
QUALITY MANAGEMENT AND QUALITY ASSURANCE

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1. Introduction

The successful accomplishment of a nuclear project requires to pursue the satisfactory achievement of the tasks assigned to people, hardware and procedures in accordance with the defined objectives. It implies to strive for the quality of the overall performance of the project and for a Quality Management able to establish, control and maintain the envisaged quality of performance.

The Quality Management is that aspect of the overall management functions that determines and implements the quality policy. Quality Management comprises several managerial actions, one of which is the implementation of a Quality Assurance (QA) Programme. The QA Programme is the main tool to be used in implementing the quality policy and for this reason many of the topics of this Regional Seminar refer directly to activities which are characteristic of the QA Programme.

It is generally agreed that QA Programmes should be applied for effective implementation of management directives and to provide feedback on the adequacy of the performance of activities. Failure of management to establish and implement an effective QA Programme as a management control system may cause major problems in the quality of construction and operation of nuclear installations. These problems have been identified in several nuclear power plant construction projects and have been clearly shown to have been a major contributing factor in the severe accident at Chernobyl.

This paper addresses the main common difficulties found in the implementation of effective Quality Management and QA Programmes and is based on the recommendations of the IAEA International Nuclear Safety Advisory Group (INSAG), the information collected by the IAEA through experts participating in its meetings and the results of the IAEA Operational Safety Review Team (OSART) missions. These difficulties are seen as challenges for which proper solutions have to be developed in order to achieve a successful Quality Management through the implementation of effective QA Programmes.

2. Difficulties in implementing effective Quality Management and Quality Assurance Programmes

The implementation of effective Quality Management and QA Programmes encounters a number of difficulties depending on the particular country or organization. There are a few common elements present in most of the difficulties.

2.1 Main Reasons for Difficulties

- a) The QA requirements established in a number of national or international standards are generally sound, but their interpretation is frequently not properly understood. This suggests that the statement of the QA requirements is not always sufficiently clear for those who have to implement them.

It was sometimes criticized that the QA documents were not containing precise indications, that their wording was excessive, overlapping and even contradictory and that an increasing proliferation of terms and definitions contributed to cloud the understanding of the QA principles and objectives.

- b) The misinterpretation of a QA identified as only regulatory requirement on form and paper. This results in a failure of management to establish and implement QA as an effective management control system and may cause major problems in the quality of design, manufacture, construction and operation of NPPs.

2.2 Specific Difficulties

The specific difficulties perceived in the implementation of effective Quality Management and QA Programmes, as identified by representatives from nuclear utilities, regulatory bodies and nuclear suppliers, can be classified into the following key areas:

2.2.1 Formulation of Quality Requirements

Issues in this area include:

- . Requirements not tailored to the specific tasks of the organizations.
- . Inadequate definition of levels of requirements consistent with the importance and complexity of items (grading).
- . Requirements not formulated in an understandable manner for inspectors, engineers, designers, vendors, etc.
- . Quality criteria not defined by technical personnel.

2.2.2 Management Support

The key difficulties in this area are:

- . Lack of understanding of quality objectives.
- . QA being regarded on too limited scope.
- . Need for enforcement action through deeper involvement by regulatory bodies.
- . Chernobyl and Three Mile Island accidents are not seen as a motivation for developing a stronger quality attitude.
- . QA being considered as a hindrance to plant management, e.g. during repairs to operating plant.
- . Lack of resources.

2.2.3 Qualification of Personnel

Problems are associated with:

- . General motivation of all personnel.
- . Training in the achievement of quality objectives for all personnel.

2.2.4 Shortage of Qualified Vendors

The shortage arises as a result of the reduced construction programme and imposes the need to use inspection forces of owners or other parties.

It also calls for consideration of the need to develop utility "clubs" to pool spare parts.

2.2.5 Performance of Audits

The difficulties here are related to the need for:

- . Involvement of technical specialists in audit teams.
- . Focusing on performance effectiveness.
- . Availability of properly qualified auditors to assess effectiveness.

2.2.6 Excessive Documentation

The main issues perceived in this area are:

- . Proliferation of unnecessary working and recording documents.
- . Lack of guidance on the contents of records.
- . Deficiencies in the review and control of documents.

2.2.7 Repeated Deficiencies

Such deficiencies indicate that proper root cause analysis procedures have not been established and implemented.

2.2.8 Effectiveness of Quality Management

There is a lack of a proven methodology to assess the effectiveness and adequacy of the Quality Management by measurement of actual performance achievement.

Measures to Improve Implementation of Effective Quality Management and Quality Assurance Programmes

The activities needed to solve the difficulties in the implementation of effective Quality Management and QA Programme are as follows:

- (a) To make available training programmes for management personnel, including those in the regulatory field, to promote comprehension of the technical issues which are important in meeting quality objectives.

The key to achieving and assuring quality lies in management. Therefore the effort to improve performance focuses on the ability of management to ensure that significant safety and reliability problems are either prevented or detected early and properly resolved. The purpose and the advantages of QA as an important management tool integral with the total task need to be stated and more widely accepted.

The IAEA is completing the development of training module packages covering quality principles. These packages can be suitably graded for various management levels, taking cognizance of national variables and management needs.

- (b) To develop means to illustrate the value of an effective Quality Assurance Programme.

Means of illustrating this approach should include the awareness of risks arising from lack of quality, e.g. safety and cost consequences or the failure to accomplish planned schedules. Performance achievement indicators should be developed and used to assess the quality of the overall plant life cycle as measured in the operational phase.

The IAEA is developing guidelines to assist Member States in establishing methodologies for assessing the effectiveness of Quality Management during Nuclear Power Plant operation.

- (c) To prepare detailed guidelines and illustrative examples of model quality activities.

The IAEA has a continuing programme on the preparation of User's Manuals to provide practical guidance and illustrative examples for implementing quality activities.

The present programme of IAEA Manuals cover the following activities:

- . QA/QC in the Manufacture of metal-clad UO₂ Reactor Fuels
- . QC of Water Reactor Fuel
- . QA Programme Auditing
- . Training, Qualification and Certification of QA Personnel
- . QA for the Survey, Evaluation and Confirmation of NPP Sites
- . QA for Computer Software
- . QA for Installation and Commissioning of Instrumentation, Control and Electrical Equipment
- . Regulatory Inspection of the Implementation of QA Programmes.
- . Quality Management for Nuclear Power Plant Operation
- . Implementation of QA Corrective Action
- . Assessing the Effectiveness of Quality Management for Nuclear Power Plant Operation
- . Grading of QA Requirements
- . QA for Fuel Manufacture
- . QA Integrated Training Packages
- . Good Practices in QA Performance

- (d) To prepare and use case history studies on quality failings.

The IAEA is collecting data on operating experience through the Power Reactor Information System (PRIS), the Incident Reporting System (IRS), the Assessment of Safety Significant Events Teams (ASSET), and OSART and expert missions. Analysis against quality criteria will then proceed.

- (e) To explore means for encouraging good performance in the pursuit of quality objectives.

The IAEA requested advice on this topic, but it was reported difficult to find common standards. Among the points raised in this regard are: human factors; different cultures and economic structures needing different motivators, e.g. in regard to money, pride, praise or power. It was found difficult to include, as motivators, such factors as reward, tangible and non-tangible performer selection, sense of honour or acknowledgement of achievement. However, it is expected that in the long

run the planned IAEA activities will contribute positively to the establishment of a quality attitude.

- (f) To identify the quality principles and practices which contribute to excellence in NPPs with good performance records.

The IAEA is promoting the exchange of experience through the organization of and cooperation in meetings with the objectives of characterizing and analysing the meaning of good quality and identifying the principles and practices which contribute to quality in NPPs with good performance records. This exchange of experience also involves the analysis of lessons learned in the implementation of quality principles.

- (g) To search for future challenges and directions to strengthen and update quality in NPP operation.

The quest for excellence is of a dynamic nature. It should encourage readiness to identify new challenges and directions to strengthen and upgrade quality in NPP operation. Issues that the IAEA promotes include:

- . contribution of quality management systems to meet higher safety goals;
- . streamlining of documentation while reinforcing the basic quality principles;
- . improving integration of Quality Management systems into plant performance objectives, with proper balance between safety, reliability and economy;
- . quality performance for 40 years plant life.

4. Conclusions

- A Quality Management system involves a collection of principles and practices properly integrated and applied through a QA Programme. Such QA Programme will ensure consistent quality in performance with the achievement of the safety, reliability and economic objectives. The QA Programme is therefore the principal management tool for integrating the project actions required to obtain, maintain and provide continued assurance of quality.
- Difficulties to the implementation of effective Quality Management and QA Programmes have been identified in several areas. The most relevant root causes can be characterized as:
 - a) lack of understanding of quality principles;
 - b) difficulty in implementation by the responsible management.
- The IAEA programme attempts to provide advice and support in the implementation of an effective quality programme through a number of activities which include:
 - . Preparation of practical guidelines.
 - . Training programmes for management personnel, including regulators, on QA practices as an integral component of an effective management system.
 - . Assistance in building up qualified manpower.

- . Promoting the quest for excellence through the exchange of experience in the implementation of effective Quality Management and QA Programmes in NPPs with good performance records.
- It is expected that this First Regional Seminar for Europe and the Middle East on Quality Management for Nuclear Power Projects will help to identify main regional needs and possible solutions in the effective implementation of quality requirements. This will also help the IAEA define future activities in order to tailor assistance for meeting the actual needs of its Member States.