

Quality Assurance

Sandia National Laboratories implements systematic quality assurance (QA) processes in everything from data collection and software, to modeling and analysis.

Trusted Answers for Complex Questions

Sandia National Laboratories abides by high quality assurance (QA) standards, integrating QA practices into virtually every element of its work. Its active enactment of QA is evident both at the program-level when Sandia's Responsive Neutron Generator Product Deployment Center was awarded the prestigious Shingo Prize recognizing its superb manufacturing quality, and the lab-wide level with the institutional deployment of its International Organization for Standardization (ISO) 9000-registered internal QA system, which is used as the principle framework to manage, plan, execute, and monitor all of Sandia's work.

As a pillar of technical excellence, Sandia integrates QA principles and standards into high consequence problems within the realm of nuclear energy. In order to deliver answers to complex questions with confidence, it implements systematic QA processes in everything from data collection and software, to modeling and analysis. This allows researchers to perform work in a reliable, sound manner, and customers to be confident that they can trust Sandia's results since Sandia grades the quality assurance rigor based on customer needs.

Quality Assurance in Experiments

Experiments performed at Sandia consistently and reliably generate quality data because Sandia researchers apply QA processes to testing. Compliant with the highest level of QA, ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facilities, Sandia's test facilities and data collection tools are calibrated and maintained to ensure that accurate, detailed information is produced for every test. For example, the Mobile Instrumentation Data Analysis System (MIDAS) is a controlled, verified, and well-documented system that provides high-quality measurement data in support of transportation system testing. Constantly checking



MIDAS trailer on location

itself for errors and monitoring its own accuracy, the MIDAS onboard diagnostic system verifies that data acquisition components are functioning correctly. This diagnostic system verifies equipment calibration and characterizes individual component performance.

Sandia's researchers also contribute to QA in experiments. With over six decades of experience supporting a variety of high rigor QA-required activities ranging from nuclear weapons testing to materials experiments, Sandia's researchers represent a wide breadth of subject matter expertise and experimental know-how. Rather than simply generating data from an experiment, researchers understand the scientific dynamics of what is happening during the test, as well as how and why results are produced. In the case of MIDAS, every piece of data from its nearly 1,000 tests is stored, which enables data comparisons over time. This incredible level of data retrievability can be used to produce a record of equipment parameters and performance both during the test and retroactively, providing a computer-generated audit trail of each piece of gear in the data path. Applying detailed knowledge of experimental dynamics, researchers know what to look for and are able to use audits like this to assure the quality of data produced.

Assuring Quality through Software

In addition to implementing QA processes into experimental design and procedures, Sandia also builds QA measures into the software it produces.



Work involving nuclear materials often requires high-grade QA.

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Waste Isolation Pilot Plant

For example, developed at Sandia, MELCOR is a fully integrated, engineering-level computer code designed to analyze severe accidents in nuclear power plants. Primarily used to model accident progression, MELCOR undergoes continuous development to address emerging issues, process new experimental information, and create a repository of knowledge on severe accident phenomena.

Despite its constant state of development, Sandia maintains configuration control over MELCOR to uphold high standards of QA. With control over the source code and user modules, Sandia code developers track and store information on all changes. Further, MELCOR's system runs a series of 100 test cases nightly and larger test cases on a weekly basis to ensure that the code is running properly. Validated against experiments, this allows developers to compare the current code to previous versions and actual data generated through experiments. These QA measures help developers quickly catch and resolve inaccuracies and inconsistencies in MELCOR,

and help users understand how updates to the code affect the data produced.

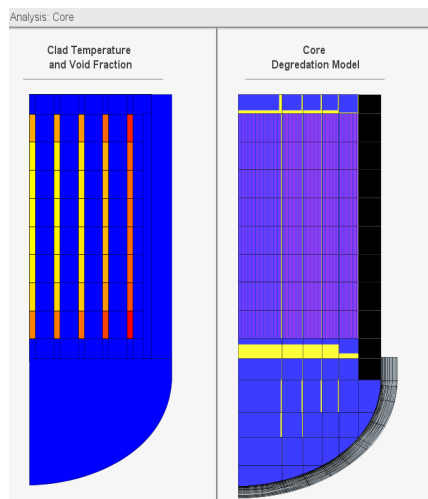
Modeling and Analysis

Sandia researchers use a number of methods to validate computer models and assure the quality of resulting analyses. In the simplest sense, quality input is used to produce quality output. Applying increasingly transparent data sets and computer code algorithms, researchers produce data with a high degree of traceability. This heightened traceability facilitates the ease and speed of periodic system checks allowing for better, more accurate quality assessments.

Further, as a systems engineering laboratory, Sandia leverages its expertise in complex systems to ensure high levels of QA in modeling and analysis. Due to the nature of complex systems, the development of a validated model is an iterative evolutionary process. Requiring a continuous feedback loop, quality assurance checks are performed to generate and enhance confidence in the model's conceptualization and results.

recertification process. Implementing a QA program allows Sandia to provide objective evidence that the program is rigorously implementing sound scientific practices with qualified staff and producing defensible results. As a result, regulators are able to evaluate and certify the WIPP.

QA is integrated into all technical and administrative work conducted by Sandia at WIPP through continuous quality reviews of documentation and oversight assessments of in-process activities in the performance assessment and repository performance sections of the Carlsbad Field Office's QA Program Document (CBFO QAPD). The overall objective is to effectively satisfy QA requirements imposed by the CBFO QAPD and to maintain, improve, and verify implementation of Sandia's QA program. General and associated schedules entail maintaining readiness for audits of Sandia's QA program by CBFO and the EPA. Sandia's WIPP-compliant QA program also supports the delivery of technical reports to CBFO in support of periodic recertification and regulatory streamlining.



MELCOR core depiction

QA in Action: Waste Isolation Pilot Plant

The Waste Isolation Pilot Plant (WIPP) is the first deep geologic repository for radioactive waste disposal in the world to be certified by a regulator. As the science advisor for the WIPP program, Sandia applies rigorous nuclear-industry QA requirements imposed by the U.S. Environmental Protection Agency (EPA) to experimental studies and performance assessments used in the certification and

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