

Eco-Tech 305-I Alternators - 260 Amps at Idle!

Background - After 50 years of alternators being built using the same design, Ecoair Corp. has developed a new, patented Alternator that has both significantly higher power density and improved efficiency. The new Alternator provides high output at both idle and high engine RPM. The new Alternators went into full-scale production in mid- 2002 under the brand name Eco-Tech.

Market Introduction - The first fleet-test Eco-Tech Alternators were installed in New York City in January 2001 with the cooperation of NYEMS and FDNY. After one year of fleet tests in New York City and other testing (including certified laboratory vibration and environmental tests), Ecoair launched the sale of the new production alternators at the end of July 2002. Eco-Tech Alternators are available in J-180 (both 14V and 28V), J9-180 (Niehoff J-180 mounting style replacement), long and short pad mount (both 14V and 28V), and Ford T mount models. The 14V Eco-Tech Alternators are in use on: fire trucks, some of which are equipped with Telma brake retarders, shuttle and school buses, utility trucks that use high output static inverters, limo party buses, and Ford 7.3L ambulances. The applications for the 28V Eco-Tech Alternator models are: military boats, overseas emergency vehicles, US construction and military vehicles, and commercial fishing boats.

Technology - Eco-Tech Alternators employ a hybrid design that consists of a rotor assembly having separate wound field and permanent magnet sections. The stator is made up of two lamination stacks that match the position of the two rotor sections. Three efficient, internal fans are used to keep the Alternators cool. Rectification is accomplished with custom designed heat sinks and heavy-duty diodes. Regulation is achieved by using a boost-buck technique described as follows: at low speed and high load, the wound field section is fully energized thereby boosting the output of the permanent magnet section; at medium speed and load, the field current is off, allowing the magnet section to produce the output; and during high speed, low load operation, the field current is reversed, bucking the magnetic field. All of the boost and buck changes occur seamlessly while also maintaining constant voltage output.

Advantages - Eco-Tech Alternators have numerous advantages compared to the current Lundell, claw pole designs that have been the standard design for so long. Output at idle, as compared to a similarly sized conventional alternator, is 2.6 times greater. At engine idle (1,800 alternator RPM) and at the ambient condition of 77 degrees F stabilized, Eco-Tech Alternators produce 260 Amperes (135 Amperes in the 28V version)! The output in the same ambient conditions at 5,000 rotor RPM is 325 Amperes (165 Amperes for the 28V Alternator). The unit is rated for 8,000 RPM continuous and 10,000 RPM intermittent.

Tests conducted by Ecoair have shown that Eco-Tech alternators operate at about 100 degrees F cooler than standard claw pole alternators due to the use of non-heat generating permanent magnets resulting in both extended life of alternator parts and reduced under-the-hood heat generation.

Built-in technical characteristics include: soft start, oversized brushes for longer life, three high efficiency internal cooling fans, internal rectification and regulation, self-excitation, one wire hook up, and optional remote voltage regulator sensing.

Since the Eco-Tech Alternator is approximately 50 percent relatively more efficient (75 to 80% compared to 50 to 55%), the required input mechanical power (engine drag) to produce the same output is also 50 per cent

less than that required by current conventional alternators. The result is a fuel efficiency gain. A direct fuel economy benefit of 5.8 percent at idle has been confirmed in a test at a major automobile OEM. In a 7.3-liter diesel powered ambulance, the use of an Eco-Tech Alternator has resulted in a 33% fuel economy benefit at idle by avoiding the 52 percent fuel use penalty associated with high idle operation, such as is common with emergency vehicles. Therefore, the operating efficiency of Eco-Tech Alternators coupled with the elimination of high idle operation together can lead to significant fuel savings (see fuel use calculator at the Ecoair.com web site).

In idle hot stabilized tests at 93 degrees C (200 degrees F), Eco-Tech Alternators can supply 275 Amperes at 5,000 alternator RPM and 200 Amperes at 1,800 RPM, thereby satisfying the more than the 150 Amperes total electrical load common on many emergency and specialty vehicles, even at idle. After starting a vehicle outfitted with an Eco-Tech Alternator with no accessory loads on, the driver will see an output voltage is regulating at 14.4 volts. While still at idle and switching on accessory loads, OUTPUT VOLTAGE STAYS AT 14.4 VOLTS! Eco-Tech Alternators supply the usual total electrical loads, have extra power to charge the batteries at the same time, and have additional electrical output available for added electrically driven components.

Additionally, multiple battery packs are no longer needed for their reserve capacities since Eco-Tech Alternators can supply the electrical load needs of the entire system. Furthermore, battery isolators become obsolete; accessory load shedding devices are no longer needed; battery deep discharge cycling is eliminated since the only time the battery sees a discharge is during engine cranking; engine high idle systems are no longer necessary, resulting in reduced engine wear and tear and extended engine life; high idle engine noise is eliminated and exhaust emissions are reduced; and new electrical accessories can be accommodated.

Vehicle manufacturers are experiencing the following benefits due to the use of the new technology Eco-Tech Alternators: vehicles can be built more economically without the need to install, maintain, and warranty all of the previously mentioned now unnecessary electrical devices that ramp up engine RPM, store electrical energy for deficit electrical operation and shed electrical loads; vehicles are simplified since by using Eco-Tech Alternators, charging systems have electrical capabilities that more than meet the electrical load demands; and electrical systems perform more reliably and efficiently than previously. In today's environmentally conscious society, the use of Eco-Tech Alternators result in the reduction of noise, exhaust, fuel usage, and fewer batteries entering the waste stream while at the same time outperforming existing charging systems.

Models - Eco-Tech Alternators have been designed in accordance with SAE mounting specifications and are available in Pad mount, J-180 (14V and 28V), J9-180 for Niehoff Series 600 replacement, and "T" mount models for 7.3 liter applications. The Eco-Tech Pad mount Alternators use a universal mount that is a drop-in-replacement for any Pad mount alternator of the following manufacturers: Robert Bosch, Delco, C.E. Niehoff and Prestolite, including its Motorola and Leece-Neville brands.

Summary - Due to Eco-Tech Alternators' ability to supply such unmatched output at idle, the need for the common, extra cost "Band-Aids", including high idle and systems and load shedding devices, has been eliminated. The result is improved fuel economy, less engine wear and tear, less engine noise, reduced exhaust emissions, and extended battery longevity.