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BUSTR COMPLIANCE GUIDANCE FOR STATISTICAL INVENTORY RECONCILIATION (SIR)

The purpose of this guidance document is to assist the regulated community, statistical inventory reconciliation (SIR) vendors, and other interested parties in understanding Ohio's policies for satisfactory utilization of SIR as a monthly monitoring method. Ohio currently recognizes SIR as one of the "other methods" of monthly monitoring allowed under its rule for Release Detection Methods and Requirements for UST Systems, See, Ohio Administrative Code (OAC) 1301:7-9-07(D)(4), which incorporates 40 CFR 280.43 (h). **Any request for an alternative form of release detection must be approved by the bureau chief on a facility by facility basis.** The Ohio rule provides that:

"(4) Any other type of release detection method, or combination of methods, can be used if approved in writing by the state fire marshal pursuant to the following:

- (a) The method can detect a two-tenths of a gallon per hour leak rate with a probability of detection of 0.95 and a probability of falsely indicating a release of 0.05...."

Probability of detection means that if numerous underground storage tank (UST) systems are tested, all of which are leaking at exactly 0.2 gallons per hour (GPH), the test would correctly identify on average 95 out of 100 of them as leaking. Probability of false alarm means that if numerous UST systems are tested, none of which are leaking (0.0 GPH), on average 5 out of 100 of them will incorrectly fail the test and be reported as leaking.

For any SIR method to be an acceptable release detection method, it must be provided by a vendor that has received a third-party evaluation and subsequent certification that the method can detect leaks at the required level and with the appropriate probabilities of detection and false alarm as outlined above. For a listing of the methods that have been evaluated please go to <http://www.nwglde.org/> and review the SIR vendors found in sub-link called "Testing Methods".

OVERVIEW

SIR analyzes inventory, delivery, and dispensing data collected over a period of time to determine if the UST system (tank and associated product lines) is leaking. Each operating day, the UST owner/operator (O/O) measures the product level using a gauge stick or other tank level monitor. The O/O also keeps complete records of all withdrawals and all deliveries to the UST. After data has been collected for a specified period of time (not to exceed thirty days), the O/O provides the data to the SIR vendor for processing. The SIR vendor processes the data and provides the O/O with monthly results showing the status of the UST system. Computer software is used to conduct a statistical analysis of the data to determine if the UST system is leaking. Some SIR methods can report if dispensers are out of calibration, theft is occurring, or product deliveries are inaccurate.

A SIR method may report results in terms of a numerical, calculated leak rate based on characteristics of the data set or as pass, fail or inconclusive based on a comparison of data set characteristics with a predetermined threshold.

"Stand-Alone" SIR software systems are available whereby the owner/operator gathers the data, analyzes the data once per month and maintains the results in their leak detection records. These SIR software systems must also have an independent third party evaluation/certification indicating that the system is capable of meeting the requirements of 40 CFR 280.43(h) and OAC 1301:7-9-07 (D)(4). The owner/operator must maintain a copy of the third party evaluation.

TERMINOLOGY

Performance Standards (PS): To qualify as a leak detection method, SIR must be able to meet the performance standards of being able to detect a 0.2 GPH leak rate. The method must be able to detect a 0.2 GPH leak rate with a probability of detection of at least 0.95 and a probability of false alarm of no more than 0.05.

Threshold for Declaring a Leak (TH): The TH is an action level leak rate. If the calculated leak rate exceeds the TH then the SIR vendor will declare a “fail”, indicating that a leak exists. The TH is not a fixed number, varying according to the data being analyzed. The Bureau of Underground Storage Tank Regulations (BUSTR) requires that the TH be less than 0.2 GPH, with a probability of detection of at least 0.95 and a probability of false alarm less than or equal to 0.05. A threshold of 0.1 GPH is a commonly used value and is recommended.

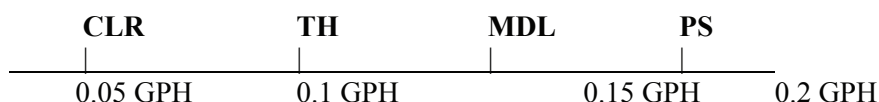
Since leakage is progressive and generally commences at very small rates, it should be identified as soon as possible after it has begun. The ability of a SIR procedure to identify loss at a very small threshold enables the UST owner/operator to take corrective action before a sustained loss ensues. Often these losses are due to broken seals or worn gaskets in the dispenser, for example, and can be corrected following a cursory examination of the UST system by the owner.

Minimum Detectable Leak Rate (MDL): MDL is a calculated value per data set obtained from a specific number of days of reconciled inventory data (gauge stick readings, deliveries, sales, meter readings, etc.) and is an indication of how reliable the results are (data quality). To be in compliance with leak detection regulations, the MDL must be less than or equal to the performance standard for a SIR analysis to provide conclusive results. In other words, if the quality of the set of data is so poor that a leak of 0.2 GPH cannot be detected with at least 95% accuracy, then the performance standard has not been met and the test result must be inconclusive or fail.

Calculated Leak Rate (CLR): The actual leak value, always expressed in GPH, for a given set of data. To obtain the most accurate calculated leak rate, the SIR analysis must account for discrepancies and conversion errors caused by tank tilt and/or deformation, mechanical problems and temperature fluctuations prior to analysis. Once all discrepancies are taken into account the residual cumulative over/short becomes the estimated leak rate for a given data set.

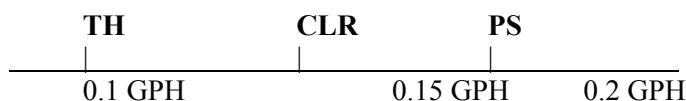
Pass: The SIR analysis indicates that the UST tank and piping system is operating within the regulatory release detection standard of less than 0.2 GPH with a probability of detection of 0.95 or more and the probability of false alarm of 0.05 or less.

Example: If the Calculated Leak Rate (CLR) does not exceed the Threshold Level (TH), and the Minimum Detectable Leak Rate (MDL) is less than or equal to the Performance Standard (PS) of 0.2 GPH, the test will be a “PASS”.



Fail: The SIR analysis indicates a leak rate from the UST tank and/or piping systems which is equal to or greater than the threshold for declaring a leak (TH). Refer to BUSTR Requirement 10, on page 5 for reporting and investigation requirements relating to a SIR failure.

Example: If the Calculated Leak Rate (CLR) is greater than the leak rate Threshold Value (TH) value of 0.1 GPH the test result will be a “FAIL”, even if the Calculated Leak Rate CLR is less than the Performance Standard (PS) of 0.2 GPH.

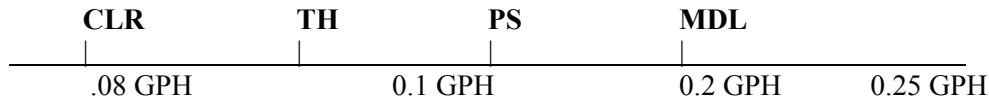


NOTE: A loss or gain of product in excess of the threshold is a fail.

Inconclusive: A SIR test result is inconclusive when it does not meet the criteria for a “pass” or a “fail”. A result of “inconclusive” may indicate that the inventory records are too poor, have too much variability, or are of insufficient length such that the data could not be analyzed with reliable results.

An inconclusive result will be interpreted by BUSTR as noncompliance with the leak detection requirements for the period of time on which the inconclusive was based. Refer to BUSTR Requirement 9, on page 4 for actions necessary to resolve an inconclusive result.

Example: A SIR test result is inconclusive when it produces a Minimum Detectable Leak Rate (MDL) that exceeds the certified performance standard (PS) of 0.2 GPH, and a Calculated Leak Rate (CLR) that is less than the Threshold Level (TH).



NOTE: In determining whether a result is inconclusive, the absolute value of the MDL should be compared to the PS.

ENSURING QUALITY DATA

Conclusive SIR analysis results are contingent upon proper and sound inventory practices. Please refer to the BUSTR guidance titled “Guide for Daily Inventory Control Procedures” for a thorough overview of inventory procedures. This guidance can be obtained by contacting BUSTR at (614) 752-7938 or visiting the BUSTR web site at <http://www.com.ohio.gov/fire/bustMain.aspx>. O/O must ensure that the following practices are employed:

- Measure the product level accurately to the nearest one-eighth (1/8”) at the same time every day the site operates. When measuring product level, take the average of two stick reading prior to converting inches to gallons.
- Equipment must be capable of measuring the level of product over the full range of the tank’s height.
- Allow no deliveries or sales during the time between product level readings and meter readings.
- Record all sales on a daily basis. All figures must be rounded to the nearest gallon.
- Record all delivery information accurately and as it appears on the bills of lading. Your SIR vendor will determine whether gross or net delivery figures are submitted for SIR analysis.
- Check for water at least once a week. Measurements must be made to the nearest 1/8” and must be taken into consideration in the SIR determination of tank status.
- Calculate and evaluate overages and shortages daily before the end of the month. If any unusual overages or shortages are detected, verify all records for that day and the day before for any computation errors.
- Keep all inventory records independently for every tank. If the site operates a manifolded tank system, separate tank product level readings must be recorded for each tank. Combined inventory data may be provided for the SIR analysis.

BUSTR REQUIREMENTS:

- 1) The procedures specified in paragraph (D)(1)(a) of rule 1301:7-9-07 of the Administrative Code for inventory control, can be used to gather data for SIR. Drop tubes which extend to within one foot of the tank bottom are required for inventory control and are likewise required for gathering data for SIR.
- 2) Monthly SIR results must be reported on a form prescribed by BUSTR titled “Monthly Inventory Worksheet” or on an equivalent form. Please refer to the BUSTR guidance titled “Guide for Daily Inventory Control Procedures” for a copy of this form. This guidance can be obtained by contacting BUSTR at (614) 752-7938 or visiting the BUSTR web site at <http://www.com.ohio.gov/fire/bustMain.aspx>.
- 3) The results reported must specifically state the results for each tank as: **“pass, fail, or inconclusive”**.

- 4) All reported results MUST state the threshold level, calculated leak rate, minimum detectable leak rate, tank capacity, the number of data points analyzed for a given month, number of days submitted by the O/O and the results of the month. This is in addition to the information required on the “Monthly Statistical Inventory Reconciliation Report”.
- 5) SIR reports should be received by the O/O no later than 20 business days after the end of the reporting period.
- 6) The threshold leak rate must be in accordance with third party certification (typically 0.1 GPH).
- 7) Monthly reports consisting of raw inventory data, plus the resulting SIR determination must be maintained by the O/O. Results of any investigation and tightness test required under BUSTR requirement (9) or (10) must be maintained by the O/O.
- 8) SIR may not be used as a tightness test for underground storage tanks, piping, containments or ancillary equipment. Underground piping that routinely contains regulated substances shall be monitored pursuant to paragraph (D)(2) of rule 1301:7-9-07 of the Administrative Code unless alternative procedures are approved by the state fire marshal.
- 9) If the results of a SIR monthly analysis are inconclusive, unusable or anything other than “pass” or “fail”, the O/O must conduct an investigation within seven (7) days from the date of receipt of the vendor’s report or their own report if they are using a stand alone SIR system. The O/O should use the vendor’s standard investigation procedures to review inventory records and calculations to determine if there are any errors. If the problem is determined not to be a data problem, the O/O must check for physical problems such as meter mis-calibration and inspect all accessible portions of the UST system for evidence of leakage. If there is physical evidence of leakage, the O/O must report the suspected release to BUSTR.

If two (2) consecutive months of SIR monthly analysis yield reports of inconclusive, unusable or anything other than a pass or fail, the O/O must:

- a) Conduct a tank tightness test within seven (7) days in accordance with paragraphs (F) of rule 1301:7-9-07 of the Ohio Administrative Code. A release is suspected and must be reported to BUSTR within 24 hours if a leak rate exceeds the amount designated for the tightness testing method.
- b) The O/O must maintain the results of all required tightness tests for a minimum of two years. All tightness test results for the past year shall be made available for inspection at the site or an alternate site within 24 hours of a request from BUSTR.

If the results of three (3) consecutive SIR monthly analyses yield reports of three fail results or three inconclusive results, or any combination of these, the O/O must use another method of release detection or take the underground storage tank out of service until a determination of the problem is made. BUSTR must be notified in writing of these three consecutive monthly analysis results. Examples of acceptable alternative release detection methods include any of those methods listed in paragraphs (D)(1)(c) through (D)(1)(d) of rule 1301:7-9-07 of the Administrative Code. Monthly precision testing of the underground storage tank and lines in accordance with OAC 1301:7-9-07 (F) may also be used as another method of release detection.

10) If the results of a SIR monthly analysis indicate a failure, the O/O must:

- a) Report a suspected release to BUSTR within 24 hours of receipt of the vendor’s report or their own report if a stand alone system is used.
- b) Investigate the suspected release in accordance with paragraph (F) of Rule 1301:7-9-13 of the Administrative Code. This includes the requirement to perform a tank tightness test. Within twenty-four (24) hours of the receipt of the tightness test results, the O/O shall notify BUSTR of the results of the test by telephone, electronic mail or the like. Test results and supporting data shall be submitted to BUSTR within seven (7) days of receipt by the O/O.

- c) Conduct an investigation within seven (7) days from the date of receipt of the vendor's report or their own report if they are using a stand alone SIR system. The O/O should use the vendor's standard investigation procedures to review inventory records and calculations to determine if there are any errors. If the investigation indicates factors accounting for the failure that may not be related to a release, these factors must immediately be corrected. The results of this investigation shall be submitted in writing to BUSTR with the results of the tank tightness test required in 10(b) above.
- d) If the result of a SIR analysis is a failure and the calculated leak rate is negative, the O/O must check the tank immediately for the presence of water. A negative calculated leak rate means that you are gaining product. Increase in product may be due to water entering the tank, or mis-calibrated meters.

11) O/O's using SIR should establish their reporting period based on the first and last date of each month (monthly basis). BUSTR reserves the right to change this reporting period. Nothing in this document supersedes any requirement to report a release or suspected release to BUSTR by a method other than SIR in accordance with Rule 1301:7-9-13 of the Ohio Administrative Code

These requirements are not all inclusive, but address many of the common concerns associated with SIR. For additional information, contact BUSTR at (614) 752-7938.

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