Is AC Really Better?

In a word, yes! It does more work with less energy consumption. And, it enables a number of features that improve performance, lengthen component life, reduce maintenance, and increase safety.

In all, it creates a better vehicle for the horizontal movement of materials in manufacturing and distribution facilities.

That's why Pack Mule made AC power standard on all its vehicles.

Pack Mule uses a 3-phase AC induction motor as the standard on all its products. This motor alone provides 20% to 40% greater efficiency than its DC counterparts, depending on the load, frequency of stops, and other operating variables. It creates significantly more torque, faster acceleration, and—since it has no mechanical connections, other than the high-quality ball bearings at each end of the rotor—it's maintenance free. *These are the same reasons that Tesla and all other major auto makers producing electric vehicles are using AC motors.*

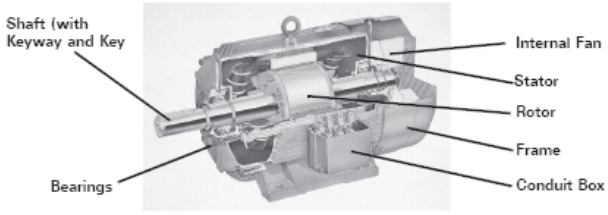
AC power has been an added-cost option on electric utility vehicles for years. Typically, the upgrade costs about $1,200. Pack Mule has significantly improved the definition of AC-powered vehicle and eliminated the upgrade cost.

Here are 8 reasons that Pack Mule's new NXG Series of AC vehicles is better, some directly and others indirectly attributable to the use of AC.

1. AC powered motors directly and indirectly provide up to twice the run time between charges.

While the AC motor itself enhances run time by 20% to 40%, the Pack Mule's AC system enables enhanced regenerative braking, programmability and control of operation that boost the Pack Mule NXG advantage further to up to around 100% more run time.

This provides everyday benefits, such as fewer interruptions in operations to charge the vehicle. And, since all batteries have a limited number of charge cycles, fewer charges per day means longer battery life. Since Pack Mule vehicles generally last well beyond 10 years, the savings in battery replacement costs alone could be in the range of $1,600-$3,200 over the life of each vehicle.



The parts of the AC motor. From the user's point of view, the important point is that none have to be replaced.

2. The AC motor enables more efficient kinetic energy harvesting.

The benefits of Pack Mule's dual regenerative braking, automatically engaged whenever the operator's foot is lifted from the accelerator, are greater runtime (since the kinetic energy is returned to the batteries), longer brake component life (since regenerative braking is wear-free and maintenance free), and much safer operation, because the extra braking can provide shorter stops when the vehicle is heavily loaded, towing a large load, or going down an incline.

3. Pack Mule's AC motors are maintenance free.

DC motors usually present at least two maintenance challenges: they are not sealed because of required ventilation, making them subject to contamination from dust, debris, fumes and moisture, and they contain brushes which must be periodically inspected and replaced. Pack Mule's AC motors are literally maintenance free. They are sealed against outside contamination, and there are no brushes to replace.

4. AC motors are safer in operation.

DC motors can produce arcing, sparks leaping from the brushes to the commutator, making them hazardous wherever flammable vapors are present (as they often are when batteries are charged). AC motors don't arc, removing the danger of explosion.

5. AC's torque characteristics reduce drive train wear.

The torque-producing characteristics of AC motors are much better aligned with the real-world operation of electric utility vehicles. DC motors deliver very high torque when moving a load from a standing start, generating unnecessary wear on

the vehicle's drive train, shortening its useful life and increasing maintenance costs.

6. AC power enables intelligent braking.

Because AC motors can be controlled more effectively by on-board computers, they can ensure smoother stops or even changes of direction. This makes the vehicle safer for both the operator and the cargo.

7. AC vehicles can be profiled to your specific environment.

The operating specifications of each vehicle can be programmed to fit the needs of your environment, resulting in more efficient operation, less wasted energy, and increased safety. For instance, speed acceleration parameters can be programmed to fit each application's workloads, safety regulations, tightness of turns, vehicle routing, and other environmental factors.

8. AC provides continuous power for loaded start-up and hill climbing.

The torque dynamics of AC motors provide for power when you need it, such as at start-up and when going up inclines. This isn't available with DC motors.

Conclusion

In short, Pack Mule's decision to offer state-of-the-art AC power on its entire line of new NXG vehicles at no extra charge is indeed revolutionary. When combined with Pack Mule's other market leading features such as those listed below, there is no reason a serious user should ever choose an electric industrial vehicle other than the Pack Mule NXG:

- 245 amp hour batteries (vs. industry standard of 185-210 amp hour batteries)
- Load range C tires (vs. industry standard load range B tires) which are safer and allow for much higher psi inflation, reducing roll friction and increasing runtime.
- Sealed transaxle, wheels, and motor requiring no maintenance.
- Industry leading 3-year warranty with no hours of use limit (vs. industry standard 1 year warranty).

PACK MULE
AC POWER