

MONITORITEMS_1DIS

RMS Health: A: ACT B: N/A Loop Status: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

Emergency Action Status: EAL

5/2/2023 13:34:17

Monitor Items: MONITORITEMS_1

LOOP NUMBER: 5 ADDRESS: 13

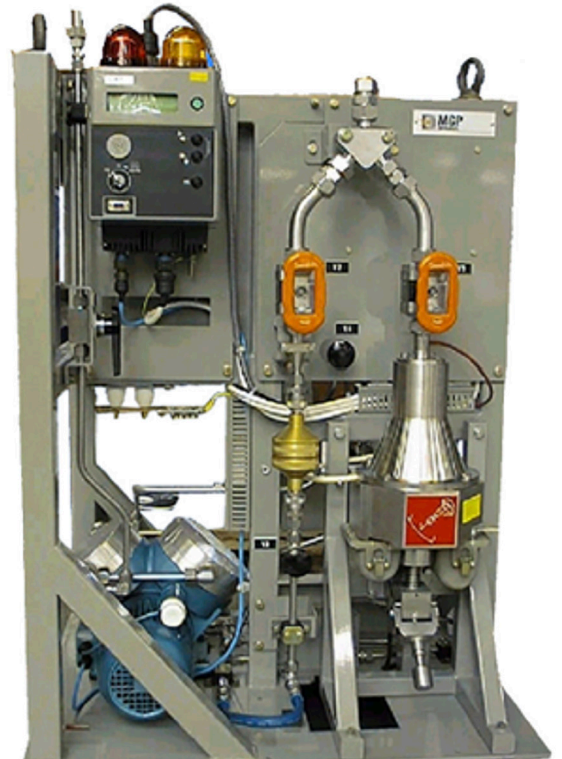
NAME	TYPE	CHANNEL ID	DESCRIPTION	VALUE	UNITS
OPB102	GAS	ORT-PR002	GAS DECAY TANK EFFLUENT MONITOR - LOW RANGE	1.52E+06	UC/ML
OPC202	GAS	ORT-PR002	GAS DECAY TANK EFFLUENT MONITOR - HIGH RANGE	5.27E+05	UC/ML
OPC302	GAS	ORT-PR002	GAS DECAY TANK COMP	9.58E+03	UC/ML
OPD402	GEFF	ORT-PR002	GAS DECAY TANK EFF	9.52E+03	UC/S

ITEM	DESCRIPTION	VALUE	UNITS	ITEM	DESCRIPTION	VALUE	UNITS
1	SUBSTITUTE VALUE REQUEST FOR SAMPLE-PROCESS FLOW	0		34	NOISE REJECTION - (0=YES 1=NO)	YES	
2	PROCESS FLOW RATE - LOW ALARM LIMIT	0.00E+00	SCFM	35	ISOKINETIC FLOW CONTROL - SETPOINT	1.67E+00	
3	CHECK-SOURCE TEST SCHEDULE	24:00	HMM	36	NUMBER OF CHANNELS	4	
4	SAMPLE FLOW RATE 1 - LOW ALARM LIMIT	1.00E+00	SCFM	37	DUCT TEMPERATURE - HIGH INSTRUMENT LIMIT	0	
5	FILTER ADVANCE SCHEDULE	00:00	HMM	38	PROGRAMMER ACCESS CONTROL - (0=NO 1=YES)	NO	
6	FILTER ADVANCE SCHEDULE	00:00	HMM	39	PROGRAMMER ACCESS CONTROL - (0=NO 1=YES)	NO	
7	FILTER ADVANCE SCHEDULE	00:00	HMM	40	PROCESS PRESSURE - LOW ALARM LIMIT	4	
8	FILTER ADVANCE SCHEDULE	00:00	HMM	41	A-D OPTIONS	15	
9	PURGE TIME DURATION	0.00E+00		42	SAMPLE FLOW CONTROL OPT. - (0=RCRD 1=SPEC 2=ISOK)	RCRD	
10	SAMPLE PRESSURE - LOW ALARM SETPOINT	0.00E+00		43	SMITH OPTIONS	64	
11	SAMPLE FLOW RATE - CONV FACTOR NORMAL	1.18E+03		44	SMITH OPTIONS	64	
12	PROCESS PRESSURE - CONVERSION FACTOR	0.00E+00		45	FILTER ADVANCE TYPE - (0=FIXED 1=MOVING)	FIXED	
13	DUCT TEMPERATURE - CONVERSION FACTOR	0.00E+00		46	FILTER ADVANCE TYPE - (0=FIXED 1=MOVING)	FIXED	
14	SAMPLE FLOW RATE 1 - CONVERSION FACTOR	1.96E-02		47	PURGE CONTROL OPTION - (0=NO 1=YES)	NO	
15	SAMPLE PRESSURE - CONVERSION FACTOR	0.00E+00		48	PURGE CONTROL OPTION - (0=NO 1=YES)	NO	
16	SAMPLE FLOW RATE 1 - SETPOINT NORMAL	1.67E+00	SCFM	49	TEST NUMBER	63	
17	SAMPLE FLOW RATE - CONTROL DEADBAND	2.00E+01	%	50	TEST RESULTS	100	
18	ISOK FLOW CONTROL RATIO SFLOW1 - NORMAL	8.38E-06		51	SCALE DEFLECTION TEST VALUE - PERCENT	255	
19	SAMPLE PRESSURE - HIGH ALARM SETPOINT	0.00E+00		52	FIRST DECADE ON METER	1	
20	DATABASE COMPLETE - (0=NO 1=YES)	YES		53	NUMBER OF DECADES ON METER	12	
21	DUCT TEMPERATURE - LOW INSTRUMENT LIMIT	0		54	SAMPLE FLOW RATE 1 SETPOINT - ACCIDENT	0.00E+00	
22	PROCESS PRESSURE - LOW INSTRUMENT LIMIT	0		55	ISOK FLOW CONTROL RATION SFLOW 1 - ACCIDENT	4.00E+00	
23	PROCESS PRESSURE - HIGH INSTRUMENT LIMIT	0		56	PROCESS FLOW RATE 1 - LOW ALARM LIMIT ACC	0.00E+00	
24	SAMPLE MASS FLOW RATE - LOW INSTRUMENT LIMIT	0		57	SAMPLE FLOW RATE 2 - LOW ALARM LIMIT ACC	1.00E-02	
25	SAMPLE MASS FLOW RATE - HIGH INSTRUMENT LIMIT	255		58	PROCESS FLOW RATE SUBSTITUTE VALUE - NORMAL	1.79E+05	
26	SAMPLE PRESSURE - LOW INSTRUMENT LIMIT	0		59	PROCESS FLOW RATE SUBSTITUTE VALUE - ACCIDENT	0.00E+00	
27	SAMPLE PRESSURE - HIGH INSTRUMENT LIMIT	0		60	PROCESS FLOW RATE SUBSTITUTE VALUE - ACCIDENT	0.00E+00	
28	SAMPLE PRESSURE - HIGH INSTRUMENT LIMIT	0		61	ISOK FLOW CONTROL RATIO SFLOW 2 - SETPOINT	0.00E+00	
29	SAMPLE PRESSURE - HIGH INSTRUMENT LIMIT	0		62	SAMPLE FLOW RATE 2 - SETPOINT	1.50E-02	
30	SAMPLE PRESSURE - HIGH INSTRUMENT LIMIT	0		63	PROCESS FLOW RATE 1 -CONV FACTOR ACCIDENT	1.50E-02	

Grp Menu: Flow Filter Purge Chk Src Selected Channel: 0PA202

Mon Items Chnl Items Status Trend

Normal Horn Ack Alarm



Radiation Monitoring Systems for Nuclear Power Plants

Reduce Obsolescence & Improve Worker Efficiency with Integrated Digital Controls

The Importance of Monitoring Radiation

The U.S. Nuclear Regulatory Commission (NRC) requires licensees to monitor radiation discharges and analyze nearby environmental samples to ensure that the impacts of plant operations are minimized. Radiation Monitoring Systems (RMS) help to ensure that plants follow appropriate safety protocols, protecting workers and the public of any potential risk of radiation exposure. These systems are configured with pre-set alarm levels that permit real-time monitoring of the radiological conditions throughout the plant. If certain atmospheric levels are exceeded, alarms are activated, and in some cases, automatic protective functions are initiated.

Nuclear power plants must comply with specific public dose limits set by the NRC and the Environmental Protection Agency. Plant operators must report to the NRC any time those levels are exceeded. Meeting these rules ensures reactors keep doses to the public so small that they are difficult to distinguish from background radiation.

Radiation Monitoring Systems are used by control room operators and radiation protection specialists to make rapid assessments of radioactivity levels in process and effluent streams, plant areas, and HVAC ducts. Many RMS have become dated and require obsolescence management. This presents an opportunity for these plants to consider integrated systems that simplify maintenance and utilize cost-effective digital technologies. In some instances, these RMS upgrades can be monetized as capital improvements (CapEx) rather than operational expenses (OpEx).

This paper outlines how Curtiss-Wright Nuclear Division partners with nuclear power plants to implement integrated RMS as part of a connected fabric of hardware and software, modernizing the plant with integrated digital controls.

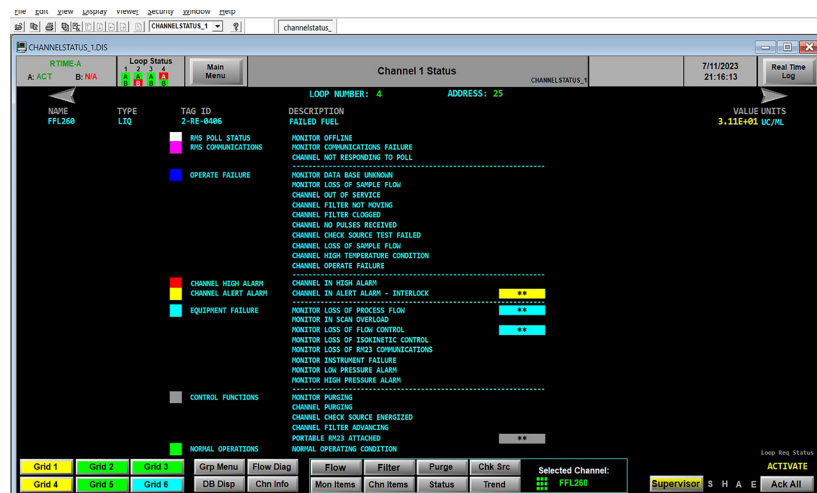
The Problem: Aging, Disconnected Radiation Monitoring Systems

Nuclear power plants are systematically addressing obsolescence issues within their control systems. However, despite a steady push towards modernization, many plants still depend on instrumentation and control systems that contain aging electronics, including radiation monitoring systems that are gradually becoming obsolete. These components are difficult to support and must ultimately be replaced, often with digital controls.

Beyond obsolescence, there are many other reasons to upgrade these systems. For example, integrating disparate components into a common technology platform allows disparate plant systems to talk to one another, and to utilize common methods of data acquisition, storage, and analysis. Enforcing standard data management and analytic practices simplifies system maintenance and enhances workforce effectiveness.

A complete RMS and associated PPC system incorporates four primary elements, some of which may already be utilized within the plant:

1. An I/O system that collects data from analog and digital equipment
2. A redundant communication network and server environment, which includes cybersecurity components
3. A common human-machine interface (HMI), often featuring large-format displays, workstations, and peripheral devices
4. Software applications that execute on the digital platform to handle data collection, validation, reporting, and archiving as a proven platform



The Curtiss-Wright Solution: RMS Modernization Integrated with R*TIME

Curtiss-Wright has extensive experience implementing plant process computer systems, radiation monitoring systems, and other digital control systems at many of the world's leading nuclear power plants. At the heart of these implementations is Curtiss-Wright's R*TIME technology, a stable and proven data management platform with the capacity and flexibility to grow with each plant's needs.

Because R*TIME is vendor-agnostic by design, nuclear power plants can quickly integrate the software with RMS equipment from many different vendors, including the following:

- Kaman
- General Atomics
- Mirion
- Fluke Biomedical (Victoreen)
- Thermal Fisher Scientific (Eberline)

R*TIME connects to these radiation monitoring systems via RS-485, Ethernet, current loop, and other popular communication interfaces.

In conjunction with RMS, many plants turn to Curtiss-Wright for help integrating other monitoring systems, which leads to the development of application programming interfaces (APIs) that enable R*TIME to integrate many types of systems and sensors, all operating a common HMI that operators are familiar utilizing.

Common HMI: R*TIME as a Plant-Wide Approach to Automation

Curtiss-Wright specializes in helping nuclear power plants modernize plant process computers, control systems, and data acquisition systems. The R*TIME platform anchors these installations by allowing customers to integrate data from multiple control systems to handle many different needs. With support for hundreds of industry protocols and standard connections to virtually any nuclear power system, R*TIME is easy to interface with radiation monitoring systems as well as many other types of analog and digital controls.

A UNIFIED SOFTWARE ENVIRONMENT

R*TIME is a plant information system that is used to implement plant process computers and integrate data from many types of plant systems, including safety related controls and non-safety related controls. This versatile software platform provides fast, reliable, real-time data retrieval, processing, presentation, and reporting, along with a powerful data archiving program, scalable to tens of thousands of channels. The software platform includes:

- Graphical user interface (GUI)
- Data acquisition functions
- Data conversion functions
- Data logging functions
- Data alarming functions
- Calculation functions
- Data historian for data archival
- Connectivity to local and wide area networks



R*TIME displays RMS data using numeric values, graphical trends, or graphical shapes. Real-time and historical data is readily accessible through a point-and-click interface, enabling engineers and operators to select data points, monitor real-time conditions, and display trends. Color-coded status indicators make it easy to see the alarm condition of each data point. A data historian maintains a complete history of all data inputs and outputs.

What to Consider: RMS Implementation/Upgrade Insights

Each RMS includes a collection of radiation monitor assemblies, also known as skids, which are independently capable of sampling the environment and communicating the results through R*TIME displays (or transmitting those results to another system via a communications network). R*TIME also controls skid hardware (such as pumps, valves and mechanical devices), retrieves status alerts, monitors self-test/diagnostics, and manages other skid-specific functions.

While Curtiss-Wright generally does not install the RMS equipment, it does perform a complete cycle of integration and testing. Once factory testing is complete and approved by plant personnel, Curtiss-Wright ships the system to the plant for site-acceptance testing prior to installation.

Typically, the plant will stage the new system side-by-side with the existing system, and then cut over from old to new, one loop at a time. The communication link to the data collection system is usually redundant to ensure reliable and robust information transfer. The RMS system supports both the existing communication structures and modern Ethernet interconnections, as required by the customer.

The RMS is a Critical Digital Asset (CDA) typically located at Level Three of the cyber security architecture, utilizing well-established interfaces for all of the popular data archives, as well as proven data diode links to lower level CDAs. When a skid also performs a safety function, a separate hard wired connection is made to the pertinent devices and alarms, which are generally located in the main control room.

Due to regulatory requirements, R*TIME can collect all the data from the RMS monitors, but is unable to directly modify the database on safety-related channels. However, R*TIME can display and archive that data on the CDA non-safety side.

All RMS data collection and display systems are fully redundant, with automatic failover and mirrored databases to maintain continual awareness of radiation parameters throughout monitored sections of the plant.

One of the advantages to standardizing on R*TIME are the economies of scale that come with having a fleet-wide standard. Once plant personnel are trained on R*TIME, the skills are transferable, which allows for easier staff movement during maintenance and outages.

In summary, Curtiss-Wright's modern software infrastructure delivers real-time data for controlling every facet of the operation—as well as more precise methods for adjusting configuration parameters with precise granularity. For a growing number of nuclear power plants, R*TIME is the only monitoring platform they need.





Contact Information

1360 Whitewater Drive

Idaho Falls, ID, 83402

USA

P: +1.208.497.3333

E: pimcsales@curtisswright.com

www.cwnuclear.com

**CURTISS -
WRIGHT**

Headquarters: 2950 Birch Street, Brea, CA 92821, U.S.A. | www.cwnuclear.com

Facilities: Berwick, PA | Cincinnati, OH | Danbury, CT | Hutchinson, MN | Idaho Falls, ID | Middleburg Heights, OH | Shelby, NC | Newmarket, Ontario, Canada

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