



Company Fact Sheet

Year Founded

1998. Became Fallbrook Technologies Inc. in 2004.

Business

Fallbrook Technologies Inc. (Fallbrook) is a technology development company dedicated to improving mechanical transmission-based products. The Company's core technology is its NuVinci® continuously variable planetary (CVP). The award-winning technology has been recognized as revolutionary and is potentially applicable to any product that uses a transmission including bicycles, light electric vehicles, outdoor power equipment, agricultural equipment, automobiles, and wind turbines among others. Fallbrook partners with other companies to commercialize its *NuVinci* technology and provides design, development and manufacturing support. In addition, it manufactures and markets *NuVinci* drivetrains for the bicycle and LEV (light electric vehicle) industries. Fallbrook currently holds over 325 patents and pending applications worldwide.

NuVinci® Technology

Fallbrook's *NuVinci* technology is a scalable and highly adaptable CVP technology that controls relationships of speed and torque. The *NuVinci* transmission uses a set of rotating and tilting balls between the input and output components of a transmission. Tilting the balls changes their contact diameters and varies the speed ratio. Compared to other current continuously variable transmission technologies, the *NuVinci* technology is less complex, scales and packages more easily, costs less to manufacture, and improves performance.

Target Markets

- Bicycles
- Continuously variable accessory drives (CVAD)
- Light electric vehicles (LEVs)
- All-terrain vehicles (ATVs)
- Outdoor power equipment (OPE)
- Automobile
- Agricultural equipment
- Wind energy

Ownership

The company is privately funded and privately held.

Executive Management

- William G. Klehm III, President, CEO and Chairman
- Paul A. DeHart, Chief Operating Officer
- Nicole T. Nicks, Chief Financial Officer and Assistant Secretary
- Alan M. Nordin, President, Bicycle Products Division
- Robert A. Smithson, Chief Technology Officer, VP Sales and Business Development
- Jeffrey A. Birchak, VP Intellectual Property and Secretary
- George L. Lowe, VP Operations
- David W. Markley, VP Product Development

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Company Overview

Originally established in 1998, Fallbrook Technologies Inc. (Fallbrook) is a technology development company dedicated to improving mechanical power transmission products.

Headquartered in San Diego, California with its primary research and development facility located near Austin, Texas, Fallbrook's patented and award-winning NuVinci[®] technology has far-reaching implications. The Company's NuVinci continuously variable planetary (CVP) technology is potentially applicable to any product that uses a transmission, including bicycles, light electric vehicles, outdoor power equipment, automobiles, agricultural equipment, and utility-class wind turbines, among others.

The NuVinci CVP provides the most adaptable and scalable continuously variable transmission (CVT) available today for companies that need a cost effective, easily controlled, and durable alternative to conventional transmissions or other CVTs. The NuVinci CVP improves acceleration, performance, cost and overall vehicle efficiency over conventional transmissions. Compared to other CVTs, it is far simpler, offers more stable control, permits more scalability across product lines, is easier to package in a vehicle, and is less expensive to manufacture and assemble.



The NuVinci transmission uses a set of rotating and tilting balls in elastohydrodynamic contact between the input and output components of a transmission that tilt to vary the speed of the transmission. Tilting the balls changes their contact diameters and varies the speed ratio.

The company currently has over 325 patents and patent applications worldwide. Additionally, Fallbrook provides transmission design, development, and manufacturing support.

Company History

The story of Fallbrook and its NuVinci technology dates, in a sense, to the year 1490, when Leonardo da Vinci developed a drawing describing how a continuously variable transmission (CVT) might work. Over 450 years later, the first real-world models of CVTs for automobiles were produced, but a variety of problems (e.g., cost, scalability, size, packaging difficulty, durability, and weight) has kept CVTs from widespread adoption and has limited their practical application.

The Quest for the World's Fastest Bike

Donald C. Miller, a cycling enthusiast, was interested in building the world's fastest bike. In analyzing the challenges involved, he quickly found that the transmission was a limiting factor. While looking around for new ideas, Don came across CVTs. His

subsequent experiments led him to develop an entirely new concept for CVT-based bicycle transmissions.

Miller and a group of investors formed Motion Systems, Inc. (MSI) to develop the technology. By 2000, Don had developed a design that fully addressed all the traditional weaknesses of a CVT, and had applied for the first patents covering the technology.

The Company Takes Shape

As part of a process to provide additional funding and guidance, Miller and The Weiss Group LLC, an investment and startup advisory firm, joined forces in 2000 to form Motion Technologies LLC (Motion Technologies). Motion Technologies acquired MSI's intellectual property and development rights, with Don serving as the initial CEO.

A second round of financing in 2003 for Motion Technologies via a private placement provided funds for the continued development of the technology. Tests on Don's transmission by a prestigious independent testing laboratory, quickly verified the potential of the revolutionary technology – providing significant gains in simplicity and durability. The testing also showed that the technology had potential applications far beyond just bicycles – to virtually any device that has a transmission. Robert Smithson, a transmission expert involved with the testing laboratory's preliminary assessment, was so impressed with what he saw that he subsequently joined the Company, first as a consultant and later as vice president of product development.

Testing Proves the Potential

As development progressed, it soon became apparent that the technology's potential was even greater than originally anticipated. Smithson discovered that the technology would also support the implementation of an infinitely variable transmission (IVT) with no additional parts, a feature unique to *NuVinci* among CVTs. Additionally, Fallbrook identified potential applications in the area of wind energy. At that point, management determined that further funding and additional executive talent would be appropriate.

Motion Technologies LLC became Fallbrook Technologies Inc., in 2004, and in May of that year, auto industry veteran Bill Klehm became Fallbrook's president and CEO. Don Miller then became vice president of advanced research. The Company immediately began an aggressive funding effort and also accelerated research and development. Fallbrook obtained additional funding via a private placement and assembled a staff that includes many top engineers in the transmission field. The technology was given the name *NuVinci* CVP (short for Continuously Variable Planetary), in honor of its 500-year-old predecessor. The accelerated R&D effort began producing tangible results in 2004, when the Company signed its first agreements with manufacturers.

Fallbrook closed an \$8.2 million funding round from a consortium of private investors in April 2005.

Fallbrook entered into a trademark licensing and development agreement with the Valvoline division of Ashland Inc. in 2006, enabling Valvoline to design, test and market specialty fluids that optimize the performance of the *NuVinci* CVP. Also during 2006, Fallbrook entered into OEM licensing agreements with Ellsworth International, Inc., Batavus BV, and Currie Technologies to design and market bikes and electric scooters featuring the *NuVinci* drivetrain. In August 2006, Fallbrook closed an additional funding round of \$16 million, again with a consortium of private investors.

Production Begins

NuVinci CVP bicycle hubs (model N170S) began rolling off the assembly line in December 2006, marking the first shipment of commercial products based on *NuVinci* technology.

The Adagio-*NuVinci* bike manufactured by Batavus BV won the 2007 Bike of the Year award at the FietsVak bicycle show in the Netherlands. At the same show, the *NuVinci* drivetrain won the Innovation of the Year award. The *NuVinci* CVP also was selected for the prestigious 2007 R&D 100 Awards as one of the most important new technologies of the year. In November of 2007, the *NuVinci*-equipped The Ride™ Performance Lifestyle bike by Ellsworth was honored by Popular Science magazine with the Grand Award for the year's "Best of What's New" in the recreational category. *NuVinci* technology also has won the iF Design EUROBIKE Gold 2008 Award.

Focus on Wind Energy

In 2007, Fallbrook created a wholly-owned subsidiary called Viryd Technologies Inc. to develop and produce *NuVinci* products for the wind energy market – specifically, so-called "small wind" products designed for homes and small businesses. In 2009, Viryd was spun off as a standalone company, which now licenses *NuVinci* technology from Fallbrook.

Doing Business with Fallbrook

Fallbrook's mission is to develop, in conjunction with its partners, the best performing, most versatile and most reliable mechanical power transmissions in the world. To achieve this, Fallbrook's partnering program is designed to work with companies known for industry leading expertise and to create a community of technology around the *NuVinci* CVP. By sharing technology, implementation techniques and innovations, Fallbrook and its partners will ultimately speed the adoption and expansion of *NuVinci* technology to:

- Enhance vehicle performance and the user experience
- Enable new functionality for existing and first-time applications
- Improve fuel economy and/or energy consumption in the operation of the end product
- Provide a sustainable competitive advantage

Fallbrook has partnerships with *Manufacturers*, companies who manufacture *NuVinci* CVPs and/or parts, and with *Original Equipment Manufacturers (OEMs)*, companies who integrate the *NuVinci* CVPs supplied by Manufacturers into products or vehicles that are then ultimately sold to consumers.

Fallbrook also offers engineering services to its partners. Through its engineering services, Fallbrook is able to help its partners develop new *NuVinci* CVPs that are specifically designed and optimized for the partner's unique applications and the requirements of those applications.

In addition, Fallbrook markets the *NuVinci* CVP Developer Kit, which helps builders of electric-, gas-, human-powered and hybrid vehicles integrate the *NuVinci* drivetrain into their designs. The kit includes *NuVinci* CVP, shift actuator, programmable controller, wiring and mounting hardware. Software tools, design instructions and technical documentation are also included.

The base price of the kit is US\$595, plus shipping and handling. For more information, visit www.fallbrooktech.com/developerkit.

Fallbrook currently has agreements with:

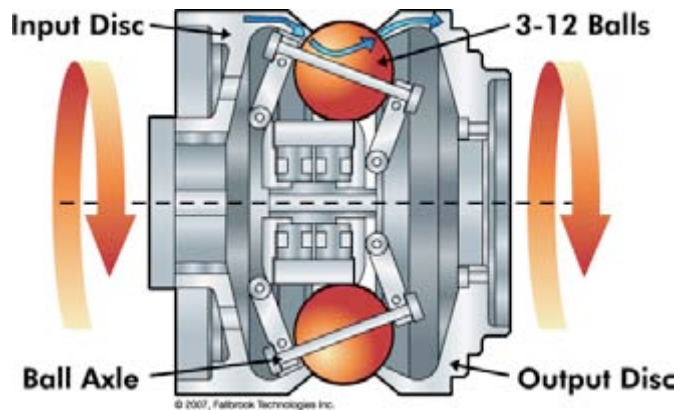
- More than 20 bicycle OEMs manufacturing over 40 models in the U.S., The Netherlands Switzerland, Denmark, and Germany. For a complete list, visit www.fallbrooktech.com/08_gallery.asp.
- Hydro-Gear, a leading manufacturer of drive systems for lawn and garden equipment, for developing, manufacturing and marketing infinitely variable transmission (IVT) *NuVinci* products in the residential and commercial lawn and garden market.
- Development partners including Valvoline, a division of Ashland Inc., who works closely with Fallbrook to develop fluids specially formulated to work with *NuVinci* CVPs.

A number of commercial agreements have not been announced due to their highly sensitive nature.

Technology Overview

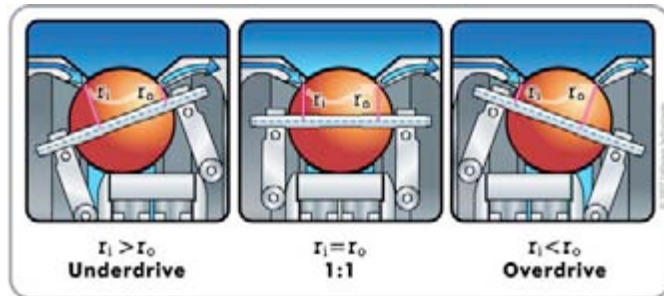
The patented NuVinci® technology developed by Fallbrook Technologies Inc. (Fallbrook) is the most practical, economical and universally adaptable continuously variable transmission (CVT) for human-powered and motor-powered vehicles and machines.

Because it is functionally analogous to planetary gear sets, the NuVinci technology defines a new species of CVT, the continuously variable planetary (CVP) drive. The NuVinci CVP is ideally suited for applications in many major industries including bicycles, light electric vehicles, automobiles, tractors, trucks,



and wind turbines among others.

The NuVinci transmission uses a set of rotating and tilting balls positioned between the input and output components of a 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 seamless and continuous transition to any ratio within its range, thus maximizing overall powertrain efficiency, with no jarring or shocks from the shifting process, and improving acceleration, performance and overall vehicle efficiency over conventional transmissions. When compared to traditional CVTs, the NuVinci CVP is less complex, has considerably fewer parts, offers more stable control and scalability across product lines, is better packaged, and is less expensive to manufacture and assemble.

Distinguishing the NuVinci CVP from Traditional CVTs

There is a clear distinction between Fallbrook's NuVinci CVP drive and more traditional CVT technologies.

A CVT is a transmission that is infinitely variable between its high and low ranges, unlike a conventional geared transmission where the number of fixed speed ratios between high and low is limited by the number of gears.

The CVT has been called the “holy grail” of transmissions because it eliminates the multiple gears, shifting clutch(es), and many other parts found in conventional transmissions. In place of gears, most CVTs use one or more cones, discs, balls, belts, toroids, or other shaped devices for gradually changing ratios. These geometric shapes allow the input or output contact points on any particular device to vary in diameter, thus changing the input to output speed.

The use of CVTs has not become widespread due to multiple problems inherent in conventional designs. These problems include shifting control difficulties, packaging problems, scalability challenges, questionable reliability and durability, high cost, increased weight, and other factors.

The *NuVinci* CVP represents a quantum leap forward from other CVTs as well as conventional mechanical transmissions. These advantages include:

- Higher torque density
- Smaller size/weight
- Easily scalable
- Simpler, more elegant design
- More adaptable and versatile
- Improved overall performance
- Easy to package (less space required)
- Lower manufacturing and maintenance costs

The *NuVinci* Transmission

The *NuVinci* CVP is continuously variable and infinitely applicable to almost any product using a mechanical power transmission. *NuVinci* technology combines the advantages of a toroidal traction CVT with the time-proven versatility of the planetary gear arrangement. It uses rolling traction to transfer torque, just as do toroidal transmissions. However, unlike toroidal CVTs, it distributes the transmitted torque over several spheres in an inherently stable configuration, thus lowering total clamping force required and significantly improving durability, control stability, and torque density.

This arrangement makes the *NuVinci* CVP the only practical CVT to combine the smooth, continuous power transfer of a CVT with the utility of a conventional planetary gear drive. Torque inputs can be summed or divided, just as in a conventional planetary. Ratio control is stable, and can be actuated down the center line of the transmission, which again is similar to the proven planetary transmission. Part shapes are simple and relatively easy to manufacture, and in most applications, there is no need for power-robbing, high-pressure hydraulics.

The *NuVinci* CVP reduces energy consumption through its continuous speed changing characteristics, allowing the power input prime mover (such as a gasoline engine or electric motor) to operate in its most efficient speed range. Overall, the *NuVinci* CVP's mechanical and manufacturing characteristics improve performance and reliability while reducing costs over conventional CVTs and stepped transmissions. As a result, the *NuVinci* CVP can potentially replace the planetary gear transmission in most mechanical devices.

Key advantages of the *NuVinci* CVP

Compared to conventional transmission technologies, the *NuVinci* CVP provides:

- **Less complexity.** There are significantly fewer parts than conventional transmissions and it is potentially much less costly to manufacture.
- **Overall improved system efficiency.** With the *NuVinci* CVP, it is easy to keep an engine or motor running at its most efficient speed.
- **Greater acceleration and optimum performance.** Acceleration is faster and smoother – right up to the vehicle's acceleration limits - because it keeps the engine running at peak performance.
- **Easier shifting.** There is no jarring associated with shifting gears.
- **Ability to accept multiple inputs while varying speed and ratio, managing torque and providing single or multiple power outlets.** A *NuVinci* CVP is the most practical CVT technology to perform all of these tasks simultaneously.
- **Support for a torque demand rather than a speed demand control solution.** The *NuVinci* CVP solves the low-speed acceleration problem inherent in some torque-demand vehicles.
- **Scalability and potential to reuse tooling.** The *NuVinci* technology is highly scalable. The design and implementation of a low-torque application utilizing four balls may involve the same basic parts as a higher torque application with eight or sixteen balls. Also, tooling can be used across a wide variety of applications.
- **Improved hill-climbing.** The *NuVinci* CVP allows a driver to drive up a hill at the desired speed and in the proper transmission ratio without having to choose, as with traditional geared transmissions, between a gear that is too high and bogs the engine down resulting in a lower speed or a gear that is too low and results in an over revving engine speed.

Compared to CVT alternatives, the *NuVinci* CVP offers:

- **Coaxial input and output.** The input and output shafts may be either in-line, offset, or in a U configuration (input and output both coaxial and coplanar), making the transmission simpler, smaller, lighter, and easier to package
- **Better torque density.** A *NuVinci* CVP delivers a large amount of torque capacity in a relatively small space. It is smaller and easier to package than other CVTs because it does not require an offset shaft and because it can spread torque across any number of traction contacts by using many balls.
- **Lower manufacturing cost.** The transmission uses simple geometry and very simple parts, which results in a lower cost. The *NuVinci* CVP can also be scaled across a wide variety of vehicles, in many cases without significant retooling.
- **Lower control cost.** Transmission control is stable, linear and does not require a major control system development effort.
- **Power path variability.** The technology is easily integrated into a wide range of applications with varying power path requirements or options
- **Scalability.** The *NuVinci* CVP's simple design and low part count make it easily scalable.

Technology Applications for *NuVinci* technology

While the *NuVinci* CVP has application potential in virtually any mechanical device requiring speed changes, Fallbrook has initially identified eight major target markets for *NuVinci* technology:

- Bicycles
- Light electric vehicles (LEVs)
- Outdoor power equipment (OPE)
- Continuously variable accessory drives (CVADs)
- All-terrain vehicles (ATVs)
- Automobiles
- Agricultural equipment
- Wind energy

Fallbrook selected these initial markets because they offer:

- High potential for early adoption by manufacturers
- Large market size
- Short time to market
- Companies seeking a competitive advantage through improved technology



Management/Director Biographies

Management Team

William G. Klehm III

President, CEO and Chairman of the Board

Bill Klehm brings over 20 years of automotive-related experience to Fallbrook Technologies Inc. (Fallbrook). With numerous leadership positions in the automotive business, including finance, marketing, sales, product development, and manufacturing operations, he has a proven track record of leading and growing successful organizations. Most recently, Bill served as the president and general manager of Newgen Results Corporation, an automotive customer relationship management firm. During his three-year tenure, Newgen's revenue and profit grew from \$60 million to over \$108 million and \$6 million to over \$15 million respectively.

Prior to joining Newgen, Bill served as president and SBU director for Visteon Climate Control Systems. He was instrumental in developing and launching Visteon's \$1 billion Aftermarket Division. Bill started his career with Ford Motor Company in 1985 and held a variety of posts within the Ford Customer Service Division where he was responsible for developing and executing the marketing/growth strategy for the \$5 billion customer service parts business.

Bill holds a B.A. in Management and Marketing from Northwood University and also participated in the Harvard Business School Executive Education Programs.

Paul A. DeHart

Chief Operating Officer

Paul has more than 25 years' experience in manufacturing management, program development and strategic planning. He oversees Fallbrook's engineering and manufacturing operations, which are based at the company's facility in Austin, Tex.

Prior to joining Fallbrook, Paul served as president of Alex Dean Consulting, a manufacturing-focused interim management and consulting firm based in Ortonville, Mich. His extensive career includes a track record of success in a series of increasingly responsible and management roles with various divisions of General Motors. After General Motors, Paul served as general manager and director of international development at L&L Products of Romeo, Mich. and then chief operating officer of Springfield Wire Corporation of Springfield, Mass.

Paul holds a BSEE from the University of Rochester and an MBA from the Harvard Business School.

Nicole T. Nicks

Chief Financial Officer and Assistant Secretary

Nicole Nicks has over 12 years of accounting, financial reporting and SEC filing experience and has worked in various industries such as database management and customer retention, real estate investment trust, home building & land developing, healthcare, public sector-enterprise fund, manufacturing, and not-for-profit.

Immediately prior to joining Fallbrook, Nicole worked as an independent consultant specializing in Sarbanes-Oxley compliance. Previously, she served as controller for Newgen Results Corporation where she helped support the company's revenue growth from \$60 million to \$108 million in 2003. Nicole also served as Senior Audit Accountant for the San Diego office of Deloitte & Touche, LLP.

Nicole holds a Business Administration/Accounting degree *magna cum laude* from San Diego State University's Honors Business Program. She is a California Certified Public Accountant.

Alan M. Nordin

President, Bicycle Products Division

Al Nordin has 20 years of successful sales, product development, and business development experience in the automotive component industry, both in the US and international markets. He most recently served as Fallbrook's vice president of sales and business development. Prior to joining Fallbrook, Al served as vice president of sales for Newgen Results Corporation, an automotive customer relationship management firm. While at Newgen, Al managed a sales group of over 100 people, and was instrumental in building company sales from \$60 to \$108 million over a three-year period. During that period, Al grew Newgen's automotive dealer base by over 35%.

Al's previous experience also includes service as divisional manager of Global Aftermarket Operations for Visteon Corporation and global sales/marketing roles at Federal-Mogul and Echlin Inc.

Al holds a B.A. in Business Administration from Western Michigan University.

Robert A. Smithson, FSAE

Chief Technology Officer, Vice President of Sales and Business Development

Rob Smithson is an author of several publications in the area of motor vehicle transmissions with over 21 years of engineering and management experience in the automotive, aerospace, and robotics fields. He previously served as Fallbrook's vice president of product development and was instrumental in the Company's early focus on intellectual property. Prior to joining Fallbrook, Rob served as group leader of the Drivetrain Design & NVH Group for The Southwest Research Institute (SwRI) in San Antonio, Texas and as an advisor to several early stage companies in the clean tech sector.

Rob's career includes serving as a product development engineer for The Ford Motor Company in Dearborn, Michigan. He also was vice president of robot design and a co-founder of ARM Automation, Inc., and worked as a spaceflight hardware engineer for the

McDonnell-Douglas Astronautics Company. Rob was the first to recognize that the *NuVinci* variator was kinematically equivalent to a variable ratio planetary gearset, hence the term “Continuously Variable Planetary” or CVP.

Rob holds a B.S. in Mechanical Engineering from Auburn University and an M.S. in Mechanical Engineering from the University of Texas at Austin. Additionally, he holds an Executive M.S. in Science & Technology Commercialization (named Kozmetzky Scholar and Outstanding Graduate) from the IC2 Institute at the University of Texas at Austin. In 2009, Rob was named a Fellow of the Society of Automotive Engineers (SAE).

Jeffrey A. Birchak

Vice President Intellectual Property and Secretary

Jeff Birchak is an intellectual property (IP) attorney specializing in IP portfolio management and strategy as well as patent defense and enforcement strategies for mechanical devices. Prior to joining Fallbrook, Jeff was an associate at Knobbe, Martens, Olson & Bear LLP, a world-renowned California-based IP law firm.

Previously, Jeff served as a nuclear engineering instructor in the U.S. Navy submarine force, and worked as a program engineer for AlliedSignal Corporation.

Jeff holds a B.S.E. *cum laude* in Mechanical Engineering from Arizona State University and a J.D. *cum laude* from California Western School of Law where he was the managing editor of the *California Western Law Review* and the *California Western International Law Journal*. He is a member of the State Bar of California and is admitted or registered to practice before the Supreme Court of the United States, the U.S. Patent and Trademark Office and the U.S. District Court for the Southern District of California.

George L. Lowe

Vice President Operations

George has an extensive background in the automotive industry, which includes a long and highly successful career with Ford Motor Company where he held a variety of Operations-related positions, including leadership roles in Quality, Service, and Product Development, both in the US and globally. After leaving Ford, he founded his own consulting business - Lowe & Associates, LLC, providing a wide range of tailored consulting, communications, and organizational development services to the automotive industry and other businesses.

George holds a Bachelor's Degree in Automotive Engineering Technology from Western Michigan University and a MBA from Michigan State University.

David W. Markley

Vice President Product Development

David previously served as Fallbrook's director of engineering. Prior to joining Fallbrook, David worked for BAE Systems where he led the award-winning Low Cost Precision Kill laser-guided missile development project. As a rotating machinery consultant with Radian International and Mechanical & Materials Engineering, he was the program

manager for Datalert™, which provided engineering and maintenance services to 120 plants in the utility, chemical, and petrochemical industries. While working for General Dynamics Fighter Aircraft Division, David provided analytical and test support for the F-16, YF-22, and other military aircraft.

David holds B.S. and M.S. degrees in Mechanical Engineering from Auburn University and is a registered Professional Engineer (PE) and Project Management Professional (PMP).

Board of Directors

William G. Klehm III

President, CEO and Chairman of the Board

Gary E. Jacobs

Director

Gary Jacobs is an investor and philanthropist. He is the Managing Director of Jacobs Investment Company, which participates in real estate development and other investment activities throughout the United States and abroad. In addition, he has multi-million dollar investments in other venture capital funds. He also owns and operates a professional minor league baseball team, the Lake Elsinore Storm, affiliated with the San Diego Padres.

Gary serves as chairman of the Board of Trustees High Tech High, a public charter high school and is a board member of the San Diego Symphony and the UCSD Board of Overseers. Gary's other philanthropic work includes being a past president of the United Jewish Federation of San Diego County. Additionally, Gary and his wife created and funded the Gary and Jerri-Ann Jacobs International Teen Leadership Institute which promotes Muslim / Jewish understanding.

Prior to his current investment and philanthropic activities, Gary worked as a Software Engineer and Senior Education Specialist at QUALCOMM, Inc. and as a Software Programmer at Linkabit Incorporated.

Gary holds a B.A. in Management Science from the University of California at San Diego.

Al Kammerer

Director

Al Kammerer is a seasoned automotive industry veteran who spent 34 years with Ford Motor Company before retiring in 2008 as product development director for Jaguar Land Rover. Prior to this assignment, he served as executive director for SUV and body-on-frame vehicles in North America, where he led product development activities for Ford, Lincoln and Mercury vehicles with these platforms. In his previous work with Ford, he also served as vehicle line director for the group that developed the critically-acclaimed Ford Focus.

Al holds a B.S. in mechanical engineering from California State University at San Luis Obispo, and an M.S. in mechanical engineering from Stanford University.

Kiempe Keuning

Director

Keimpe Keuning is a Senior Investment Manager at Robeco, a Dutch-headquartered asset management firm wholly owned by Rabobank. Robeco was established in Rotterdam in 1929 and has offices located world-wide. Robeco offers a wide range of investment products and services to institutional and private investors.

Keimpe joined Robeco in 2006 and his focus is on Clean Technology investments. He is also on the boards of Enerpulse Inc., the Albuquerque based maker of the Pulstar (TM) pulse plug and AWS Eco Plastics Ltd., the UK based plastic bottle recycling company. Prior to Robeco, Keimpe worked at Fortis Bank as Associate Director where he advised a broad range of clients on numerous transactions. These included the listing of Tele Atlas on Euronext Amsterdam and the sale of the Dutch state publisher, Sdu, to ABN AMRO Capital and Allianz Capital Partners. He began his working career at Ernst & Young as a tax advisor.

Keimpe studied U.S. and International tax law at the University of Florida and received a master's degree in tax law from the University of Leiden. He has also participated in executive education at the Amsterdam Institute of Finance and INSEAD.

Steven E. Parry

Director

Steve Parry is managing partner of NGEN Partners, LLC, an investment firm specializing in the cleantech sector. He began his career as a professional geologist and worked in the minerals industry for more than 25 years. However, his career in geology focused on the development, implementation and management of deal pipelines and deal structures and he was involved in approximately 200 transactions. Steve's pioneering efforts, popularizing a venture capital approach to early stage investment in the mining business, are well known in the industry.

Prior to NGEN, at Billiton plc and BHP Billiton, Steve held the position of vice president business development and general manager, innovation for the company's exploration subsidiary. As a principal in BHP Billiton's venture capital group, he was responsible for creating its first technology venture fund in 2001. Steve is also a member of the board at Artificial Muscle, EnviroTower, eps corp, Powerspan, SolFocus, Tioga Energy, and Venture Vehicles.

Steve holds a BSc degree from Queen's University, Canada, and an MSc degree from and the University of Western Ontario. He has been awarded the Canada 125 Medal for his activist role in support of sustainability in northern Canadian resource communities.

Jeremiah B. Robins

Director

Jere Robins is the chairman and CEO of Great Pond Management Company (GPMC), a private equity firm which he formed in 1979. Over the past three decades, Jere has participated in the successful development of companies in a wide range of industries, including Iron and Steel, Specialty Chemicals, HVAC, and Semiconductor Packaging.

Jere also currently serves as chairman and CEO of Thermal Dynamics Corporation (TDX), a manufacturer of specialty heat exchangers for the North American OE Automotive and Industrial markets, and chairman of Rotation Dynamics Corporation (Rotadyne) a multinational manufacturer of consumables for the commercial printing industry with facilities in North, Central and South America, Eastern and Western Europe, and the Peoples Republic of China.

Jere maintains residences both in San Diego, California and Shanghai, PRC and divides his time equally between the U.S. and China.



Continuously Variable Accessory Drives (CVADs)

A continuously variable accessory drive (CVAD) is a device that helps the front-end accessories on a car or truck engine (alternator, air conditioner, water pump, etc.) run more efficiently. These belt-driven accessories have always been connected directly to the engine, so their speeds are tied to engine RPM. A CVAD sits between the engine and these accessories, allowing their speed to vary according to performance needs rather than engine RPM.

The NuVinci® CVP is ideally suited for CVAD applications. It is a power management system that offers seamless and continuous transition to any ratio within its range, thus maximizing overall powertrain efficiency. A NuVinci-based CVAD produces more torque at low input speeds, providing improved performance for belt-driven accessories. It improves fuel economy by decoupling accessory speed from engine speed. In addition, NuVinci technology is quiet, smooth, compact, and easy to package.

The NuVinci CVP has three major application areas for accessory drives:

- Alternator-mounted: extracting additional power from the alternator to increase power at idle without overspeeding the alternator, or even slowing it down for fuel conservation, at higher speeds.
- Crankshaft-mounted: optimizing the performance of belt-driven engine accessories to improve fuel economy
- Supercharger: providing significant boost at low RPM by enabling high turbine speeds at low engine speeds

Alternator-Mounted

A NuVinci-equipped CVAD improves alternator performance by decoupling engine speed from alternator speed, enabling the alternator to produce maximum current regardless of engine RPM. As a result, NuVinci technology:

- Increases power at idle
- Increases capacity of front-end accessories
- Enables downsizing of accessory capacity
- Reduces engine startup torque requirements
- Improves battery life

Crankshaft-Mounted

A crankshaft-mounted CVAD decouples belt-driven accessories from engine speed, enabling them to run at the minimum speed required to meet accessory load. At higher engine RPM, decreasing accessory speeds decreases power, thus saving energy.

Additional energy savings can be realized by optimizing the accessories for a narrow speed range operation. Conversely, at low engine RPM, the accessory belt speed can be increased to provide additional battery-charging power or to increase the water pump speed. Thus, the NuVinci-equipped crankshaft CVAD:

- Improves fuel economy

- Improves acceleration by under-driving the accessories to a greater degree than would be practical with fixed ratio pulleys
- Provides smooth accommodation of engine/load transients
- Creates opportunities to add “smart” controls for accessory drives
- Enables downsizing of accessory capacity

Supercharger

The *NuVinci* CVP is a power management system for engine accessories that enables significantly more boost at low RPM by enabling high supercharger speeds at low engine speeds, providing increased torque for launch and towing. The *NuVinci* CVP 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. The *NuVinci*-equipped supercharger CVAD enables:

- Supercharger speed control independent from engine speed
- More boost, providing higher performance, especially at lower engine speeds
- Engine downsizing without sacrificing performance:
 - Improved fuel economy
 - Reduced operating costs of heavy-duty fleets
 - Diesel-like performance from gasoline engines



Frequently Asked Questions

Q: What is Fallbrook Technologies Inc.?

A: Fallbrook Technologies Inc. (Fallbrook) is a technology development company headquartered in San Diego, California with engineering, operations and customer support in Cedar Park, outside of Austin, Texas. The Company's core technology is its traction-based, NuVinci® transmission – a continuously variable planetary (CVP) drive ideally suited for applications in virtually any mechanical device that has a transmission or requires speed variation.

Q: What is the NuVinci® CVP?

A: The *NuVinci* CVP is a continuously variable and broadly applicable technology, with applications for almost any product using mechanical power transmission. *NuVinci* technology combines the advantages of the inherently smooth and quiet traction continuously variable transmission (CVT) with the advantages of a time-proven planetary gear arrangement. The *NuVinci* CVP is the only continuously variable transmission that has a planetary gearset's advantages of high torque density, versatility of use, inline shafts, capability to sum and divide torque from one or multiple input devices, and low production cost. As a result, *NuVinci* technology is the only technology potentially capable of replacing the planetary gear transmission – in every application – as virtually a plug-and-play, yet vastly more capable, replacement.

Q: How does the NuVinci CVP work?

A: The *NuVinci* transmission uses a set of rotating balls between the input and output components of a transmission that tilt and vary the output speed of the transmission. Tilting the balls changes their contact diameters with the discs, which varies speed. As a result, the *NuVinci* CVP improves acceleration, performance and powertrain efficiency over conventional transmissions. It is far simpler, permits more stable control, provides more scalability across product lines, is better packaged, and is less expensive to manufacture and assemble than traditional CVTs.

Q: Why is the technology named NuVinci?

A: The name represents a “tip of the hat” to Leonardo da Vinci who, over 500 years ago, sketched what is considered to be the first documented continuously variable transmission.

Q: CVTs have been around for a long time. Why have they not become commonplace?

A: The use of CVTs has not become widespread due to multiple problems including scalability challenges, questionable reliability and durability, high cost, and other factors. Despite some obvious drawbacks, some manufacturers such as Ford, Nissan, Honda, and Audi have implemented limited production with old CVT technology because the market need was so great. However, with the development of the *NuVinci* CVP, the technical roadblocks have now been eliminated – clearing the way for a wide range of CVP applications for which markets are ready and waiting.

Q: How is the *NuVinci* CVP different from conventional transmissions?

A: The *NuVinci* CVP offers a wide range of advantages over conventional transmissions. These advantages include:

- Less complexity
- Greater powertrain system efficiency
- Greater acceleration and optimum performance
- Easier shifting
- Ability to accept multiple inputs while varying speed and managing torque
- Multiple power outlets such as for a power take off (PTO) application
- Easier to package and potentially lighter
- Easier and less costly to manufacture
- Greater scalability and potential to reuse tooling
- Improved hill-climbing

Q: How is a *NuVinci* CVP different from other approaches to CVT technology?

A: There are four widely accepted alternative approaches to CVT technology:

- **Toroidal.** The *NuVinci* CVP, comparatively offers better torque capacity in the same package volume and simpler control, and is more easily packaged for inclusion in a given application due to its concentric input and output shafts. It is also much more effective to scale across a vehicle range because of its modular nature and is more durable because of its greater number of traction contacts.
- **Push Belt.** The *NuVinci* CVP is simpler in design, more scalable, easier to control, allows for inline shafts and is less expensive to manufacture. It also does not have the ultimate torque capacity limitations of the push belt and is expected to be more durable.
- **Hydromechanical.** The *NuVinci* CVP is much easier to manufacture, easier to control, lighter, more scalable, inherently quieter, and easier to maintain.
- **Chain.** The *NuVinci* CVP has greater torque capacity, allows for inline shafts, and is easier to control, more scalable, inherently quieter, and less expensive to manufacture and maintain.

Q: What markets have the greatest potential for *NuVinci* technology?

A: While the *NuVinci* CVP has application potential in virtually any mechanical product that has a transmission, Fallbrook has initially identified eight major industries for the *NuVinci* technology:

- Bicycles
- Light electric vehicles (LEVs)
- Outdoor power equipment (OPE)
- Continuously variable accessory drives (CVADs)
- All-terrain vehicles (ATVs)
- Automobiles
- Agricultural equipment
- Wind energy

Q: What companies are currently using *NuVinci* technology?

A: Fallbrook currently has agreements with:

- Leading vehicle system and component suppliers under development programs in a variety of industries
- More than 20 bicycle OEMs manufacturing over 40 models in the U.S., The Netherlands, Switzerland, Denmark, and Germany. For a complete list, visit www.fallbrooktech.com/08_gallery.asp.
- Distributors
 - Quality Bike Products, a leading distributor to the cycling industry and authorized reseller of *NuVinci* CVP kits. Based in Bloomington, Minn., the company employs nearly 400 people and offers 5,000 domestic and international retailers a wide array of bicycle products and services.
 - Seattle Bike Supply, a full service bicycle and bicycle parts distributor, and authorized reseller of *NuVinci* CVP kits for the bicycle aftermarket business. The company serves bicycle retailers and suppliers from sales and warehouse operations in Kent, Wash.; Rancho Dominguez, Calif.; Reynoldsburg, Oh.; and Dallas, Tex.
 - Norco Products Ltd., Canada's leading bicycle manufacturer. Based in Port Coquitlam, British Columbia, Norco is known for its leading-edge products and innovative bicycle designs. In-house engineering, R&D, and meticulous attention to detail ensure that Norco bikes meet rigorous standards for performance and durability. www.norco.com.
 - Southcott Cycles, located in Victoria, Australia, one of Australia's largest bicycle distributors. Southcott Cycles is a subsidiary of Southcott Pty Ltd. Visit www.southcottcycles.com.au.
 - Cycle Supplies, located in Christchurch, New Zealand, which provides components to bike shops throughout New Zealand. Visit www.cyclesupplies.co.nz.
- Development partners including Valvoline, a division of Ashland Inc., who works closely with Fallbrook to develop fluids specially formulated to work with *NuVinci* CVPs.

A number of agreements have not been announced.

Bicycle FAQ's

Q: How does the NuVinci® hub impact the riding experience?

A: The *NuVinci* CVP provides a totally new kind of riding experience. Instead of fumbling around to find the right gear, the rider is able to shift immediately and intuitively to meet even the slightest changes in terrain or incline. A twist of the wrist is all that's needed to find the perfect "sweet-spot" for every rider. The *NuVinci* CVP shifts without noise or hesitation, and eliminates dropped chains caused by mis-shifting derailleurs.



The Ride™ by Ellsworth Handcrafted Bicycles

Q: Is there any required maintenance?

A: Unlike derailleurs, only periodic light cleaning (depending on usage conditions) is recommended.

Q: What is the ratio range and efficiency of the NuVinci CVP hub?

A: The ratio range is approximately 350%. As a traction drive transmission, the *NuVinci* CVP will be less mechanically efficient than direct drive transmissions.

However, because the rider can always be in the "appropriate" gear with no gaps and no power losses during shifting, mechanical efficiency should not be the primary measure for the *NuVinci* CVP. In getting a non-expert rider from point A to point B, the *NuVinci* CVP compares well with internally geared hubs and derailleurs on the market today, while delivering a superior ride experience.



Adagio-*NuVinci* by Batavus (Netherlands)

Q: How much does the NuVinci CVP hub weigh?

A: Since this was the first version of an all new technology, Fallbrook chose to focus more on durability and rugged construction, and less on overall weight. A bike equipped with the *NuVinci* hub weighs about 2.2kg more than the same bike equipped with a typical internally-geared hub, and the weight difference is slightly more when compared to a typical derailleur bike. Fallbrook believes that the ability to optimize cadence, the extra comfort of always having the right gear, and the security of knowing you will never miss a gear or drop the chain more than makes up for the additional weight.

Q: What does a *NuVinci* CVP hub cost?

A: Fallbrook is dedicated to developing affordable, advanced technology. The Suggested Retail Price (SRP) for a *NuVinci* kit, including drivetrain and controller available from bicycle dealers is \$449.

Q: Where can I buy a bicycle equipped with a *NuVinci* hub?

A: An increasing number of bicycle dealers either stock or can order bicycles equipped with *NuVinci* technology. Contact a local bicycle dealer. For a complete list of brands currently offering *NuVinci*-equipped models, please visit the Bicycle area of www.fallbrooktech.com.

Q: Can I obtain just a *NuVinci* hub and install it on an existing bicycle?

A: *NuVinci*-equipped bicycles are currently available from over 20 OEMs. For a complete list, please visit www.fallbrooktech.com/Partners

NuVinci CVP kits and pre-laced wheels are also available to bicycle retailers from the following distributors:

- **Quality Bike Products** www.qbp.com
- **Seattle Bike Supply** www.seattlebikesupply.com
- **Norco Products Ltd.** www.norco.com
- **Southcott Cycles (Australia)** www.southcott.com.au
- **Cycle Supplies (New Zealand)** www.cyclesupplies.co.nz

Consumers may order or purchase a *NuVinci* CVP drivetrain and controller from local bicycle retailers as a standalone kit or pre-laced into a replacement wheel. Ask for *NuVinci*.



Light Electric Vehicle FAQs

Q: How will NuVinci® CVP technology improve the performance and capabilities of a light electric vehicle (LEV)?

A: *NuVinci* Continuously Variable Planetary technology allows an electric motor in an LEV to operate in a more efficient manner by not overloading it in normal operation. Vehicle performance and rider experience is enhanced with improved hill climbing ability, smoother/quicker acceleration, higher top-end speed, increased load carrying and towing capacity, better accommodation of larger adult riders, and extended range and battery life.

NuVinci CVP technology coupled with an efficient motor, an intelligent shifter and motor controller, and state-of-the-art batteries provides manufacturers a technical canvas to design LEVs never before possible. This is a major step forward in the continuing quest to make LEVs that are truly practical commuter vehicles.

Q: How will a *NuVinci* CVP transmission be shifted?

A: An intelligent CVP controller will be integrated into the vehicle allowing fully automatic control for both performance and economy operation, or a manual-shifting mode for a fun and different rider experience. Under normal operation, the *NuVinci's* shifting will be completely seamless and silent, with no disruption to torque, jerks, clunks or other undesirable characteristics that would detract from the inherent smoothness of an electric drivetrain.

Q: Is there any required maintenance with a *NuVinci* CVP transmission?

A: The *NuVinci* CVP contains a fully synthetic "traction" fluid. The only recommended maintenance is that the fluid be changed periodically. The change interval will be determined by the manufacturer and type of use, with most applications being fill-for-life. Some more aggressive applications, such as off-road vehicles, may require regular fill intervals due to contamination and/or heavy usage.

Q: When will an LEV with a *NuVinci* CVP be available in the market?

A: Currie Technologies Inc offers an e-bicycle with a *NuVinci* CVP drivetrain. Applications with other LEV OEMs are pending.

Q: What will a *NuVinci* CVP drivetrain cost?

A: Fallbrook is dedicated to developing affordable, advanced technology. However, the price of an automatic shifting system for LEVs will be determined by electric vehicle manufacturers. A manual shifting *NuVinci* CVP drivetrain is available in kit form at a suggested retail price (SRP) of \$449 from bicycle dealers. The *NuVinci* Developer Kit, which includes a programmable automatic shifter for powertrain optimization, is sold for \$595 thru the Fallbrook website.
www.fallbrooktech.com/09_LEV_Kit.asp.

Q: How can I get a *NuVinci* CVP drivetrain?

A: To help facilitate the design of new LEVs, Fallbrook has made available the *NuVinci* CVP Developer's Kit. The Kit includes the *NuVinci* CVP transmission, shift actuator, user-programmable shift controller, wiring, mounting hardware, software and technical documentation. The system is ideal for electric motors from 250W to 5KW and for gas-powered engines under 7 hp.
www.fallbrooktech.com/09_LEV_Kit.asp.

Consumers may order or purchase a *NuVinci* CVP drivetrain and controller from local bicycle retailers as a standalone kit or pre-laced into a replacement wheel. Ask for *NuVinci*.



Traction Fluid FAQ's

Q: What is a traction fluid?

A: Traction fluid is a transmission fluid with properties specifically designed for transmitting torque between two smooth rolling elements. The fluids are generally based on special synthetic oils. The ability of a traction fluid to transfer torque is measured by its Coefficient of Traction, or Ct. While most fluids have some measurable Ct, the Ct of a fluid engineered as a traction fluid is 3x to 10x greater than the Ct of a typical standard lubricant. The synthetic base oil used in a traction fluid is tailored to give them high traction coefficients over wide operating ranges.

Q: How does a fluid transmit torque?

A: Torque is transferred between the rolling elements through shear forces in a thin fluid film. Under normal conditions of hydrodynamic lubrication, the shear forces transmitted are very small. However, under specific operating conditions (i.e., certain relative surface speeds and contact pressures), the fluid transitions into the elastohydrodynamic lubrication (EHL) regime and exhibits shear force transmitting properties similar to those of elastic solids. In engineering terms, materials like steel and aluminum are elastic solids. So, in effect, the traction fluid serves the same purpose as the steel gear teeth of a conventional transmission.

Q: Won't the rolling elements slip at higher torques?

A: Most traction drives, including the NuVinci[®] CVP, incorporate mechanisms to dynamically control the contact pressure as torque is increased. The properties of the traction fluid and the geometric and material properties of the rolling elements and the pressure-control mechanisms are designed to manage internal forces to prohibit slipping. Therefore, design of a traction drive includes careful selection and testing of the traction fluid. All traction transmissions have a very small amount of what is called creep that occurs within the fluid under normal conditions. The amount of creep is generally small enough that precision instrumentation is required to measure it.

Q: Does the traction fluid also provide lubrication?

A: Yes. In addition to a high traction coefficient, a traction fluid is designed to provide lubrication to protect elements from wear, dissipate heat, and dampen vibrations in the transmission, just as conventional transmission fluids do in gear type transmissions.

Q: Why haven't I heard of traction fluids before?

A: Though traction CVTs have been used for vehicular and industrial applications for nearly a century, advances in material and fluid properties over the last decade and a better understanding of the elastohydrodynamic phenomenon were required to enable wide-spread use of traction drives. The NuVinci CVP and Valvoline traction fluid leverage these technology advances to provide a solution that is more broadly applicable than previous designs.



NuVinci® Milestones

2004

- Technology branded *NuVinci* Continuously Variable Planetary; previewed at Interbike 2004 Expo, Las Vegas

2005

- Fallbrook closes \$8.2 million private funding round
- Fallbrook and *NuVinci* technology officially introduced
- National Renewable Energy Labs presents *NuVinci* technology at WindPower 2005 Conference. Reports significant savings in cost of energy.
- *NuVinci* CVP prototype selected as “Most Potential” at Interbike show
- ATC becomes first *NuVinci* manufacturing partner

2006

- Valvoline signs development / trademark licensing agreement to supply *NuVinci* traction fluid
- Ellsworth becomes first bike maker for *NuVinci* CVP; announces plans to introduce new line of performance lifestyle bikes around *NuVinci* technology
- Fallbrook business model featured in Intellectual Property article
- Fallbrook closes \$16 million funding round
- *NuVinci* commercial product officially introduced at Interbike 2006; Batavus bike and IZIP scooter e-bike customers deals announced; Ellsworth *NuVinci* bike unveiled

2007

- ATC ships first commercial products in volume
- Batavus Adagio-*NuVinci* bike wins Bike of the Year Honors at FietsVak Netherlands; *NuVinci* wins Innovation of the Year
- *NuVinci* LEV technology presented at EV Conference in Taiwan; Company proposes e-bike ratings standard
- Fallbrook announces agreement with ATC to produce *NuVinci* drivetrain for Outdoor Power Equipment
- *NuVinci* bikes, LEVs, Lawn & Garden and Automobile technology featured on SD ABC television news
- *NuVinci* featured on BBC broadcast; LEV technology presented at European EV Conference in Brussels, Belgium

- *NuVinci* CVP wins 2007 R&D 100 Award
- Ellsworth The Ride™ Performance Lifestyle bicycle powered by *NuVinci* drivetrain wins Popular Science Magazine's 2007 "Best of What's New Grand Award – Recreation Product"

2008

- Fallbrook purchases ATC's *NuVinci* manufacturing assets.
- Fallbrook announces decision to create in-house manufacturing capability for *NuVinci* drivetrains for bicycle and LEV markets
- Fallbrook selects MTD Products Inc as its prime supplier for the manufacture of *NuVinci* CVPs
- *NuVinci* CVP drivetrain wins iF Design EUROBIKE Gold Award 2008
- Fallbrook extends *NuVinci* hub warranty to industry-best six years, which is triple the industry average

2009

- Fallbrook spins out its Viryd division as a standalone company, which licenses *NuVinci* technology for use in wind power applications.
- Fallbrook closes \$25.4 million venture investment round, led by NGEN III, LP and Robeco.
- Fallbrook begins offering the *NuVinci* Developer Kit
- Fallbrook introduces *NuVinci* CVAD (continuously variable accessory drive) capability
- Fallbrook signs licensing agreement with Hydro-Gear to manufacture IVT (infinitely variable transmission) for lawn and garden equipment using *NuVinci* technology
- Fallbrook creates Bicycle Products Division