

Application Guidance Notes: Technical Information from Cummins Generator Technologies

## AGN 002 – Customer Training

Cummins Generator Technologies offers training as a pre-sales advantage to support the alternator selection process and also specified technical training for customer service technicians.

### **TRAINING FOR CUSTOMER SERVICE TECHNICIANS**

The training of Customers Service Technicians is covered by the Cummins Generator Technologies Customer Service department, which is under the control of our Global Service Support Leader.

Any request for training should include some guidance of the nature of the training required, and similarly some guidance should be provided regarding the calibre and background of the Technicians to be trained, such that the training starting level can be appropriately set.

Many Service Technicians for Generating Set companies are very competent in Mechanical Engineering, especially with all aspects of Diesel Engine technology. But often their depth of Electrical Engineering experience is less so, and when this is the case the starting point for a training session has to go back to electrical basics.

This is not a problem, but obviously does limit the time available to cover the specialist applications for Generating Sets where a much more in-depth level of electrical characteristics are discussed aimed at building onto an established basic appreciation of the characteristics of electrical components and electrical equipment.

Training programmes are offered by the Cummins Generator Technologies Customer Service department, and this typically consists of:

- Basic principles of the operation of an alternator.
- An introduction to the Cummins Generator Technologies range of alternators.

- A factory tour to familiarise trainees with the component parts and methods of manufacture.
- Mechanical arrangements, including single bearing and two bearing coupling schemes.
- Basic principles of different excitation systems.
- Electrical characteristics appropriate to different excitation systems.
- Electrical fault finding for alternator windings and internal wiring.

It would be possible to offer a three hour 'FUNDAMENTALS' course that takes the trainee through the very basics of the sections of electrical science associated with alternators, starting with what constitutes an electrical insulating material from a conductor. Then progressing to playing with magnets and copper wire to generate a voltage. The real identification of; ac & dc, volts, amps, resistance, impedance, reactance, etc. Culminating with how these basic principles are followed to manufacture a rotating electrical machine known as an ac generator (alternator).

Specialist Technical Topics for more advanced Trainees can be offered and could cover such topics as:

- Mechanical design Considerations including Coupling arrangements, pitfalls, benefits and characteristics.
- Commissioning / Set-up Procedures for the Electronic accessories from Cummins Generator Technologies, such as the power factor controller PFC3.
- Considering specialist applications, and how to nominating a suitable alternator to be incorporated into a Generating Set, and then the expected performance of that Generating Set.

### **PRE-SALES APPLICATION ENGINEERING TRAINING**

Application Engineering training is offered to customers who wish to advance their knowledge of alternators and the applications in which they are used. Pre-sales technical support is offered in the following categories:

- Provide technical data and support for all alternators:
  - Technical data, drawings, application guidance notes.
  - Size alternators for different load applications - motors, lighting, non-linear (UPS, VSD, SCR).
- Advise and discuss all aspects of alternator application, control and installation:
  - Discuss needs, resolve issues, review specifications.
  - Provide qualified technical recommendations to ensure fit for purpose products.
  - Assist with the design and development of complete Generating Set systems.
- Provide bespoke application engineering training to suit customer requirements:
  - Application sizing.
  - Alternator selection considerations.
  - Changing market requirements such as grid codes or diesel electric propulsion.

Specialist Subjects and Applications that could be discussed are:

- Classifications of the thermal ratings, both Industrial and Marine.
- Environmental considerations, available accessories and appropriate rating factors.
- The British and International Standards that are commonly encountered.
- Motor starting, start methods, Transient Voltage Dip (TVD) and impacts on the Generating Set.
- Powering of Non Linear Loads such as; Uninterruptable Power Supplies, Variable Speed Motor Drives, Rubber-Tyred Gantry Cranes [including reverse power under braking] and Rectifier units.
- Parallel operation, the basic principles.
- Parallel operation to Mains Supply - G59 & ETR 113.
- Fault level contribution, and appropriate parameters.
- Operating charts, and system stability.
- Telecommunication applications,
- Electro Magnetic Compatibility [EMC].
- Generated waveform harmonics, and the effects of alternator winding design.
- Alternator testing methods, and the expected results.
- Generating Set vibration characteristics.
- The characteristics of various lamp / lighting units.
- Thermistors or RTD's for winding temperature detection.
- Generator efficiency, rejected heat, and generator air flow.
- Electrical insulation and impregnation systems.
- Life expectancy, MTBF, MTTR, predictions and considerations.
- Generator maintenance considerations.
- Canopy design considerations.
- Powering electric welders.

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