TEC INFO

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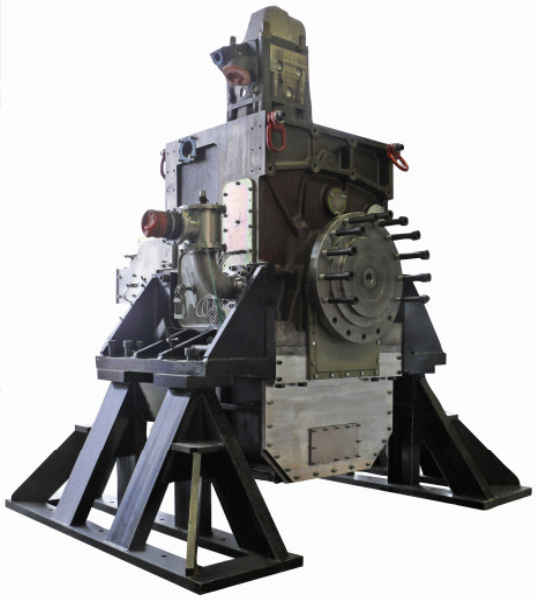
Large Single Cylinder Engine

Introduction

The development of large bore engines for marine, locomotive and stationary applications is facing new challenges in terms of compliance with future exhaust emission legislation. Especially with regard to combustion, the possible use of exhaust gas recirculation and / or after-treatment but also with regard to engine mechanics additional development efforts will be required. For such investigations, a single-cylinder test engine is a very suitable tool in order to reduce the amount of multi cylinder testing. In combination with the targeted intensive use of CAE- tools, development cost and development time can be minimized.

To take this fact into account and to be able to offer attractive development services, FEV has developed and built its own modular single-cylinder engine. This engine can be used for combustion development, as well as for mechanical investigations and different component tests.



Large Single Cylinder Engine

Engine Concept

The test engine is of modular and variable design to be flexible in use of different engine configurations. This approach makes it possible to use the core components of different customer engines for the single cylinder tests and thus reflect realistically the actual conditions of the multi cylinder engine. Therefore representative results are achieved which are directly transferable to the multi cylinder engine.

The core engine is characterised by a multi-cylinder-inline-engine based cast crankcase. This ensures a well proven and reliable base engine design. The crank train contains a very robust crankshaft with 3 serial production main bearings. The crankshaft for the different engine configurations is made of bar material.

The crank case design offers sufficient space to vary the stroke of the engine in a certain range and to allow different crankshaft designs. The camshaft and the mass balancing system is driven by the crankshaft via gear train. A compact mass balancing module with roller bearing supported balancing shafts for the first and second order is placed underneath the crankcase. The balancing masses can be variably adjusted to the installed engine in order achieve the optimal mass balancing for each engine configuration.

Piston, cylinder liner and connecting rod with bearings are normally used from the multi cylinder engine and provided by the customer. However also newly designed customized components can be installed. This flexibility is ensured by a module that is attached to the crankcase and which forms the water jacket and carries the cylinder head. This approach will enable a significant range of installable bore diameters. The cylinder head with valve train and drive is usually also adapted from the multi cylinder engine of the customer, but also new configurations can be installed. Fixed and variable Miller valve timing can be realized.

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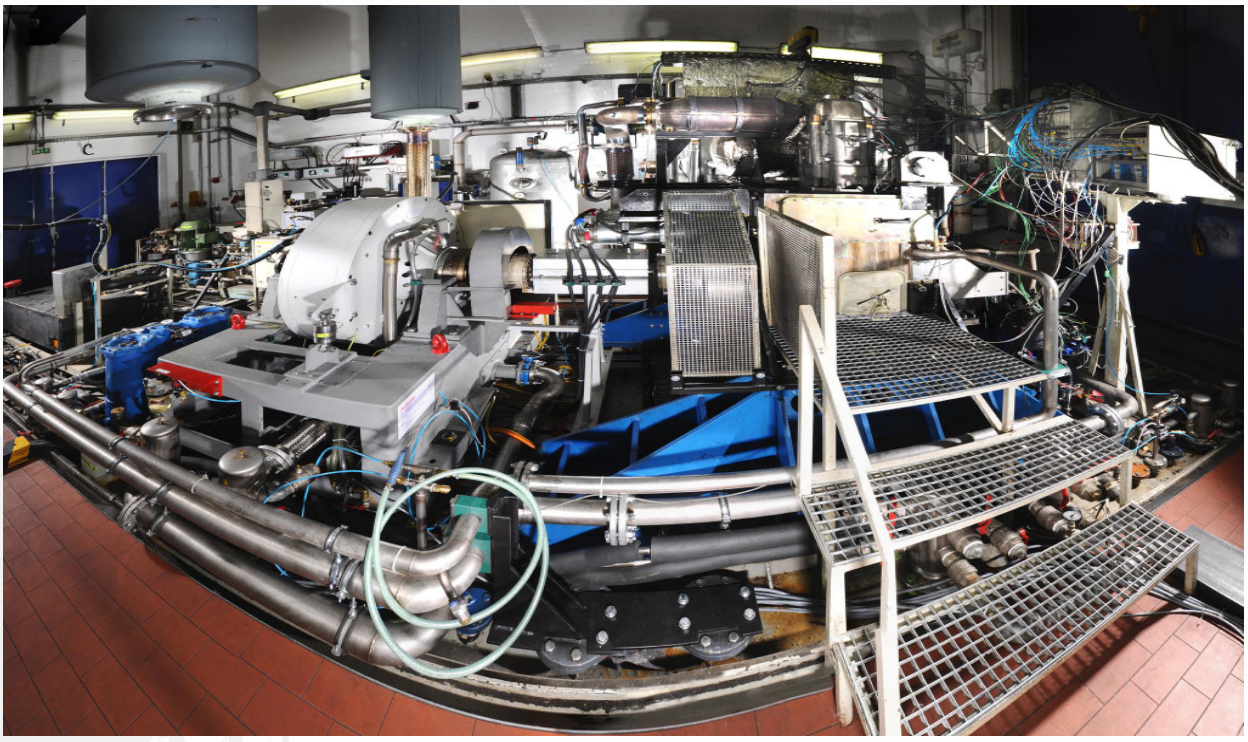

Test Cell Setup of Large Single Cylinder Engine

The engine is available with a pump-line-nozzle- and with a common rail injection system. With the installation of exhaust gas recirculation systems combustion development investigations as well as EGR-component testing such as EGR-coolers and EGR-valves are possible.

Both, diesel fuel and heavy oil can be used as well as alternative fuels and gas.

The engine is supplied on the test bench with conditioned coolant and lubricating oil, and on demand operated with an external charging system. For the most important engine systems (e. g., intake system, exhaust gas system, lubricating oil system, main bearings, fuel system, cylinder pressure, etc.) the base engine is equipped with pressure- and temperature-monitoring devises. Depending on the test program additional measurement and monitoring devices can be installed.

Additional technical data of the engine can be seen on the following table:

Bore	180 - 260 mm
Stroke	220 - 350 mm
Displacement	5,6 - 18,6 dm^3
BMEP	up to 30 bar
Power	150 - 400 kW
Nominal Speed	900 - 1800 rpm (depending on applied bore and stroke)
Minimum Speed	250 rpm
Peak Cyl. Pressure	300 bar (depending on applied bore and stroke)
Fuels	Diesel, HFO, alternative fuels, Gas,...

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