
Harmonics Management Training Course: Distortion Limits, Filters and Network Planning

5 – 9 July 2027
Cape town





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Programme Summary

Harmonics management, covering distortion limits, filter choice and network planning, is the subject of this five-day training course for electrical engineering managers, network planners and power quality leads at a managerial level, ending in a harmonics management plan for one network. Distortion from drives, rectifiers and inverters shortens equipment life and disturbs neighbouring users when limits are set late and filters are bought by guesswork. The programme moves from principles and limits, through diagnosis of sources and resonance, to filter and connection design, then to a worked plan. Mars Training Centre UK delivers this programme in harmonics management.

The Business Case

When harmonics are handled only after a failure, organisations replace capacitors, transformers and drives repeatedly without finding the cause, and new connections are approved without a view of their effect on the network. Leaders who set distortion limits, survey routines and filter criteria can show why each investment was made and what it protects.

- Equipment Failures: Fall as sources and resonance points are found before they damage plant.
- Filter Spending: Becomes targeted as filter type and rating follow measured distortion.
- Connection Disputes: Decline as emission limits are applied to every new load in the same way.

Principles and Evidence Base

- IEEE 519, recommended practice and requirements for harmonic control in electric power systems: It shapes the distortion limits and the point of common coupling reviews built in Session 1.
- IEC TR 61000-3-6, assessment of emission limits for distorting loads in medium, high and extra-high voltage power systems: It frames the connection assessment method designed in Session 3.
- Resonance principles for capacitors and network inductance: They guide the diagnosis of amplification risks in Session 2.
- Passive and active filter design principles: They inform the filter selection matrix completed in Session 3.

Intended Participants

- Electrical engineering managers who decide how distortion is measured, limited and funded.
- Network planners who approve new connections and reinforcement of supply points.
- Power quality leads who run surveys and report distortion levels to management.
- Maintenance and reliability managers who answer for repeated failures of drives, capacitors and transformers.



The programme serves electricity utilities, oil and gas facilities, manufacturing plants and large commercial estates.

Learning Outcomes

1. Participants will be able to evaluate a network's harmonic distortion against limits at the point of common coupling.
2. Participants will be able to diagnose sources, resonance and failure patterns from survey records and equipment history.
3. Participants will be able to construct a survey routine with measurement points, intervals and reporting rules.
4. Participants will be able to compare passive and active filters and select one for a defined case.
5. Participants will be able to prioritise new connections and reinforcements by their effect on distortion.
6. Participants will be able to justify a harmonics management plan and its indicators to a network director.

Programme Structure

Day 1: Harmonics Management Principles and Distortion Limits

What causes harmonic distortion, and which limits apply at the point of common coupling?

- Harmonic Source Inventory
- Distortion Measures and Limit Tables
- Point of Common Coupling Review
- Waveform Reading Without Mathematics
- Roles and Responsibilities Chart for Distortion

Day 2: Diagnosing Sources, Resonance and Failure Patterns

Where does distortion originate, and why does it damage some equipment more than other equipment?

- Survey Record Analysis
- Capacitor Bank Resonance Check
- Transformer and Cable Heating Review
- Drive and Rectifier Contribution Ranking
- Equipment Failure History Audit

Day 3: Designing Filters, Connections and Network Plans

Which control measure suits each source, and how is a new connection assessed?



- Passive and Active Filter Selection Matrix
- Emission Limit Assessment for a New Load
- Capacitor Detuning Options Table
- Network Reinforcement Option Comparison
- Filter Cost and Benefit Sheet

Day 4: Surveys, Monitoring and Governance

How are measurements organised, reported and kept under management control?

- Survey Plan with Measurement Points
- Monitoring Dashboard Layout
- Connection Approval Procedure
- Supplier Specification Clauses for Distorting Equipment
- Exception and Escalation Register

Day 5: Applying Harmonics Management to One Network

Is the plan ready for a network director to adopt?

- Applying the Session 2 Source Ranking to the Chosen Network
- Testing the Session 3 Selection Matrix on a Live Case
- Checking the Session 4 Approval Procedure Against a New Connection
- Setting Distortion Indicators for the Team
- Completing the Harmonics Management Plan

Methodology

The programme uses case analysis and data exercises on anonymised survey records from utility, industrial and commercial networks. Participants work in small teams as power quality lead, planner and network director, and take one distortion problem from first complaint to an agreed control measure while the group reviews each decision.

- Suggested activity: Reading a survey summary and naming the likely source and the equipment at risk.
- Suggested activity: Choosing between a passive and an active filter for a sample plant and defending the choice.
- Suggested activity: Drafting the emission limit conditions for a new connection request.

Capstone Output

Each participant completes a harmonics management plan for one network. It holds a ranked source list, a limit and survey routine, a filter selection note, a connection approval procedure and distortion indicators. The plan is used to brief a network director and to review the next connection request.



Frequently Asked Questions

Is harmonics management suitable for managers who are not power quality specialists?

Yes. Harmonics management is set at managerial level and assumes basic familiarity with electrical networks, not waveform mathematics. Technical ideas are explained through cases and simple tables.

Which standards does harmonics management rest on in this training?

Harmonics management rests on IEEE 519 for harmonic control in electric power systems and IEC TR 61000-3-6 for assessing emission limits of distorting loads, with resonance and filter design principles.

How is the plan from harmonics management used at work?

You use the harmonics management plan to brief a network director, set survey and filter priorities and assess each new connection request against agreed limits.

How does harmonics management differ from a programme on power system protection?

Harmonics management centres on waveform distortion, limits and filters across a network, while a protection programme centres on relay settings and fault clearing for individual equipment.