



R10306647

Document title:

System Logic Description for Pretreatment Facility Spent Resin Collection and Dewatering Process (RDP) System

Contract number:

DE-AC27-01RV14136

Department:

Controls and Instrumentation

Author(s):

Mark Woodworth Mark A. Friedrich

ISSUED BY
M.A. Friedrich
INIT DATE

Principal author signature:

Mark A Friedrich

Document number:

24590-PTF-PER-J-02-011, Rev 0

Checked by:

Paul Schmitz

Paul Schmitz

Checker signature:

Date of issue:

22 April 04

Issue status:

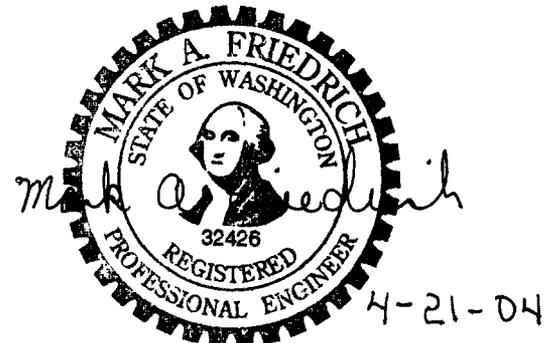
Issued for Permitting Use

Approved by:

Steve E. Anderson

Approver's position:

C&I Engineering Manager



Approver signature:

A. E. Anderson

EXPIRES: 08/31/04

This bound document contains a total of 11 sheets

River Protection Project
Waste Treatment Plant
2435 Stevens Center Place
Richland, WA 99352
United States of America
Tel: 509 371 2000

Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

History Sheet

Rev	Date	Reason for revision	Revised by
0	4-22-04	Issued for Permitting Use	MGW

Contents

Notice.....	ii
History Sheet	iii
Acronyms and Abbreviations	v
Glossary	vi
1 Introduction	1
2 Applicable Documents.....	1
3 Description	1
3.1 RDP-VSL-00002A/B/C	1
3.2 RDP-VSL-00004.....	3

Figures

Figure 1. Level Measurement for Spent Resin Slurry Vessel (Typical for RDP-VSL-00002A/B/C).....	4
Figure 2. Level Measurement for Spent Resin Dewatering Moisture Separation Vessel (RDP-VSL-00004)	5

Acronyms and Abbreviations

AI	Analog input
CRP	Cesium Resin Addition Process System
CXP	Cesium Ion Exchange Process System
FEP	Waste Feed Evaporation Process System
IX	Ion exchange
LAH	Level alarm high
LAHH	Level alarm high high
LI	Level indication
LOL	Lower operating limit
LSH	Level switch high
LSHH	Level switch high-high
LT	Level transmitter
P&ID	Piping and Instrumentation Diagram
PT	Pretreatment
PWD	Plant Wash & disposal
RDP	Spent Resin Collection and Dewatering Process System
UOL	Upper operating limit
WTP	River Protection Project - Waste Treatment Plant

Glossary

acquire	Acquire is a command under a batch control that reserves a group of equipment for that particular batch control operation.
batch	The material that is being produced or that has been produced by a single execution of a batch process.
batch control	This term refers to control activities and control functions that provide an ordered set of processing activities to complete a batch process.
batch process	The production of a finite quantity of material by subjecting quantities of input material to an ordered set of processing activities over a finite period of time using one or more pieces of equipment.
control system	Electronic Processors that perform regulatory and logic control functions necessary for plant normal operation.
exception handling	Those functions that deal with plant or process contingencies and other Logic events, which occur outside the normal or desired behavior of batch control.
interlock	This term refers to a mechanism that automatically brings about or prevents the operation of another mechanism.
lower operating limit	A vessel low-level set point used to stop a transfer-out batch operation from the vessel under normal plant operations.
permissive	Interlock which allows a device to change state or a sequence to start. Once a device has changed state or a sequence started, a permissive has no further effect on the device or sequence.
release	A command under a batch control, that opens up a group of equipment for any batch control to acquire.
trip	A trip is a conditional interlock that forces a device or a sequence to a defined state. A trip continues to have an effect on the device or sequence until the interlock condition no longer exist.
upper operating limit	A vessel high-level setpoint used to stop a transfer-in batch operation to the vessel under normal plant operation.

1 Introduction

This document describes the instrument control logic for tank and ancillary equipment for the spent resin collection and dewatering process (RDP) system within the pretreatment (PT) facility that are associated with dangerous waste management.

2 Applicable Documents

24590-WTP-M6-50-P0001, *P&ID Symbols and Legend Sheet 1 of 6*

24590-WTP-M6-50-P0002, *P&ID Symbols and Legend Sheet 2 of 6*

24590-WTP-M6-50-P0003, *P&ID Symbols and Legend Sheet 3 of 6*

24590-WTP-M6-50-P0004, *P&ID Symbols and Legend Sheet 4 of 6*

24590-WTP-M6-50-P0005, *P&ID Symbols and Legend Sheet 5 of 6*

24590-WTP-M6-50-P0006, *P&ID Symbols and Legend Sheet 6 of 6*

24590-PTF-M6-RDP-P0001, *P&ID-PTF Ion Exchange Spent Resin Collection & Dewatering Process*

24590-PTF-M6-RDP-P0002, *P&ID-PTF Ion Exchange Spent Resin Collection & Dewatering*

3 Description

The following tank and ancillary equipment are associated with dangerous waste management within the RDP system, which resides in the PT facility.

- Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C)
- Spent Resin Dewatering Moisture Separation Vessel (RDP-VSL-00004)

3.1 RDP-VSL-00002A/B/C

The Spent Resin Collection and Dewatering Process utilize a two-vessel process for collecting and disposing of resin, and a third vessel available for the contingency of off-specification resin. The third vessel will allow plant operation to continue without impact while the appropriate disposal path for the off-specification resin is determined. All three spent resin slurry vessels are interchangeable and will be capable of transporting liquid, collecting resin, and being used as contingency.

The spent resin slurry vessels (RDP-VSL-00002A/B/C), with associated piping and controls, serve as both the source of transport liquid and the receipt vessels for spent resin slurry. These vessels are provided to accommodate temporary holdup for resin sampling and analysis while maintaining system operability. Each vessel is designed to contain one full batch of ion exchange resin plus the transport liquid associated with transferring the resin bed out of an IX column. The total batch volume required for removing the spent resin from an IX column is 7,500 gallons per vessel (6,900 gallons of transport fluid and up to 600 gallons of resin). The vessels contain level indication and control capable of operating in clear liquid as well as slurries. During normal operation, a spent resin slurry batch contained in a spent resin slurry vessel will be approximately 5% vol/vol solids.

For greater waste management reliability, batch controlled transfers into each vessel are limited by the control system to one transfer in or out at a time by the batch control mechanism of acquiring and releasing. A batch of transport liquid is sent from one spent resin slurry vessel to an ion exchange column in the CXP system, the transport liquid displaces the spent resin from that ion exchange column as a slurry to a different spent resin slurry vessel in the RDP system. Once acquired, no other batch control operation will be able to coordinate activities with the chosen spent resin slurry vessels (RDP-VSL-00002A/B/C) until they are released.

When the spent resin slurry vessels are available to receive spent resin slurry/send transport liquid, the operator will initiate the transfer sequence. Once the sequence is initiated, the control system will verify that instruments, utilities, and equipment associated with the transfer are within operational parameters. If any of the monitored parameters are not within the specified limits during the transfer, the control system will switch to exception handling logic. The transfer is stopped by the control system when any of the following are true:

- The level in receiving spent resin slurry vessel reaches its upper operating limit (UOL)
- The level of the spent resin slurry vessel sending transport liquid to the IX column reaches its lower operating limit (LOL).

Once the transfer is complete an operator will initiate a sample sequence. Sample results will determine if the resin slurry may be dewatered and concentrated in preparation for disposal.

Once the resin slurry is determined acceptable for disposal, the operator initiates the dewatering sequence within the control system. This sequence sends the spent resin slurry from the filled spent resin slurry vessel to the dewatering unit, which collects the resin and dewateres it, sending the excess fluid back to another spent resin slurry vessel. Once initiated, the control system acquires the dewatering container portion of the system and a spent resin slurry vessel to receive excess fluid. It then verifies that instruments, utilities, and equipment associated with the transfer are within operational parameters and remain as such throughout the transfer. If any of the monitored parameters are not within the specified limits during the transfer, the control system will switch to exception handling logic. The transfer will end when any of the following are true:

- The level in the receiving spent resin slurry vessel reaches its UOL
- The sending entity reaches its LOL.

Once one of the above conditions are met the filled spent resin slurry vessel continues to send slurry to the dewatering system; however, excess fluid is recycled back to the filled spent resin slurry vessel. This will continue until the solids content limit in the stream discharged from the filled spent resin slurry vessel, as indicated by the solids measuring instrument, is reached. The dewatering system is then released.

The spent resin slurry vessels also receive fresh resin transport fluid from the CXP system. Once an IX column is emptied of spent resin an operator will run a sequence to refill the IX column with fresh resin, as a slurry, in from the CRP system. Once initiated, the CXP IX column acquires one of the spent resin slurry vessels to receive the transport fluid. It then verifies that instruments, utilities, and equipment associated with the transfer are within operational parameters and remain as such throughout the transfer. If any of the monitored parameters are not within the specified limits during the transfer, the control system will switch to exception handling logic. The transfer will end when any of the following are true:

- The level in the receiving spent resin slurry vessel reaches its UOL
- The set volume of resin slurry has been transferred to the IX column.

Each spent resin slurry vessel will discharge excess fluid to the FEP system as required and add make-up fluid as required. If excess fluid is to be purged from a spent resin slurry vessel an operator will initiate a sequence that

sends the fluid to the FEP system. Once initiated, the spent resin slurry vessel requiring purging acquires FEP-VSL-00017 A or B to receive the fluid to be purged. It then verifies that instruments, utilities, and equipment associated with the transfer are within operational parameters and remain as such throughout the transfer. If any of the monitored parameters are not within the specified limits during the transfer, the control system will switch to exception handling logic. The transfer is stopped by the control system when any of the following are true:

- The level of the sending vessel reaches its lower operating limit (LOL)
- Or a specified volume is transferred.

If make-up fluid to a spent resin slurry vessel is required an operator will initiate a sequence that sends demineralized water to the vessel. Once initiated, a valve is opened allowing flow of water to the vessel. If any of the monitored parameters are not within the specified limits during the transfer, the control system will switch to exception handling logic. The transfer is stopped by the control system when any of the following are true:

- The level in receiving vessel reaches its upper operating limit (UOL)
- Or a specified volume is transferred.

If the level is no longer within the normal operating range due to an abnormality, interlocks along with alarms within the control system help prevent an overflow condition. Figure 1, shows the typical interlocks and alarms for the level instruments associated with the spent resin slurry vessels (RDP-VSL-00002A/B/C). At the high alarm setpoint, an alarm is generated. At the high-high alarm setpoint, an alarm is generated and all dedicated controlled feeds are isolated. Isolation occurs by a combination of either stopping the motive force, closing valves, or a combination.

3.2 RDP-VSL-00004

The spent resin dewatering moisture separation vessel is used to remove moisture from the air circulated through the spent resin dewatering container, dehumidifying the air so that it can be recirculated through the spent resin dewatering container to remove excess fluid from the spent resin to 1% vol/vol. The water removed from the air stream is collected in the spent resin dewatering moisture separation vessel until a UOL setpoint is reached, then the water is pumped out of the vessel (until the LOL is reached) to a spent resin slurry vessel. The operator initiates this operation sequence once the batch of resin has been transferred from the spent resin slurry vessel to the spent resin dewatering container. Once initiated, the dewatering unit acquires a spent resin slurry vessel. It then verifies that instruments, utilities, and equipment associated with the transfer are within operational parameters and remain as such throughout the transfer. If any of the monitored parameters are not within the specified limits during the transfer, the control system will switch to exception handling logic. The sequence is stopped by the control system when any of the following are true:

- The level in the receiving spent resin slurry vessel reaches its UOL
- Or the spent resin in the spent resin dewatering container reaches a free liquid set point of 1% vol/vol.

If the level is no longer within the normal operating range due to an abnormality, interlocks along with alarms within the control system help prevent an overflow condition. Figure 2 shows the interlocks and alarms for the level instrument associated with the spent resin dewatering moisture separation vessel (RDP-VSL-00004). At the high alarm setpoint, an alarm is generated. At the high-high alarm setpoint, an alarm is generated and all dedicated controlled feeds are isolated. Isolation occurs by a combination of either stopping the motive force, closing valves, or a combination.

Figure 1. Level Measurement for Spent Resin Slurry Vessel (Typical for RDP-VSL-00002A/B/C)

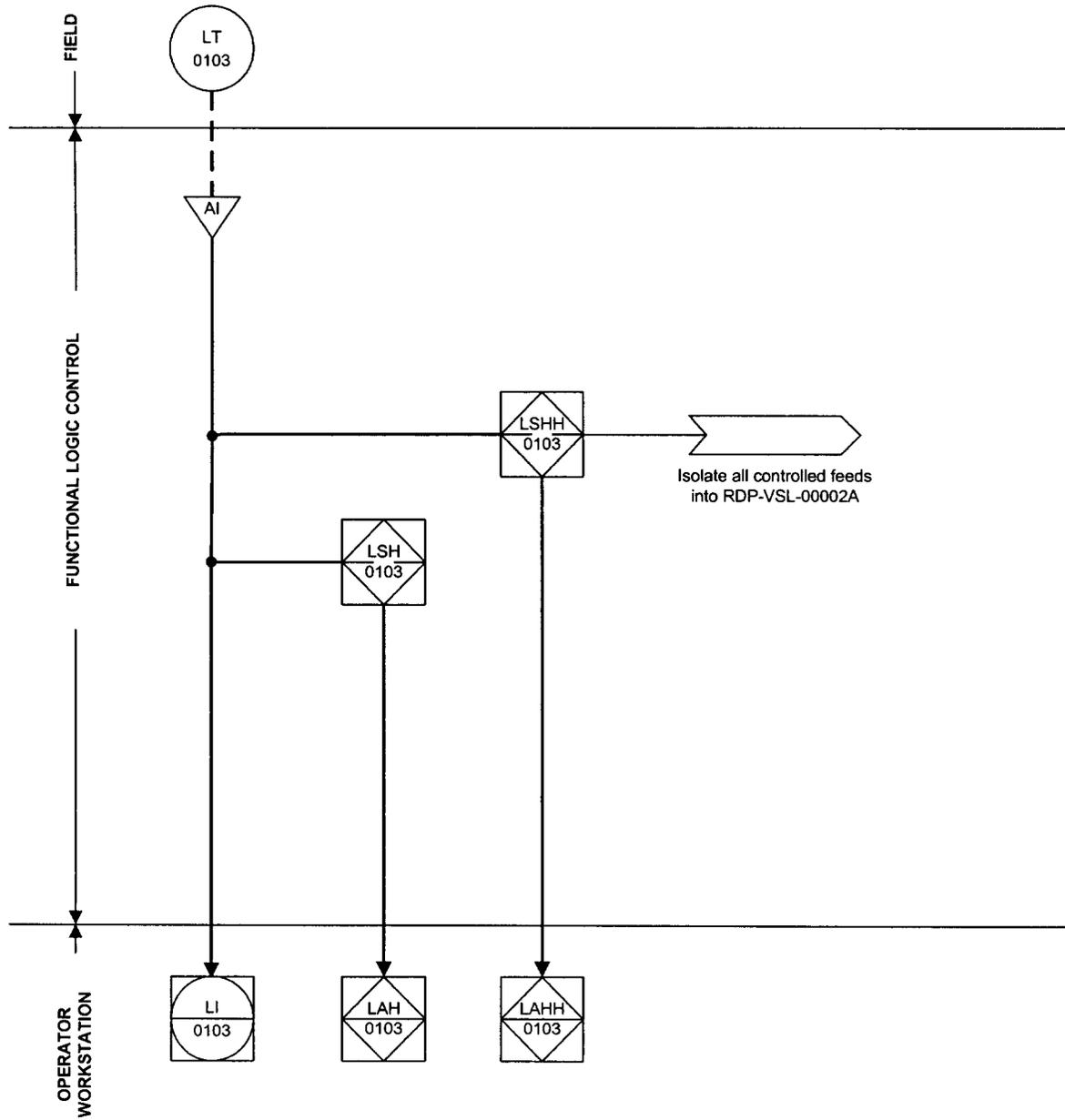


Figure 2. Level Measurement for Spent Resin Dewatering Moisture Separation Vessel
(RDP-VSL-00004)

