

DELPHI

40 YEARS OF DELPHI IN LUXEMBOURG





Dear Delphi employees and friends,

As Minister of the Economy and Foreign Trade of Luxembourg, I do my utmost to take personal interest and care of all the companies that make up the economy of our country. In a globalized world with economic factors driving the business, a place like Luxembourg needs to specialize in high value-add activities and continuously ensure a favorable and evolving environment for such operations. Delphi, no doubt one of the key players in Luxembourg, is a model of a company that has constantly adapted over now 40 years to become a dynamic and competitive state-of-the-art technology center recognized by all auto makers. I would like to congratulate all your people for this outstanding achievement by wishing you a "Happy Birthday Delphi" and all the best for the future.

Jeannot Krecké
Luxembourg Minister of Economy and Foreign Trade



40 years already !

With the establishment of General Motors in the Bommelscheuer Industrial Zone, exactly 40 years ago, a new era was introduced for the commune of Bascharage.

Under the leadership of the former Mayor, Mr. Robert Steichen, milestones were placed for an unprecedented development of the Industrial Zone and the Commune. To commemorate this event, the Communal Council decided earlier this year to rename the "Zone Industrielle Bommelscheuer" in "Economic Activity Area Robert Steichen", effective July 1st 2011. This is to honor the memory and the work done by this outstanding visionary and to emphasize the development of the activities of the zone itself.

Over the years, many companies have joined our commune. First exclusively industrial, the area has developed and diversified into new niches, including that of research.

To this end, Delphi, worthy successor of General Motors, is today one of the examples of our municipality. With more than 600 people, specialized in automotive research, Delphi is one of the companies taking the name of our commune well beyond our country. That is to be thanked.

Michel Wolter
deputy-mayor of Bascharage





Dear Delphi Employees and Friends,

As we celebrate the 40th anniversary of our Technical Centre in Luxembourg, it is a good time to recognize the tremendous work done by the Delphi team here in the automotive heart of Europe. Over the course of time, this site has continued to evolve and now is one of the company's most important technical centres. Luxembourg offers a favorable, commercially neutral location for major European customers and an attractive business environment. The central geographical location and the cultural diversity of our employees allow us to better serve our customers. Our talented engineers here have developed great technologies to help make cars safer, greener and better connected.

Automakers around the world are using new advances to address these Safe, Green and Connected trends with technologies that are innovative, reliable, cost-effective and address real-world problems. Delphi is at the forefront of these advances. Our technical expertise and heritage of innovation in Luxembourg and around the world help us create the right products, with the right quality, at the right price and at the right time for our customers and global markets. We are pursuing our strong commitment to research and development to address challenges and opportunities. And we continue to differentiate ourselves from our competitors by securing business with some of the most highly regarded vehicle manufacturers worldwide.

Delphi is perfectly positioned with a product portfolio that addresses market trends with the design, engineering and manufacturing excellence that global customers require, a lean cost structure and an unmatched global footprint to compete in every region of the world. And Delphi considers Luxembourg as a performing business location for research and development activities.

But I know that our true strength is our people. Through your efforts, we are meeting the challenges of a global market while becoming more efficient and effective.

We can all be proud of our history and the innovations this site has pioneered. I am pleased to celebrate this anniversary with you and look forward to the great work yet to come. Thank you!

Steve Kiefer
President, Delphi Powertrain Systems



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#001 Inauguration forum da Vinci

#002 40 years of DELPHI in Luxembourg

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Delphi's Customer Technology Centre (CTC) in Bascharage will celebrate this year the 40th anniversary of Delphi's presence in Luxembourg which dates from Oct. 7, 1971. The current site, which opened in 1982, is Delphi's Europe, Middle-East and Africa regional headquarters, Powertrain Systems divisional headquarters as well as headquarters for the European Thermal Business Unit. As the "Automotive Heart of Europe," Luxembourg hosts one of the company's most important European technical centres. 500 engineers and technicians develop automotive energy and engine management systems, as well as automotive thermal systems and electronics.

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40 YEARS OF DELPHI IN LUXEMBOURG_



DELPHI LUXEMBOURG, THE HISTORY

_1970-1971 The Luxembourg site is inaugurated

The Luxembourg site was created on Feb. 25, 1970, when General Motors Luxembourg S.A. was incorporated as a subsidiary of General Motors Corporation to manufacture and sell TEREX earthmoving equipment.



The site was inaugurated on Oct. 7 1971, and many famous representatives of royal families (such as S.A.R. Prince Charles and S.A.R. Princess Joan), and political and economic sectors took part in the event.



_1971-1978 The production of Terex (General Motors)

The production of TEREX began on May 18, 1971. Initially, approximately 100 people worked at the Terex site. From May 1971 to December 1978, the company produced and sold Terex earthmoving equipment – four front-end loaders and two types of rear dump trucks, such as the R-35 and the R-33-19.

Production was stopped in 1978 as business declined and factoring activity ceased for economical reasons (especially due to the depreciation of the pound sterling and U.S. dollar). All except 30 employees were separated, the equipment was sold to GM Scotland and plans were made for new activity at the site.



_1979-1987 General Motors Luxembourg Operations S.A. The Luxembourg operation became General Motors Luxembourg Operations (GMLO) S.A. in July 1979. The facility

produced special tooling, such as jigs and fixtures, presses, welding equipment, conveyor belts, automatic machines and robots for the GM European Assembly Plants. From 1981 to 1987, GMLO also manufactured components (f.ex. fuel pumps) and expanded its business to outside customers in an attempt to provide a more balanced workload for the production departments. The production of Jigs and Fixtures ceased in 1987 and GM Luxembourg started its re-conversion by selling its production and equipment.

_May 1981: The inauguration of GMLO



The new installations of General Motors Luxembourg were inaugurated on May 13, 1981, followed by an open house on May 16. This open house included a tour of the facilities, video shows and an exhibition of GM vehicles. About 150 guests - featuring top American and Luxembourg's business, economic, political and social representatives as well as representatives from the European plants of General Motors - attended.

_1982: Start of the Technical Centre Activities in Luxembourg
In 1982, the technical centre activity was created within GMLO to provide a unique source for the supply of advanced technology design. This activity was given different names, but eventually was called ESEC (European System Engineering Centre) to highlight the European activities of the site. This was in response to the needs of various divisions of the electrical components group (such as Delco Electronics, created in 1982) to have a European presence and share in the expanding market of sophisticated engine and emission control systems.

_May 1985 Inauguration of the European Technical Centre (ETC)

In May 1985, the European Technical Centre was inaugurated at Luxembourg. S.A.R. Grand Duc Henri and many famous representatives from political and economical sectors participated in the inauguration.



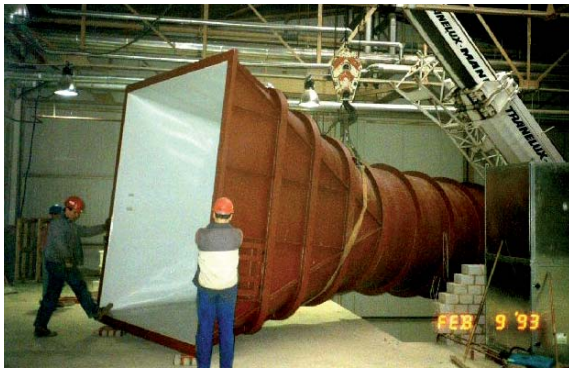
_1988 - 1993 A new orientation

In 1988, the General Motors Corporation formed a group called ACG (Automotive Component Group) to provide central coordination of the components supply divisions of General Motors. The ETC in Luxembourg became part of this group.

The site continued its transformation into a technical centre: Following the first phase of the technical centre in 1983, the expansion project was approved in 1989. In April 1990, the company began a 2 billion FLUX expansion (particularly in thermal testing and engine testing facilities) to enable the site to become a complete and fully-focused technical centre. With wind tunnels, the EMI/RFI chamber, test cells and the tool lab expansion, the size of the facility was doubled.

_Jan. 1992 – Feb. 1993 Construction of the wind tunnels

Two wind tunnels were built: the Thermal Management System tunnel (TMS) to support thermal system development, and the Engine Management System tunnel (EMS). The Climatic Wind Tunnels allow development of engine and thermal management systems and emissions measurement under extreme environmental conditions. The main challenge of the construction was to integrate the wind tunnels in an existing building.



_1999 An Independent Delphi

On Aug. 3, 1998 General Motors Corporation and its Delphi Automotive Systems division jointly decided to make Delphi an independent group. Delphi became a publicly traded company in 1999. But the path to independence from General Motors really began in 1994 with the establishment of Delphi as a separate business sector within General Motors.

_Jan. 29, 2007 - Delphi Powertrain Headquarters Grand Opening

In May 2006, Delphi announced its decision to relocate the global headquarters of its Powertrain division to Luxembourg. Delphi Corporation officially opened the global headquarters of its Powertrain division in Luxembourg on Jan. 29, 2007. "We are dispersing our leadership globally to manage our business", Delphi's Executive Chairman said at the time. "We are committed to Europe and to supporting our local customers and we expect to continue our track record of growth in the region."

Minister Jeannot Krecké, minister of Economy and Foreign Trade of Luxembourg, welcomed the Delphi division's global headquarters to the country. "Delphi is in fact casting a vote of confidence for Luxembourg as a performing business location for research-driven, cutting-edge technological solutions for one of the most demanding markets, namely the automotive sector," he said.

Delphi's CTC Luxembourg is now part of Delphi Automotive LLP, which was created in October 2009 when a group of private investors acquired assets of the former Delphi Corporation.

In March 2010, Delphi Luxembourg received a government award for Stress Prevention. Delphi was among five national companies in Luxembourg to receive the 2009 Prix Santé en Entreprise (Company Health Prize), which was presented by the Luxembourg Minister of Health, Mars Di Bartolomeo. The subject covered employee well-being with regards to health promotion and prevention of physical and psychological problems, extending as well to best-practices to live a healthier life outside the workplace.

In February 2011, Delphi was awarded for excellence in technology management. Delphi Automotive received the 2010 "Successful Practice Award" for targeted and efficient technology management from the prestigious Fraunhofer Institute for Production Technology.

DELPHI LUXEMBOURG TODAY

_The Activities of Delphi Luxembourg

Delphi's Luxembourg Customer Technology Centre has become one of the company's most important European operations, providing crucial support for the development of energy and engine management systems, as well as thermal systems, electronic control modules and power electronics products.

The site concentrates specifically on design, development and test of components, sub-systems and systems related to Energy and Engine Management Systems as well as Heating, Ventilating and Air Conditioning Systems and the development of the required power and control electronics, as well as the energy storage for hybrid and electric vehicles. From Bascharage, all European customers can be served and work for vehicle manufacturers also can be undertaken on a global basis. The geographical location of Luxembourg in the centre of Europe also is an important benefit. The Luxembourg workforce has a total of 27 different nationalities and 18 languages can be spoken.

The site is Delphi's Middle-East and Africa regional headquarters, Powertrain Systems Divisional Headquarters as well as headquarters for the European Thermal Business Unit.

_The Facilities of Delphi Luxembourg

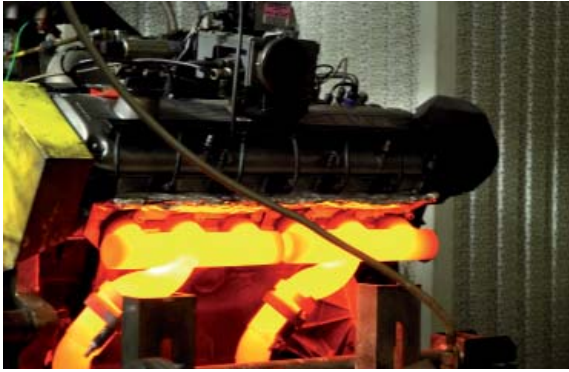
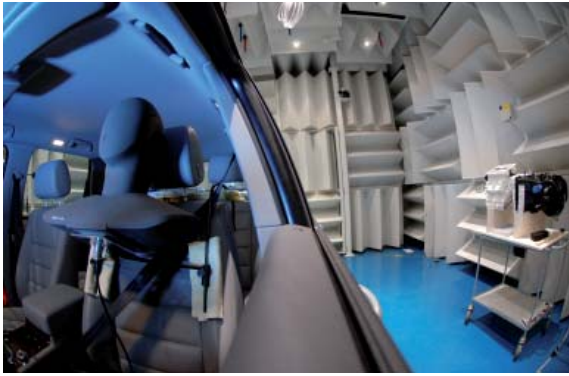
The Luxembourg site is fully equipped to design, develop, simulate, test and validate products from the component level up to the vehicle level. Hundreds of specific component test stands for thermal cycling, noise, vibration and performance characterization are available for component development. Two model shops and the large garage are equipped with tooling and assembly machinery to build components and install them in vehicles. At the system level, the site is equipped with module test stands and engine dynamometers able to simulate the entire lifecycle of the system. Finally, large vehicle evaluation equipment is available to perform real-life testing of vehicles under all conditions, such as noise, electromagnetic compatibility, emissions, comfort and drivability evaluation. This includes cold chambers and an external test track with pass-by noise measurement facility. The operation is supported by a material laboratory and a large electronics facility able to develop complete electronic hardware and software for production vehicle application.

Testing and verification in the Electromagnetic Compatibility Chamber (EMC) ensures excellent operation of Delphi systems and components in the presence of strong electromagnetic disturbances. Emissions testing range is possible from 20Hz – 1800 MHz. Immunity testing can be done in a range from 10kHz – 1000 MHz.

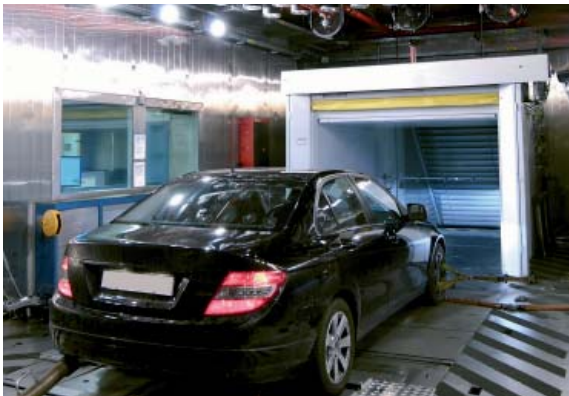


In the Vehicle Semi Anechoic Chamber, systems are tested for noise and vibration performance within the car. Testing and verification in this chamber ensures Delphi systems to match with customer's noise and vibration requirement under all conditions.

A total of 13 engine dynamometers are running prototype engines in all operating conditions while recording temperatures, emissions and performance data real-time. These dynamometers also are used for calibration purposes, which is where the control software and parameters for the engine operation are defined and downloaded to the engine control unit.



The two Climatic Wind Tunnels that can simulate extremes in environmental driving conditions and safely evaluate performance of components, engine management systems, thermal management systems and electronic modules. Real-life driving conditions can be simulated instantly: temperature range from -30°C to +55°C, humidity of 5 percent to 95 percent, altitude simulation from 0 to 1500m, wind speed up to 250km/h, hot road surface and a full spectrum of solar conditions.



AUTOMOTIVE TECHNOLOGY DEVELOPED IN LUXEMBOURG

The world's population is growing and the mobility needs of that population are increasing and diversifying. The technology spectrum is larger than ever, ranging from small electric two-wheelers for urban mobility to 1200hp luxury sports cars, trucks for long distance transportation and off-road equipment. At the same time there is an increasing safety, environmental and economic awareness around the world, along with a globalization of mobile communication. Therefore Delphi has grouped its activities into three segments: "Safe, Green and Connected."

While customer image has always been associated with performance, cost, styling and quality, sustainable environmental impact is now gaining significant momentum. The 2009 economic downturn, originating from the financial market, had a direct impact on vehicle sales. In turn, rescue packages developed by the European Commission and the member states used the opportunity to boost development

Global Megatrends

- People Megatrends**
 - Natural Growth
 - People Live Longer
 - Generations X & Y
 - Increased Concern about Safety, Security and Privacy
 - Health Care
 - 8/5 > 12/6 > 24/7
- World Megatrends**
 - World Turmoil
 - Globalization
 - Higher Cost of Natural Resources
 - Increasing Environmental Awareness/ Regulations
- Technological Megatrends**
 - Information Explosion
 - Wireless World

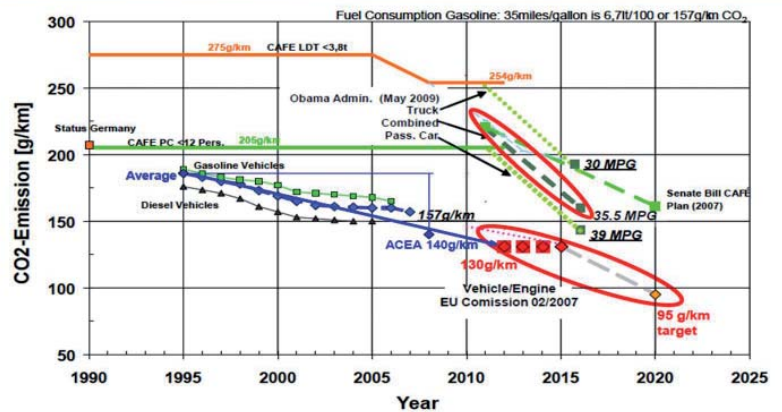
- Safe**
 - Traffic congestion in major metro areas around the world becomes worse; more accidents; longer commute; higher stress
- Green**
 - Fast growing economies: more fuel for mobile platforms
 - Demand for electrical energy and related resources far exceeds capabilities
- Connected**
 - Global demand for broadband access will continue to grow

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and sales of low-carbon vehicles, thus sustaining technology development and responding to environmental and natural resource drivers at the same time.

This has strengthened the focus on the CO₂ subject in the public eye. Automotive fuel economy improvement has been a continuous development goal since the '70s. And so were exhaust emissions. However, they now have become political subjects, increasing their marketing value to automotive companies and challenging legislators to define common standards for new vehicle categories using alternative fuels, electric powertrains or fuel cells. At the same time, new players in product technology and energy distribution come into the game.

(7) CO₂ Targets up to 2020



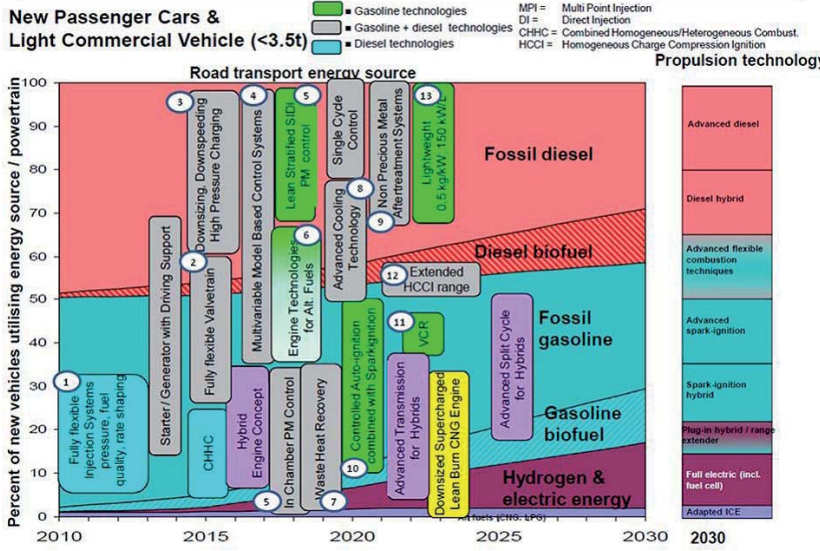
VDA 2011 / Dr. S. Schilling

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CO₂ and pollution is a global subject, with emerging countries like China catching up to the latest standards at an accelerated rate. This provides the opportunity to standardize technology around the world. Technical solutions such as the diesel particulate filter allow for common emission standards between diesel and gasoline engines. Now the challenge is to understand and define the emissions and CO₂ impact of hybrid or electric, where the raw energy source is not directly carried by the vehicle but needs to be counted in the vehicle ecological balance sheet.

The European Road Transport Research Advisory Council (ERTRAC) 2010 Strategic Research Agenda shows that electrification is expected to increase over the next decade, but a large proportion of newly sold light-duty vehicles will continue to incorporate an internal combustion engine. The expectations indicate that by even 2050, more than half of new light-duty vehicles will be powered by an internal combustion engine. The boxes on the timeline of the chart indicate the major research needs and the expected market readiness of the respective technologies.

Main technology trends and the Vision of share of engines in Europe



Source: European Council for Automotive R&D (EUCAR) Working Group Powertrain Roadmap for research needs in light-duty powertrain technologies 8 November 2010 - Brussels

Therefore, it is essential that - in parallel to research and development of components and systems for electrification of the vehicle - focus must remain on the internal combustion engine for light-duty vehicles to ensure its contribution to sustainable mobility. Decarbonization of the internal combustion engine itself will be achieved through efficiency improvements and the application of low carbon fuels, particularly biofuels. Even though internal combustion engines already have reached a very high level of maturity, they still offer potential for further refinements that need to be explored in research programs.

Portfolio of Green Solutions developed in Luxembourg

- Fuel Economy and Performance Technologies
 - Cylinder Deactivation System
 - Two-step Valve Train with Dual Independent Cam Phasers
- Reman ECM/PCM
- Universal Reflash Tool
- Alternative Fuel Systems/Components
 - Fuel System for Dimethyl Ether
- Evaporative Emissions Canisters
- Diesel Fuel Injection Systems and After-treatment
- Gasoline Direct Injection
- Next Generation Energy Efficient A/C
- HVAC Compressors
- HVAC Systems for Alternative Refrigerants

Green.

- Electric HVAC Systems
- Hybrid Electric Vehicle Technologies
- Hybrid Vehicle Electrical, Electronics, Components & Integration
- Power Conversion Products
- High Voltage Battery Pack System
- Ammonia, Planar Oxygen & Battery IVT Sensors
- Electronics Packaging

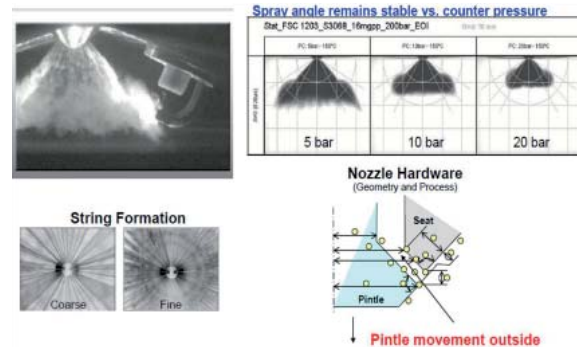
State-of-the art fuel injection systems

The heart of the engine management system is the fuel injection system, the brain is the electronic control unit. Delphi develops and produces both diesel and gasoline engine management systems and drives new technology for future improvement of fuel combustion and performance. This includes additional components like hydraulic and electric cam phasers, exhaust gas sensors and ignition systems.



The diesel engine has become very popular due to its low fuel consumption and high torque provided by turbocharging. However there is a tradeoff for emissions with higher NO and NO₂ (commonly grouped as NOx) numbers for diesel engines. This drives higher exhaust after-treatment cost. In both areas though, there is great potential in downsizing and turbocharging, leading to a combination of diesel-like torque and fuel consumption characteristics with the gasoline-type noise and power benefits. Future combustion modes like HCCI (homogeneous charge compression ignition) are under development, combining both principles in the same engine.

The direct injection technology, where fuel is injected directly into the cylinder, allows much better control of fuel quantity and preparation, and therefore higher engine efficiency. The injector has to meter in a precise and timely fashion quantities as low as 1 mg of fuel to the combustion chamber, and this up to five times during each cylinder cycle. This allows to control the combustion process such that maximum energy is delivered and minimum unburned fuel or particulates are generated. This technology operates with fuel pressures of 200 bar for gasoline and 2,000 bar for diesel to generate a spray pattern able to provide stable and clean combustion under all conditions. This injection technology requires massive investment in research equipment, simulation and manufacturing equipment capable of producing a precise and durable product that will perform during the entire life of the vehicle under all environmental conditions.



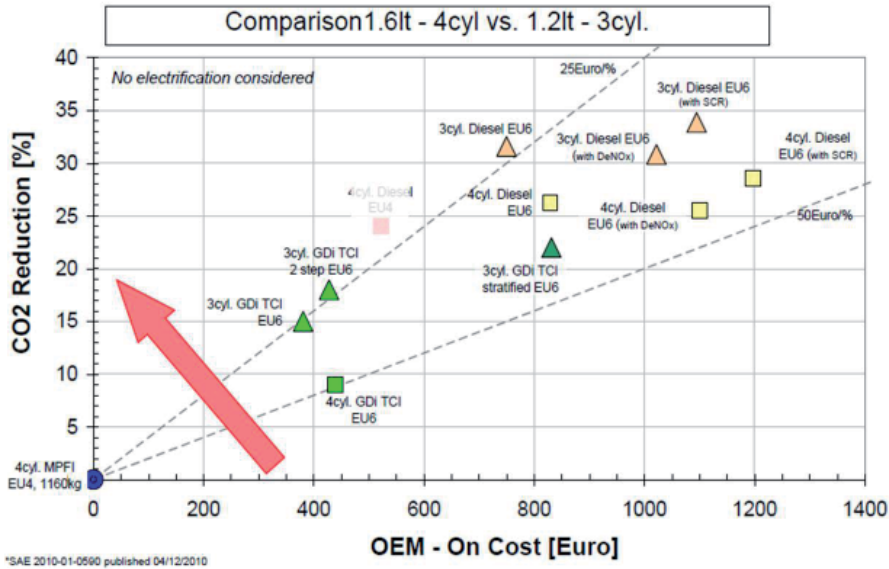
Direct injection technology and turbocharging allows for extracting more power from the engine or, inversely, engines can be downsized while generating the same power as before. This saves cost, weight and fuel. Delphi's Direct Acting Piezo Injector won a prestigious 2010 Automotive News PACE Award (Premier Automotive Suppliers' Contribution to Excellence).

When comparing different engine concepts for their cost and CO₂ benefits, there is an interesting relation between the cost of technology (as seen by the vehicle manufacturer) and the possible CO₂ improvement potential. Green datapoints are gasoline, yellow and brown datapoints are diesel engines. For example, a downsized 3-cylinder Gasoline Direct Injection (GDI) engine has a similar CO₂/cost ratio than a good diesel engine.

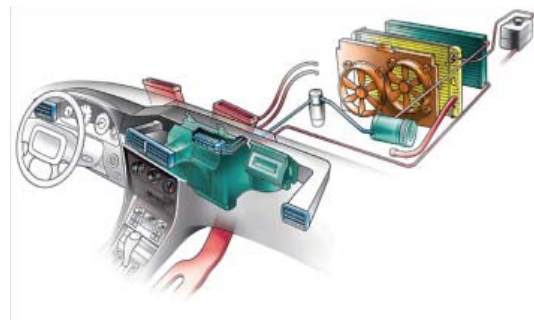
Energy Efficient Air Conditioning units

Air conditioning and thermal management systems need to follow the same trend of reduced environmental impact while maintaining or increasing their performance. The Delphi Thermal division in Bascharge develops components and full systems solutions for cabin heating, ventilation and air conditioning. In addition, radiators and other heat exchanger solutions are developed for engine cooling, charge air cooling and exhaust gas recirculation.

The next Generation Energy Efficient Air Conditioning units will contribute to CO₂ reduction due to reduced power



consumption. HVAC Compressors and Systems for Alternative Refrigerants will reduce the global warming potential of the cooling media used in vehicles and finally the Electric HVAC systems will be adapted to vehicles fully powered by electrical energy in future applications.



Innovative technologies for hybrid and electric vehicles

Hybrid and electrical vehicles have been on the market for many years and Delphi has been a major player in this area from the beginning. The incremental advantages of hybrid systems, based in principle on the interchangeability of electrical and mechanical energy, are to be weighed against significantly higher cost, complexity and weight, such that these solutions are not universally better than traditional powertrains. They represent a new market segment that will certainly show steady growth. Also, new players are entering this market with powertrain-type electric motors and new battery technology. The key focus for these technologies is the overall cost and battery lifetime.

Delphi does not develop electric motors or battery cells but focuses on the controls and integration of those systems in the vehicle with the components shown in the picture.

Delphi Power Electronics
Innovative solutions for all levels of powertrain electrification

- Inverters
- Battery Pack Controllers
- NiMH & Li High Voltage Battery Pack Systems
- DC/DC Converters
- On-Board Battery Chargers
- Hybrid Controllers
- Integrated Systems Li Battery Pack
 - Battery Pack Controller
 - Inverter
 - DC-DC Converter

Delphi technologies developed in Luxembourg

Since almost 30 years, Delphi's CTL Luxembourg has been developing technologies to help cars to be safer, greener and better connected. Many vehicles - on the road and off the road, from the tractor to the sports car - use Delphi technology, be it Mercedes and VW Diesel common rail systems, BMW ignition and fuel systems, Bentley radiators or Ferrari air conditioning systems. These products are developed in Bascharage already today and Delphi continues to invest heavily in future technologies and contributes, through continuous innovation, to this exciting journey toward future sustainable mobility.



Among the key recent technologies developed at Delphi's CTC Luxembourg, we can quote:

Award winning Delphi's Multec® homogeneous GDi injector which won a prestigious 2011 Automotive News PACE Award (Premier Automotive Suppliers' Contribution to Excellence)

Delphi's energy efficient and high performance heating, ventilation and air conditioning systems, which increase vehicle fuel economy without sacrificing passenger comfort.

Delphi Charge Air Coolers not only enhance engine performance but also help lower exhaust emissions.

Delphi's innovative low-cost, high-power inverter helps reduce emissions and improve fuel economy. Part of the electrified powertrain, the inverter converts DC (direct current) from a high-voltage vehicle battery pack into the AC (alternating current) voltage, which is needed to efficiently drive the vehicle's electric motor.

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