

Introduction to Quality Control and Management

Introduction to Quality Control (QC) & Quality Management (QM)

Designed as quick-reference study notes

1. Core Concepts

Term	Definition	Goal
Quality	Degree to which a product, service, or process meets specified requirements and satisfies customer expectations.	Deliver value, reduce waste, build trust.
Quality Control (QC)	Operational techniques and activities used to monitor, inspect, and test products or processes to ensure they meet quality standards.	Detect and correct defects before delivery.
Quality Assurance (QA)	Systematic activities and processes that provide confidence the quality requirements will be fulfilled.	Prevent defects through planned processes.
Quality Management (QM)	Integrated set of policies, procedures, and responsibilities for achieving quality objectives across the organization.	Align quality with business strategy and continuous improvement.

2. Quality Management System (QMS)

- Policy & Objectives** – Formal statement of commitment and measurable targets.
- Planning** – Define processes, resources, and responsibilities.
- Implementation & Operation** – Execute processes, train personnel, maintain documentation.
- Monitoring & Measurement** – Collect data (KPIs, audits, inspections).
- Analysis & Improvement** – Identify non-conformities, root causes, and implement corrective actions.

Typical standards: ISO 9001, ISO/TS 16949 (automotive), ISO 13485 (medical devices), AS9100 (aerospace).

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3. QC Techniques & Tools Management

Category	Tool	Typical Use
Statistical Process Control (SPC)	Control charts ($\bar{X}$, R, p, c)	Monitor process stability in real time.
Sampling Plans	Acceptance sampling (MIL-STD-1916, ANSI/ASQC Z1.4)	Decide batch acceptance/rejection with limited inspection.
Inspection	Visual, dimensional (CMM), functional testing	Verify conformance to specifications.
Measurement Systems Analysis (MSA)	Gage R&R, bias, linearity studies	Validate accuracy & repeatability of measurement tools.
Problem Solving	Fishbone (Ishikawa) diagram, 5 Whys, Pareto chart	Identify root causes of defects.
Process Capability	Cp, Cpk, Pp, Ppk indices	Quantify how well a process can meet specs.
Design of Experiments (DoE)	Factorial, Taguchi methods	Optimize process parameters with minimal trials.

4. Key QC Activities

1. **Incoming Inspection** – Verify raw material/ component compliance.
2. **In-Process Inspection** – Check work at critical control points (WIP).
3. **Final Inspection** – Confirm finished product meets all requirements.
4. **Testing** – Functional, performance, reliability, safety tests as required.
5. **Documentation** – Inspection reports, non-conformance records, traceability logs.

5. Quality Management Principles (ISO 9001:2015)

1. **Customer Focus** – Understand and exceed customer needs.
2. **Leadership** – Establish unified direction and create an environment for engagement.
3. **Engagement of People** – Involve all employees in quality activities.
4. **Process Approach** – Manage activities as interrelated processes.
5. **Improvement** – Pursue continual, incremental, and breakthrough improvements.

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6. Evidence-Based Decision Making – Base actions on data and analysis.

7. **

Management