2004 saw the launch of the first V6 engine with petrol direct injection, the 3.2 l FSI [1]. This was followed in 2006 by the first representative with the Audi valvelift system and regulated oil pump [2]. Since 2008, the 3.0 l TFSI is the first Audi V6 engine with direct injection and supercharging. It extends the range of engines in the V6 family at the top end, and is intended to underline the sportily dynamic claim of the Audi brand [3].
1 Introduction

The basic design of the new FSI engines has been adopted, and hence also the advantages of the V-format petrol engine family, such as consistently reduced frictional losses, extremely compact design, a high degree of modularisation and extensive synergy effects with regard to production and assembly.

Supercharging is provided for the first time at Audi by a highly integrated module with a Roots blower inside the V [4]. In current production application the engine range stretches from a comfortable, assured variant in the Audi A6 through to a sportily agile variant in the new Audi S4.

2 Engine Design Concept

2.1 Choice of Charging Technology

Along with the global aims of the Audi V6 petrol engines, such as
- a uniform basic engine design
- a high degree of modularisation with the rest of the family of V engines
- extremely compact design
- low fuel consumption
- ease of maintenance
- a high degree of synergy in the V6 production and assembly concept
- suitability for worldwide sales, compatible with RON95/91

the following criteria were above all key to the choice of charging technology:

- a high degree of comfort while delivering powerful take-off acceleration
- a design suitable for a wide range of applications, with quick response
- cost-effective adaptability for adoption in the Audi A4, A6 and A8 model series and the SUV platforms
- fulfilment of all current and future legal requirements worldwide
- deployment of different engine characteristics (comfort/sport).

In the course of a oneyear design phase, the potential of a V6 twin-turbo engine and a V6 with mechanical supercharging, each with FSI technology, was evaluated on the test rig and in the vehicle. In the case of charged V6 petrol engines the assessment is not clear-cut, however, but requires a conscious philosophical decision. Mechanical supercharging offers significant advantages in terms of takeoff and emissions, as well as package benefits based on the positioning of the supercharger module in the V. Figure 1.

Audi has chosen mechanical supercharging in the V6 segment, because of the benefits in terms of the required vehicle characteristics.

With high thermodynamic efficiency, dynamic torque build-up/early attainment of peak torque and good take-off permit economical long gear ratios and optimised dynamic response, especially by heavy vehicles, as well as ensuring a high degree of customer acceptance in typical V6 markets such as the USA and Asia.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Comparison of turbo/compressor characteristics for V6 TFSI [5]}
\end{figure}

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