October 13, 2009

VIRIDIAN MOTOR CORPORATION

THE ZERO-2010 INITIATIVE: AN OVERVIEW

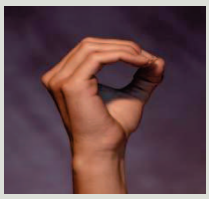
Viridian Motor Corporation's Vision and Plan for
Zero Emission Vehicle Production in 2010.

Contents

Mission Statement

Viridian Motor Corporation (hereinafter abbreviated as "**VMC**") has two core goals:

1) To assemble and to market zero emission electric vehicles for government, commercial, and consumer applications that will exceed all safety and emission standards.



"We are prone to speak of the resources of this country as inexhaustible; this is not so."

--Theodore Roosevelt

2) To implement sustainable manufacturing, recycling, and reclamation practices for the vehicle power and propulsion systems to ensure a continuous cycle of raw materials for future production.

Introduction

VMC is committed to implementing revolutionary green vehicle technology under the most stringent safety standards while decoupling vehicle power systems from carbon-based fuel sources. By producing attractive yet safe vehicle designs powered only by renewable energy sources, VMC will not only reduce the global environmental impact caused by vehicle emissions but will also reduce the production costs that typically have been offered as arguments against rapid adoption and integration of zero emission vehicle technology on regional, national, and global scales.

VMC's approach to produce and to market zero emission electric vehicles is based on a three point action plan.

I. Design vehicle frames that meet or exceed all crash test standards.

II. Implement vehicle propulsion systems using non-Lithium-ion battery technology and revolutionary fuel cell technology.

III. Promote vehicle assembly within the United States using globally outsourced parts suppliers.

I. Meeting Safety and Emission Standards: The Key to a Global Manufacturing Model.

VMC does not wish to enter the market as vehicle manufacturer but instead is positioned to become an assembly and distribution provider for zero emission vehicles. A third-party automotive manufacturing company would build the vehicle chassis and other vehicle components to specifications provided by VMC and would then ship the vehicle frames and parts to the United States-based VMC assembly plant located in Chesapeake, Virginia.

Image 1: VMC's Assembly Plant in Chesapeake, Virginia

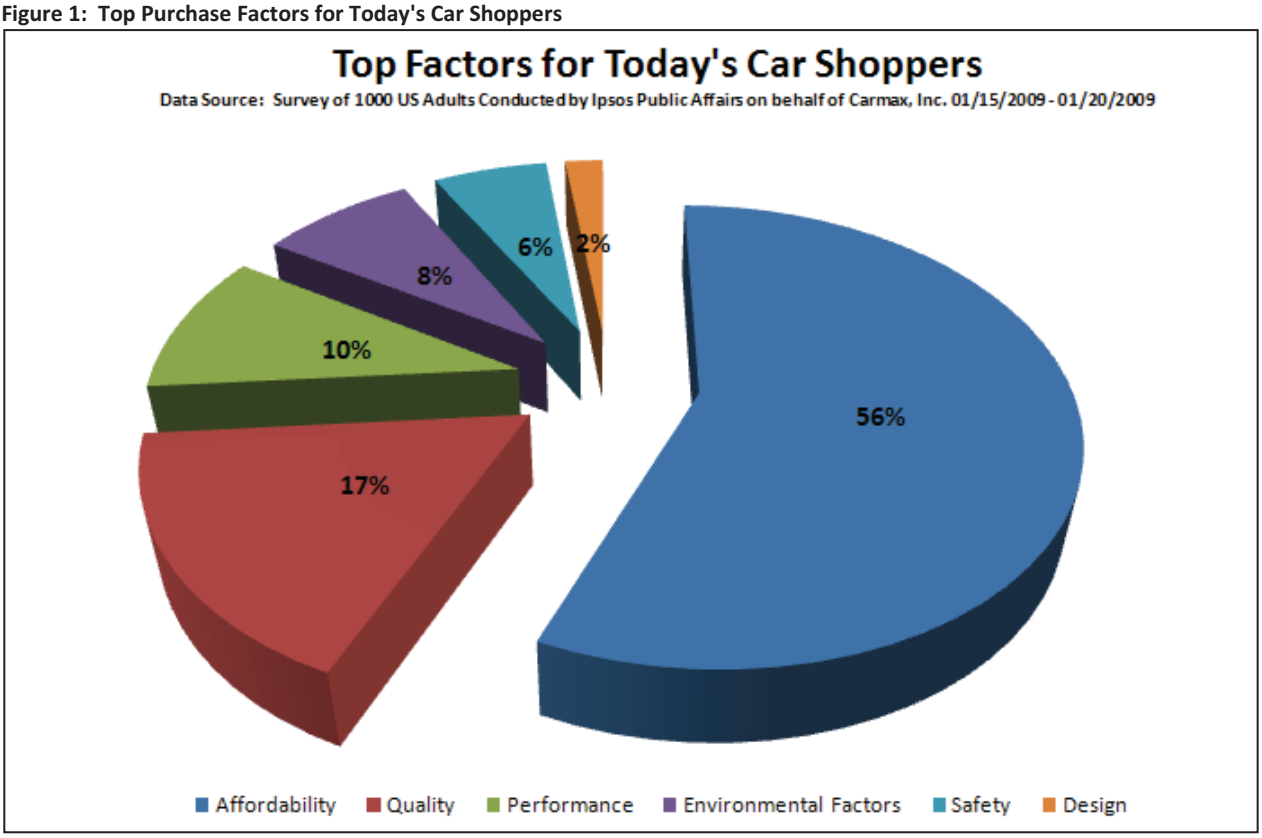
To minimize vehicle manufacturing costs, the ideal third-party vehicle manufacturer partner would be a Chinese-based company. As Irma Venter noted in *Engineering News*-"China's most sizeable competitive advantage lies in the fact that vehicles can be produced *more cheaply than in any other part of the world*." (emphasis added) (Venter)

KEY CONCEPT: Vehicles can be produced in China more cheaply than any other region of the world.

These cost savings are even more important in the aftermath of the recession that began in December, 2007, since, as indicated in the results of a Carmax-sponsored poll conducted in January, 2009, "When given one choice, fifty-six percent of those surveyed chose affordability as the most important consideration in their next vehicle purchase, while quality came in second, selected by 17 percent of respondents." (Thompson Reuters)

KEY CONCEPT: Consumers want more affordable, higher quality vehicles.

Figure 1: Top Purchase Factors for Today's Car Shoppers



Standing in contrast to the cost savings of importing Chinese-manufactured vehicles is the fact that Chinese vehicle manufacturers, "have not made much headway in the US due to the strict emission and safety norms." (Wanzeck and Fangfang) Indeed, as quoted by Jerry Garrett in the *New York Times*, George Peterson, president of AutoPacific, stated, "The one weakness Chinese automakers appear to have is that they don't listen to consumers very well…They don't understand how really important things like safety, reliability and durability are." (Garrett)

KEY CONCEPT: Chinese automotive manufacturers want to enter the US market but do not yet have vehicles that will pass emission and safety standards.

VMC's Solutions to Vehicle Manufacturing Problems

Table 1: VMC's Solutions to Vehicle Manufacturing Problems

Problem	VMC's Solution
Chinese-made vehicles do not meet US DOT and EPA emission standards.	VMC will import only the vehicle chassis and certain other vehicle components into the United States. At its assembly plant, VMC will add zero emission propulsion systems and fuel cells to the chassis to produce a vehicle that will pass all emission tests.
Chinese-made vehicles do not meet National Highway Traffic Safety Administration and DOT safety standards.	One of VMC's directors, Marcus Alan Aylor, is President Of General Testing Laboratories, Inc., Leedstown, Virginia, and is an expert in testing vehicles under the Federal Motor Vehicles Safety Standard Compliances Guidelines. VMC will leverage Mr. Aylor's expertise to revise vehicle designs so that all safety standards will be met.

II. Implementing New Battery Technology: Lithium-ion Battery Chemistry isn't the Answer

Many domestic and foreign automotive manufacturers have focused on lithium-ion battery technology for electric vehicle production in either battery-only electric vehicles or hybrid vehicles in which the on-board battery systems are recharged by auxiliary power sources such as a gasoline engine or a fuel cell.

Some prominent examples of lithium-ion battery technology used in electric vehicle battery packs by automotive manufacturers include:

1) Toyota Motors' "**Prius Plug-in Hybrid Vehicle (PHV)"**

   The Prius PHV is designed to, "…to package either the lithium-ion battery pack with plug-in capability, or the nickel-metal hydride battery for the conventional gas-electric system." (Toyota Motors Sales, U.S.A, Inc.)

2) Tesla Motors' "**Tesla Roadster**"

   In an FAQ page on its website, Tesla Motors clearly states that for its battery chemistry, "The Tesla Roadster uses Li-ion cells - the same kind of batteries used in most consumer-electronics devices, such as laptops, cell phones, and camcorders. Only a few more of them." (Tesla Motors, Inc.)

3) General Motors' "**Chevy Volt**"

   The Chevy Volt "…has a revolutionary propulsion system that takes you beyond the power of the battery. It will use a lithium-ion battery with a gasoline-powered, range-extending engine that drives a generator to provide electric power when you drive beyond the 40-mile battery range." (General Motors)

   In addition to launching the Chevy Volt in "Late 2010" (General Motors), GM has announced plans to "establish the first lithium-ion battery pack manufacturing facility in the United States operated by a major automaker" (General Motors)

4) Ford Motor's "**Transit Connect**"

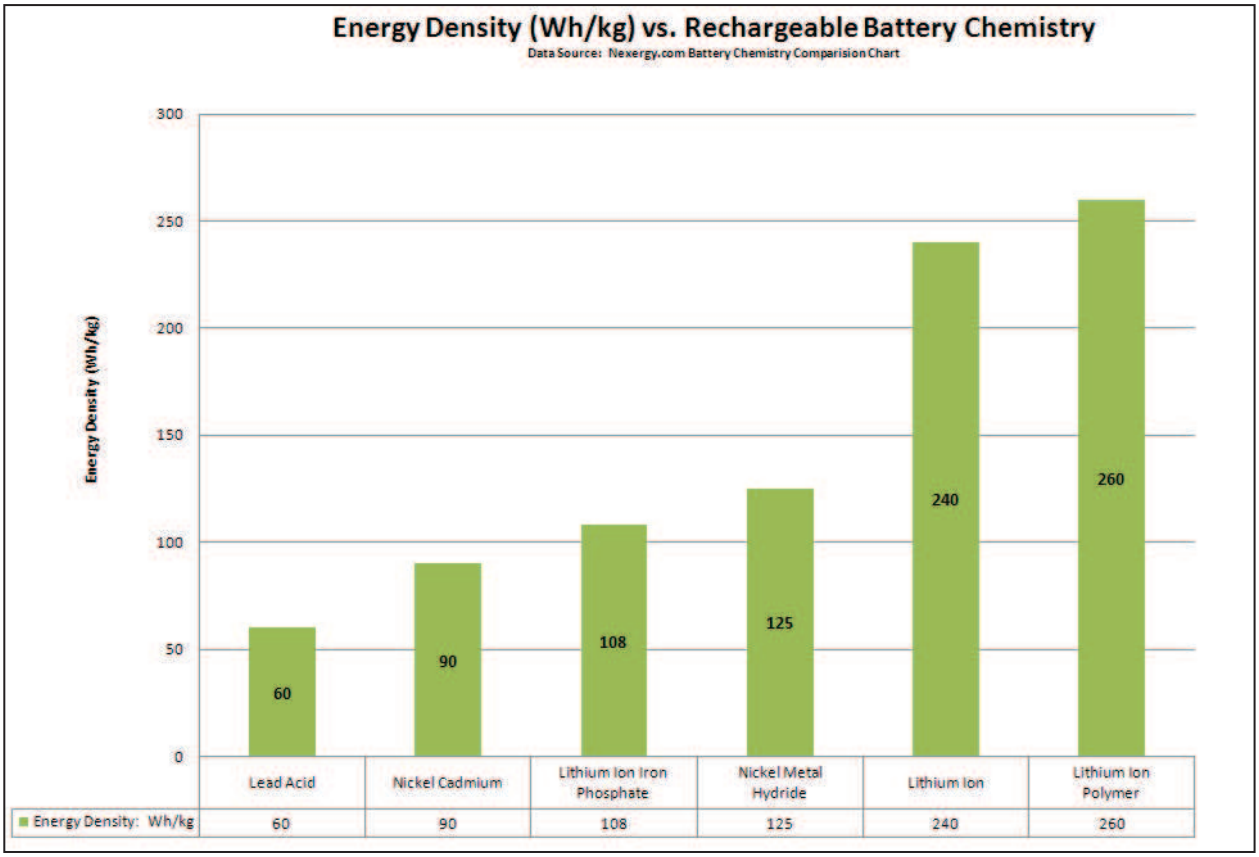
   The Tourneo Connect BEV Concept vehicle uses, " A 21 kWh Lithium-Ion Phosphate battery pack…" (Ford Motor Company) and forms the foundation for the Ford Motor Company's 2010 Ford Transit Connect panel van, "…with the

electric drivetrains and lithium-ion battery packs installed by S.E.V. U.S. Corp." (Ford Motor Company)

As **Figure 2** demonstrates, one of primary reasons that Lithium-ion battery chemistries are selected for all-electric and hybrid-electric vehicles is that Lithium-ion batteries deliver higher energy densities than other rechargeable battery chemistries. In fact, Lithium-ion batteries provide almost twice as much energy density as Nickel Metal Hydride batteries per kilogram.

KEY CONCEPT: Lithium-ion batteries deliver higher energy densities per unit mass than other commercially-available rechargeable battery chemistries.

Figure 2: Energy Densities for Rechargeable Battery Chemistries



Despite the design and engineering of all-electric, plug-in hybrid, and hybrid electric vehicles using Lithium-ion battery chemistry, there is research to indicate that Lithium-ion battery technology may not be the best choice for electric vehicle production. For example, consider the comments regarding lithium-ion battery technology made by Vinod Khosla, a co-founder of Sun Microsystems and a venture capitalist. As reported by Josie Garthwaite in an article referencing the AlwaysOn Summit at Stanford University, Vinod Khosla observed, "'Lithium-ion batteries are overhyped and will possibly be replaced.'" (Garthwaite)

The media have reported on the physical hazards that can accompany lithium-ion batteries for years. For example, Dan Orzech published an article in Wired in 2007 that discussed next-generation battery technologies in which potential hazards of lithium-ion technology were discussed.

KEY CONCEPT: Lithium-ion batteries are unstable and can cause spontaneous explosions and fires.

> "In their charged state, lithium-ion batteries are intrinsically unstable," says Bart Riley, the CTO of A123Systems, a Watertown, Massachusetts, company that is using nanotech research to create a new and safer version of lithium-ion batteries.
>
> "If they get damaged, or there's a manufacturing defect, as was the case with the Sony batteries last year, there can be a spontaneous internal short, and you've got an explosion or fire," Riley says. (Orzech)

However, the physical hazards of lithium-ion technology may not be the most restrictive component of electric vehicle manufacturing. As reported by Bill More in an article entitled, “Peak Lithium?”, “Seventy-eight percent of all the lithium carbonate produced in the world comes from Chile and Argentina.” (Moore) Although Moore notes that China may recover additional lithium carbonate from “some 33 brine lakes in and near Tibet” (Moore), he quotes William Tahil, Director of Research for Meridian International Research, regarding future sources of lithium carbonate

KEY CONCEPT: Actively available lithium supplies are limited to sites in a few countries in the world.

> "These will be the main sources in the future, the Andes and China," Tahil contends.
>
> "There are no other sources in the world that will be economically recoverable, and the only other source is Nevada, but that's now in decline after 40 years production. (Moore)

To decouple its vehicle line-up from lithium-ion battery technology, VMC has obtained rights from a battery technology provider to outfit its assembled vehicles with a battery technology that costs **one seventh of the cost** of lithium-ion technology while providing a **higher energy density**.

VMC's Alternatives to Lithium-ion Battery Technologies

Table 2: VMC's Solutions to Lithium-ion Battery Technologies

Problem	VMC's Solution
Lithium-ion batteries deliver higher energy densities than other rechargeable battery chemistries.	VMC's battery chemistry solution competes against the Li-ion energy density by introducing a number of technologies designed to increase the surface area of the active materials within the battery.
Lithium-ion batteries are inherently unstable and can cause fires and explosions.	VMC's battery solutions use a mature and stable battery chemistry that is thermally stable at much higher operating temperatures than Li-ion batteries.
Lithium-ion batteries rely on raw materials that are commercially available from only a few sites.	VMC's battery chemistry solution uses raw materials that are abundantly available and that are produced at sites around the world. In addition, the raw material costs for the batteries selected by VMC are much lower than that of Li-ion batteries.

III. Promoting US Vehicle Assembly: A Healthy Response to Protectionism.

By relying on Chinese manufacturing for the vehicle frame production, a potential obstacle in the supply chain is the growing protectionist tendencies of the United States toward goods imported from China. As reported by Bloomberg News, China faces a "…'a severe situation' after a 57 percent tumble in shipments partly caused by rising overseas trade barriers." (Bloomberg News) VMC wishes to avoid disruptions in the vehicle component supply chain that tariffs and other protectionist measures may impose.

KEY CONCEPT: VMC wants to ensure that trade barriers do not impede its vehicle manufacturing and distribution process.

One recent example of these component-goods trade barriers was US President Barack Obama's announcement that, "…the U.S. will now impose a 35 percent tariff on tires imported from China." (Davidson and Montagne) With the desire that most of the vehicle components are to be manufactured in China, VMC proposes that an appropriate response to protectionist measures is to assemble the vehicles within the United States in an effort to balance the economic opportunities created by the manufacturing and distribution of the zero emission vehicles across both China and the United States.

KEY CONCEPT: Trade barriers are a reality for the near-term, so a compromise position that seeks to balance trade imbalances has the best chance of gaining political traction.

Considering that many of the tariffs and other trade barriers have been imposed, "…to protect domestic U.S. producers from being damaged by a sudden surge in imports from China." (Gu), a compromise position is to promote the domestic economic benefits of employing US workers to assemble the zero emission vehicles as part of an new green technology industry. Thus, both the United States and China benefit from this compromise. China receives economic stimulus through the manufacturing of many of the vehicle component parts, and the United States receives economic stimulus through the labor opportunities created by the US-based assembly plants.

KEY CONCEPT: Because many of the trade barriers have been introduced to protect domestic producers, the promotion of the economic benefits of assembly processes that create new jobs will provide strong arguments for the compromise position.

Further, VMC intends to explore many tax credit and grant opportunities offered by federal, state, and municipal authorities and agencies. These tax credits and grant funds promote both green technology manufacturing initiatives and the creation of new job opportunities in economically underperforming localities.

VMC's Strategies to Combat Protectionist Trends in the United States Economy

Table 3: VMC's Strategies to Protectionist Trends in the United States Economy

Problem	VMC's Solution
Chinese exports face trade barriers both now and in the foreseeable future.	VMC will lobby for tariff exemptions based on the concept that more than fifty-one percent of the vehicle will be assembled within the United States.
Overseas manufacturing produces an inequitable economic effect on US domestic producers.	VMC's solution is to split manufacturing and assembly into two distinct processes. Manufacturing will occur in China and certain other locations while assembly will occur in the United States. Both countries will benefit from this distribution of effort. Further, by promoting US vehicle assembly, VMC positions itself to capture tax credits and grants for creating job opportunities for American workers.

References

Bloomberg News. "China Says Vehicle Exports Tumble on Protectionism (Update1) ." 22 September 2009. Bloomberg.com Web Site. 24 September 2009 <http://bloomberg.com/apps/news?pid=20601089&sid=aIMJJFTZWYkU>.

Davidson, Adam and Renee Montagne. "China, U.S. At Odds Over Tariffs." 18 September 2009. NPR.org Web Site. 24 September 2009 <http://www.npr.org/templates/story/story.php?storyId=112953526>.

Ford Motor Company. "FORD REVEALS NEW TOURNEO CONNECT WITH BATTERY ELECTRIC POWERTRAIN - Ford Motor Company - digital snippets:." 2 March 2009. Ford Motor Company Digital Snippets Web Site. 12 September 2009 <http://ford.digitalsnippets.com/2009/03/02/ford-reveals-new-tourneo-connect-with-battery-electric-powertrain/>.

—. "Ford Transit Connect to be assembled in Kansas City - Ford Motor Company - digital snippets<." 27 March 2009. Ford Motor Company Digital Snippets Web Site. 12 September 2009 <http://ford.digitalsnippets.com/2009/03/27/ford-transit-connect-to-be-assembled-in-kansas-city/>.

Garrett, Jerry. "Detroit Auto Show - Chinese Cars Inch Closer to U.S." 16 January 2009. The New York Times Web Site. 24 Septembt 2009 <http://www.nytimes.com/2009/01/18/automobiles/autoshow/18CHINA.html>.

Garthwaite, Josie. "Vinod Khosla On Why Lithium-ion Batteries Are Overhyped." 30 July 2009. earth2tech Web Site. 12 September 2009 <http://earth2tech.com/2009/07/30/vinod-khosla-on-why-lithium-ion-batteries-are-overhyped/>.

General Motors. "Chevy Volt: The Future is Electrifying | Chevrolet." 12 September 2009. Chevrolet Web Site. 12 September 2009 <http://www.chevrolet.com/pages/open/default/fuel/electric.do?evar23=fuel_solutions_landing%20page>.

—. "GM - Technology - News - Chevrolet Volt Battery Packs Will Be Manufactured by General Motors in the United States:." 12 September 2009. General Motors Web Site. 12 September 2009 <http://www.gm.com/experience/technology/news/2009/battery_011209.jsp>.

Gu, Wei. "U.S.-China trade spat more about cars than tyres." 15 September 2009. Reuters Blogs Web Site. 24 September 2009 <http://blogs.reuters.com/commentaries/2009/09/15/us-china-trade-spat-more-about-cars-than-tyres/>.

Moore, Bill. "EV WORLD: Peak Lithium?" 28 January 2007. EV World Web Site. 12 Septembet 2009 <http://evworld.com/article.cfm?storyid=1180&first=3171&end=3170>.

Orzech, Dan. "Next-Gen Car Batteries Promise Longer Life, More Power." 5 July 2007. Wired.com Web Site. 12 September 2009 <http://www.wired.com/cars/futuretransport/news/2007/07/batteries?currentPage=1>.

Tesla Motors, Inc. "Tesla Motors - FAQs." 12 September 2009. Tesla Motors, Inc. Web Site. 12 September 2009 <http://www.teslamotors.com/learn_more/faqs.php>.

Thompson Reuters. "Affordability and Quality Are Top Factors for Today's Car Shoppers, According to Survey." 19 February 2009. Reuters Web Site. 24 September 2009 <http://www.reuters.com/article/pressRelease/idUS186050+19-Feb-2009+BW20090219>.

Toyota Motors Sales, U.S.A, Inc. "Toyota Vehicles : Toyota Maintains Pace, Broadens Scope Of Advanced Environmental Technologies / Toyota:." 10 January 2009. Toyota Motos Sales Pressroom Website. 12 September 2009 <http://pressroom.toyota.com/pr/tms/toyota/maintain-pace-broaden-scope.aspx>.

Venter, Irma. "From quality manufacturing to new-generation vehicles, Chinese auto firm lays down markers ." 11 September 2009. Engineering News Online Web Site. 18 September 2009 <http://www.engineeringnews.co.za/article/global-aspirant-2009-09-02>.

Wanzeck, Markus and Li Fangfang. "Chinese cars at the European market gates." 06 May 2009. China Daily Web Site. 18 September 2009 <http://www.chinadaily.com.cn/bizchina/2009-05/06/content_7747755.htm>.