

**STOP &
START**



STOP&START
MEDIA PRESENTATION September 7, 2004

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07 September 2004

**Fuel savings of 10 to 15% in cities with
PSA Peugeot Citroën's Stop & Start System**

Jean-Martin Folz, CEO of PSA Peugeot Citroën, today unveiled the Group's new Stop & Start system at a ceremony in Paris attended by Serge Lepeltier, French Minister of Ecology and Sustainable Development, and Patrick Devedjian, French Minister of Industry.

With the Stop & Start system, the engine is automatically turned off and is in standby mode, when the vehicle stops at traffic lights and traffic jams. The engine instantly starts up again when the brake pedal is released, with the vehicle pulling away once the accelerator is pressed. The Citroën C3 1.4i 16V Stop & Start, which will be rolled out in early November, will be the first mass-produced car equipped with this innovative system. It will be combined with another leading-edge technology already commercially available on the C3, the SensoDrive electronically controlled manual gearbox. The new system will gradually be extended to other Citroën and Peugeot vehicles.

Rather than causing excessive fuel consumption, in fact repeated stopping and starting of the engine reduces consumption and enhances driving pleasure. The Stop & Start system has reduced fuel consumption by 10% for city driving, 6% in a standard combined cycle and up to 15% in heavy traffic. CO2 emissions are reduced by a similar proportion - PSA Peugeot Citroën considers greenhouse gas emissions to be the greatest threat to the environment.

The Stop & Start system also helps to improve the quality of life in cities, since drivers and the urban environment benefit from total silence during the many times the vehicles are stopped.

PSA Peugeot Citroën produced the Stop & Start system as part of its strategy of developing new technologies to combat the greenhouse effect by reducing fuel consumption and CO2 emissions while enhancing drivability. More than 500,000 vehicles that emit less than 120 grams of CO2 per kilometre have already been sold by the Group, with a target of 1.7 million by 2006. This performance results from the assertive policy deployed to further develop HDi diesel engines and introduce innovations such as electronically controlled gearboxes.

This latest development reinforces PSA Peugeot Citroën's strategic focus on "useful technology for everyone," delivering benefits for both customers and society as a whole. This pragmatic approach systematically produces quick-to-the-market, cost-effective solutions.

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Media presentation

September 7, 2004



Hubert MAILLARD

Platform 1 Director

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Overview



- A genuine innovation
- A useful innovation offering real benefits
- Simple architecture
- Driver friendly

PSA PEUGEOT CITROËN

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A genuine innovation

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A genuine innovation

- PSA Peugeot Citroën has experience and expertise in hybrid vehicles and associated technologies:
 - Several technical demonstrators:
Dynalto, Dynavolt, Dynactive
 - Industrial experience in electric vehicle production

- STOP&START,
 - An innovation offering the best cost/ environmental performance ratio

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A genuine innovation

- STOP&START:
 - The engine switches to standby as soon as the vehicle stops
 - The engine re-starts instantly in a driver-friendly manner

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A useful innovation offering
real benefits

A useful innovation offering real benefits

- Substantial fuel savings and reduced emissions
- Greater driving comfort:
 - Greater comfort when the vehicle is stationary with the engine on standby
 - Silent engine start
- Instant vehicle re-start

A useful innovation offering real benefits

Citroën C3 – Our first STOP&START application

- Citroën C3
 - A city car
- 1.4i 16V petrol engine
 - Because petrol engines consume more fuel at idle than diesel engines
- STOP&START is used with the SensoDrive gearbox:
 - Maximum fuel savings achieved by the two systems combined
 - Uncomplicated driver operation

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A useful innovation offering real benefits

Immediate fuel savings

- When an engine starts, it consumes the equivalent quantity of fuel to three seconds' idling
- So, as soon as the vehicle stops for more than three seconds, fuel savings are made

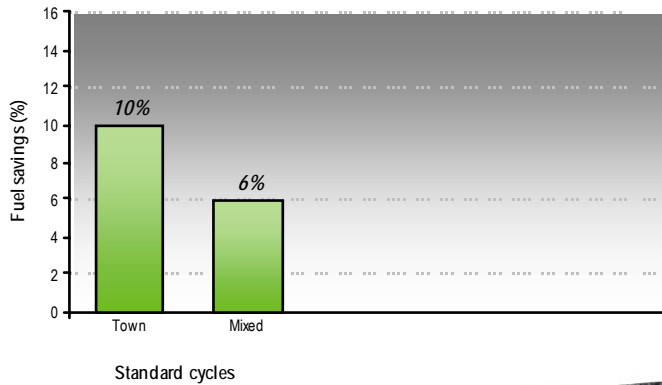
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A useful innovation offering real benefits

Reduction in fuel consumption

C3 1.4i 16V SensoDrive STOP&START



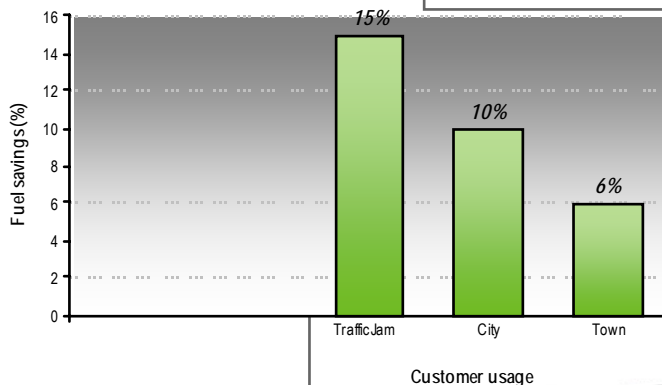
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Reduction in fuel consumption

C3 1.4i 16V SensoDrive STOP&START

Traffic Jam	Paris at around 8.00 am.	Speed < 10 kph
City	Paris at around 10.00-11.00 am.	Average speed 15 to 20 kph
Town	Provincial town.	Average speed 25 to 30 kph



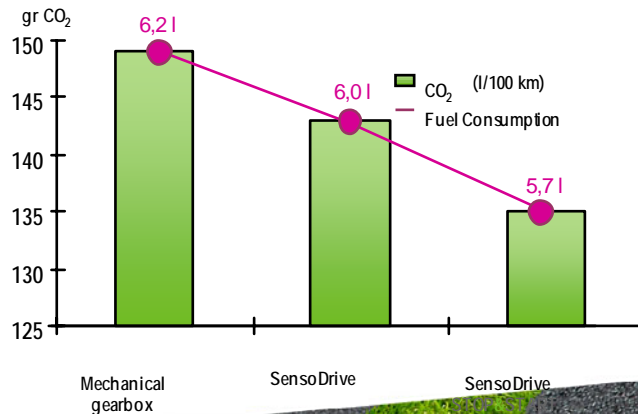
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A useful innovation offering real benefits

Fuel Consumption and CO₂ emissions in a mixed cycle

C3 1.4i 16V SensoDrive STOP&START



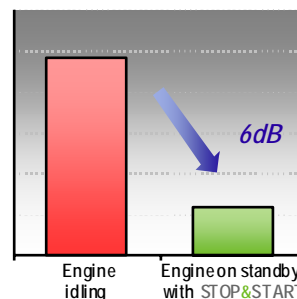
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A useful innovation offering real benefits

Greater comfort with the engine on standby

- No vibrations
- No exterior noise
- Reduced interior noise
 - Total noise levels reduced four-fold

Noise level inside the vehicle



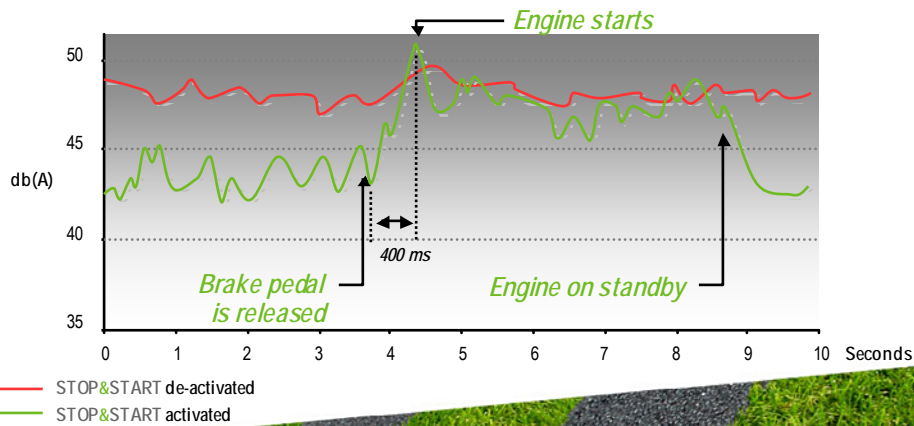
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A useful innovation offering real benefits

Immediate and silent start

Noise level when starting / engine idling



A useful innovation offering real benefits

Instant vehicle re-start

- Pulls away as quickly as with the engine idling
 - When the brake pedal is released the engines starts instantly (400 milliseconds)
 - The vehicle pulls away as soon as the driver presses the accelerator



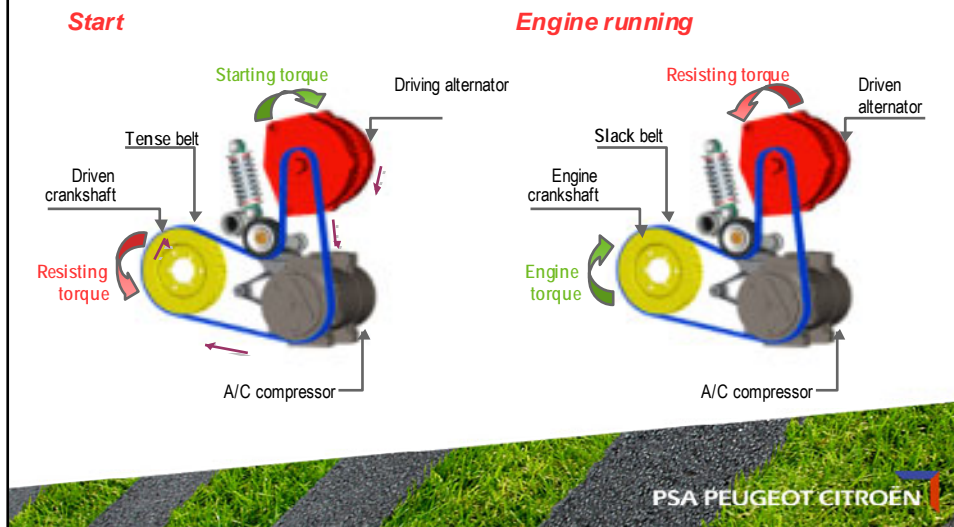
Simple architecture

Simple architecture

- The system comprises the following main components:
 - A reversible alternator:
 - Works as a starter motor and alternator
 - Driven by a special belt and tensioner
 - Electronic control unit
 - A battery capable of a high number of charge/discharge cycles

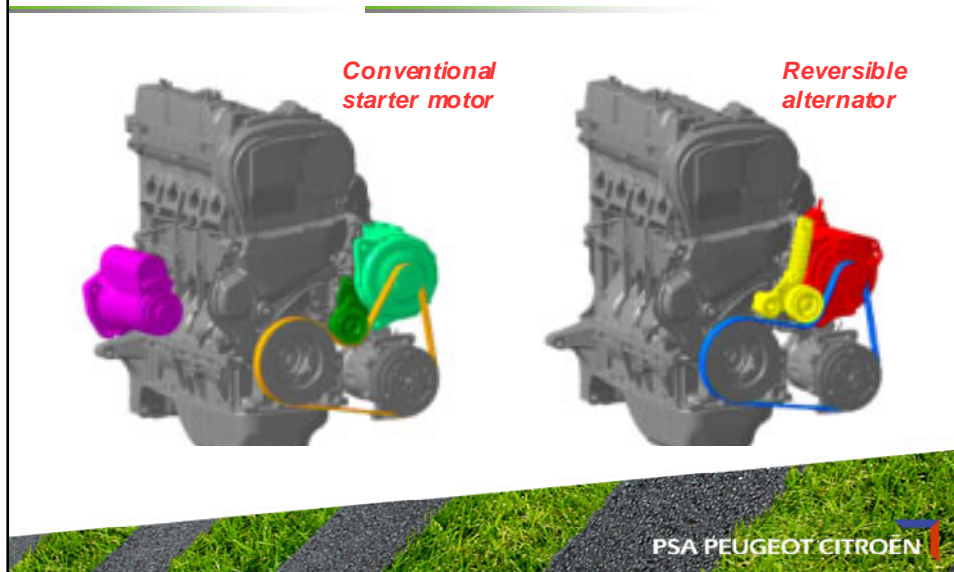
Simple architecture

The reversible alternator

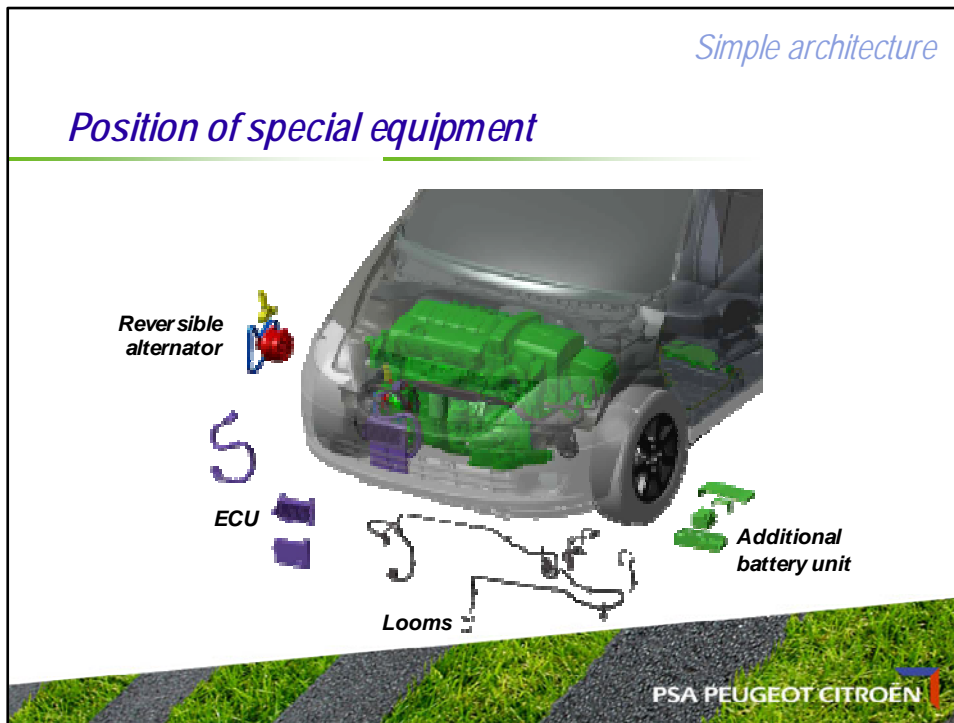
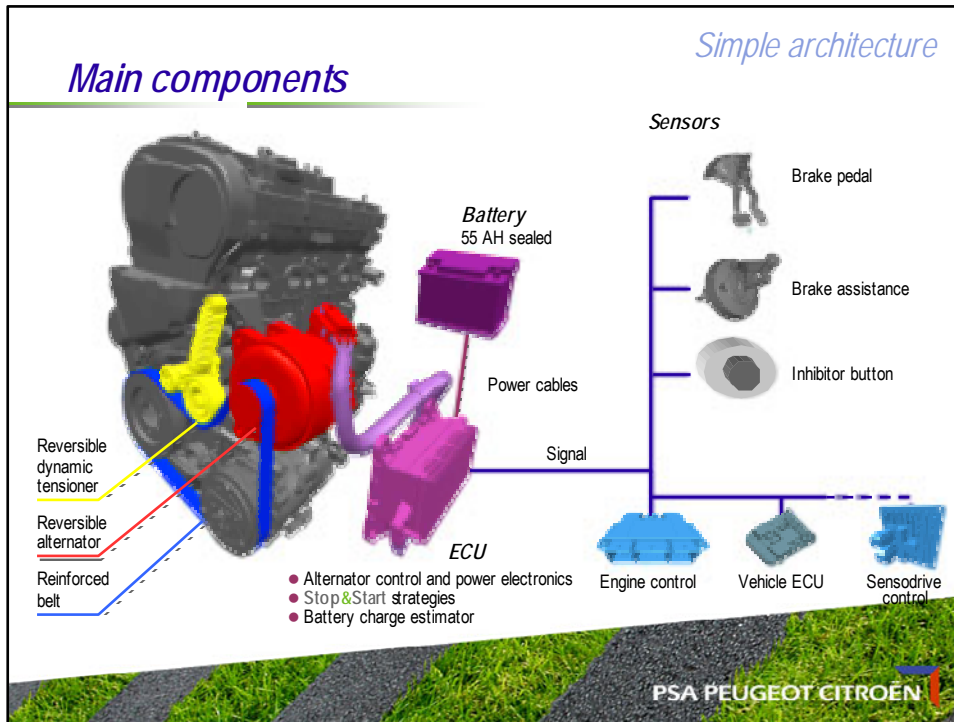


Simple architecture

Position of the reversible alternator



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Simple architecture

Controls and displays



Simple architecture

An innovation for general application

- Easy to adapt to our vehicle platforms

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Simple architecture

A uniting of expertise

- **PSA PEUGEOT CITROËN:**
 - Design and functional validation of the complete system and integration into the vehicle
 - Standby and engine re-start control
 - Battery charge management
 - Dialogue strategy between ECUs
- **VALEO:**
 - Reversible alternator
 - Alternator ECU

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Driver-friendly

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Driver friendly

- **STOP:**

- When the driver brakes, the engine switches to standby just before the vehicle comes to a complete halt (*speed < 6 kph*). The green «eco» light on the dash comes on
- The engine remains on standby as long as the brake pedal is pressed, even lightly

- **START:**

- The engine re-starts automatically when the brake pedal is released. The green «eco» light goes off

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Driver friendly

- **STOP&START becomes active when:**

- The vehicle exceeds 10 kph for the first time
- The battery is sufficiently charged
- The catalyst is ready

- **The driver can switch off the system manually**

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Driver friendly

- **STOP&START** is automatically de-activated under certain circumstances for safety and comfort of occupants
- **Safety:**
 - Windscreen de-ice or de-mist switched on
 - Insufficient braking assistance
 - In reverse gear when manoeuvring
- **Comfort:**
 - When outdoor temperatures are below -10°C or above +30°C and the A/C is switched on
 - When the desired temperature has not been reached in the passenger compartment

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Summary

Every C3 1.4i 16V SensoDrive will be equipped with STOP&START

- **Customer benefits:**
 - An innovation that has a cost but is priceless
 - Immediate and demonstrable fuel savings
 - No noise and no vibrations when stationary
 - Driver-friendly
- **Environmental benefits:**
 - Reduced CO₂ emissions
 - No noise pollution when at standstill
- **Benefits for the manufacturer:**
 - Easy to adapt to our vehicle platforms



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THE "STOP & START" SYSTEM

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As part of its research into controlling the greenhouse effect, the PSA Peugeot Citroën Group has developed "Stop & Start". Designed for mass-market use, this new system improves fuel economy. The basic principle: as soon as the car comes to a standstill (red lights, traffic jam, etc.), the engine cuts out.

1 When the vehicle stops, the engine cuts out

When the driver brakes to stop the car, the engine cuts out and a green "eco" indicator appears on the dashboard. The engine remains in standby for as long as the driver keeps a foot on the brake pedal, even if the pressure is slight.



The different control units (BSI, engine control (CMM), gearbox control (BVM), Stop & Start reversible alternator control (AR2S), etc.) check that conditions for stopping the engine are satisfied: driver's foot on the brake pedal, vehicle speed of less than 6 km/h, battery sufficiently charged, etc. The reversible alternator control unit (AR2S) orders the engine control unit to stop fuel injection, and the engine cuts out.

2 The engine starts again automatically and instantaneously

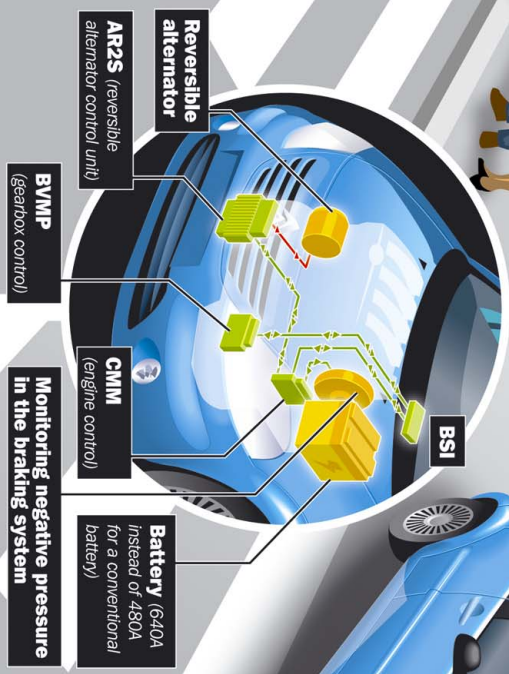
When the driver releases the brake pedal, the engine starts up again, automatically, instantaneously and in complete silence (in some 400 milliseconds compared with around one second for a conventional start-up). The green "eco" indicator is switched off.



The release of the brake pedal is detected by an electric contactor controlling the rear brake lights. A start-up order is then sent to the reversible alternator through the AR2S.



Advantages of Stop & Start
Driving pleasure: simple to use, no noise and vibration when the car stops moving, instant and silent start-up.
Environmental protection: fuel consumption and CO₂ emissions reduced by 10% over an urban cycle (6% over a combined cycle).



Stop & Start is making its debut on the Citroën C3 1.4i petrol model, fitted with the Sensodrive gearbox.