
Variable Frequency Drive Selection, Harmonics and Energy Saving Decisions Training Course

23 – 27 August 2027
New York





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Programme Summary

Variable frequency drive selection, covering sizing, harmonics and energy saving decisions, is the subject of this one-week training course for electrical, mechanical and project managers and heads of function, ending in a drive project decision pack. Drives cut energy use on pumps, fans and compressors, yet poor selection brings harmonic problems, motor stress and savings that never appear. The programme moves from drive principles, through application diagnosis, to specification and business case, then applies them to one project. Mars Training Centre UK delivers this variable frequency drive programme for managers who specify, buy and run drive-controlled plant.

The Business Case

When drives are bought on a vendor quotation and a rule of thumb, plants oversize equipment, inject harmonics into their own networks and shorten motor life through poor cabling and settings. Managers who can test whether a load suits a drive, write a clear specification and challenge the claimed saving can reduce energy cost, protect equipment and avoid disputes at commissioning, while giving finance a case it can audit.

- Energy Cost: Falls as drives are applied to loads with real speed variation and verified savings.
- Power Quality: Improves as harmonic effects are assessed before drives are installed.
- Equipment Life: Extends as motor protection, cabling and settings suit the drive.

Principles and Evidence Base

- Affinity laws for pumps and fans: They link speed, flow and power and frame the saving estimates built in Session 2.
- Harmonic distortion analysis: It structures the assessment of drive effects on the supply in Session 3.
- Life cycle costing: It organises the comparison of purchase, energy and maintenance cost in Session 4.
- Control theory basics: They support the discussion of how drives regulate speed and torque in Session 1.

Intended Participants

- Electrical managers who are accountable for supply quality and the protection of motors and drives.
- Mechanical managers who own pumps, fans and compressors and their operating profiles.
- Project managers who procure drive packages and manage commissioning.
- Heads of function who approve energy saving investments and must verify the results.



The programme serves water utilities, oil and gas facilities, cement and mining plants and building services operators, where large motors run on variable duty.

Learning Outcomes

1. Participants will be able to explain how a drive controls motor speed and torque and where its limits lie.
2. Participants will be able to evaluate whether a load profile justifies a drive, using affinity laws and operating data.
3. Participants will be able to size and specify a drive against duty, environment and motor details.
4. Participants will be able to assess harmonic distortion limits and choose mitigation options.
5. Participants will be able to review protection, cabling and commissioning needs for drive-fed motors.
6. Participants will be able to justify a drive investment with a lifecycle cost and saving verification plan.

Programme Structure

Day 1: Variable Frequency Drive Principles

How does a drive control a motor, and where do its limits lie?

- Rectifier, Link and Inverter Stages
- Speed and Torque Control Modes
- Constant and Variable Torque Loads
- Soft Starter and Drive Comparison
- Drive Selection Decision Tree

Day 2: Application Diagnosis and Saving Estimates

Which loads gain from a drive, and what saving is realistic?

- Pump and Fan Affinity Calculations
- Load Profile Data Review
- System Curve and Throttling Loss Check
- Baseline Energy Measurement Plan
- Saving Estimate Worksheet

Day 3: Harmonics, Power Quality and Motor Effects

What does a drive do to the supply and to the motor it feeds?

- Harmonic Source and Spectrum Reading
- Distortion Limit Compliance Check
- Mitigation Options Comparison
- Cable Length and Motor Insulation Stress
- Protection and Earthing Review



Day 4: Specification, Procurement and Business Case

How is a drive specified, bought and justified?

- Duty and Environment Specification Sheet
- Drive Sizing and Margin Rules
- Tender Evaluation Scorecard
- Lifecycle Cost Model
- Commissioning and Acceptance Test Plan

Day 5: Applying Variable Frequency Drive Selection to One Project

Is the drive project ready for an investment decision?

- Applying the Session 2 Saving Worksheet to the Project Loads
- Checking the Session 3 Distortion Limits for the Site
- Testing the Session 4 Lifecycle Model Under Cost Changes
- Setting Saving Verification Measures
- Completing the Drive Project Decision Pack

Methodology

The programme uses a data exercise built on anonymised load profiles, harmonic measurement summaries, drive datasheets and tender responses from water, process and building services plants. Participants work in small teams as project manager, electrical lead and finance lead, calculating savings, questioning vendor claims and recording which assumptions would change the decision.

- Suggested activity: Estimating the saving from replacing throttling control on a pump.
- Suggested activity: Reading a harmonic spectrum and agreeing a mitigation option.
- Suggested activity: Scoring two competing drive tenders against one specification.

Capstone Output

Each participant completes a drive project decision pack for one plant project. It holds a load suitability check, a saving estimate, a specification summary, a harmonic assessment, a lifecycle cost comparison and a plan to verify savings after commissioning. The pack is used to brief an investment committee, support the tender and hold suppliers to the stated performance.



Frequently Asked Questions

Is variable frequency drive selection suitable for managers who are not drive specialists?

Yes. Variable frequency drive selection is taught for managers who specify, buy and justify drives, assuming familiarity with plant electrical systems but no drive commissioning experience.

Which principles does variable frequency drive selection rest on in this training?

Variable frequency drive selection here rests on the affinity laws, harmonic distortion analysis, life cycle costing and control theory basics, applied to pump, fan and compressor cases.

How is the decision pack from variable frequency drive selection used at work?

You use the drive project decision pack to brief an investment committee, support tender evaluation and hold suppliers to the stated savings and performance.

How does variable frequency drive selection differ from an AC motor maintenance programme?

Variable frequency drive selection centres on choosing, specifying and justifying drives for a load, while an AC motor maintenance programme centres on monitoring, protecting and repairing motors in service.