The 123 of Quality Management for Material Producers

A guideline to quality management

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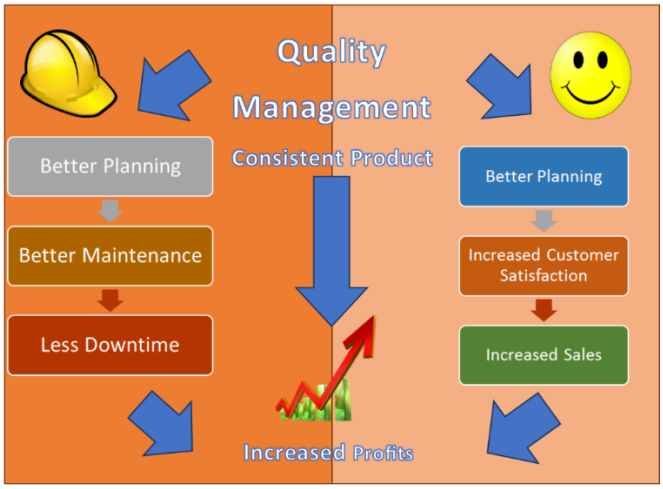
ASPASA

1 Introduction

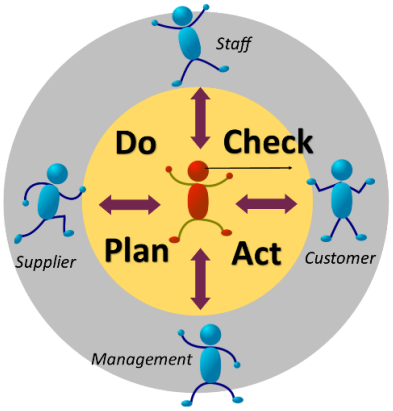
The ultimate of quality management is the implementation of SANS 9001:2015 in the surface operation and SANS 17025:2005 in a SANAS accredited laboratory. The cost implication of these two standards and accreditation is sometimes daunting. This should not deter a producer to implement a quality management programme. ASPASA has developed this guideline to put material producers on the road to quality management. It contains links to relevant methods, standards and specifications as well as checklists to facilitate the work.

1.1 Benefits of Quality Management



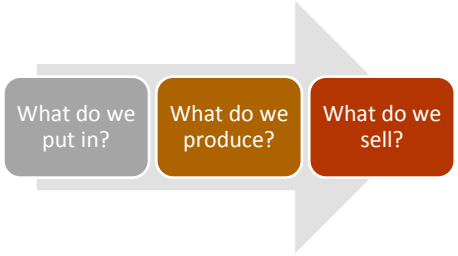
The ultimate benefit of proper quality management is increased profits.

1.2 The Seven Quality Management Principles as outlined by ISO 9000



1. **Customer focus** – make sure that you know what you customer wants.
2. **Leadership** – quality management cannot be driven from below, it must be led from above.
3. **Engagement of people** – everybody in the organisation should be involved, from the executive to the workers.
4. **Process approach** – get consistent and predictable results through managing interrelated processes.
5. **Improvement** – strive for continuous improvement.
6. **Evidence-based decision making** – improve planning by basing decisions on evidence.
7. **Relationship management** – build relationships with all stakeholders, including suppliers, customers, and staff.

1.3 Quality Management Simplified



There should be three types of inspections:

1. **In the pit**: If the chemical composition of the product is important, tests must be done regularly, otherwise tests should be done yearly or when the source material changes.
2. **During production**: Depending on the quality requirements of the customers and the consistency of the process, samples might be taken and tested daily, hourly or a certain number of times per shift by time or tons produced, and definitely after maintenance or closure for December.
3. **Final product**: Be accompanied by an in-house result.

2 Buy-in

Secure buy-in from all staff. Remember that a chain is only as strong as its weakest link. In the case of quality management, the quality is only going to be as good as the buy-in from every staff member.

Strong leadership is required where quality is modelled and spoken about.

3 Determine what the customer wants

Check	Product	Specification
☐	Concrete stone and sand	SANS 1083:2017
☐	Road pavement products	Standard Specifications for Road and Bridge Works for State Road Authorities Published by: South African Institution of Civil Engineering Email: civilinfo@saice.org.za
☐	Ballast	Spoornet S406
☐	Silica sand for foundries	AFS

Keep in mind that customers often have their own specifications. Agree on the specification before entering into a contract with the customer and make sure that the specification is documented.

4 Run a Laboratory

Decide on the tests that will be conducted and the methods and standards that will be followed. The following is a minimum to start with.

Check	Test	Standard
☐	Handling Test Sieves	SANS 3001-PR10:2011: Civil engineering test methods Part PR10: Checking, handling, maintenance and verification of test sieves
☐	Technical Requirements of Sieves – Metal Wire Cloth	SANS 3310-1:2000: Test Sieves – Technical requirements and testing Part 1: Test sieves of metal wire cloth
☐	Technical Requirements of Sieves – Perforated Metal Plate	SANS 3310-2:2015: Test Sieves – Technical requirements and testing Part 2: Test sieves of perforated metal plate
☐	Sampling	TMH5: Sampling Methods for Roads Construction Materials, 1981
☐	Moisture Content	SANS 3001-GR20:2010: Civil engineering test methods Part GR20: Determination of the moisture content by oven-drying

Check	Test	Standard
☐	Grading analysis	SANS 3001-AG1:2014: Civil engineering test methods Part AG1: Particle size analysis of aggregates by sieving SANS 3001-GR1:2013: Civil engineering test methods Part GR1: Wet preparation and particle size analysis SANS 3001-GR2:2011: Civil engineering test methods Part GR2: Dry preparation and dry particle size analysis of gravels and sands
☐	Flakiness Index	SANS 3001-AG4:2015: Civil engineering test methods Part AG4: Determination of the flakiness index of coarse aggregate
☐	Fineness Modulus and Grading Modulus	SANS 3001-PR5:2011: Civil engineering test methods Part PR5: Computation of soil-mortar percentages, coarse sand ratio, grading modulus and fineness modulus

Note that the requirements of a specific product, e.g. road pavement materials, might include many more tests. These should be conducted by an accredited external laboratory.

Each specification lists the equipment that are required. Basic equipment includes:

Check	Test	Equipment
☐	Sampling	Sampling shovel and scoop
	Grading Analysis	Set of sieves of 450 mm or 300 mm diameter[1]:
☐		100 mm;
☐		75 mm;
☐		63 mm;
☐		50 mm;
☐		37,5 mm;
☐		28 mm;
☐		20 mm;
☐		14 mm;
☐		10 mm;
☐		7,1 mm;
☐		5 mm;
☐		2 mm; and
☐		1 mm.
		Set of sieves of 200 mm diameter:
☐		7,1 mm;
☐		5 mm;
☐		2 mm;
☐		1 mm;
☐		600 µm;
☐		425 µm;
☐		300 µm;
☐		150 µm; and
☐		75 µm.
☐		Pans and covers that fit sieve diameters.
☐		Electronic balance complying with SANS 1649:2014 reading to 1 g with capacity to 16 kg depending on product.
☐		Non-corrodible metal basins – about 300 mm diameter.
☐		Non-corrodible metal basins – about 500 mm diameter.

Check	Test	Equipment
☐		Non-corrodible, metal, flat-bottomed square pans – about 300 mm.
☐		Drying oven.[2]
☐		A brush with hard nylon bristles not more than 25 mm long.
☐		A nail brush with hard nylon bristles.
☐		A soft paint brush.
☐		Riffler with at least three pans – the right riffler for the right size material.
☐		Mechanical sieve shaker (optional – hand sieving still required).

1. Please note that the diameter of these sieve sizes is a practical suggestion.
2. Small laboratories often do not invest in a drying oven but dry a sample on a hot plate. Place a basin filled with a well-graded sand on the hotplate. The sample to be dried will be placed on top of this. The purpose is to prevent the sample from burning and changing properties. It is important to reach constant mass.

Other:

Check	Action
☐	Get the lab staff/s trained – SAQA Qualification 48817: Further Education and Training Certification: Construction Materials Testing. To be replaced shortly with QCTO.
☐	Start a calibration programme for scales, balances and sieves – it is a daily process.

5 Start a Sampling and Testing Regime

There are two considerations:

- Production requirements – how often is sampling and testing required to achieve and maintain a consistent product?
- Customer requirements – what do the customers need?

Sampling forms a vital part of quality management. If the sample is not as representative as possible, the test results are meaningless. Spend the time and effort to sample correctly.

Understand that due to the nature of the product, it is not possible to have a completely representative sample. The aim is to get a sample that is as representative as possible. This entails taking several samples from all over the area to be sampled over a period of time. Note that one scoop is not a representative sample.

When preparing a sample for testing in a laboratory, the sample must be riffled down to the correct size. It is not enough to simply take the required size.

6 Proficiency Testing

Laboratory results should be validated against results from an external laboratory, preferably an accredited laboratory. A proficiency testing scheme should be agreed upon where different laboratories test the same samples and results are compared. Differences in results should be examined so that procedural errors can be identified and corrected.

7 Reporting

Reporting is another important part of quality management.

1. If making use of Excel, make sure that the formulae are correct.
2. Check for typing errors if any software is used.
3. Double check handwritten calculations.
4. Reports should go out as quickly as possible to ensure informed decision-making.
5. Include trend analysis in reporting results for informed decision-making.

8 Non-conformance

If a lab staff notices that a product does not conform to the specification, the relevant people must be informed immediately.

Lab staffs should report to a person with the authority to implement immediate corrective action in the case of a non-conformance.

Root Cause Analysis should form part of dealing with non-conformances to help determine the cause for the non-conformance.

Non-conformances should be logged and discussed on a regular basis so that preventive action can be taken. This leads to continuous improvement of processes and therefore the product.

9 Communication

Regular communication with the customer should be a priority. Agree with the customer at the beginning of a contract when the customer will be informed of deviations from the specification.

Do not make changes to a product without informing the customer beforehand.

Most customers want to be informed of the following:

- If there is a change in colour;
- When a new stockpile is built;
- When there is a change in shape of the product;
- When the moisture content changes;
- When mining is started in a new area in the quarry.

10 Final Checklist (Managerial Level)

Check	Action
☐	Do we have buy-in from everyone?
☐	Do we know what the customer wants?
☐	Is the laboratory up and running?
☐	Have we implemented a sampling and testing regime?
☐	Have we implemented a proficiency testing scheme?
☐	Are reports going out in time for informed decision-making?
☐	Are we acting on non-conformances and working to prevent them?
☐	Do we communicate regularly with our customers?