NuVinci
DELTASERIES™

THE POWER YOU NEED, WHEN YOU NEED IT.

NuVinci® DeltaSeries™ Alternator Drives Enable:

- Alternators to produce rated current regardless of engine RPM
- Optimally size the alternator for application / need
- Reduced failure rate of conventional alternator
- Improved system efficiency and fuel economy
- Improved battery life; total energy from the alternator is dramatically increased (testing shows >750% additional energy generated during a typical workday)

Untraditional Alternator Performance

Government vehicles, transit buses and commercial vehicles share a common alternator problem – namely that a belt-driven alternator doesn't make rated electric power during engine idling. This is because, at idle, the alternator speed falls below its rated speed. Sizing the pulley ratio to spin the alternator faster (beyond rated speed) at idle may cause the alternator to over-speed and fail.

A *NuVinci DeltaSeries* alternator drive improves alternator performance by decoupling the engine speed from the alternator speed, enabling the alternator to operate in its optimal range based on demand regardless of engine speed. As a result, the *NuVinci* alternator drive delivers the ideal alternator speed all the time – providing needed power regardless of engine speed, reducing speed when power is not needed, thereby improving fuel economy.

NuVinci CVP Technology

At the heart of every *NuVinci* accessory drive is Fallbrook's award-winning *NuVinci* continuously variable planetary (CVP) transmission technology. The *NuVinci* CVP is a new class of CVT transmission technology that acts as a power management system to control the speed and optimize the performance of any engine accessory. Unlike conventional CVTs, the *NuVinci* CVP uses a set of rotating and tilting balls positioned between the input and output components of the transmission that tilt to vary the speed of the transmission. Tilting the balls changes their contact diameters and varies the speed ratio. As a result, the *NuVinci* CVP offers a seamless and continuous transition to any ratio within its range.

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Power at Idle.

A *NuVinci DeltaSeries* alternator drive improves alternator power at low engine speeds, with minimal complexity, easy installation and low cost. Figure 1 illustrates the *NuVinci* CVP's "U" drive power path configuration. Power comes in from the belt, is transferred to one traction ring, through the planet balls, and out of the other traction ring. Tilting the balls provides a smooth ratio transition from overdrive, providing high alternator speeds at low engine speeds, to underdrive, when the alternator might be operated at slower speeds.

The *NuVinci* CVP enables control of output speed (see red line in Figure 2), independent of engine speed (the grey line). At engine idle, output speeds may be increased, providing more power to the alternator. At higher engine speeds (such as accelerating from a stop or cruising), accessory speeds may be reduced, saving energy. The *NuVinci* CVP also shifts quickly, helping to smooth out transients.

Results:

The graph in Figure 3 illustrates the improvements in alternator performance possible with a *NuVinci* equipped alternator. A typical-high performance alternator (grey curve) does not provide full power at low engine speeds (less than 1200RPM). A *NuVinci*-equipped alternator (red curve) enables optimal alternator operation, even at low engine speeds. The green area represents the increase in alternator current generated at low RPM, as compared to a standard alternator. During idle, this can result in 50-100% more delivered power, depending on the alternator.

Thus, the *NuVinci DeltaSeries* Alternator Drive offers:

- Increased alternator production at idle
- Opportunity to right-size the alternator
- Flexible packaging
- Reduced engine startup torque requirements
- Reduced belt hop
- Improved battery life

Figure 1. Power at Idle -Alternator Accessory

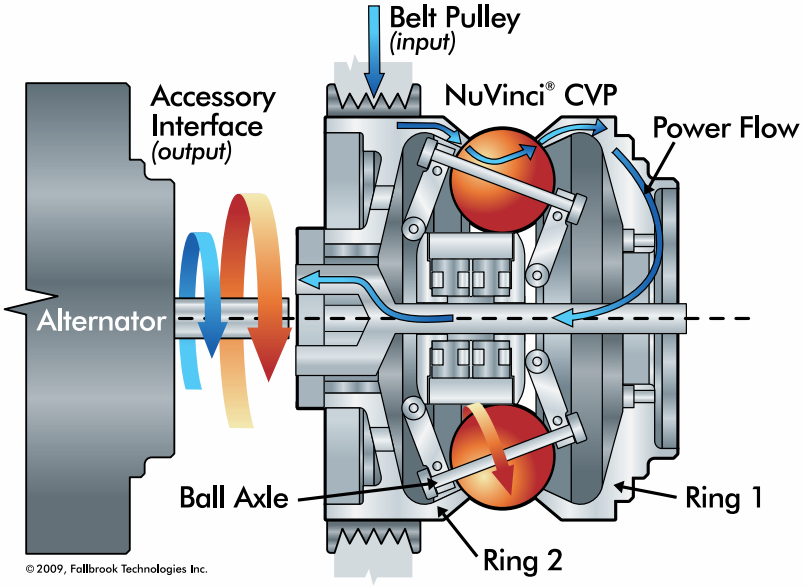


Figure 2. Speed Comparison

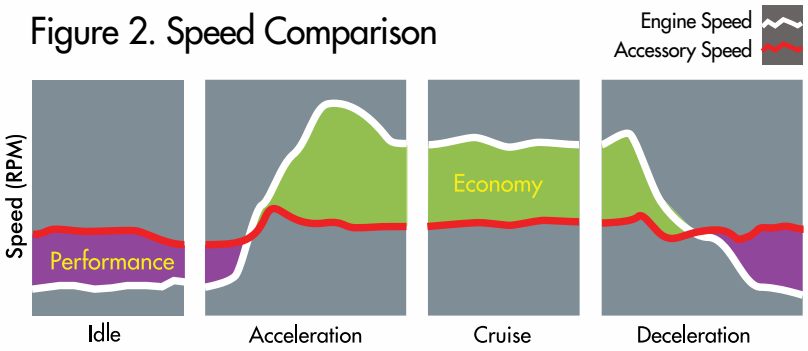
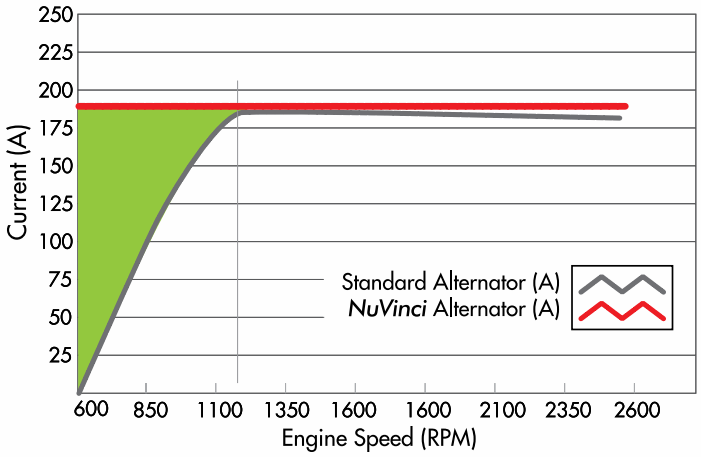


Figure 3. Drive Comparison



Become a *NuVinci* Development Partner

Fallbrook Technologies is currently selecting *NuVinci* CVP accessory drive development partners in several cleantech/ heavy duty market areas. Becoming a development partner gives you first-strike capability in reaching your market with innovative new products, as well as access to the comprehensive and unmatched *NuVinci* technology portfolio of over 350 patents and patent applications worldwide.

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