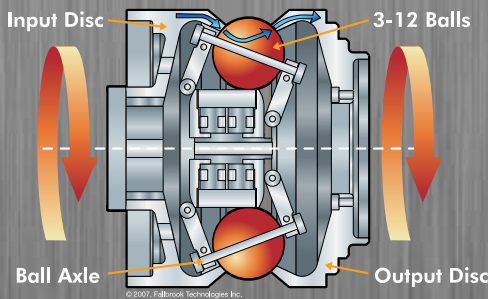




The NuVinci CVAD is an energy management system for engine accessories that enables unprecedented ability to change accessory loads and outputs on the fly for improved performance. It also provides dramatically higher accessory output (up to 75% improvement demonstrated) at low engine speeds, while maintaining reliable accessory operation at high engine speeds.



The NuVinci CVAD does this by offering an infinite number of speed ratios between its high and low ratio extremes, with programmable instantaneous, smooth and continuous ratio changes. Operation is completely seamless and transparent to the driver.

Problem: Under-performing AC compressors at low engine speeds

Military, transit bus and commercial vehicles share a common AC problem – namely that belt driven AC compressors are typically undersized for the desired refrigerating capacity. The installation of larger compressors to meet higher performance levels is often limited by available package space in the existing engine compartment. Scroll compressors are one solution, but then they cannot be spun at high enough speeds with the existing belt line.

www.nuvinci.com

Maximize AC Performance at Idle using NuVinci® Continuously Variable Accessory Drive (CVAD) Technology.



A CVAD using the NuVinci continuously variable planetary (CVP) transmission improves AC compressor performance by decoupling the engine speed from the compressor speed, enabling the compressor to operate in its optimal range regardless of engine speed.

NuVinci AC Compressor CVAD technology delivers:

- Better AC performance at Idle
- Optimized AC performance above idle
- Quiet, smooth operation
- Compact, in-line packaging



FALLBROOK®
TECHNOLOGIES

CVAD-AC COMPRESSORS

Solution: A CVAD using NuVinci® CVP Technology

A NuVinci CVAD improves AC compressor performance at low engine speeds, with minimal complexity, easy installation and low cost.

Figure 1 illustrates a thru-drive power path configuration. The AC Compressor CVAD receives power from the belt, transfers it to one traction ring, through the planet balls, and brings the power out of the other traction ring. Tilting the balls provides a smooth ratio transition from overdrive to underdrive. In overdrive, the NuVinci CVAD provides high compressor speeds at engine idle. In underdrive, it keeps the compressor from overspeeding at high engine speeds.

An AC Compressor CVAD enables control of output speed (see red line in **Figure 2**), independent of engine speed (the white line). At engine idle, output speeds may be increased providing more performance from the compressor. At higher engine speeds (such as accelerating from a stop or cruising), accessory speeds may be reduced, saving energy. The NuVinci CVAD also shifts quickly to help smooth out transients.

Results:

The graph in **Figure 3** illustrates the improvements in both refrigerating capacity and volumetric efficiency that result from a NuVinci AC Compressor CVAD. The improvements in capacity will vary with compressor type, but the benefit to refrigerating capacity at idle can be as much as double for some compressor types.

The NuVinci AC Compressor CVAD offers:

- Increased performance at idle
- Increased capacity for AC compressors
- Uniquely flexible NuVinci packaging enables application, even with tight underhood requirements
- Opportunity to downsize AC compressors
- Reduced cabin noise without pitch changes
- Ability to reduce startup torque transients to the clutch and compressor

Become a NuVinci Development Partner

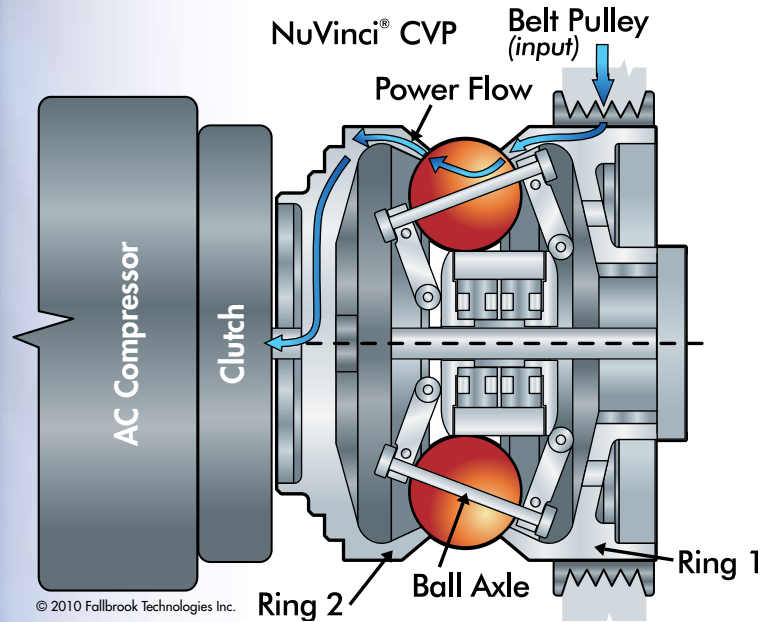
Fallbrook Technologies currently is selecting NuVinci CVAD development partners in several key cleantech/heavy duty market areas. Becoming a development partner gives you first-strike capability in reaching your market with innovative new products, as well as access to the extensive NuVinci technology portfolio of over 325 patents and patent applications worldwide.

For more information, visit www.nuvinci.com.

Contact: info@fallbrooktech.com

(888)-NUVINCI

Figure 1. Power at Idle - AC Compressor



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Figure 2. Speed Comparison

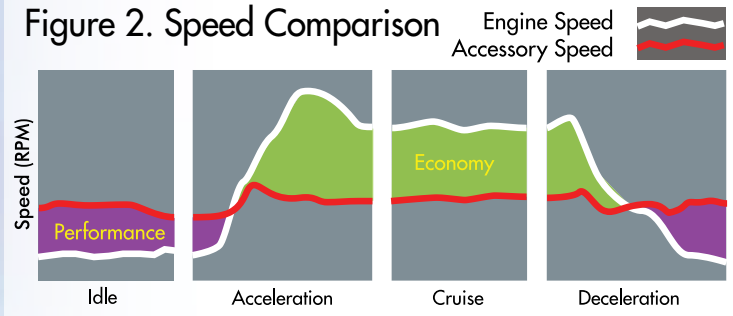
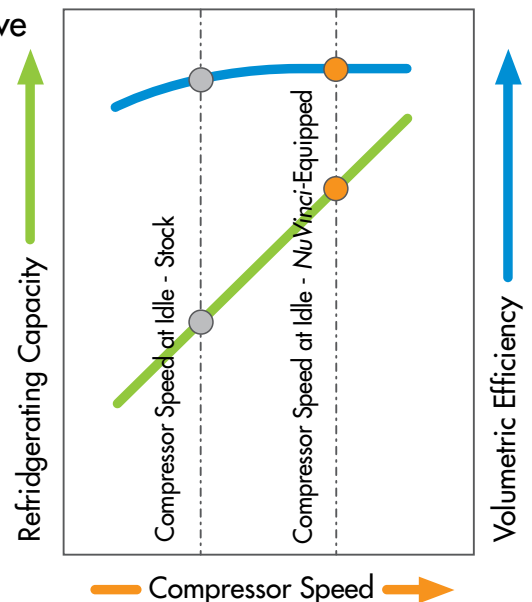


Figure 3. Relative Performance Improvements at Idle



Fallbrook Technologies Inc.

505 Cypress Creek Road, Suite C
Cedar Park, TX 78613

Tel: +1 (888) NuVinci (688-4624)

Tel: +1 (512) 279-6200

Fax: +1 (512) 267-0159

support@fallbrooktech.com



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