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FUNCTIONAL REQUIREMENTS FOR GAS CHARACTERIZATION
SYSTEM COMPUTER SOFTWARE

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Functional Requirements for Gas Characterization System Computer Software

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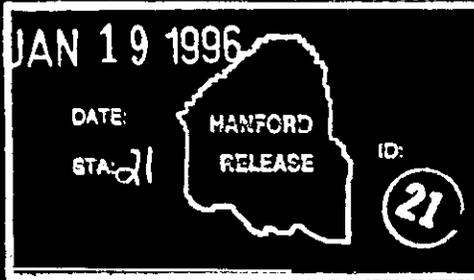
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Abstract: This document provides the Functional Requirements for the Computer Software operating the Gas Characterization System (GCS), which monitors the combustible gasses in the vapor space of selected tanks. Necessary computer functions are defined to support design, testing, operation, and change control. The GCS requires several individual computers to address the control and data acquisition functions of instruments and sensors. These computers are networked for communication, and must multi-task to accommodate operation in parallel.

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**FUNCTIONAL REQUIREMENTS
FOR
GAS CHARACTERIZATION SYSTEM
COMPUTER SOFTWARE**

(WHC-SD-WM-SFR-011)

Prepared by

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January 4, 1996

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SOFTWARE FUNCTIONAL REQUIREMENTS for The GAS CHARACTERIZATION SYSTEM (GCS)

1.0 INTRODUCTION

The Gas Characterization System (GCS) Project was commissioned by TWRS management with funding from TWRS Safety, on December 1, 1994. The project objective is to establish an instrumentation system to measure specified gas concentrations in the vapor space of selected watch list tanks, starting with tank AW-101. Data collected by this system is meant to support first tank characterization, then tank safety. System design is premised upon Characterization rather than mitigation, therefore redundancy is not required.

The flammable gas watch-list (FGWL) tanks, have the greatest potential of releasing hydrogen and other combustible gasses approaching the lower flammability limit (LFL). Tanks which have had measured releases of hydrogen in excess of 0.75%, by volume, require characterization in addition to that provided by the Standard Hydrogen Monitoring System (SHMS), to establish the actual LFL. Gas Characterization Systems will be fabricated and installed on these FGWL tanks to provide this characterization.

2.0 SCOPE

This document provides an itemization of the necessary GCS computer functions. To accomplish the envisioned goals, the GCS must service the functional requirements defined in this document.

3.0 DESCRIPTION

The Gas Characterization System (GCS) computer system consists of several individual computer components necessary to address the control and data acquisition functions of the several specific types of instruments used to monitor the vapor space. These computers are networked, using the Microsoft Windows NT[†] multi-tasking operating system, and networking software. This allows the system components to function in parallel and perform instrument and valve control, data collection, calculations and analysis, computer synchronization and interfacing, and archiving functions.

[†] = *Windows NT is a registered trademark of Microsoft Corporation*

4.0 SOFTWARE REQUIREMENTS SPECIFICATION

The Gas Characterization System requires computers to control and sequence the many instruments, sensors, and electric valves. Additionally, the computers must perform mathematical functions (ie. integrate the area under the curve) to produce "Calculated Concentrations". Control and sequencing of the valves and instruments, with these microcomputers, requires not only vendor supplied software, but also configuration, automation, and integration programming. This section will address the requirements, functions, inputs, outputs, and format associated with the GCS product.

At the beginning of the GCS project, the following criteria was established as necessary in relation to the GCS software:

- 4.1 The following vapor space gasses shall be monitored within the listed ranges.
- ◆ H₂ from 0 to 30,000 ppm
 - ◆ NH₃ from 1 to 10,000 ppm
 - ◆ N₂O from 1 to 30,000 ppm
 - ◆ CH₄ from 0 to 30,000 ppm
- 4.2 The system shall be automated to provide continuous sampling and calculated data.
- 4.3 The system CPU shall be network connected for:
- ◆ data retrieval, without entering a radiation zone
 - ◆ remote system monitoring
 - ◆ remote diagnostics
 - ◆ as close to real time availability of data as possible
- 4.4 The system shall be reconfigurable to read other gasses
(with some degree of software and hardware change)
- 4.5 The system shall selectively preserve spectral data[®] for future review[®]
- ◆ save all calibration data
 - ◆ save faulty data sets (O data)
- 4.6 The Gas Chromatograph shall sample at a rate faster than once per 5 minutes.
- 4.7 The Fourier Transform InfraRed spectrometer (FTIR) sample rate, at 64 scans, shall be a minimum of 6 per hour.
- 4.8 The computer operating systems shall be compatible with the site standard and shall provide for preemptive multi-tasking. Windows NT[®] 3.5 (or later version) is recommended. The software shall be Windows[®] 3.11, Win95[®], or Win NT[®] compatible.

[®] = Windows, Win NT, and Win95 is a registered trademark of Microsoft Corp.

- 4.9 System software shall control calibrations and flag them in the data set.
- 4.10 The calculated concentrations file and the associated spectral data files, shall be given unique record names based upon the date. Each record of the calculated concentrations file shall contain both a date and time stamp.
- 4.11 Process data (such as pressure, flow, & temperature) shall be logged at one minute intervals. Input channels shall be denoted in the saved data, and the records shall be identified by date and time. Each process data file shall be uniquely named using a date stamp.
- 4.12 Each computer controlling a directly connected instrument shall save necessary data for a minimum of 24 hours, in the event of a failure of another part of the system.
- 4.13 The GCS host computer (local to the instruments) shall preserve data for a minimum of one week, in the event of a failure of the central archival system (LABHOST) or related telecommunications.
- 4.14 No data shall be deleted from the local system without verifying the data is resident on the receiving computer.
- 4.15 Files containing the calculated concentrations and selected spectral data, shall be archived for long term availability.
- 4.16 After release of the developed integration software and the vendor supplied software, a formal change control process will be necessary, prior to making production software changes.

◊ *Notes:*

Selectively Preserve Spectral Data -- is referring to the archival retention of data denoting significant data, changes, calibrations, and errors. Retention of routine data which may remain the same for days at a time, is unnecessary.

Future Review - The need to retrieve the spectral data associated with significant calculated data is to be considered on the order of years.

5.0 SAFETY CLASSIFICATION

The monitoring instruments and systems used for the Westinghouse Hanford Waste Gas Characterization System are designated Safety Class 3 (Payne - ref.A). The Safety Class 3 Equipment Classification level is for Systems and components that address the health and safety of facility workers and radioactive, chemical, or thermal releases to the environment.

6.0 REFERENCES

- A) Payne, M. A., 1994, "*In-Tank Instrument Safety Classification*", (Internal Memo, 9307342B R1, to R. E. Gerton, October 14, 1993), Westinghouse Hanford Company, Richland, Washington.

DISTRIBUTION SHEET

To DISTRIBUTION	From CHARACTERIZATION MONITORING DEVELOPMENT	Page 1 of 1
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