



System Logic Description for the Low-Activity Waste Facility - LAW Stack Discharge (SDJ) System

Document title:

Document number: 24590-LAW-PER-J-19-001, Rev 0

Contract number: DE-AC27-01RV14136

Department: Controls and Instrumentation

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Issue status: Issued for Permitting Use

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This bound document contains a total of 11 sheets

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Notice

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History Sheet

Rev	Reason for revision	Revised by
0	Issued for Permitting Use	Edison Mercado

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Glossary

Bad Quality (BQ)	On instrument failure, the operator receives an alarm and the process control system (PCJ) display shows a red X over the process value.
Control System	Control system refers to electronic processors that perform regulatory and logic control functions necessary for normal plant operation.
Permissive	Interlock that allows a device to change state or a sequence to start. Once a device has changed state or a sequence has started, permissive has no further effect on the device or sequence.
Trip	Interlock that does not allow a device to change state or a sequence to start. Once a device has changed state or a sequence has started, trips continue to have an effect on the device or sequence.
Non-radiological Monitoring	A continuous monitoring system means using a device which continuously samples a permit regulated parameter, evaluates the detector response at least once every fifteen (15) seconds, and computes and records the average value at least every sixty (60) seconds, except during allowable periods of calibration and except as defined otherwise by the CEMS Performance Specifications in 4B and 8A in Appendix B, 40 CFR Part 60 [DWP Definition].
Continuous Emissions Monitoring System (CEMS)	The total equipment that may be required to meet the data acquisition and availability requirements, used to sample, condition (if applicable), analyze, and provide a record of emissions in the Code of Federal Regulations (40 CFR 63.2).

Acronyms and Abbreviations

Reference the piping and instrumentation diagrams' symbols and legend sheets as listed in the Applicable Documents section, for acronyms and abbreviations used in the Appendix.

AEA	Atomic Energy Act
AW	Analysis Sample Probe
AWFCO	Automatic Waste Feed Cutoff
AE	Analysis Element
AT	Analysis Transmitter
AI	Analysis Indicator
AAHH	Analysis Alarm High
ASHH	Analysis Switch High-High
CEM	Continuous Emissions Monitor
CEMS	Continuous Emissions Monitoring System
CO	Carbon Monoxide
DAHS	SDJ's Data Acquisition Handling System
DOE	US Department of Energy
DWP	Dangerous Waste Permit
LAW	Low Activity Waste
P&ID	Piping and Instrumentation Diagram
PCJ	Process Control System
SDJ	Stack Discharge Monitoring System
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1 Introduction

This Dangerous Waste Permit (DWP) document describes the instrument control logic for LAW non-radiological monitoring equipment designed to connect with and provide activity, alarm, and status signals to the process control system (PCJ) for monitoring stack parameters for online display of Carbon Monoxide (CO) concentration. This document was prepared to provide stack discharge monitoring system (SDJ) control narrative description to meet the requirements of Dangerous Waste Permit (DWP) permit condition III.10.E.9.d.vii.

2 Applicable Documents

24590-WTP-M6-50-00001	<i>P&ID Symbols and Legend Sheet 1 of 8</i>
24590-WTP-M6-50-00002	<i>P&ID Symbols and Legend Sheet 2 of 8</i>
24590-WTP-M6-50-00003	<i>P&ID Symbols and Legend Sheet 3 of 8</i>
24590-WTP-M6-50-00004	<i>P&ID Symbols and Legend Sheet 4 of 8</i>
24590-WTP-M6-50-00005	<i>P&ID Symbols and Legend Sheet 5 of 8</i>
24590-WTP-M6-50-00006	<i>P&ID Symbols and Legend Sheet 6 of 8</i>
24590-WTP-M6-50-00007	<i>P&ID Symbols and Legend Sheet 7 of 8</i>
24590-WTP-M6-50-00008	<i>P&ID Symbols and Legend Sheet 8 of 8</i>
24590-LAW-M6-LVP-00002006	<i>P&ID – LAW Secondary Offgas/Vessel Vent Process System Stack Discharge Monitoring System</i>
24590-LAW-PCN-ENV-18-012	<i>Hanford Facility RCRA Permit Modification Notification Form Part III, Operating Unit 10 Waste Treatment and Immobilization Plant.</i>

3 Description

The LAW Facility aerial stacks' discharge non-radiological data are monitored by Continuous Emission Monitor (CEM). Emission sample gas is measured by analyzer sample probes, which is translated into analog signals by analyzer transmitters. The signals from the analyzers are transmitted to the CEMS monitor computer. CEMS is connect with and provide activity, alarm, and status signals to the Process Control System (PCJ) for monitoring stack parameters for online display of non-radiological emissions such as carbon monoxide (CO) and oxides of nitrogen (NO_x). The CEMS perform self-diagnostics on their detectors every 15 seconds.

The continuous emissions monitoring system (CEMS) includes Data Acquisition Historian System (DAHS). Data is archived as historical data by DAHS. One of the DAHS workstations functions as Ecology's onsite location to access the WTP non-radiological environmental emissions monitoring data.

The DAHS have protection features ensuring security of its archived data, ensuring access to the database is by authorized users only, ensuring security of report generation data interfaces, and ensuring secure and unidirectional data transmission from the DAHS to the workstation dedicated for Ecology's use only.

3.1 Stack Discharge Carbon Monoxide Monitoring

Sample is continuously extracted separately via analysis sample probes, SDJ-AW-2110 and SDJ-AW-2124. The sample separately goes thru analysis element SDJ-AE-2110 (located in CEMS panel SDJ-PNL-00062) and SDJ-AE-2124 (located in CEMS-PNL-00125) and then the samples are separately returned to the stack discharge.

Analyzer Transmitters SDJ-AT-2110 and SDJ-AT-2124 convert the gas sample reading into analog signal. Stack gas analyzer transmitters SDJ-AT-2110 and SDJ-AT-2124 are designated as Automatic Waste Feed Cutoffs (AWFCOs). The permittees will operate the AWFCO instrument loops to automatically cut-off and/or lock-out the dangerous and mixed waste feed to the LAW vitrification System when the monitored operating conditions deviate from the set-points, except during calibration or maintenance of the instrument.

LVP Stack Gas Analyzer SDJ-AT-2110

The LVP stack gas analyzer SDJ-AT-2110 sends CO analog signal SDJ-AT-2110B to PCJ. SDJ-AT-2110B provides a dual signal, this can correspond to a low value range of 0-200 ppmv or a high value range of 0-3000 ppmv. The analyzer transmitter can switch between the low range or to the high range mode based on its normal operating cycling and PCJ is configured to detect the ranges. Regardless if the transmitter is in the low range mode or the high range mode, PCJ is programmed to trigger a high alarm (SDJ-AAH-2110B) when the CO concentration reaches the high level setpoint. The CO concentration alarm reading value is displayed at SDJ-AI-2110B indicator at the control room and alerts operator about the high-level CO concentration.

During the daily drift and span check as well as when CEMS analyzer is out of service, the CO value is held at its last value.

LVP Stack Gas Analyzer SDJ-AT-2124

The LVP stack gas analyzer SDJ-AT-2124 sends CO analog signal SDJ-AT-2124B to PCJ. SDJ-AT-2124B provides a dual signal, this can correspond to a low value range of 0-200 ppmv or a high value range of 0-3000 ppmv. The analyzer transmitter can switch between the low range or to the high range mode based on its normal operating cycling and PCJ is configured to detect the ranges. Regardless if the transmitter is in the low range mode or the high range mode, PCJ is

programed to trigger a high alarm (SDJ-AAH-2110B) when the CO concentration reaches the high level setpoint. The CO concentration alarm reading value is displayed at SDJ-AI-2124B indicator at the control room and alerts operator about the high-level CO concentration.

During the daily drift and span check as well as when CEMS analyzer is out of service, the CO value is held at its last value.

Rolling Hourly Average CO Concentration

The rolling hourly average is the mean of the sixty (60) most recent one-minute readings recorded. PCJ is configured with a select switch, SDJ-HS-2110, to choose the higher value reading between the CO concentration SDJ-AI-2110B or SDJ-AI-2124B output signal. The rolling hourly average value is displayed on SDJ-AI-2110D indicator, and if the CO concentration value reaches the high-high setpoint (SDJ-ASHH-2110D), PCJ logic trips the Melter 1 and melter 2 ADS pumps to stop melter feed. A high-high alarm SDJ-AAHH-2110D alerts the operator on the high-high interlock.

Table 1 depicts the DWP instrumentation associated with the above description. Figure 1 depicts the typical DWP control logic function.

Table 1 DWP Instruments for LAW Stack Discharge CO Concentration Monitoring

P&ID	Monitoring/control parameter	Type of instrument/control device	Instrument/control device tag number
24590-LAW-M6-LVP-00002006	CO Concentration Measurement for SDJ-AT-2110	Analysis Sample Probe	SDJ-AW-2110
		Analysis Sample Element	SDJ-AE-2110
		LVP Stack Gas Analyzer	SDJ-AT-2110
		CO Conc Analog Signal	SDJ-AT-2110B
		CO Conc Indicator	SDJ-AI-2110C
		High CO Conc Range Indicator	SDJ-AI-2110B
		CO Conc Alarm High	SDJ-AAH-2110B
24590-LAW-M6-LVP-00002006	CO Concentration Measurement for SDJ-AT-2110 or SDJ-AT-2124	Rolling Hourly Ave CO Conc Indicator	SDJ-AI-2110D
		Rolling Hourly Ave CO Conc Switch High-High	SDJ-ASHH-2110D
		Rolling Hourly Ave CO Conc Alarm High-High	SDJ-AAHH-2110D
24590-LAW-M6-LVP-00002006	CO Concentration Measurement for SDJ-AT-2124	Analysis Sample Probe	SDJ-AW-2124
		Analysis Sample Element	SDJ-AE-2124
		LVP Stack Gas Analyzer	SDJ-AT-2124
		CO Conc Analog Signal	SDJ-AT-2124B
		CO Conc Indicator	SDJ-AI-2124C
		Hi CO Conc Range Indicator	SDJ-AI-2124B
		CO Conc Alarm High	SDJ-AAH-2124B

Figure 1 LAW LVP Stack Discharge CO Concentration Measurement

