MIRION
TECHNOLOGIES

I&C Systems Engineering

Process Radiation Monitoring System (PRMS)

I&C SYSTEMS ENGINEERING

Mirion Technologies

At Mirion Technologies, we partner with industry leaders to advance radiation safety and empower the next wave of critical innovation.

From R&D labs, to critical nuclear facilities, and on the front lines, we provide proven radiation safety technologies that operate at the highest levels of precision, and deliver trusted expertise that empowers our customers to solve problems and enable breakthrough innovation.

60
years of experience

90%
of nuclear centers trust Mirion Technologies equipment

PROCESS RADIATION MONITORING SYSTEM (PRMS)

FEATURES

The Process Radiation Monitoring System (PRMS) is designed to diagnose the state of protective barriers and process equipment of systems with radioactive medium and search for sources of radionuclide leakage.

The PRMS offers monitoring of radioactive substance release into the environment in all operating modes of a nuclear facility, including accidents.

Mirion Technologies designs and delivers the Process Radiation Monitoring System for the nuclear facility performing the full individual I&C Systems Engineering life cycle as per the IEC 61513 standard.

DESCRIPTION

Once Overall I&C architecture is completed, Mirion Technologies takes over the entire design of the PRMS. This starts with the project planning and requirements engineering, with further architecture definition. Later implementation is followed by the delivery of a fully integrated and tested system proven by more than 30,000 measurement channels in operation all over the world.

In addition, Mirion Technologies can provide early support during the Overall I&C architecture design stage.

Support capabilities can incorporate: functions, safety classification, independence, diversity, interferences requirements definition, provisioning of platform descriptions, preliminary feasability studies for the Overall I&C designer.

Mirion Technologies provides trusted expertise to thus enhance the confidence in the Overall I&C architecture viability.

Monitoring of radioactive substance release into the environment in all operating modes of a nuclear facility.

PRMS FUNCTIONS

The Process Radiation Monitoring System performs its functions, ensuring required independence between the Defense-in-Depth levels during normal operation, anticipated operational occurrences, postulated accidents, design extension conditions and severe accidents.

Provides monitoring of:

- Fuel cladding integrity
- Containment leak-tightness
- Primary circuit leak-tightness
- Liquid and gaseous waste
- Solid radioactive waste
- Activity in the Primary circuit coolant
- Activity of Emergency injection system
- Gamma radiation dose rate of hot steam pipelines, containment
- Gas-aerosol emissions and discharges
- Activity of the air, supplied by a ventilation system into main and emergency control rooms

The System also determines the efficiency of:

- Active ventilation filtering stations
- Active water and gas treatment plants

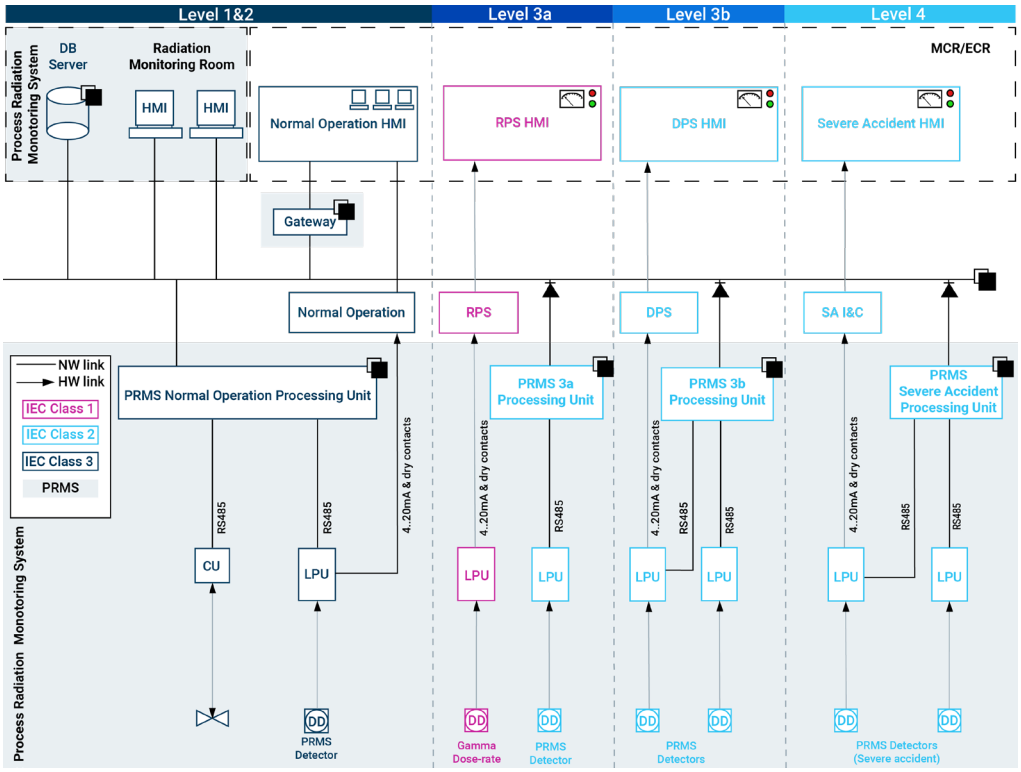
PRMS ARCHITECTURE AND COMPONENTS

PRMS constitutes the whole I&C system based on the Mirion Technologies proTK™, RAMSYS™, CAMSYS™ product lines
(see brochures for components):

- Detector devices
- Local processing units (LPU)
- Junction boxes
- Remote display units
- Alarm display units
- Penetrations
- Data acquisition stations
- Servers
- Operator workstations
- Gateways
- Cables
- Maintenance equipment
- Calibration devices
- Spare parts

Components are integrated in a whole RMS I&C system, spread over the 3 levels of I&C:
field, automation, and HMI.

ARCHITECTURE EXAMPLE



QUALITY FRAMEWORK

Mirion Technologies establishes a dedicated Project Quality Assurance Program, which is based on the following pillars:

- Mirion Quality Management System
- Dedicated project management setup
- Dedicated project technical plans
- Non-conformities management
- Risk management
- Supply chain management
- Specific engineering procedures

ISO 9001, ISO 19443 certified

CYBERSECURITY

Mirion Technologies develops Project and System Security Plans to implement required measures: to protect the organization during the project execution; to prevent cyberattacks based on the postulated project and system threats model; and to secure the system and its components during their operation in a nuclear facility.

SYSTEM REQUIREMENTS SPECIFICATION

Mirion Technologies performs analysis of requirements from the stakeholders' input documentation to produce the agreed set of requirements with all traceability links according to which the PRMS will be designed and validated against.

During the Systems Requirements Specification stage, the following tasks are performed:

- Norms and standards identification
- Ambiguity assessment
- Applicability assessment
- Preliminary feasibility assessment
- Priorities definition
- Missing requirements identification
- Conflict resolutions

REQUIREMENTS AND CONFIGURATION MANAGEMENT

Mirion Technologies implements configuration and requirements management through the whole system life cycle by the following means:

- Configuration control board
- Requirements' traceability
- Unique identification of the configuration items
- Baselining
- Data model
- Input data, deliverables, design items configuration consistency
- Change management

SYSTEM SPECIFICATION

Mirion Technologies provides a description of the hardware and software architecture for the PRMS, specifies the existing components to be used or to be developed, develops human-machine interface specifications, and assigns the application functions.

Once the deliverables of the System Specification stage are validated, Mirion Technologies thus completes the basic design of the PRMS and is ready to proceed with the Detailed Design.

SYSTEM AND COMPONENTS DETAILED DESIGN

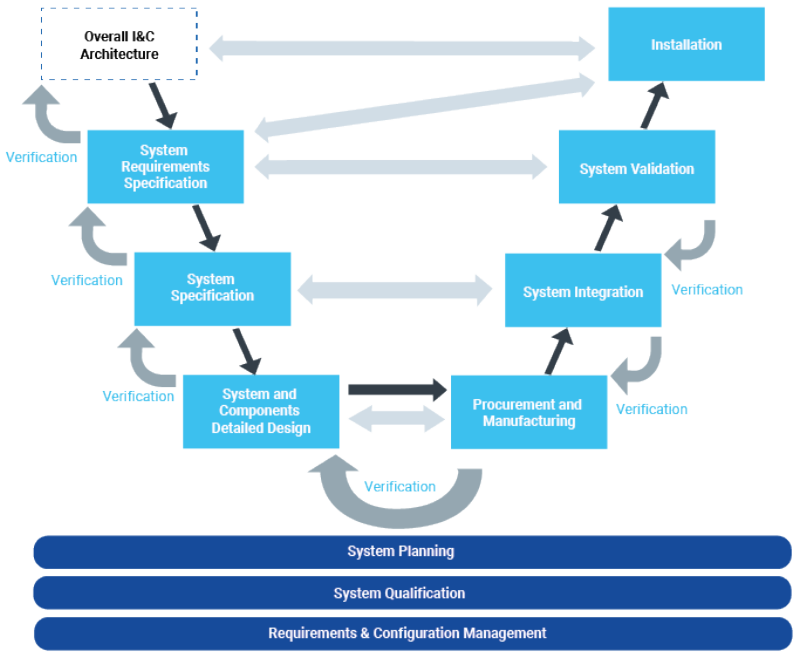
When PRMS Architecture is validated, Mirion Technologies develops Component requirements specifications, Component specifications and performs the System, Hardware & Software detailed design as per IEC 60880, IEC 62138, IEC 60987 standards. This is followed by the environmental qualification.

PROCUREMENT AND MANUFACTURING

PRMS components are procured, manufactured, and assembled following the long-standing Quality Management System of Mirion Technologies. This process includes checks, hold points, and inspections, concluding with the components Factory Acceptance Test (FAT).

SYSTEM INTEGRATION

The PRMS components are collected in a dedicated testing facility to integrate the various components into one system, allowing performance check of interfaces and functionality to prepare for the system FAT.



PRMS Life Cycle

VERIFICATION VALIDATION QUALIFICATION

Through the PRMS life cycle, the following techniques, methods, and activities ensure the PRMS is qualified for its intended use:

- Input and stage gate reviews
- Document reviews
- Designer safety assessments
- Case studies and analyses (Reliability, CCF, FMECA, safety impact)
- Functional testing
- Environmental qualification IEC/IEEE 60780-323 standard (Non 1E, 1E HARSH, 1E MILD)
- Type tests
- Third party assessments for Class 1
- Preliminary and final suitability analyses

TRAINING

Mirion Technologies offers standard or customized training sessions at dedicated locations equipped with Mirion Technologies products.

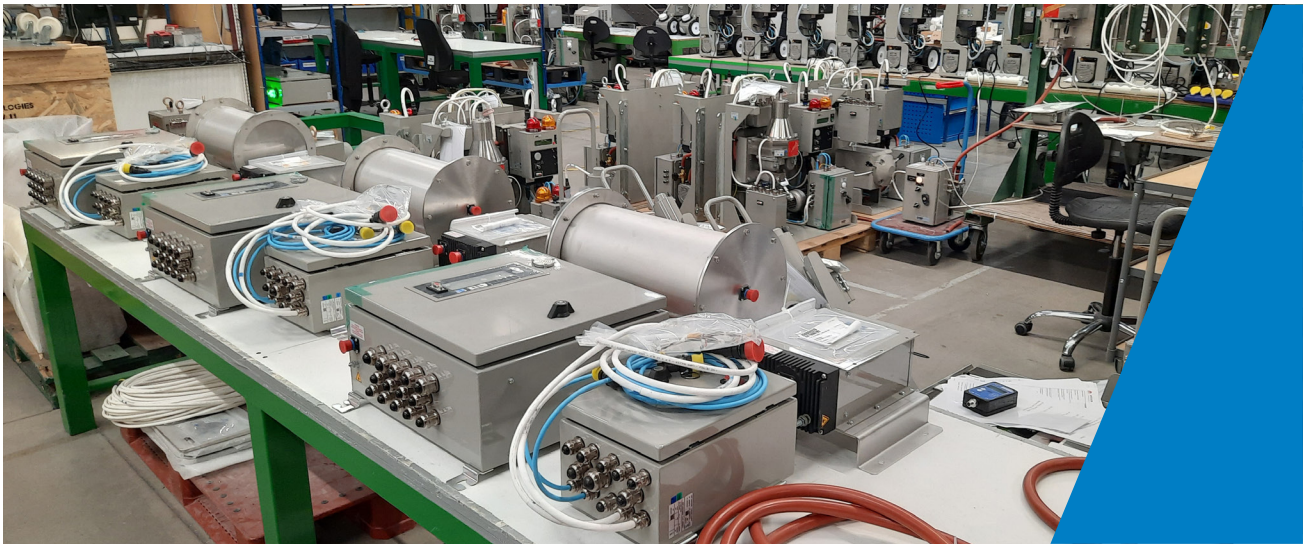
INSTALLATION

Onsite nuclear facility installation supervision can be provided by Mirion Technologies to ensure PRMS components are installed and connected according to the approved design and installation instructions. This includes the PRMS site acceptance testing activities to handover the system for overall I&C integration and commissioning activities.

OPERATION SUPPORT AND MAINTENANCE

Basic service agreements are available to Mirion Technologies customers (hotline, e-mail support, access to documentation, component updates, yearly review meeting).

Mirion Technologies can also handle the maintenance of the system on your behalf.



Protect What's Next™

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