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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 643874

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
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13a. Description of Change

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14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

To bring the document up to Fiscal Year 1999 performance agreement standards.

15. Distribution (include name, MSIN, and no. of copies)

See attached distribution.

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ENGINEERING CHANGE NOTICE

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16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
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[X] No	Savings	[ ] $	Savings	[ ] $	Delay	[ ]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[ ]	Seismic/Stress Analysis	[ ]	Tank Calibration Manual	[ ]
Functional Design Criteria	[ ]	Stress/Design Report	[ ]	Health Physics Procedure	[ ]
Operating Specification	[ ]	Interface Control Drawing	[ ]	Spares Multiple Unit Listing	[ ]
Criticality Specification	[ ]	Calibration Procedure	[ ]	Test Procedures/Specification	[ ]
Conceptual Design Report	[ ]	Installation Procedure	[ ]	Component Index	[ ]
Equipment Spec.	[ ]	Maintenance Procedure	[ ]	ASME Coded Item	[ ]
Const. Spec.	[ ]	Engineering Procedure	[ ]	Human Factor Consideration	[ ]
Procurement Spec.	[ ]	Operating Instruction	[ ]	Computer Software	[ ]
Vendor Information	[ ]	Operating Procedure	[ ]	Electric Circuit Schedule	[ ]
OM Manual	[ ]	Operational Safety Requirement	[ ]	ICRS Procedure	[ ]
FSAR/SAR	[ ]	IEFD Drawing	[ ]	Process Control Manual/Plan	[ ]
Safety Equipment List	[ ]	Cell Arrangement Drawing	[ ]	Process Flow Chart	[ ]
Radiation Work Permit	[ ]	Essential Material Specification	[ ]	Purchase Requisition	[ ]
Environmental Impact Statement	[ ]	Fac. Proc. Samp. Schedule	[ ]	Tickler File	[ ]
Environmental Report	[ ]	Inspection Plan	[ ]		[ ]
Environmental Permit	[ ]	Inventory Adjustment Request	[ ]		[ ]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
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21. Approvals

Signature	Date	Signature	Date
Design Authority		Design Agent	
Cog. Eng. D.J. McCain	1-29-99	PE	
Cog. Mgr. K.M. Hodgson	2-2-99	QA	
QA D.C. Board	2-8-99	Safety	
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Environ.		Environ.	
Other M.F. Erhart	2/18/99	Other	
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S.H. Rifaey	2/23/99	Signature or a Control Number that tracks the Approval Signature	
T.C. Schneider	2/17/99		
R.J. Shupe	3/2/99	ADDITIONAL	

Engineering Task Plan for Standard Hydrogen Monitoring System Operation

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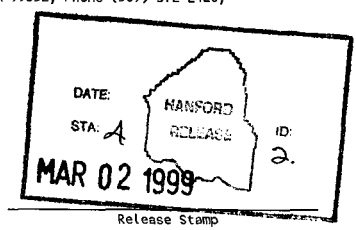

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(2) Title

Engineering Task Plan for Standard Hydrogen Monitoring System Operation

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1.0 INTRODUCTION

Tanks that are known or suspected to retain and occasionally release flammable gases are equipped with Standard Hydrogen Monitoring System (SHMS) cabinets. These cabinets contain Whittaker™ electrochemical cells and may also have a gas chromatograph (GC) and/or a Bruel and Kjaer infrared photo-acoustic multi-gas monitor (B&K). The GC and B&K will be referred to collectively as "analytical instruments" in this document. Using these instruments, a tank can be monitored for hydrogen, ammonia, methane, and nitrous oxide. Air from the tank vent header (for actively ventilated tanks) or dome space (for passively ventilated tanks) is drawn continuously through the monitoring instruments via a sample pump. This monitoring is performed to track the gas release behavior of selected waste storage tanks and to help identify any potentially serious gas release behavior. Vapor grab samples are obtained from the SHMS as well and are analyzed with a mass spectrometer to obtain concentration data about hydrogen and other gases.

2.0 SCOPE

This document describes the requirements for the operation, maintenance, calibration, and data collection for the Standard Hydrogen Monitoring System. Additionally, this document defines who is responsible for the various tasks.

3.0 PHYSICAL DESCRIPTION

A SHMS consists of hydrogen specific monitors (Whittaker™ cells), a grab sampler, and a gas sampling system (tubing, valves, vacuum pumps, etc.). The grab sampler allows vapor samples to be isolated and transported to a laboratory for measurement of hydrogen and other gases. The first SHMS was developed to continuously monitor hydrogen concentrations on waste tank 241-SY-101. See WHC-SD-WM-SDD-001 (Atencio 1992) for the system design description.

Based on the success of the original SHMS, the system was upgraded to automatically obtain a grab sample on a high hydrogen reading. Also, the Whittaker™ cells were configured so that one covers a high range (0 - 10% by volume) and one covers a low range (0 - 1% by volume). This modified version is called the SHMS-B. See WHC-SD-WM-SDD-055 (Schneider 1996a) for the system design description.

As specific needs have arisen, the SHMS-B has been modified to provide the needed capabilities. This has resulted in several variations that include models C, D, E, and E+.

The SHMS-C is a SHMS-B unit that is modified to accommodate a dual column gas chromatograph with thermal conductivity detectors (GC-TCD). The SHMS-C is designed to accurately record baseline hydrogen concentrations that are well below the range of the Whittaker™ cells. The system design description is found in WHC-SD-WM-SDD-058 (Schneider 1996b).

The SHMS-D is a SHMS-B unit that is modified to accommodate a B&K monitor, which measures ammonia. The SHMS-D was developed to monitor ammonia concentrations in the ventilation exhaust of double-shell tanks (DSTs). The system design description is found in WHC-SD-WM-SDD-059 (Schneider 1996c).

The SHMS-E accommodates a GC-TCD and a B&K monitor (but they are not installed). The SHMS-E is intended for the same applications as a SHMS-B. The SHMS-E can be easily upgraded to an E+. The SHMS-E+ is a SHMS-E with the GC and the B&K monitor installed. The GC measures hydrogen, nitrous oxide, and methane, and the B&K monitor detects ammonia. The system design description is found in HNF-SD-SDD-077 (Schneider 1997).

For SHMS on tanks with a history of high moisture and on all new systems, Sample Gas Conditioners (SGCs) have been or are being installed. These systems consist of a condenser coil that separates moisture from the sample stream. These systems are intended to prevent moisture clogging of the SHMS sample lines.

Drawing tree H-14-100834 (MCE Engineering 1997a) has the system drawing list for the SHMS cabinets. The Certified Vendor Information (CVI) file for the SHMS is VI-22192. Table 3-1 lists the tanks and types of SHMS currently installed.

Table 3-1. Tanks Equipped with SHMS Instrumentation

Tank	SHMS Type	Date Installed
SY-101	SHMS (3 units)	March 1992
SY-103	SHMS-B	May 1992
AW-101	SHMS-B	September 1994
AW Farm exhaust vent	SHMS-D	June 1996
AN-101	SHMS-E+	May 1997
AN-103	SHMS-B	September 1994
AN-104	SHMS-C	September 1994
AN-105	SHMS-B	September 1994
AN-107	SHMS-B (from A-101)	May 1997
AN Farm exhaust vent	SHMS-D	June 1996
AY-102	SHMS-C	March 1997
BY-103	SHMS-B	July 1995

Table 3-1. Tanks Equipped with SHMS Instrumentation

BY-105	SHMS-E+	May 1997
BY-106	SHMS-D	July 1995
BY-109	SHMS-D	July 1995
A-101	SHMS-E+	May 1997 (replaces a SHMS-B installed March 1995)
AX-101	SHMS-B	March 1995
AX-103	SHMS-B	March 1995
AZ-101	SHMS-E	May 1997
AZ-102	SHMS-E	May 1997
C-106	SHMS-C	March 1997
S-101	SHMS-E	September 1997
S-102	SHMS-B	March 1995
S-106	SHMS-E+	September 1997
S-107	SHMS-B (from SX-103)	September 1997
S-109	SHMS-E+	September 1997
S-111	SHMS-B	March 1995
S-112	SHMS-B	March 1995
SY-102	SHMS-E+	September 1997
SX-101	SHMS-B	March 1995
SX-102	SHMS-B	March 1995
SX-103	SHMS-E+	March 1998
SX-104	SHMS-B	March 1995
SX-105	SHMS-B	March 1995
SX-106	SHMS-B	March 1995
SX-109	SHMS-B	March 1995
T-110	SHMS-B	March 1995
U-102	SHMS-B (from U-105)	May 1998
U-103	SHMS-B	March 1995

Table 3-1. Tanks Equipped with SHMS Instrumentation

U-105	SHMS-E+	May 1998
U-107	SHMS-B	March 1995
U-108	SHMS-B	March 1995
U-109	SHMS-B	March 1995

4.0 OPERATION AND MAINTENANCE

4.1 SHMS

Routine operations for the SHMS cabinets consist of checking the alarm panel for any illuminated alarm lamps, testing the alarm panel, recording hydrogen concentrations from the display panel, recording inlet filter differential pressure and flow, and checking the strip chart recorder for paper. These operations are performed daily.

Vapor grab samples are taken periodically from tanks with SHMS cabinets for the purpose of comparing measurable gas concentration values recorded by the SHMS systems versus those determined by mass spectrometry on the captured gas sample. Those tanks with alternate hydrogen measuring systems are occasionally grab sampled (no preset frequency required), double-shell tanks with only the SHMS are grab sampled quarterly, and single-shell tanks with only the SHMS are measured once per year.

The procedure for these operations is in TO-040-040 (LMHC 1997b) for SHMS, SHMS-B, and SHMS-C. The procedure for SHMS-D, SHMS-E and SHMS-E+ is TO-040-041 (LMHC 1997c). Operation of the Sample Gas Conditioning Cabinets is listed in TO-040-043 (LMHC 1997d).

4.2 ANALYTICAL INSTRUMENTS

Routine operations for the analytical instruments; i.e., gas chromatographs and B&K infrared photo-acoustic multi-gas monitors, are system checks that verify proper flow and temperature properties, calibration gas pressure, carrier gas pressure, and instrument functionality. Data files are archived and system clocks are synchronized. Routine system checks are performed at least once per week.

5.0 INSTRUMENT CALIBRATION AND VERIFICATION

5.1 CALIBRATION AND VERIFICATION OF WHITTAKER™ CELLS

The Whittaker™ cells are calibrated quarterly. The calibration procedure for SHMS, SHMS-B, and SHMS-C is 6-TF-408 (LMHC 1997h). The calibration procedure for SHMS-D, SHMS-E, and SHMS-E+ is 6-TF-440 (LMHC 1997i).

In most SHMS, the Whittaker™ cell data output is transmitted to the Tank Monitoring and Control System (TMACS). TMACS converts the 4-20 mA output signal to 0 - 10,000 counts. These counts are converted to percentages depending on whether the signal is transmitted from the low range or high range cell. A maintenance check will be performed at least annually to verify the output signals from the Whittaker™ cells correctly correlate to the values recorded on TMACS.

5.2 CALIBRATION OF ANALYTICAL INSTRUMENTS

Calibrations of the B&K monitor will be conducted in the 306-E Gas Laboratory by instrument technicians. The B&K monitors are calibrated semi-annually. The calibration procedure is 6-GM-143 (LMHC 1997a). Other general maintenance procedures are 6-RECD-175 (LMHC 1997g), 6-RECD-258 (LMHC 1997j), and 6-PCD-259 (LMHC 1997f). The following section describes calibration terms, methodologies, frequencies, and documentation requirements. Table 5-1 summarizes the information presented in sections 5.2.1 through 5.2.5.

Table 5-1. Calibration Description and Frequency.

Description	Frequency	Documentation
Gas Chromatograph Verification	Biweekly	Verification log to file
Gas Chromatograph Calibration	As Needed	Verification and method report to log and file
GC Multi-Point Certification	Annually	Certification log to file
B&K Calibration	Semi-annually	Calibration Data Sheets to PMS files

5.2.1 Terminology

Chromatogram	Raw data acquired by a gas chromatograph. Consist of binary or ASCII representation of detector signal versus acquisition time. The injection of sample or calibration standard results in peaks in the chromatogram. Areas under the peaks are proportional to concentration.
Response Factor	Linear proportionality constant relating area under a chromatogram's peak to gas concentration. Response factor or RF is defined as Area/Concentration.
Verification	Verification refers to process of injecting standard calibration gases into analytical systems and comparing the instrument response to these standards. Verification also refers to the process of insuring the integration is not including area from an adjacent peak and that the delay column is functioning normally.
Validation	Process of updating the linearization curve (response factor), or the integration method used to convert peak areas to concentration.
Purge	The process of heating (baking out) the delay column to remove impurities which may reduce the accuracy or sensitivity of the detectors.
Multi-point	The GCs will be tested annually, using at least two Certification calibration gas concentrations, to assure that the response of the GC is linear and accurate (i.e., 100 ppm and 1000 ppm).
SHMS-E+	The addition of the "+" to the SHMS-E designation, is an abbreviated form of saying that a specific SHMS has the gas chromatograph and B&K monitor installed.

5.2.2 Gas Chromatograph Verification

The gas chromatograph instruments shall be verified a minimum of once every two weeks. This verification shall consist of injecting a hydrogen standard of known concentration into the GC. The indicated concentration is compared to the certified concentration of the standard. If the deviation between these two values is greater than $\pm$ 10%, a response factor change, method reconstruction, or further diagnostics is required.

Results of the biweekly gas chromatograph verifications shall be recorded in the logbook using the gas chromatograph verification log format (see Figure 5-1). Each gas chromatograph has a logbook, which is kept in the cabinet. Only Remote Automation Instrumentation Laboratory (RAIL) personnel make log entries. A description of the problem and/or changes made shall be

provided to the data customer and electronically included in the meta-data supplement of the Data Archive.

Figure 5-1. Verification Log Format

GC Verification Log for SHMS					
Date	**Sample ID**	**Standard H_2 Concentration**	**Reported H_2 Concentration**	**Deviation from Standard H_2**	**Comments**

5.2.3 Gas Chromatograph Multi-Point Certification

The gas chromatograph instruments shall be verified for accuracy and linearity a minimum of annually or more frequently as required by biweekly instrument checks. Verification shall consist of injection of at least two different concentrations of standard calibration gases. The Response Factor of the instrument shall be calculated and updated as required.

Results of the annual gas chromatograph certification shall be recorded on a gas chromatograph log report. A copy of the calibration report shall be maintained in the SHMS project file maintained by RAIL personnel. The Multi-point test shall be noted in the SHMS Log Book along with any changes made. This information shall also be included in the meta-data supplement of the Data Archive.

5.2.4 System Loop Verifications

All SHMS analytical instrumentation data communication is digital via Ethernet or RS-232 communications. No analog conditioning or loop losses are introduced into the system.

At least annually, a random check shall be performed comparing at least 15 data points from each instrument's host computer file and associated master data file.

Results of the annual loop verifications shall be recorded on a SHMS System Loop Verification Log Sheet and maintained on file in the RAIL instrument calibration file.

5.2.5 Process Instrumentation

SHMS also houses process instrumentation for trending system pressures, flow, and temperatures. These instruments are non-data and used for information purposes only. The process instrumentation is initially calibrated by FDH Standards Laboratory. Recalibration of these instruments is performed according to the following schedule:

Table 5-2. Process Instrumentation Calibration Schedule.

Instrument	Calibration Schedule
electronic or chart recorder	annually
Newport voltmeter monitoring the Whittaker™ cell voltages	quarterly with Whittaker™ cells
input sample pressure gauge	every 3 years
differential pressure gauge across filters	every 3 years
Rosemount flow/pressure gauges (selectable - differential pressure across gas chromatograph and various selectable lines to atmosphere)	every 3 years
rotometers – flow	no calibration
low flow alarm	no calibration but functional test at shutdown
cabinet thermocouple and temperature controller	no calibration
calibration gas temperature controller	no calibration
sample line temperature controller and thermocouple	no calibration

6.0 DATA COLLECTION

SHMS hydrogen data are recorded electronically and on a strip chart recorder. Tanks in AN, S, SX, SY, T, and U farms have SHMS, which are connected to the Tank Monitoring and Control System (TMACS). TMACS checks the hydrogen reading once per minute and records a datum point if the difference between this point and the previously recorded datum point is over 50 ppm (for the low range cell) or 150 ppm (for the high range cell). Data are examined on a weekly basis by Process Engineering.

Data from SHMS not connected to TMACS are recorded on strip charts. The SHMS are checked during daily rounds by Tank Farm Operations, and the hydrogen concentrations displayed by the digital readout are recorded on round sheets. The shift office sends these sheets once per week to Process Engineering, and the readings are typed into computer spreadsheets. If a rise in hydrogen concentration is detected, the strip chart may be collected and delivered to Process Engineering if requested. Data during any hydrogen activity are transcribed from the strip chart into computer spreadsheets. These spreadsheets are kept on the Fileserver AP013\BARO. The Technical Data Service Center permanently stores the strip charts.

Tanks 241-AY-102, AZ-101, AZ-102, 241-C-106 and S-101, are equipped with "paperless strip charts", computerized recorders which copy data to floppy disks. Paperless strip charts will be installed on tanks that have a SHMS-E. The floppy disks are collected once per month, and a

copy of the data will be sent to Process Engineering.

A high hydrogen alarm on the SHMS is activated if the hydrogen concentration exceeds 6250 ppm. If the alarm is activated, all work in or near the tank is stopped. Hydrogen readings above 2500 ppm require notification of DOE-RL within 24 hours. The 24-hour period begins with the discovery of the high hydrogen reading and ends on the next business day. Notification is made through Process Engineering and Safety Issues Resolution.

If the high hydrogen alarm is activated, a vapor grab sample will be taken automatically at the SHMS. The valves on either side of the sample cylinder must be manually closed within two hours after the initiation of the high hydrogen alarm. If the alarm continues for a longer period than two hours, the valves must be closed immediately after the alarm has stopped. If the valves are not tightened, vapor leaks from the cylinder, and the sample is lost.

6.1 DETERMINATION OF VALID DATA DAYS

Performance agreements often require measurable goals. The unit of performance measurement most associated with the SHMS are 24-hour days (midnight to midnight) during which at least one reliable hydrogen gas concentration measurement has been taken from a tank with a SHMS cabinet installed. A reliable measurement is a reading taken from any of several possible hydrogen monitoring systems present on the tank, including gas chromatographs, provided the instrument is within calibration requirements and there is proper air flow through the instrument. Vapor grab sample measurements, using mass spectrometry, will also provide valid data days for those days on which the measurements were taken. The number of data days needed to fulfill performance agreements may vary from year to year, so will not be specifically addressed in this document.

6.1.1 Calibration Requirements for Valid Data Days

The SHMS cognizant engineer, from Equipment Engineering, shall monitor all calibration activity for the SHMS monitoring equipment. All data recorded during periods when the instrument is found to be out of calibration (per Section 5.0), or taken in a period during which a prescribed calibration date has expired, will be considered suspect. The cognizant engineer will review the operation of the instrument and the data recorded over the period when the data were suspect and notify Process Engineering of the anomaly. Together, the cognizant engineer and a SHMS process engineer shall determine which data are not reliable and discount those days that were credited as valid data days. This discounting will be documented in Process Engineering letter books.

6.2.2 Air Flow Requirements for Valid Data Days

Each tank with a SHMS monitor also has an airflow monitor. A "Flow Value" for each tank has

been determined and is routinely posted on or near the airflow monitor. Operations takes monitor readings every day for each SHMS cabinet and records the flow value on a "rounds" sheet. If the airflow recorded varies by more than 0.4 inches of water (2.5 inches is roughly equivalent to 0.5 cubic feet per minute) from the posted airflow, operations is to so note on the round sheets and notify appropriate Maintenance personnel of the anomaly for correction. Process Engineering reviews the round sheets weekly and places all data recorded during any period where the airflow drops below a 0.4 inches reading as suspect. Process Engineering then reviews the data coincidental to the anomaly and determines if reliability for the hydrogen concentration has been lost. All data recorded for that day, if determined unreliable, will lead to elimination of the valid data day, unless a vapor grab sample was taken. Documentation of this decision must be kept in Process Engineering letter books.

7.0 DIVISION OF RESPONSIBILITIES

TWRS Tank Waste Operations are ultimately responsible for the activities covered in this plan. Routine operation, maintenance, and calibration of the SHMS are defined by the procedures listed in Sections 4.1, 5.1, and 5.2.5. The maintenance of spare parts and consumables is also a key responsibility. With the procurement of carrier gas and calibration gas comes the requirement to obtain vendor certifications on the calibration gases. Each calibration gas certification sheet shall be stored for record. Validation of the data requires a vendor certified reference gas standard (auditable).

Physical items of equipment and documentation included in this set are:

- SHMS Cabinet with Whittaker™ cells, controllers, and filters
- Exterior gas bottle rack(s)
- Bottles, regulators, and sample lines
- Sample pump
- Gas Sample Conditioner
- Gas Sample Probe
- Power supply (breaker, cables, and transformer)
- Environmental control system
- TMACS communication interface
- Data recorder (where present)

SHMS documentation must be maintained in an auditable manner. The following list contains specific documents to be maintained:

- Gas certification sheets, from the bottled gas vendor, for each calibration gas bottle. Operations is to note on each certification, the SHMS unit served by the gas, and the date connected to the manifold.

- Standard Hydrogen Monitoring System, System Design Description, "WHC-SD-WM-SDD-001, Rev. 0."

- Standard-B Hydrogen Monitoring System, System Design Description, "WHC-SD-WM-SDD-055, Rev. 1."
- Standard-C Hydrogen Monitoring System, System Design Description, "WHC-SD-WM-SDD-058, Rev. 0."
- Standard-D Hydrogen Monitoring System, System Design Description, "WHC-SD-WM-SDD-059, Rev. 0."
- Standard-E Hydrogen Monitoring System, System Design Description, "HNF-SD-WM-SDD-077, Rev. 0."
- Standard Hydrogen Monitoring System-A Operations and Maintenance Manual, "WHC-SD-WM-OMM-005, Rev. 0."
- Standard Hydrogen Monitoring System-B Operations and Maintenance Manual, "HNF-SD-WM-OMM-015, Rev. 1."
- Standard Hydrogen Monitoring System-C Operations and Maintenance Manual, "HNF-SD-WM-OMM-018, Rev. 0."
- Standard Hydrogen Monitoring System-D Operations and Maintenance Manual, "HNF-SD-WM-OMM-028, Rev. 0."
- Standard Hydrogen Monitoring System-E Operations and Maintenance Manual, "HNF-SD-WM-OMM-029, Rev. 0."
- Operating Procedures: T0-040-040, T0-040-041, and T0-040-043
- Maintenance Procedures: 6-GM-143, 6-RECD-175, 6-RECD-258, 6-PCD-259, 6-TF-408, 6-TF-440, and 6-TF-509

This task plan covers the SHMS, sample pump, bottle rack, sample lines, and power supply, but does not extend to the temporary analytical equipment added to some SHMS units. Oversight for all aspects of the functional SHMS is a Tank Waste Operations responsibility. Any modification by RAIL personnel of the analytical equipment will be coordinated with Operations, including the SHMS Cognizant Engineer and the Shift Manager.

The Field Sampling Group from Characterization Project Operations is responsible for obtaining vapor grab samples from the SHMS. The frequency for obtaining these samples is defined in section 4.1. Process Engineering will develop a work schedule before sampling. TWRS Tank Waste Operations are responsible for manually tightening the sample cylinder valves if a vapor grab sample is automatically taken, as discussed in section 6.0. Truck drivers ship the samples to Pacific Northwest National Laboratory (PNNL) from the West Area Resource Pool. PNNL analyses these samples for hydrogen, nitrous oxide, and methane using a mass spectrometer. The results are sent to Process Engineering, and hydrogen readings from the grab samples are

compared to SHMS readings to check the accuracy of the SHMS. Additional gas specie concentrations are archived and are available if needed.

Instrument technicians shall perform maintenance of the strip chart recorders. Data analysis and electronic archival of the SHMS data recorded exclusively on strip charts are the responsibility of Process Engineering. RAIL personnel archive data files downloaded from gas chromatographs and other analytical instruments on CD-ROM and on Fileserver AP005\gas.

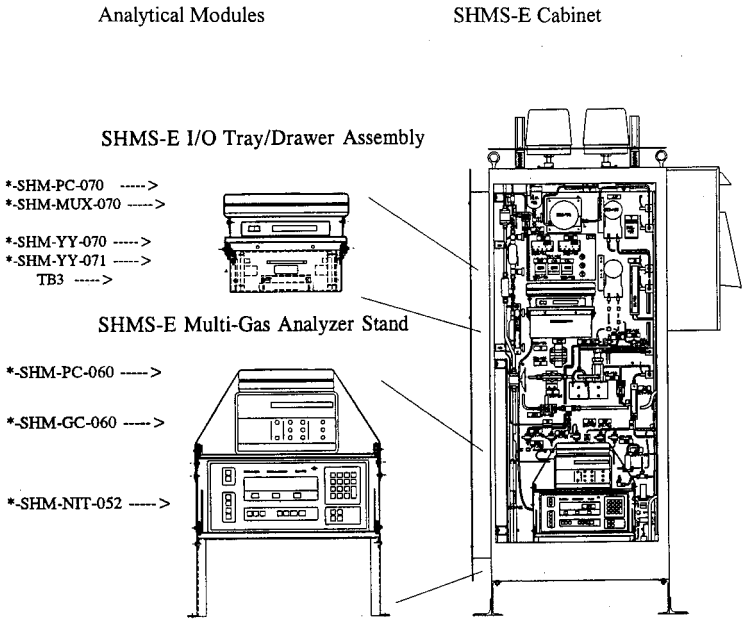
Operators or their managers will notify the on-call Process Engineer of flammable gas concentrations above notification limits per WHC-IP-0842, Volume II, Section 5.10. Process Engineering will then notify Safety Issue Resolution and DOE-RL within one business day following the notification. .

Special analytical and temporary equipment installed in some SHMS units, will be owned, supported and later removed by RAIL.

Equipment and administrative criteria included in this set (see Figure 7-1) are defined by drawings H-14-100846, sheets 1-3 (MCE Engineering 1997c), H-14-100847, sheets 1-4 (MCE Engineering 1997b), and the following list:

- MTI Gas Chromatograph (SHM-GC-060)
- GC Computer (SHM-PC-060)
- B&K Photo Acoustic Monitor (SHM-NIT-052)
- National Instruments Data Acquisition Module (SHM-MUX-070)
- National Instruments Analog to digital converters, signal conditioners, and I/O switches (SHM-YY-070, SHM-YY-071, TB3, Cab-1)
- Host Data Acquisition Computer (SHM-PC-070)
- SHMS Analytical Subsystem Software
- HLAN Interface (in 2 forms: twisted pair and radio modem)

Figure 7-1. SHMS-E with Analytical Module.



Responsibility for maintenance of some SHMS Documentation will be retained by RAIL. Specific documents to be maintained by RAIL are:

- Electronic copy of data from the analytical subsystems, including calculated data, chromatogram files, and meta-data defining errors, also showing system outages or gaps in the data.

- Computer Systems and Software Description for Standard-E+ Hydrogen Monitoring System (SHMS-E+), "HNF-SD-WM-CSWD-084, Rev. 0."

- Functional Design Criteria for Standard-E Hydrogen Monitoring System, Portable Platform, "HNF-SD-WM-FDC-055, Rev. 0."

Validation of the Gas Chromatograph system and data as well as verification of the integration method will be accomplished by the RAIL team as described in Sections 5.2.2, 5.2.3, and 5.2.4.

7.1 FUNDING BOUNDARIES

Funding for maintenance, modification, or operational activities, and training will be Tank Waste Operations budget responsibility. The cost of installing, supporting, repairing, modifying, and removing the analytical package, in a "C", "D", or "E" SHMS configuration will be funded by those programs which are responsible for monitoring and evaluating the flammable gas safety issue.

7.2 MAINTENANCE OPERATIONS

Tank Farms Crafts using work packages and the Job Control System (JCS) will conduct maintenance activities, initiated by RAIL personnel. Work package resolutions will be drafted by the SHMS cognizant system engineer and conducted by Tank Farms Crafts in conjunction with RAIL personnel and Operations as appropriate. The appropriate Tank Farm Cognizant Engineer maintains final signature approval for JCS work packages that modify his/her facility. Prior to field maintenance on a SHMS system, training of Maintenance and Operations personnel shall be conducted as required on the off-line SHMS mock-up system located in the 306E building. The cognizant SHMS engineer may elect to witness any field maintenance.

7.3 TANK ISOLATION (SAFETY ISSUE)

The tank vapor space gases will be isolated from the maintenance activity prior to opening the line for maintenance.

7.4 NOTIFICATIONS AND APPROVALS

Communication of changes, outages, and reduced capability are an important factor in optimum system performance. Shift Operations will, therefore, notify the SHMS Cognizant Engineer and RAIL personnel of outages or activities that may impact the SHMS system (power outage, sample line valved out, exhauster outage, or access change). Likewise RAIL personnel will notify the SHMS Cognizant Engineer and the appropriate Area Shift Manager in advance of any planned SHMS analytical equipment outage.

Change authorization for the SHMS analytical equipment, including its hardware or software, shall include RAIL personnel and the TWRS Equipment Engineering - SHMS Cognizant Engineer. TWRS Equipment Engineering will supply the Cognizant Engineer and the Cognizant Engineer Manager for the SHMS.

8.0 QUALITY ASSURANCE

All work is conducted in accordance with the relevant quality requirements of HNF-IP-0842, *Lockheed Martin Hanford Corporation Quality Assurance Program Plan* (Byers 1998). Additionally, equipment that is deployed in Hanford's waste tank applications, must be in compliance with NEPA (National Environmental Protection Act) requirements, with associated documentation.

9.0 SAFETY.

Section 2.0 of HNF-SD-WM-BIO-001, *Tank Waste Remediation System Basis for Interim Operations* (Nourani 1999), describes two levels of classifications for equipment, the Safety-Class level, and the Safety-Significant level. The SHMS for tank 241-SY-101 is listed as a Safety-Class level system in subsection 2.1.1.10. All other hydrogen monitoring systems on single- and double-shell tanks are not listed. By default, these are classified as General Services systems. HNF-SD-WM-SEL-040, *Tank Waste Remediation System Safety Equipment List* (Jensen, 1998), also indicates that the only Safety-Class SHMS is that found on 241-SY-101. All applicable requirements/criteria from these two documents shall be in effect for the SHMS.

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