DAF and Hybrid Technology

DAF's parent company, PACCAR, has set itself the ambitious target of achieving a 30% improvement in fuel efficiency for specific medium-duty vehicles. Hybrid technology will primarily be used to achieve such a target. As part of PACCAR's global hybrid program, DAF Trucks N.V. has presented a prototype of an LF45 based Hybrid Truck at a number of exhibitions in Europe. The truck uses an advanced diesel/electric drive system.

DAF has extensive experience of hybrid technology. As long ago as the eighties, DAF developed a hybrid bus concept, followed in the nineties by a prototype of a hybrid utility vehicle based on the CF. It was the weight of the battery packs (around 3000 kilos) in particular that constrained further development. Now that the energy storage capacity of today's batteries has been achieved at only 10% of the previous weight, hybrid technology is within reach.

The prototypes that DAF Trucks are operating, which are based on the successful LF model, have been developed in close co-operation with Eaton, TNO and Leyland Trucks Ltd, another PACCAR company. The vehicles use parallel diesel/electric hybrid systems, where the truck can be driven by the diesel engine, the electric motor or a combination of both.

In co-operation with

EATON

TNO

LEYLAND TRUCKS
A PACCAR COMPANY

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DAF
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Hybrid Technology from DAF

With hybrid technology being the key to cleaner vehicles, DAF is ensuring it remains at the forefront of its development.

DAF

Understanding hybrid technology

Simple and straightforward, hybrid technology is fast becoming a viable alternative to traditional driveline engines. The prototype hybrid offering from DAF is in the 7.5 tonne Hybrid Truck, which is fitted with a new 4.5 litre PACCAR FR diesel engine that already meets Euro 5 and EEV emission levels.

Why choose a hybrid:

- *Reduced emissions for urban usage*
- *Increased fuel economy (up to 30%)*
- *Lower repair and maintenance costs*
- *Less brake and clutch wear*
- *Better acceleration*
- *Conventional fueling infrastructure*
- *Smoother ride and quieter operation in cities*

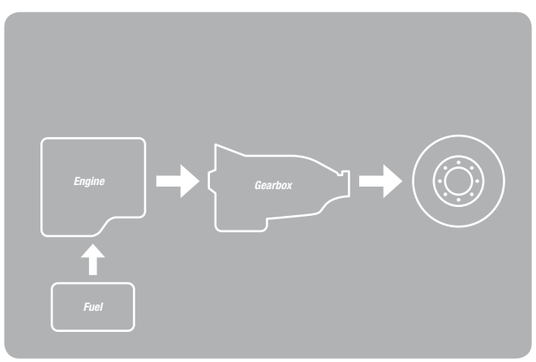
This has a maximum output of 118kW/160hp and is connected to an automated six-speed Eaton gearbox (Autoshift). Between the clutch and the gearbox a 44kW electric motor has been installed – this can provide the drive as well as function as a generator. Energy is then released during braking and stored in the lithium-ion batteries for re-use during acceleration. Depending on the fill ratio of the lithium-ion batteries, a central computer determines when the diesel engine provides the drive and to what extent the electric motor is used.

A major benefit of the electric motor is that less diesel power can be utilised for driving the truck in city distribution. Therefore, instead of a six-cylinder engine a four-cylinder engine can be chosen – delivering the same acceleration without compromising the performance. This change in engine and the weight saved (around 150-200kg) compensates for the extra weight gained through the introduction of the hybrid technology (around 200-250kg).

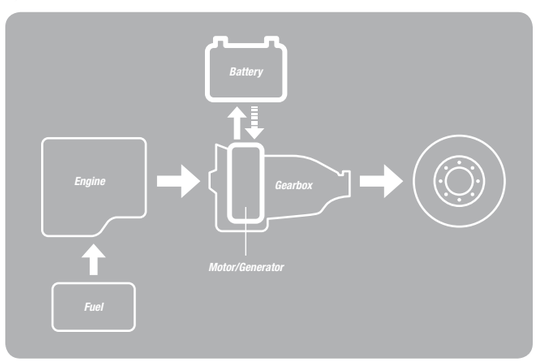
Development program

Hybrid technology is a key element in the development of even cleaner vehicles. Operating completely in line with PACCAR's goal of achieving an improvement in fuel efficiency of 30% for certain medium-duty vehicles within seven years, as well as the associated reduction in CO_2 emissions, DAF Trucks is also investigating other possibilities, particularly for the LF and CF series, for the distribution transport sector. DAF's Product Development Department emphasises, however, that further development and tests are necessary in order to be able to guarantee reliability and service life, while time is also needed to make the hybrid truck an attractive alternative from an economic perspective. First prototypes have already entered service with customers for 'field proving trials'.

Traditional Driveline

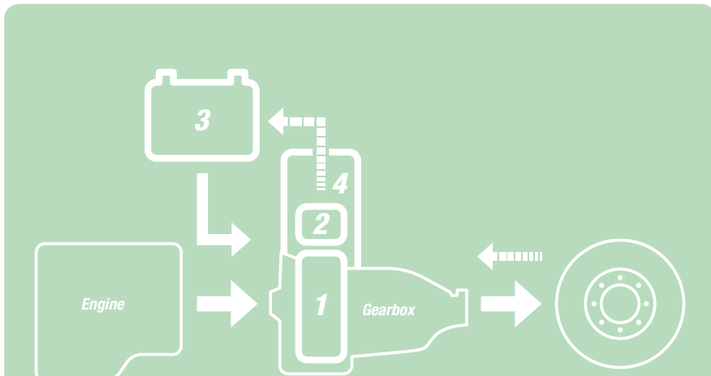


Hybrid Driveline



How does a hybrid work?

The battery pack of the hybrid system weighs around 100kg and consists of lithium-ion batteries with a total of 100 3.4 volt cells. Once these batteries are fully charged, the DAF LF Hybrid Truck can travel approximately 2km electrically without the need for the diesel engine. What this equates to is the required amount of energy needed for driving out of the 'green zones' of most city centres.



1. Electric Motor/Generator 2. Invertor 3. Battery & Cooler 4. Liquid Cooling

1

2

3

4

When used during utility applications, DAF Hybrid Technology can result in a reduction in fuel consumption of around 25%-30%. An additional advantage is that components that are susceptible to wear, like brake linings, will actually have a longer service life because the regenerative braking reduces the use of foundation brakes – and in doing so, lowers operational costs.