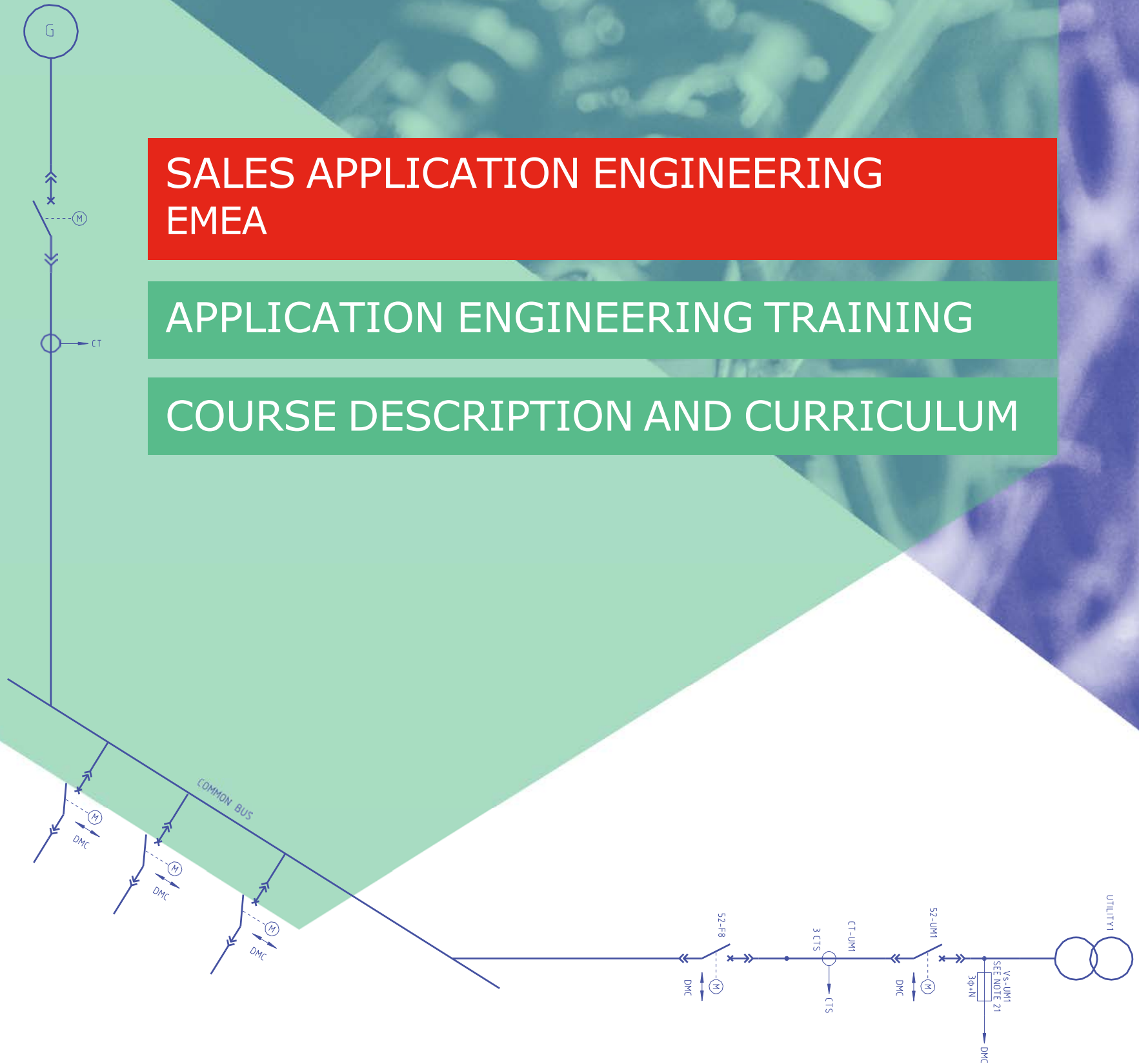


SALES APPLICATION ENGINEERING EMEA

APPLICATION ENGINEERING TRAINING

COURSE DESCRIPTION AND CURRICULUM



AIM OF THE COURSE

The objective of this Application Engineering training is to provide a comprehensive study of the technical aspects of the selection and installation of Diesel generating sets and related sub-systems. Divided into three different parts, this training aims to provide engineers, from varied backgrounds or responsibilities, with the necessary skills and tools to leverage sales, select and effectively install Cummins Power Generation products. At the same time, this course also encourages the discussion and exchange of experiences between application engineers from different locations.

METHODOLOGY

The training will be delivered in a classroom format and will be focused on real case studies and practical examples. Attendees are expected to participate actively in the training by engaging in the discussions and by sharing their own views or experiences. Extensive documentation for each part will be provided with manuals, white papers, application bulletins and more. There will be a knowledge check session at the end of each training day followed by an exam at the end of each section.

COURSE REQUIREMENTS

To attend any of the Application Engineering training parts the course participants must be a recognized Cummins Distributors / Dealers.

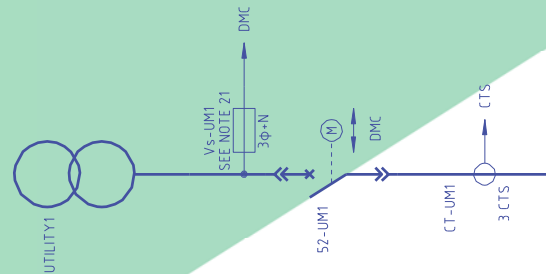
CONTACT

sae.emea@cummins.com

COURSE STRUCTURE

This course is structured in three different and separate parts, Product Selection, Mechanical Design and Electrical Design.

PRODUCT SELECTION		MECHANICAL DESIGN		ELECTRICAL DESIGN	
PS01	ISO8528 Ratings & Applications	MD01	Exhaust Systems	ED01	Alternator Performance
PS02	Fuel requirements	MD02	Cooling Systems	ED02	Controllers
PS03	Location considerations	MD03	Room Ventilation	ED03	System Topologies
PS04	Loads and Transient Performance	MD04	Fuel Systems		Final Assessment
PS05	Product Selection-Gensize	MD05	Noise & Vibration		



WHO SHOULD ATTEND?

Product Selection is mostly focused on the several aspects to be taken into consideration whilst selecting diesel generating sets and their related sub-systems. Due to its diversified content, it is targeted at both technical sales and application engineers.

Mechanical Design and *Electrical Design* focus on all the mechanical and electrical considerations required for project design and implementation. Due to its purely technical nature, these two parts are mainly targeted to engineers looking to develop and improve their skills and knowledge in these fields.

RESOURCES

During the Application Engineering training the course participants will be required to access different databases to gather information. Prior to the training attendants must ensure that they have access to the following databases and tools:

- GCE (Global Customer Engineering) – access to G-Drive technical data
- Power Suite™ – access to technical data, drawings, Gensize™ amongst others.
- Power Zone – online ordering tool for CPG gensets
- QuickServe Online – aftermarket and service database

EVALUATION AND CERTIFICATION

Certificate will be attributed to those who attend the training days and successfully pass the exam. The pass criteria is 85% minimum.

PRODUCT SELECTION

PS01

ISO8528 RATINGS & APPLICATIONS

Rating definition as per ISO 8528 and standard conditions defined. What parameters impact the genset rating? How to select the right rating for standard and specific conditions. Discussions on competitor's optional ratings. What are site-specific ratings (SSR) and when they should be used?

PS02

FUEL REQUIREMENTS

Recommended fuel properties for Cummins Engines and impact of fuel properties on product performance. HVO, Biodiesel fuel blending. Fuel storage regulations and recommendations. Fuel consumption VS Lubricating oil consumption.

PS03

LOCATION CONSIDERATIONS

The impact of altitude and temperature on the genset components. Altitude and temperature derate calculations. Outdoor or Indoor applications. Noise requirements, Cold weather application considerations Hot weather application considerations. Operation at high altitude. Sandy environments. Coastal and other corrosive environments. Site security.

PS04

UNDERSTANDING LOADS AND TRANSIENT PERFORMANCE

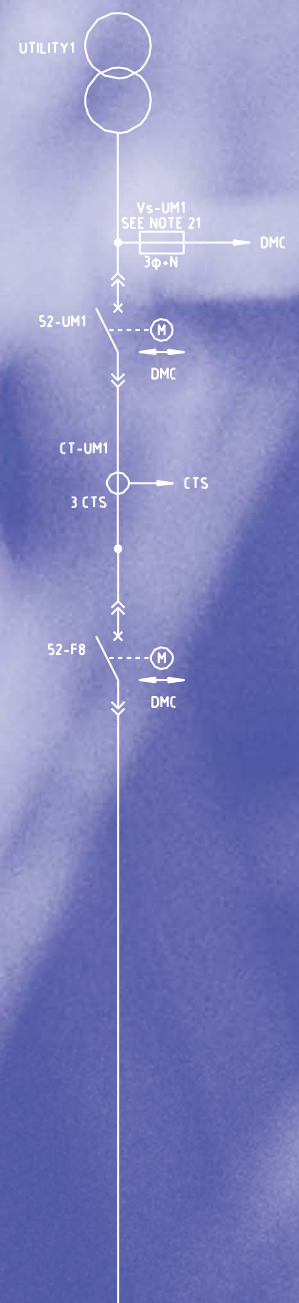
Impact on generating set performance from the different types of loads: lighting, transformers, motors, pumps, UPS and regenerative loads. Power factor considerations. How some loads impact alternator performance and how some others impact engine performance. Starting methods, starting sequence, and customer-specified starting requirements for load stepping. Transient performance classes as per ISO 8528-5. Customer requirements versus ISO 8528. Beyond ISO 8528-5.

PS05

Product Selection and Gensize

This course will dig deeper into the different components of a generating set from engine, alternator, cooling package, controllers, Emissions and how to select the best generating set for your application. We will target about different type of engines, cooling packages, controllers, alternators and battery types.

Another section of this course would be an on-hand training about gensize using exercises to be conducted between instructors and attendees.



MECHANICAL DESIGN

MD01

EXHAUST SYSTEMS

Exhaust system considerations. Exhaust backpressure calculations. Common issues and specific solutions.

MD02

COOLING SYSTEMS

Engine cooling requirements: coolant, installation considerations, maintenance and serviceability. Radiator arrangements and radiator performance. Remote cooling applications: types of systems, how to decide, calculating static and friction heads. Deaeration tanks. Limiting Ambient Temperature.

MD03

VENTILATION

System design recommendations: requirements, single and multiple sets, inlet and outlet louvres. Calculating airflow requirements. Airflow restriction recommendations. Common issues and solutions.

MD04

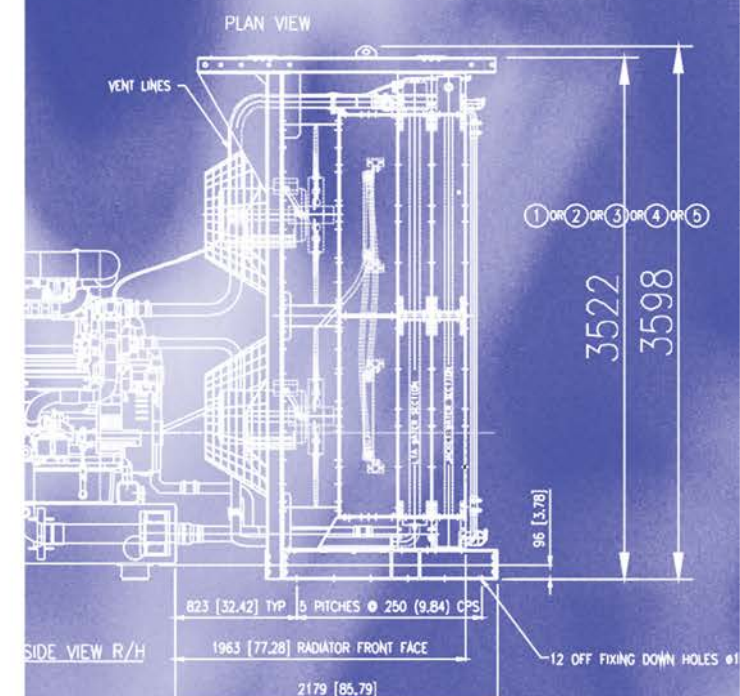
FUEL SYSTEMS

Fuel Supply and fuel properties. Day tank sizing and recommendations. Bulk tank sizing and recommendations. Fuel Systems layout considerations: day and bulk tanks location and recommendations. Fuel cooling: identify the need for fuel cooling, fuel cooler calculations and use of a day tank as a heat sink. Fuel maintenance: fuel shelf life and fuel polishing.

MD05

NOISE & VIBRATION

Sound Power and Sound Level and sources of noise. Adding multiple noise sources. Noise attenuation over distance. Noise reduction techniques and solutions. Understanding silencer attenuation. Vibration isolating foundation calculations. Vibration isolators (single isolation and dual isolation). Seismic isolation requirements. Common issues and solutions.



ELECTRICAL DESIGN

ED01

ALTERNATOR PERFORMANCE

Alternator fundamentals: construction, principals of operation, configuration. Single phase application and conversion. Alternator curves: locked rotor, short circuit, thermal damage, operating chart, magnetization curve. Reactance's and Short Circuit Capability calculations. Examples of Load currents and Fault currents. Leading power factor considerations.

ED02

CONTROLLERS

In this course we will go into the details of controllers features and the different models Cummins has to offer on its generating sets on different power nodes. As well we will have an emphasis on PCC3.3 architecture, customer connections, paralleling applications, network communications and AmpSentry™ protection.

We will discuss about Paralleling genset interconnections: Master First Start Sensor (MFSS), Masterless Load Demand (MLD), Load Sharing and third-party controller's interaction.

ED03

SYSTEM TOPOLOGIES

This section will target system level controls and their topologies. We will discuss about the different DMCs and where to include them in our application.

The last section will discuss about uptime institute Tier requirements: Tier I (Basic Infrastructure), Tier II (Redundant Capacity), Tier III (Concurrently Maintainable) and Tier IV (Fault Tolerant).

