



## **Eco-Tech 305-I Alternators - 240 Amps at Idle!**

**Background** - After 50 years of alternators being built using the same claw pole or Lundell 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, NYPD 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. Available in J-180 (both 14V and 28V), Pad, and T mount models, Eco-Tech Alternators are in use on: Ford 7.3L ambulances; fire trucks, some of which are equipped with Telma brake retarders; shuttle and school buses; and utility trucks that use high output static inverters. Some of the current 14V applications are in hot, alternator-unfriendly climates, such as Houston, Phoenix and Las Vegas. The applications for the 28V Eco-Tech Alternators are 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.

**Output Advantage (both at idle and high RPM)** - Eco-Tech Alternators have numerous advantages compared to 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 (1,650 alternator RPM) and at the ambient condition of 77 degrees F stabilized, Eco-Tech Alternators produce 240 Amperes (120 Amperes in the 28V version)! The output in the same ambient conditions at 6,000 rotor RPM is 325 Amperes (165 Amperes for the 28V Alternator). The Alternator is rated for 8,000 RPM continuous and 10,000 RPM intermittent.

**Output in Hot Environments** - Eco-Tech Alternators, in idle hot stabilized tests with a capability of supplying 185 amperes, satisfy the more than the 150 Amperes total electrical load common on many emergency and specialty vehicles. After starting a vehicle outfitted with an Eco-Tech Alternator and with no accessory loads on, the driver will see that the output voltage is regulating at 14.1 volts. While still at idle and switching on all accessory loads, **OUTPUT VOLTAGE STAYS AT 14.1 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 features, even at idle.

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**Efficiency Advantage** - Since the Eco-Tech Alternator is approximately 50 percent relatively more efficient (75 percent versus 50 percent), the required input mechanical power (engine drag) to produce the same output is also 40 per cent less than that required by a conventional claw pole alternator. 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.

**Equipment Savings** - Another advantage is that multiple battery packs are no longer needed for their reserve capacities since the alternator can supply the electrical load needs of the entire system. Along with the elimination of the additional battery packs, battery isolators become obsolete; accessory load shedding devices are no longer needed; battery deep discharge cycling is eliminated, greatly extending battery longevity 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 finally, many new electrical accessories can be added.

**Manufacturers' Advantages** - The following are among the beneficial ramifications for vehicle manufacturers that occur 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 batteries entering the waste stream while at the same time outperforming existing charging systems.

**Models** - Eco-Tech Alternators are available in Pad mount, J-180 (14V and 28V), and "T" mount models for 7.3 liter applications. Three AC taps and a D+ terminal tap have been included in convenient locations to facilitate installation for tachometers, hour meters and/or no charge light indicators, respectively.

**Features** - Built-in technical characteristics include: soft start, oversized brushes for longer life, electronic over-voltage protection, electronic load dump protection, avalanche diodes, three high efficiency internal cooling fans, internal rectification and regulation, self-excitation, one wire hook up, and remote voltage regulation sensing.

**Summary** - Briefly, Eco-Tech J, P and T-305-I Alternators reduce engine wear and eliminate the need for all of those components that have been developed just because currently used claw pole, Lundell alternators do not generate the needed electrical power to satisfy the needs of many of today's vehicles. In addition, Eco-Tech Alternators provide electrical power for additional devices while extending battery life. Finally, Eco-Tech Alternators are significantly more efficient thereby reducing under-the-hood heat and increasing fuel economy.

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