MECHAZINE

VOLUME-3 ISSUE-1

Department of Mechanical Engineering

Sri Vasavi Engineering College
Pedatadepalli, Tadepalligudem
West Godavari
Andhra Pradesh

ADVANCEMENTS IN HYBRID ENGINE TECHNOLOGY

By
M.Vivek 12A81A0391

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Introduction Definition Need for hybrid engines Brief History

Definition Hybrid Engines are typically described as engines with two power sources. A hybrid electric vehicle (HEV) is a type of hybrid vehicle and electric vehicle which combines a conventional internal combustion engine (ICE) propulsion system with an electric propulsion system.hybrid vehicleelectric vehicleinternal combustion enginepropulsionelectric

Need for hybrid engines: Greener Earth Global warming Sustainable development Increasing price of fuel

Electric Motor Lots of torque Zero emissions Tax breaks No transmission needed Starts more efficiently ◦ Can turn off motor when you stop

Gasoline Higher energy density than batteries ◦ 1,000 pounds of batteries = 1 gallon (7 pounds) of gas Cheaper initial cost for car ◦ Hybrids are $3500-5000 more Reliable, more history

Brief History: 1900 - Ferdinand Porsche developed a gasoline-electric hybrid 1997 – Toyota Prius 1999 – Honda Insight 2000 – Hybrids become core market

Advancements in hybrid powertrains Hybrid electric vehicles can be classified according to the way in which power is supplied to the drivetrain: PARALLEL HYBRIDS: In parallel hybrids, the ICE and the electric motor are both connected to the mechanical transmission and can simultaneously transmit power to drive the wheels.parallel hybridselectric motortransmission Usually parallel hybrids can use a smaller battery pack as they rely more on regenerative braking and the internal combustion engine can also act a generator for supplemental recharging.regenerative braking Parallel hybrids are more efficient for highway driving than in urban stop-and-go conditions.

SERIES HYBRIDS: In series hybrids, only the electric motor drives the drivetrain, and the ICE works as a generator to power the electric motor or to recharge the batteries.series hybridsgenerator The battery pack can recharged from regenerative braking or from the ICE. Series hybrids usually have a smaller combustion engine but a larger battery pack as compared to parallel hybrids, which makes them more expensive than parallels. This configuration makes series hybrids more efficient in city driving.

SERIES – PARALLEL HYBRIDS: Series-parallel hybrids have the flexibility to operate in either series or parallel mode. Series-parallel hybrids They are more efficient overall, because they can operate as a series hybrid at lower speeds and as parallel at high speeds, but their cost is higher than a pure parallel.

Degrees of hybridization: FULL HYBRID: Full hybrid, sometimes also called a strong hybrid, is a vehicle that can run on just the engine, just the batteries, or a combination of both. Full hybrid A large, high-capacity battery pack is needed for battery-only operation.

MILD HYBRID: Mild hybrid, is a vehicle that can not be driven solely on its electric motor, because the electric motor does not have enough power to propel the vehicle on its own. Mild hybrid Mild hybrids only include some of the features found in hybrid technology, and usually achieve limited fuel consumption savings, up to 15 percent in urban driving and 8 to 10 percent overall cycle.fuel consumption savings A mild hybrid is essentially a conventional vehicle with oversize starter motor, allowing the engine to be turned off whenever the car is coasting, braking, or stopped, yet restart quickly and cleanly. Accessories can continue to run on electrical power while the gasoline engine is off, and as in other hybrid designs, the motor is used for regenerative braking to recapture energy. As compared to full hybrids, mild hybrids have smaller batteries and a smaller, weaker motor/generator, which allows manufacturers to reduce cost and weight.

POWER ASSIST HYBRIDS: Power assist hybrids use the ICE for primary power, with a torque-boosting electric motor also connected to a largely conventional powertrain. Power assist hybrids The electric motor, mounted between the engine and transmission, is essentially a very large starter motor, which operates not only when the engine needs to be turned over, but also when the driver "steps on the gas" and requires extra power.

PLUG-IN HYBRIDS: A plug-in hybrid electric vehicle (PHEV), also known as a plug-in hybrid, is a hybrid electric vehicle with rechargeable batteries that can be restored to full charge by connecting a plug to an external electric powersource.plug-in hybrid electric vehiclerechargeable batterieselectric powersource A PHEV shares the characteristics of both a conventional hybrid electric vehicle, having an electric motor and an internal combustion engine; and of an all-electric vehicle, also having a plug to connect to the electrical grid.electric motorinternal combustion engineall-electric vehicleplugelectrical grid

What we can expect in the near future

Koenigsegg Regera

HYPER CAR DRIVES WITHOUT A GEARBOX

By

M.Bharath Chndra

12A81A0390

The **Koenigsegg Regera** is a limited production, plug-in hybrid sports car manufactured by Swedish high-performance sports carmaker Koenigsegg. It was unveiled at the 2015 Geneva Motor Show. The name Regera is a Swedish verb, meaning "to reign" or "to rule." Only 80 units will be built, all of which have already been sold, each costing approximately US$1.9 million.[1][2] The Regera was created and designed to be a more practical, luxurious, hypercar alternative to the rest of Koenigsegg's lightweight hypercar lineup, including the Agera RS and the One:1. Koenigsegg states that the Regera will be the most powerful and fastest accelerating production car ever. The production of the Regera will result in Koenigsegg, for the first time ever, simultaneously having two modelsinproduction.

Powertrain

The Regera produces a reported total of 1,822 PS (1,340 kW; 1,797 hp) through a hybrid powertrain. As in general, the Regera's internal combustion engine (ICE) produces its greatest power only at high RPMs; however, due to the fixed gear, this corresponds to very high speeds. Power at low speeds is filled in by the electric motors, giving a maximum combined mechanical output of 1,500 PS (1,100 kW; 1,500 hp) and 2,000 N·m (1,475 lb·ft) of torque.[3][4][5] The ICE is a mid-rear mounted, in-house developed, twin-turbocharged V8 engine with a 5.0-litre capacity. It produces 820 kW (1,115 PS; 1,100 hp) at 7,800 rpm and 1,280 N·m (944 lb·ft) at 4,100 rpm. It works in conjunction with three YASA electric motors with a total capacity of 520 kW (707 PS; 697 hp) and 900 N·m (664 lb·ft) of torque. One 215 hp (160 kW; 218 PS) electric motor-generator on the crankshaft acts as starter and generator and supplies torque fill; and two 241 hp (180 kW) wheel-shaft mounted electric motors drive each rear wheel and provide torque vectoring. The electric motors are powered by a 4.5-kWh, 800-volt, 75-kg liquid cooled battery pack developed by Rimac Automobili, making it the first 800-volt production car.[6]Koenigsegg claims that the battery pack is the most power-dense battery pack ever created for a production car.[2][3][5][7]

Transmission

Christian von Koenigsegg invented the Koenigsegg Direct Drive System (KDD) and it was developed for the Regera by the Koenigsegg Advanced Engineering Team. The KDD system effectively eliminates the need for a transmission and allows for pure EV (electric vehicle) mode. The Regera doesn't have a traditional multi-gear transmission but instead features a single-speed fixed-gear transmission, often called a direct drive, with a 2.73:1 reduction ratio, meaning the crankshaft mounted on the ICE will rotate 2.73 times for every 1 time that the output shaft of the direct drive mechanism will rotate. At speeds below 30 mph, mostly the wheel shaft electric motors propel the car through the use of a hydraulic coupling that lets the ICE and the crankshaft mounted electric motor slip. In reverse, only the wheel shaft electric motors propel the car.[2][8] Above 30 mph, the RPM of the crankshaft mounted electric motor and internal combustion engine are proportional to wheel speed through locking of the hydraulic coupling.[9] However, in the first driving footage from the Regera through Koenigseggs official YouTube channel, Christian von Koenigsegg described and demonstrated how the Regera features a steering wheel mounted paddle that simulates a traditional downshift by initiating slip of the hydraulic coupling connecting the crankshaft to the output shaft. This results in higher RPM of the ICE and the cranskshaft mounted electric motor and therefore higher power at lower speeds than what would have been possible if the coupling would have been locked at all times.[10] Koenigsegg reported that the omission of a gearbox and addition of electric motors and battery only added 88 kg (194 lb) compared to what the Regera would have weighed with the same combustion engine but a 7-speed dual-clutch transmission (DCT) and no electric motors or batteries.[11][12]

ChassisWheels

The Regera has carbon fiber wheels with diameters of 19 inches at the front and 20 inches at the rear with center-lock wheel nuts. The tires are Michelin Pilot Sport 4S' with codes of 275/35 R 19 Y for the front and 345/30 R 20 Y for the rear. Optional dedicated Michelin Pilot Sport Cup 2 tires are also available. The brakes are ventilated ceramic discs, with a diameter of 397mm and six-piston calipers at the front, and a diameter of 380mm and four-piston calipersattherear.[2]

Interior features

Interior of the Koenigsegg Regera

The Regera will include added insulation to help add to the luxury by reducing cabin noise caused by wind and powertrain noises. Also included as an added luxury item over previous models will be 8-way electrically adjustable memory foam seats. The Regera will also include many new technical features such as a Koenigsegg 9-inch information and entertainment system, a complete camera system with recording capabilities (front, inner, and rear), Apple CarPlay, a new sound system, ambient lighting, and 4G and Wi-Fi connectivity. It will also feature front and rear parking sensors.[11][13]

The Regera will feature active engine mounts for the ICE and transmission to rest on. The engine mounts are designed to stay soft at lower speeds, significantly reducing vibrations and engine noise, adding to the luxury effect of the vehicle. While driving more aggressively or at higher speeds, the engine mounts will firm up, giving greater lateral response to the vehicle.[11]

Exterior features

Christian von Koenigsegg believes that a good design of the day-time running lights (DRL) on a vehicle gives it character, and developed a DRL system that is supposed to resemble a constellation with the carbon-fiber background resembling the night sky.[11]

Koenigsegg claims that the Regera is the first "fully-robotized" car. The vehicle features hydraulic pumps and accumulators to control the active front and rear wings, as well as active chassis control and lifting. Hydraulic lifters were added to the already existing pumps and accumulators to allow for all body panels on the vehicle to be remotely operated.[11]

Performance

The car has a claimed, electronically limited top speed of 410 km/h (255 mph), is capable of reaching 100 km/h (62 mph) in 2.7 seconds, 300 km/h (186 mph) in 10.9 seconds, and a speed of 400 km/h (249 mph) in 20 seconds. Koenigsegg also claims that the acceleration from 150 to 250 km/h (from 93 to 155 mph) requires 3.9 seconds.[6]

Koenigsegg Regera has a power to weight ratio of 0.69 kW (0.93 hp) per kilogram.

GUEST LECTURES/FDP'S ORGANIZED IN THE DEPARTMENT:

S. No	DATE	DESCRIPTION OF THE EVENT	NO. OF STUDENTS PARTICIPATED
1.	19/8/2015	Seminar on **"Road Safety and Importance of Helmet"** by Mr. R. Rajendra Prasad, Motor Vehicle Inspector	110
2.	18/09/2015	Guest lecture on **"Simulation and its Importance"** by Ms. Monica Nimmi	107

FDP'S AND WORKSHOPS ATTENDED:

S. No	Name of the faculty	Name of the workshop	Date
1.	Mr. K. Kiran Kumar Mr. B.N.V. Srinivas	FDP on "Engineering Mechanics"	25/05/2015 to 27/05/2015
2.	Mrs. N. Tulasi Radha Mrs. K. Dorathi	National seminar on "Smart materials and structures"	28/08/2015& 29/08/2015
3.	Mr. G. Surya Narayana Mr. G. Gopinadh	FDP on "Engineering Drawing"	02/09/2015 to 05/09/2015

PUBLICATIONS:

S. No	Name of the faculty	Publication details
1.	Dr.DVSSSV Prasad and P Sandeep Kumar	Optimization Of CNC Turning Of Al/SiC MMC using RSM And Genetic Algorithm IJMCA, Vol 3,Issue 3,PP 76-80,Aug 2015
2.	Dr.DVSSSV Prasad, V.Sarath Teja and KSBSVS Sastry	Numerical Study On Materials And Design Optimization Of A Bicycle Frame

PLACEMENTS:

S. No	Student Name	Regd. No.	Name of the Employer and their Website	Date of Interview/ Appointment Letter/ Job offer
1.	A. Harish Kumar	11A81A0303	ROTODYNE & www.rotodyneindustries.com	09/02/2015 & 04/06/2015
2.	M.B.R. Surekha	11A81A0331		
3.	M. Rakesh	11A81A0335		
4.	Yalamati Sushma	11A81A0359		
5.	Maki Reddy Mahesh	12A81A0304		
6.	T.Chalapathi	12A81A0307		

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