No. EPA-HQ-OAR-2021-0299-0032.

to the additional annual compliance demonstration based on feedback from other commenters. The EPA does not specify who would perform the EPA Method 21 monitoring and leaves that to the discretion of FHR.

G. Comments and responses on other topics related to the AMEL

Comment: FHR requested additional references be added to Table 5 of the initial notice (Table 1 in section IV of this notice) so that they are covered under the AMEL. The specific references and provisions include the following:

- 40 CFR part 60, subparts GGG and GGGa (NSPS GGG and NSPS GGGa) – NSPS for Equipment Leaks of VOC in Petroleum Refineries
- 40 CFR 63.163(d)(2) – National Emission Standards for Hazardous Air Pollutants for Organic Hazardous Air Pollutants From the Synthetic Organic Chemical Manufacturing Industry (HON) pump quality improvement program (QIP)
- 40 CFR 63.181(b)(1)(i) – List of identification numbers for equipment subject to the HON
- 40 CFR 63.181(b)(4)-(5) – List of instrumentation systems and list of screwed connectors
- 40 CFR 63.181(h) – QIP program recordkeeping
- 40 CFR 60.482-7(h)(2) and 40 CFR 60.482-7a(h)(2) – Criteria for a valve to be designated as difficult-to-monitor
- 40 CFR 60.486(b)(2) and 40 CFR 60.486a(b)(2) – Leak tag removal after 2 consecutive months of monitoring with no leaks detected after repair

- 40 CFR 60.486(e)(1) and 40 CFR 60.486a(e)(1) – List of identification numbers of equipment subject to 40 CFR part 60, subparts VV and VVa (NSPS VV and NSPS VVa).

Another commenter[31] stated their support for the EPA to remove requirements for maintaining a list of components or tracking LDAR changes on a component-by-component basis because these activities can add significant cost to a traditional LDAR monitoring program. This commenter also stated that moving away from tracking LDAR changes and tagging of individual LDAR components would encourage further acceptance of newer technologies.

Response: The EPA agrees with FHR that some of the specific references and provisions are appropriate for inclusion in this AMEL. As such, Table 1 of the AMEL has been updated to include:

- NSPS GGG and NSPS GGGa because the LDSN-DRF has been demonstrated to provide emission reductions at least equivalent to those required by the requirements in those subparts.
- HON pump QIP because we are already including the valve QIP and view the AMEL as an alternative for pumps as well.
- QIP program recordkeeping because it is not relevant if FHR is not using the QIP.
- Criteria for a valve to be designated as difficult-to-monitor because the AMEL already serves as an alternative for difficult-to-monitor monitoring.

[31] See Document ID No. EPA-HQ-OAR-2021-0299-0037.

- Leak tag removal after 2 consecutive months of monitoring with no leaks detected after repair because the 2-month follow up on leaking valves is not required under the AMEL.

We disagree that the other references to the lists of equipment identification numbers are appropriate to add to Table 1. Because the AMEL requires FHR to maintain records that indicate what equipment is complying with the AMEL or the applicable EPA Method 21 requirements, the EPA finds that maintaining these lists of equipment are important for compliance assurance purposes.

Comment: Multiple commenters supported the implementation and advancement of sensor networks for leak detection. One commenter[32] stated their support for alternative means of compliance that do not include duplicative EPA Method 21 monitoring as that decreases the creation and adoption of new technology. Another commenter[33] noted that programs such as this LDSN-DRF, should be implemented because they can speed up the leak detection process.

Response: The EPA has noted the support for these sensor networks.

Comment: One commenter[34] stated that the abbreviation "ppbe" was not included in the Table of Abbreviations.

Response: This abbreviation has been added as requested.

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[32] See Document ID No. EPA-HQ-OAR-2021-0299-0037.
[33] See Document ID No. EPA-HQ-OAR-2021-0299-0033.
[34] See Document ID No. EPA-HQ-OAR-2021-0299-0032.

Comment: One commenter[35] remarked on the CRADA between FHR, Molex, and the EPA Office of Research and Development. First, this commenter stated that FHR did not present the results of their study at a recent conference, thus preventing public scrutiny of its results and in direct conflict with one of the longer-term objectives of the CRADA to "disseminate non-proprietary technical learning established in this CRADA by publishing aspects of this research as part of scientific conferences and in peer reviewed journal articles and reports."

Next, the commenter provided comments comparing the CRADA to EPA Method 21. Specifically, the commenter stated that the CRADA postulates unsubstantiated claims that are critical of EPA Method 21, such as modest emission reduction estimates based on concentration measurements at the leak interface, high turnover rates for inspectors, inefficiency with monitoring all components to find the few that are leaking, and difficulty with interfacing the data management and reporting software in multiple touchpoints. This commenter provided counter arguments to the statements in the CRADA, specifically noting that data loss is an issue also built into the LDSN-DRF.

Third, the commenter noted that common complaints about EPA Method 21 could also apply to the LDSN-DRF. The specific complaints noted in the comment letter deal with inefficiencies of programs (most components are not leaking), expense (safety and human capital), non-efficacy (all leaks will not be identified, or there may be a long time between checks), and proneness to error (recordkeeping for thousands of inspection events). The commenter noted that with the wrong incentives in place, LDAR can be ineffective. On the other

[35] See Document ID No. EPA-HQ-OAR-2021-0299-0034.

hand, the commenter also notes that having an effective LDAR program provides additional "eyes and ears" for operations and maintenance because they can proactively inform these programs. The comment is concerned that the LDSN-DRF system would remove the presence of LDAR contractors from the refinery.

Response: The EPA made all the information provided by FHR available to the public in this docket and provided the opportunity for the public to comment on the data. Additionally, the report from the CRADA is publicly available.[36] Whether or not this study was presented in other forums is outside the scope of this AMEL.

Comment: One commenter[37] asked how EPA would perform an audit of this AMEL. This commenter also specifically asked how the EPA would determine that enough sensors are present in the process unit to effectively detect leaks, noting that FHR determined that additional sensors were needed during the pilot study.

Response: An additional annual compliance verification procedure has been established in section IV.E of the AMEL which includes EPA Method 21 monitoring of components to ensure that the LDSN-DRF is properly detecting leaks from components covered by this AMEL. This procedure includes EPA Method 21 monitoring of components covered by this AMEL to verify that the LDSN-DRF is detecting leaks as intended. The EPA would also look at records related to sensor downtime, actions taken in response to PSLs, and sensor bump tests, among other information required by the AMEL to determine compliance with the requirements. The

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[36] *https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=350905&Lab=CEMM*
[37] See Document ID No. EPA-HQ-OAR-2021-0034.

procedure for developing the optimized sensor node placement is laid out in the CRADA report, and the information provided in FHR's AMEL application demonstrates that the LDSN-DRF will provide a reduction in emissions at least equivalent to the reduction in emissions required by the applicable LDAR standards.

Comment: One commenter[38] stated that this LDSN framework should not replace, but instead should supplement, current LDAR practices.

Response: For the purposes of this AMEL, the EPA finds the pilot test study shows the LDSN provides equivalent or better emission reductions as the current LDAR requirements for the Mid-Crude and Meta-Xylene process units at FHR's West Refinery in Corpus Christi, Texas.

H. Out of Scope Comments

Several comments were received that are outside the scope of this AMEL.

Comment: One commenter asked if the LDSN will detect methane leaks and if the EPA will ask for methane reductions in the future.

Response: The AMEL is an alternative to LDAR work practices for VOC and HAP emissions. Any use of the LDSN for methane detection is outside the scope of this AMEL.

Comment: One commenter[39] asked if this AMEL will address how the facility will estimate emissions and permitted emission rates for equipment leak fugitive sources, and what effect this AMEL will have on permitting emission factors and control efficiencies based on traditional leak definitions and monitoring frequencies.

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[38] See Document ID No. EPA-HQ-OAR-2021-0034.

[39] See Document ID No. EPA-HQ-OAR-2021-0299-0032.

Response: This AMEL does not address how the facility will estimate emissions and permitted emission rates for equipment leak fugitive sources, as that is outside the scope of this AMEL, and the applicable standards summarized in Table 1 of section IV.

Comment: One commenter stated that the data presented in this AMEL shows that nontraditional LDAR components should be monitored too.

Response: Expanding the requirements of current LDAR programs is outside of the scope of this AMEL. Additionally, this AMEL is limited in scope to the proposed LDSN-DRF and whether or not it results in equivalent or better emissions reductions. However, we note that we are requiring the repair of non-LDAR leaks in this AMEL when they contribute to a PSL.

Comment: One commenter stated that the pilot study indicated that the facility's LDAR program was not run as well as it could be and asked why the LDSN would be any different.

Response: This is outside the scope of this AMEL.

III. Final Framework for Streamlining Approval of Future LDSN-DRF AMEL Requests

The EPA is finalizing a framework that sources may use to submit an AMEL request to the EPA for the use of a LDSN-DRF to comply with the LDAR requirements under 40 CFR parts 60, 61, and 63. Sources applying for use of a LDSN-DRF as a work practice standard should provide the EPA with the following information, at a minimum, in their AMEL application to demonstrate equivalency of emission reductions.

A. Site-specific information related to all process unit(s) included in the alternative request

1. Site name and location and applicable process units

2. Detailed list or table of applicable regulatory subparts for each included process unit, the citations within each subpart that will be replaced or changed by the AMEL and, if changed, how it will be changed, and the authority that allows for use of an AMEL

3. Details of the specific equipment or components that will be inspected and repaired as part of the AMEL and whether any equipment within the process unit will not be covered by the AMEL.

4. A diagram showing the location of each sensor in the process unit and the minimum spacing that achieves equivalence (*i.e.,* the furthest distance a component can be located from a sensor while demonstrating equivalence), taking into consideration multi-level and elevated components

5. Information on how MOC will be addressed. At a minimum, the MOC must include a determination of whether the changes are within the LDSN coverage area (*i.e.,* within the specified radius of coverage for each individual sensor, including coverage based on elevation) or if changes will result in components added to an applicable EPA Method 21 work practice where the LDSN would not provide coverage. The MOC must also address updates to the diagrams of each sensor or the list of equipment identification numbers, as applicable.

B. Identification of Monitoring Techniques Used for Both the LDSN and DRF

1. Identification of the sensors that will be used to detect and locate leaks, including the sensor measurement principle, type, and manufacturer

2. Data recording frequency, the minimum data availability for the system and for each sensor, and the process for dealing with periods where data is not available

3. Initial and ongoing QA/QC measures and the timeframes for conducting such measures

4. Restrictions on where the sensors cannot be used

5. How meteorological data will be collected, the specific data that will be collected, and how it will be paired with the sensor data

C. Defined Work Practice

1. Description of what triggers action, description of the action(s) that is triggered, and the timeline for performing the action(s)

2. Definition for when a leak requires repair

3. Identification of repair deadlines, including verification of repair

4. Description for how repairs will be verified

5. Actions that will be taken if an alert is issued by the system, but a leak cannot be found

6. Initial and continuous compliance procedures, including recordkeeping and reporting, if the compliance procedures are different than those specified in the applicable subpart(s)

7. Compliance assurance procedures to ensure the LDSN is operating as designed and corrective actions (including timeframes) in response to findings

D. Demonstration of Equivalency

1. Demonstration of the emission reduction achieved by the alternative work practice including restrictions and downtime. Restrictions should include any conditions which are not demonstrated as equivalent in the request, such as replacement of audio, visual, or olfactory (AVO) monitoring or no detectable emissions standards.

2. Determination of equivalency between the standard work practice and the alternative requested, which may include modeling results.

3. Results of the pilot test study conducted for each unit.

a. For each PSL generated, the date for each notice, the identified emission source, the date the associated emission source was found for each PSL, the date the emission source was repaired, the EPA Method 21 reading associated with the emission source, and the date of the last required and next required EPA Method 21 inspection for the emission source (or identification of the source as not subject to inspection).

b. For each leak found with an EPA Method 21 inspection that was not found by the LDSN-DRF during the test study, the date the leak was found, the EPA Method 21 reading for the leak, the date the leak was repaired, and the inspection frequency of the component.

c. The results of all EPA Method 21 inspections for the unit during the test study.

IV. Final Notice of Approval for the Mid-Crude and Meta-Xylene Process Units at the FHR West Refinery AMEL Request and Required Operating Conditions

Based on information the EPA received from FHR and the comments received through the public comment period, the EPA is approving FHR's request for an AMEL for the LDSN-DRF system for the Mid-Crude and Meta-Xylene process units located at FHR's West Refinery in Corpus Christi, Texas. The specific requirements of this LDSN-DRF AMEL are provided in this section. The approved work practice requirements for the LDSN-DRF will achieve a reduction in emissions at least equivalent to the emissions reductions achieved by the portion of the current LDAR work practice specified in Table 1. This AMEL replaces the portions of the work practice standards outlined in Table 1. The leak definitions specified in Table 2 apply to all EPA Method 21 instrument readings required by this AMEL.

TABLE 1. SUMMARY OF LDAR REQUIREMENTS TO BE REPLACED WITH THE LDSN-DRF AMEL REQUIREMENTS

Applicable rules with LDAR requirements	Citation	Requirement replaced with LDSN-DRF AMEL Requirements
NSPS VV	60.482-2(a)(1)	EPA Method 21 monitoring of pumps in light liquid service.
	60.482-7(a) and (c)	EPA Method 21 monitoring of valves in gas/vapor service and in light liquid service.
	60.482-7(h)(2)	EPA Method 21 monitoring criteria for difficult-to-monitor
	60.482-7(h)(3)	EPA Method 21 monitoring at a reduced frequency for valves in gas/vapor service and in light liquid service that are designated as difficult-to-monitor.
	60.486(b)(2)	Leak tag removal after 2 consecutive months of monitoring with no leaks detected after repair
	60.486(g)	Schedule of monitoring and leak percentage for valves utilizing skip periods.
NSPS VVa	60.482-2a(a)(1)	EPA Method 21 monitoring of pumps in light liquid service.
	60.482-7a(a) and (c)	EPA Method 21 monitoring of valves in gas/vapor service and in light liquid service.
	60.482-7a(h)(2)	EPA Method 21 monitoring criteria for difficult-to-monitor
	60.482-7a(h)(3)	EPA Method 21 monitoring at a reduced frequency for valves in gas/vapor service and in light liquid service that are designated as difficult-to-monitor.
	60.482-11a(a), (b), (b)(1), (b)(3), (b)(3)(i)-(iv), and (c)	EPA Method 21 monitoring of connectors in gas/vapor service and in light liquid service.
	60..486a(b)(2)	Leak tag removal after 2 consecutive months of monitoring with no leaks detected after repair
	60.486a(g)	Schedule of monitoring and leak percentage for valves utilizing skip periods.
NSPS GGG	60.482-2(a)(1), by reference from 60.592.	EPA Method 21 monitoring of pumps in light liquid service.
	60.482-7(a) and (c), by reference from 60.592.	EPA Method 21 monitoring of valves in gas/vapor service and in light liquid service.

	60.482-7(h)(3), by reference from 60.592.	EPA Method 21 monitoring at a reduced frequency for valves in gas/vapor service and in light liquid service that are designated as difficult-to-monitor.
	60.486(g), by reference from 60.592.	Schedule of monitoring and leak percentage for valves utilizing skip periods.
NSPS GGGa	60.482-2a(a)(1) by reference from 60.592a.	EPA Method 21 monitoring of pumps in light liquid service.
	60.482-7a(a) and (c) by reference from 60.592a.	EPA Method 21 monitoring of valves in gas/vapor service and in light liquid service.
	60.482-7a(h)(3) by reference from 60.592a.	EPA Method 21 monitoring at a reduced frequency for valves in gas/vapor service and in light liquid service that are designated as difficult-to-monitor.
	60.482-11a(a), (b), (b)(1), (b)(3), (b)(3)(i)-(iv), and (c) by reference from 60.592a.	EPA Method 21 monitoring of connectors in gas/vapor service and in light liquid service.
	60.486a(g) by reference from 60.592a.	Schedule of monitoring and leak percentage for valves utilizing skip periods.
HON	63.163(b)(1)	EPA Method 21 monitoring of pumps in light liquid service.
	63.163(d)(2)	Quality improvement program for pumps
	63.168(b)-(d)	EPA Method 21 monitoring of valves in gas/vapor service and in light liquid service.
	63.168(f)(3)	EPA Method 21 monitoring following successful repair of valves in gas/vapor service and in light liquid service.
	63.173(a)(1)	EPA Method 21 monitoring of agitators in gas/vapor service and in light liquid service.
	63.173(h)	EPA Method 21 monitoring at a reduced frequency for agitators in gas/vapor service and in light liquid service that are designated as difficult-to-monitor.
	63.174(a)-(c)	EPA Method 21 monitoring of connectors in gas/vapor service and in light liquid service.

	63.175(c)(3), (d)(1), and (d)(4)(ii)	Quality improvement program for valves where the leak rate is equal to or exceeds 2 percent.
	63.178(c)(1)-(3)	EPA Method 21 monitoring of components using the alternative means of emission limitation for batch processes.
	63.181(b)(1)(ii)	Schedule by process unit for connector monitoring.
	63.181(b)(7)(i) and (ii)	Identification, explanation, and monitoring schedule of difficult-to-monitor components.
	63.181(d)(7)	Listing of connectors subject to EPA Method 21 monitoring.
	63.181(d)(8)	EPA Method 21 monitoring for batch processes.
	63.181 (h)	Quality improvement program recordkeeping

TABLE 2. APPLICABLE LEAK DEFINITIONS FOR COMPONENTS IN THE LDSN-DRF SYSTEM

LDSN Leak Source Classification	Leak Source Component Class	LDSN Leak Definition	Initial Repair Attempt	Final Effective Repair	Final Repair Confirmation
LDAR Component Leak – "LDAR"	Agitator – FF	500 ppmv	5 days	15 days	<500 ppmv
LDAR Component Leak – "LDAR"	Agitator – VV	2,000 ppmv	5 days	15 days	<2,000 ppmv
LDAR Component Leak – "LDAR"	Agitator – HON	10,000 ppmv	5 days	15 days	<10,000 ppmv
LDAR Component Leak – "LDAR"	Compressor – HON	500 ppmv	5 days	15 days	<500 ppmv
LDAR Component Leak – "LDAR"	Compressor – non HON	2,000 ppmv	5 days	15 days	<2,000 ppmv
LDAR Component Leak – "LDAR"	Compressor in Hydrogen Service	AVO	5 days	15 days	No AVO indication
LDAR Component Leak – "LDAR"	Connector	500 ppmv	5 days	15 days	<500 ppmv
LDAR Component Leak – "LDAR"	Pump – with permit	500 ppmv	5 days	15 days	<500 ppmv

	specifying 500 ppmv				
LDAR Component Leak – "LDAR"	Pump – HON	1,000 ppmv	5 days	15 days	<1,000 ppmv
LDAR Component Leak – "LDAR"	Pump – VV	2,000 ppmv	5 days	15 days	<2,000 ppmv
LDAR Component Leak – "LDAR"	Valve	500 ppmv	5 days	15 days	<500 ppmv
Non-LDAR Component Leak – "Emission Event"	Agitator – Hydrocarbon (HC) but non LDAR	10,000 ppmv	Follow emission event reporting and repair guidelines		<10,000 ppmv
Non-LDAR Component Leak – "Emission Event"	Compressor – HC but non LDAR	2,000 ppmv	Follow emission event reporting and repair guidelines		<2,000 ppmv
Non-LDAR Component Leak – "Emission Event"	Connector – HC but non LDAR	500 ppmv	Follow emission event reporting and repair guidelines		<500 ppmv
Non-LDAR Component Leak – "Emission Event"	Pump – HC but non LDAR	2,000 ppmv	Follow emission event reporting and repair guidelines		<2,000 ppmv
Non-LDAR Component Leak – "Emission Event"	Relief Device – HC but non LDAR	500 ppmv	Follow emission event reporting and repair guidelines		<500 ppmv
Non-LDAR Component Leak – "Emission Event"	Valve – HC but non LDAR	500 ppmv	Follow emission event reporting and repair guidelines		<500 ppmv
Non-LDAR Component Leak – "Emission Event"	Other	500 ppmv	Follow emission event reporting and repair guidelines		<500 ppmv
"Authorized Emission"[1]	Authorized Emission	N/A	N/A	N/A	N/A

[1]Authorized emissions may include emissions from a stack or otherwise allowed. These emissions are not considered equipment leaks for purposes of this AMEL.

A. LDSN Specifications

1. Sensor Selection.

A sensor meeting the following specifications is required:

a. The sensor must respond to the compounds being processed.

The average response factor of each process stream must be less than or equal to 3. If the average response factor of a process stream is greater than 3, the components in that service are not covered by this AMEL.

b. The sensor must be capable of maintaining a detection floor of less than 10 ppbe on a 10-minute average. The detection floor is determined at three times the standard deviation of the previous 10 minutes of data excluding excursions related to emissions peaks.

$$Detection\ Floor_{Sensor\ n} = 3\ \times\ SD_{Local\ n}$$

Detection Floor $_{\text{Sensor n}}$ = Calculated detection floor of sensor n (ppbe)

$SD_{\text{Local n}}$ = Local (previous ten minutes) standard deviation of measurements excluding transient spikes (sensor raw output typically mV)

c. The sensor must record data at a rate of once per second.

d. Records of sensor selection must be maintained as specified in IV.C(3) and records of detection floor must be maintained as specified in IV.C(g).

2. Sensor placement.

The sensor placement must meet the following specifications:

a. The Mid-Crude process unit must have a minimum of 44 sensors and the Meta-Xylene process unit must have a minimum of 10 sensors.

All components covered by the LDSN-DRF must be no further than 50 feet from a sensor node in the horizontal plane and no more than 20 feet from a sensor node in the vertical plane. Sensor nodes must be placed and must remain in accordance with the single level and multi-level records required in IV.C(4).

b. As part of the management of change procedure, FHR must identify if the changes (i.e., additions or removals) to process equipment in the Mid-Crude and Meta-Xylene process units are within the 50-foot radius and 20-foot vertical distance to any single sensor within the process unit or whether new process streams exist within the LDSN.

FHR must identify any LDAR-applicable components associated with the changes to the process equipment that are outside of the 50-foot radius and 20-foot vertical distance requirements for the LDSN and either comply with the standard EPA Method 21 LDAR requirements for those components as required in the applicable subpart(s) or add additional sensor nodes to the LDSN such that all of the LDAR-applicable components covered by the LDSN-DRF are no further than 50 feet from a sensor node in the horizontal plane and no more than 20 feet from a sensor node in the vertical plane. FHR must identify any LDAR-applicable components associated with the changes to the process equipment that contain process streams with a response factor of greater than three and comply with the standard EPA Method 21 LDAR requirements for those components as required in the applicable subpart(s). FHR must maintain the management of change records in IV.C(5).

3. PSL Notifications

The system must perform a 72-hour lookback a minimum of once per day that includes the previous 24-hour period to determine the percent of time positive detections were registered.

Positive detections are defined as peak excursions above the detection floor. If positive detections are registered for at least 5 percent of the time during the rolling 72-hour lookback, a PSL notification must be issued. Records of raw sensor readings and PSL notifications must be maintained in accordance with IV.C(7) and (9), respectively.

4. Meteorological Data

FHR must continuously collect wind speed and wind direction data at least once every 15 minutes. The wind sensor must be located onsite and within 2 miles of each sensor node. FHR must maintain records in accordance with IV.C(8).

5. QA/QC

The following QA/QC must be employed for the sensors in the network:

a. Sensors must be calibrated by the manufacturer prior to deployment.

Once installed, each sensor must be tested for responsivity and wireless communication by challenging it with isobutylene gas or another appropriate standard. FHR must maintain records in accordance with IV.C(6).

b. FHR must conduct a bump test on each sensor quarterly.

At a minimum, quarterly bump tests must be conducted no more than 123 days apart.

(i) The bump test must be conducted with isobutylene gas or another appropriate standard (*e.g.*, with similar response factors) and include a mechanism to provide nominally ambient level moisture to the gas (within 25 percent of ambient relative humidity).

(ii) The bump test is successful if the response of the sensor exceeds 50 percent of the nominal value of the standard. The bump test may be repeated immediately up to 2 additional times if the first bump test is unsuccessful.

(iii) If the bump test is unsuccessful after the third try, the sensor must be recalibrated or replaced with a calibrated sensor within 24 hours of the third unsuccessful try. After recalibration, a new bump test must be conducted following the procedure outlined above.

(iv) FHR must maintain records of the bump test in accordance with IV.C(6).

c. The health of each sensor must be confirmed for power and data transmission at least once every 15 minutes.

Data transmission, which includes data recorded by the sensor every second as noted in IV.A(1)(c), must occur at least once every 15 minutes. Appropriate corrective actions must be taken for any sensors that fail to collect data in accordance with IV.A(1)(b) and (c) and transmit data in accordance with this paragraph to ensure any errors or malfunctions are corrected in a timely manner. Such periods are considered downtime until corrected. If a sensor repair is necessary, FHR must test the responsivity and wireless communication of the sensor through a bump test according to the procedure specified in IV.A(5)(b). FHR must maintain records of sensor health in accordance with IV.C(6).

d. The sensor detection floor shall be reviewed at 00:00 UTC each day to confirm each sensor detection floor remains below the established threshold of 10 ppbe during at least one 10-minute period in the past 72-hour period. If a sensor does not pass the detection floor review, then a sensor fault notification shall be issued, and the sensor issue shall be corrected through repair, replacement, or another appropriate measure, unless FHR can demonstrate the sensor was continuously experiencing positive detections during this time.

e. At least once each calendar quarter, conduct a check for wind direction to ensure the wind sensor is properly oriented to the north. If the wind sensor is not within 15 degrees of true north,

it must be adjusted to point to true north. At a minimum, quarterly wind direction checks must be conducted no more than 123 days apart. The results of the quarterly check for wind direction must be kept in accordance with IV.C(8).

6. Downtime

The sensor network must continuously collect data as specified in paragraph IV.A(5)(c), except as specified in this paragraph:

a. The rolling 12-month average operational downtime of each individual sensor must be less than or equal to 10 percent.

b. Operational downtime is defined as a period of time for which the sensor fails to collect or transmit data as specified in IV.A(5)(c) or the sensor is out-of-control as specified in IV.A(6)(c).

c. A sensor is out-of-control if it fails a bump test or if the sensor output is outside of range. The beginning of the out-of-control period for a failed bump test is defined as the time of the failure of a bump test. The end of the out-of-control period is defined as the time when either the sensor is recalibrated and passes a bump test, or a new sensor is installed and passes the responsivity and communication challenge. The out-of-control period for a sensor outside of range starts at the time when the sensor first reads outside of range and ends when the sensor reads within range again.

d. The downtime for each sensor must be calculated each calendar month. Once 12 months of data are available, at the end of each calendar month, FHR must calculate the 12-month average by averaging that month with the previous 11 calendar months. FHR must determine the rolling 12-month average by recalculating the 12-month average at the end of each month.

e. FHR must maintain records of the downtime for each sensor in accordance with IV.C(13).

B. DRF Specifications

When a new PSL notification is received, the following requirements apply:

1. An initial screening investigation must begin within 3 calendar days of receiving a new PSL notification.

a. The initial screening investigation must utilize technology that can detect hydrocarbons or that is capable of responding to the compounds or mixture of compounds in the process streams at levels appropriate for locating leaks.

This technology must be maintained per manufacturer recommendations. Technologies that the EPA finds appropriate for use are photoionization detectors (PID), flame ionization detectors (FID), and optical gas imaging (OGI) cameras.

b. Each potential leak source identified in the initial screening investigation must be monitored by EPA Method 21 as specified in section 60.485a(b) of 40 CFR part 60, subpart VVa.

c. If an instrument reading equal to or greater than the concentrations listed in Table 2 is measured, a leak is detected.

The maximum instrument reading must be recorded for each leak identified. A weatherproof and readily visible identification shall be attached to the leaking equipment. The identification may be removed once the component has been repaired, with the repair confirmed through follow up EPA Method 21 monitoring.

d. When a leak is detected, it shall be repaired as specified in the applicable subpart(s), except as specified in this paragraph.

1. If the leak source is not applicable to LDAR but is within the AMEL covered area, repairs must be completed and verified within 30 calendar days of identification or placed on delay of

repair. Delay of repair of equipment for which leaks have been detected will be allowed when repair cannot be completed within 30 days of identification and either the repair is technically infeasible without a process unit shutdown or the non-LDAR equipment is isolated from the process and does not remain in contact with process fluids. Repair of this equipment must occur prior to the end of the next process unit shutdown or prior to ending the equipment's isolation from the process and returning process fluids to the equipment. These requirements do not supersede repair requirements for other regulations.

2. If the leak source is determined to be associated with authorized emissions (*e.g.,* regulated emissions from a stack or process equipment that are not fugitive emissions), the facility must document this information for the record, and the PSL can be closed.

e. If a single leak is detected at 3,000 ppmv or greater by EPA Method 21, the investigation is complete, and the PSL can be closed once this leak and any leaks above the leak definitions specified in Table 2 found by Method 21 during this investigation have been repaired in accordance with the applicable subpart(s) or for non-LDAR equipment leaks, when the repair has been verified by EPA Method 21.

f. If a total of 3 leaks are detected below 3,000 ppmv but above the leak definitions specified in Table 2 by EPA Method 21, the investigation is complete, and the PSL can be closed once these leaks and any leaks above the leak definitions specified in Table 2 found by Method 21 during this investigation have been repaired in accordance with the applicable subpart(s) or for non-LDAR equipment leaks, when the repair has been verified by EPA Method 21.

g. For each initial screening investigation in which a potential leak source is not identified after 30 minutes of active screening within the PSL, record the latitude and longitude coordinates in

decimal degrees to an accuracy and precision of 5 or more decimals of a degree using the North American Datum of 1983 or newer to document the path taken by or presence of the technician in the PSL during the screening investigation. Include the date and time stamp of the start and end of the investigation. The PSL must remain open, but the initial screening investigation may stop.

2. A second screening investigation must be conducted within 7 calendar days of stopping the initial screening investigation as described in IV.B(1)(g). The requirements specified in IV.B(1)(a) through (f) apply to this second screening investigation.

3. If no potential leak sources are identified during the second screening investigation, and the PSL detection level increases by 2 times the initial detection level, a PSL update notification must be sent to facility personnel based on the higher detection level. A new screening investigation must occur within 3 calendar days of receiving the PSL update notification with the higher detection level, following the conditions specified in paragraphs IV.B(1)(a) through (f). This step must be repeated every time the PSL notification is sent, and a leak source is not found in the previous screening. The PSL must remain open until the conditions in IV.B(1)(e) or (f) are met.

4. If no potential leak source has been identified following the screening investigations in IV.B(2) and (3), the PSL can be closed after meeting the conditions specified in either paragraph IV.B(4)(a) or (b).

a. If 14 days have passed since a positive detection within the PSL (i.e., there have been no peak excursions above the detection floor), the PSL may be closed.

b. If 90 days have passed since the original PSL notification, all sensors used to create the PSL must be bump tested in accordance with IV.A(5)(b) and a full survey of the LDAR-applicable components within the PSL must be conducted with EPA Method 21 within 10 calendar days. A leak is defined by the applicable subpart(s). All leaks identified during this survey must be repaired and verified after which the PSL will be closed. If no leaks are identified in this final screening, "no leak source found" must be recorded and the PSL will be closed.

c. FHR must maintain the records in accordance with IV.C(9)-(11).

C. Recordkeeping

The following records related to the LDSN-DRF must be maintained in addition to the records from the relevant subparts, except as noted in Table 1.

1. Fugitive Emission Management Plan (FEMP) detailing the boundaries of the Meta-Xylene and Mid-Crude process units which are complying with this AMEL.

The plan must include the records for the LDSN specified in paragraph IV.C(4), a list of identification numbers for equipment subject to the EPA Method 21, no detectable emissions, or AVO work practice requirements of the applicable subparts, and a map clearly depicting which areas in each process unit are covered by the LDSN-DRF and which are covered by the EPA Method 21, no detectable emissions, or AVO work practices.

2. Records of the sensor response factors for the applicable process streams

3. Manufacturer, measurement principle, response factors, and detection level for each sensor

4. Records of sensor placement, including geographic information system (GIS) coordinates and elevation of the sensor from the ground, and diagrams showing the location of each sensor and the detection radius of each sensor. One diagram must show all sensors, with an indication of the

level each sensor is located on. Additional diagrams showing sensor layout must be provided for each level of the process unit.

5. Records of each MOC in an AMEL covered unit. For each MOC, records of the determination that IV.C(5)(a), (5)(b), or (5)(c) applies. The MOC must also address updates to the diagrams in the FEMP of each sensor or the list of equipment identification numbers, as applicable.

a. The changes are within the LDSN coverage area (i.e., no further than 50 feet from a sensor node in the horizontal plane and no more than 20 feet from a sensor node in the vertical plane) and the response factor of any new process streams is less than or equal to 3.

b. The response factor any new process streams is less than or equal to 3 and additional sensor nodes are being added to the LDSN such that all the LDAR-applicable components covered by the LDSN-DRF are no further than 50 feet from a sensor node in the horizontal plane and no more than 20 feet from a sensor node in the vertical plane.

c. The components will be added to an applicable EPA Method 21, no detectable emissions, or AVO work practice where the LDSN would not provide coverage.

6. Records of initial and subsequent calibrations, bump tests for responsivity and wireless communication initially and upon sensor repair or reset, quarterly bump tests, bump tests prior to PSL closure where leaks have not been found within 90 days, and bump tests following out-of-control periods, including dates and results of each calibration and bump test, as well as a description of any required corrective action and the date the corrective action was performed. Records of calibration gases used for the bump tests, the ambient moisture level during the bump tests, and the mechanism for providing nominally ambient level moisture to the gas during the bump tests. Records of sensor health related to power and data transmission.

7. Raw Sensor Readings. Additionally, for each sensor, the percent of time positive detections were registered during the 72-hour lookback must be recorded each day and the minimum, average, and maximum detection floor.

8. Network Meteorological Data, Including Wind Direction and Wind Speed

Record the results of each quarterly check of the wind sensor orientation. Record the latitude and longitude coordinates of the original location of the wind sensor. The wind sensor must remain within 300 feet of the original location. Record each movement of the wind sensor, the latitude and longitude coordinates for the new location, and the distance in feet between the new location and the original location.

9. PSL Documentation. For each PSL, the record must include the notification date, investigation start date, investigation results including the date each leak was found, leaking component location description, EPA Method 21 reading, repair action taken, date of repair, and EPA Method 21 reading after repair. Additionally, for equipment placed on delay of repair, note that the equipment was placed on delay of repair and the reason for the delay of repair.

10. PSL documentation where PSL is not closed out after the initial investigation.

For each PSL that cannot be closed out after the initial investigation, the record must include each screening investigation performed, including the latitude and longitude coordinates indicating the path taken during the screening investigation, the start and end date and times of the investigation, any OGI video taken during the investigation, and any Method 21 readings observed during the investigation. The record must also include the date of each PSL update notification sent to facility personnel when the PSL detection level increases by 2 times the initial detection level.

11. If a PSL is caused by an authorized emission source or a source outside the AMEL-covered process unit, the documentation must include the notification date, investigation start date, investigation results, emission source identification, and description of the "authorized emissions" or source outside the AMEL-covered process unit.

12. Records of PSLs closed out where no cause of the PSL was determined. Note whether the PSL was closed because 14 days had passed since a positive detection within the PSL or the PSL was closed following the EPA Method 21 inspection conducted 90 days after the original PSL notification.

13. For each sensor, the date and time of the beginning and end of each period of operational downtime.

14. For each additional annual compliance demonstration conducted under the compliance assurance provisions of IV.E below, the documentation must include:

a. The date of each survey conducted with Method 21 of appendix A-7 of part 60.

b. If valves are monitored in accordance with IV.E(1)(b)(i) through (v), the plot plan showing the verification zone of each sensor, the list of valves in the verification zones, and the total population of valves in the process unit.

c. If valves are monitored in accordance with IV.E(1)(b)(vi), the list of all valves in the process unit and identification of each valve monitored during the survey.

d. The EPA Method 21 reading for each valve and pump monitored.

e. For each leak found, the date each leak was found, leaking component location description, repair action taken, date of repair, and EPA Method 21 reading after repair.

Additionally, for equipment placed on delay of repair, note that the equipment was placed on delay of repair and the reason for the delay of repair. Delay of repair shall be determined and signed-off from the relevant process unit supervisor or person of similar authority that the piece of equipment is technically infeasible to repair without a process unit shutdown.

f. Plot plan with all components identified with EPA Method 21 screening values greater than 3,000 ppmv, all active PSLs, and the locations of each sensor node, if applicable.

g. Identification of all non-compliant leakers and each zone of incomplete coverage.

h. For each survey conducted in a zone of incomplete coverage, the information in IV.D.(14)(a), (14)(d), and (14)(e), as well as an identification of each valve and pump monitored.

i. The start and end dates and results of any required root cause analysis, any corrective action taken in response to a non-compliant leaker, and any corrective action plans developed.

14. Records of deviations where a deviation means FHR fails to meet any requirement or obligation established in this AMEL or fails to meet any term or condition that is adopted to implement an applicable requirement or obligation in this AMEL and that is included in the operating permit for the Mid-Crude or Meta-Xylene process units at FHR.

D. Reporting

Semiannual reports must be submitted via the Compliance and Emissions Reporting Data Interface (CEDRI), which can be accessed through the EPA's Central Data Exchange (CDX) (*https://cdx.epa.gov*), following the procedures specified in 40 CFR 63.9(k). Semiannual reports must include the following information:

1. All of the information required in the relevant subparts for components not covered by this AMEL.

2. For each PSL, the notification date, investigation start date, investigation results including the date each leak was found, type of component, EPA Method 21 reading, and date of repair. For each PSL that was not closed out after the initial investigation, the date of each PSL update notification sent to facility personnel when the PSL detection level increases by 2 times the initial detection level, each investigation start date, and results for each investigation.

3. Identification of equipment placed on delay of repair and the facts that explain each delay of repair.

4. The number of PSLs that were closed out where no cause of the PSL was determined. Note how many PSLs were closed because 14 days had passed since a positive detection within the PSL and how many PSLs were closed following the EPA Method 21 inspection conducted 90 days after the original PSL notification.

5. The number of PSLs that were closed because the emissions were authorized.

6. The number of PSLs that were closed because the source was found to be outside the AMEL covered process unit.

7. The operational downtime percentage for each sensor determined each month.

8. For each sensor that fails a bump test, identification of the sensor, date of failed bump test, and corrective action taken.

9. Any changes to the sensor network, including those resulting from the compliance assurance actions in IV.E.

10. For the additional annual compliance demonstration in IV.E:

a. The date of each EPA Method 21 survey

b. The number of valves and pumps monitored

c. The number of leaks identified

d. The number of non-compliant leakers

e. The number of leaks identified above 18,000 ppmv

f. Date of each survey conducted in a zone of incomplete coverage, and for each survey in a zone of incomplete coverage the number of valves and pumps monitored and the number of leaks identified

g. Any corrective action taken if there are non-compliant leakers

11. Once the criteria in IV.E(3) is met, a statement that FHR has met the criteria and additional annual compliance demonstrations are no longer required.

12. Reports of deviations recorded under IV.C(15) which occurred in the semi-annual reporting period, including the date, start time, duration, description of the deviation, and corrective active.

E. Additional Annual Compliance Demonstration

In addition to continuous compliance with the LDSN-DRF as required by the sections IV.A-D, the following annual compliance demonstration actions are required for the LDSN-DRF system located in the Meta-Xylene and Mid-Crude process units:

1. Method 21 of appendix A-7 of part 60 must be conducted in each process unit equipped with the LDSN-DRF according to the following requirements:

a. The first survey must be conducted within 12 calendar months of implementation of the AMEL in a given process unit.

Subsequent surveys must be conducted no sooner than 10 calendar months and no later than 12 calendar months after the preceding survey.

b. Identify the valves to be monitored as described below.

Monitor the valves as described in IV.E(1)(b)(i) through (v) or IV.E(1)(b)(vi) using Method 21 of appendix A-7 of part 60 as specified in section 60.485a(b) of 40 CFR part 60, subpart VVa, with the exception that the high scale calibration gas must be 20,000.(+/-1000.) ppmv.

(i) Determine the total number of valves located in the individual process unit. The minimum number of valves monitored must equal 20 percent of the total population of valves in the process unit.

(ii) Identify each verification zone on a plot plan. The verification zone is the area between the radii that are 45 and 50 feet from each individual sensor. Determine the total number of valves that occur in only one sensor verification zone (*i.e.,* verification zones that have no overlap with other verification zones). If the number of valves that occur in only one sensor verification zone is greater than the minimum number of valves that must be monitored, monitor a random selection of these valves according to IV.E(1)(b)(v).

(iii) If the number of valves that occur in only one sensor verification zone is less than the minimum number of valves that must be monitored, determine the total number of valves that occur in all verification zones, including those that overlap. If the total number of valves in all verification zones is greater than the minimum number of valves that must be monitored, monitor all the valves that occur in only one sensor verification zone. Additionally, monitor a random selection of valves, chosen in accordance with IV.E(1)(b)(v), that appear in verification zones that overlap until the 20 percent minimum is achieved.

(iv) If the number of valves in all verification zones is less than 20 percent of the total population, then monitor all of the valves in all verification zones. Additionally, monitor a

random sample of additional valves within the LDSN but outside of the verification zones, chosen in accordance with IV.E(1)(b)(v), until the 20 percent minimum is achieved.

(v) Random sampling of valves. To determine the random selection of valves to monitor, determine the population of valves that must be randomly sampled as determined in IV.E(1)(b)(ii), (iii), or (iv) (*i.e.,* the total valve population in one sensor verification zone, the total valve population in verification zones that overlap, or the total valve population minus the number of valves in the verification zones). Divide the population of valves by the number of valves that must be sampled and round to the nearest integer to establish the sampling interval. Using the valve IDs sequentially, monitor valves at this sequential interval (*e.g.,* every 5 valves). Alternatively, use the valve IDs and a random number generator to determine the valves to monitor. Each survey conducted under IV.E(1)(a) must start on a different valve ID such that the same population of valves is not monitored in each survey.

(vi) In lieu of implementing IV.E(1)(b)(i) through (v), FHR may elect to monitor 50 percent of the total number of light liquid and gas vapor (LL/GV) valves that occur within the LDSN coverage area each year. This shall be done by dividing the valves into 2 sets, with each set containing every other valve in the given tag range (*e.g.,* all odd numbered valves in one set and all even numbered valves in the second set). In the first survey, one set of valves shall be monitored, such that nominally 50 percent of the valves have been monitored. Each subsequent survey must rotate between the 2 sets of valves such that the same population of valves is not monitored during 2 consecutive surveys.

c. Monitor each pump located in the process unit using Method 21 of appendix A-7 of part 60 as specified in section 60.485a(b) of 40 CFR part 60, subpart VVa.

d. For purposes of this monitoring, a leak is identified as an instrument reading above the leak definitions in Table 2 of this AMEL.

All identified leaks must be repaired or placed on delay of repair within 15 calendar days of detection, with a first attempt completed within 5 calendar days of detection.

e. Once the annual monitoring survey is complete, any components identified with EPA Method 21 screening values greater than 3,000 ppmv shall be plotted on a plot plan of the process unit along with all active PSLs and the locations of each sensor node.

Any LDAR applicable component that is not in an active PSL or which was not previously placed on delay of repair, will be considered a NC leaker if it meets at least one of the specifications in IV.E(1)(e)(i) or (ii):

(i) A component identified with an EPA Method 21 screening value above 3,000 ppmv that is located within 18 feet of any sensor node.

(ii) A component identified with an EPA Method 21 screening value above 18,000 ppmv that is located anywhere in the LDSN coverage area.

f. For each NC leaker, FHR must identify a ZIC. The ZIC shall be defined as the area with a 15-foot radius horizontally and vertically around the leaking component.

Monitoring with Method 21 of appendix A-7 of part 60 shall be conducted for all LL/GV valves and pumps in the ZIC that were not already monitored during the most recent annual survey. The leak definitions in Table 2 shall be used to determine if a leak is detected. Any identified leaks shall be repaired or placed on delay of repair per IV.E(1)(d).

g. All NC leakers shall be deviations of the AMEL and reported as such. The period of noncompliance shall end when the monitoring under IV.E(1)(f) has been completed and repairs

for all leaking components have been made and verified or the components have been placed on delay of repair.

h. Until the actions in IV.E.(1)(f) are completed, FHR shall monitor all LL/GV valves and pumps in the ZIC quarterly using Method 21 of appendix A-7 of part 60.

i. For each NC leaker, FHR shall conduct a root cause analysis (RCA) to determine the cause of the defect of the sensor network and to determine appropriate corrective action. The RCA shall begin within 5 days and be completed no later than 45 days after completion of the most recent annual survey. FHR must submit a corrective action plan within 15 days of the completion of the RCA to CCG-AWP@epa.gov. For any NC leaker with an EPA Method 21 screening value above 18,000 ppmv, the corrective action plan must include revisions to the sensor network. Revisions to the sensor network must include the addition of new sensors to reduce the detection radius of each sensor, location changes of any previously deployed sensors, and/or the deployment of a different sensor type.

j. If 2 or more NC leakers are found in the same annual survey and corrective actions will take longer than 45 days to complete, this shall be a deviation of the AMEL for the sensor network and reported as such.

The period of noncompliance shall end when corrective actions are completed.

2. The EPA or its delegated authority may conduct audits of the LDSN at any time, using the same approach as outlined in IV.E(1), to determine NC leakers. For each NC leaker found during any inspection by the EPA or its delegated authority, the requirements in paragraphs IV.E.(1)(f) through (j) apply.

3. FHR may stop conducting the additional annual compliance demonstration required in IV.E(1) if no NC leaks are identified with Method 21 of appendix A-7 of part 60 over a period of 2 consecutive calendar years.

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