

# UP TO 5 % FUEL SAVING WITH HYDROSTATIC ELECTRONICALLY-CONTROLLED VARIABLE FAN DRIVE SYSTEM

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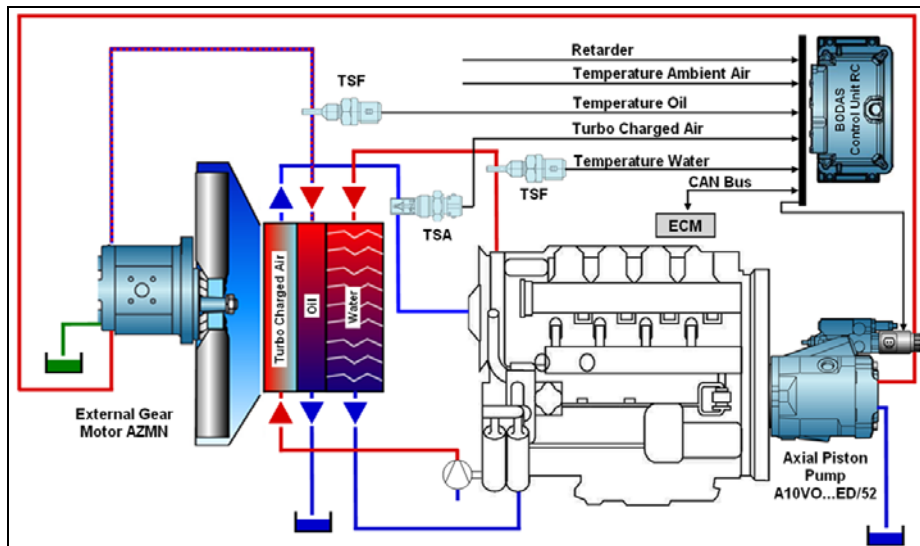
In Europe, the Euro 5 standards, and from 2013 Euro 6, stipulate extremely strict limits for trucks and buses, so-called on-highway commercial vehicles. For mobile equipment (off-highway vehicles), emission legislation Tier 3 and in future Tier 4 apply, which also drastically reduce the permissible limits for particulate and nitric oxide emissions. On the world map Figure1 the blue coloured areas show the strict regulations worldwide which are valid today, in 5 years or 10 years.



**Figure1: Strict emission regulations world wide**

Engine and vehicle manufacturers are reacting with exhaust gas recirculation (EGR) and selective catalytic reduction (SCR). In addition, they are shifting peak torque to the lower speed range. Combustion engines optimized in this way require a complex cooling management system that keeps the operating temperature in a very narrow temperature window. In addition, the charge air also has to be kept within a defined temperature range.

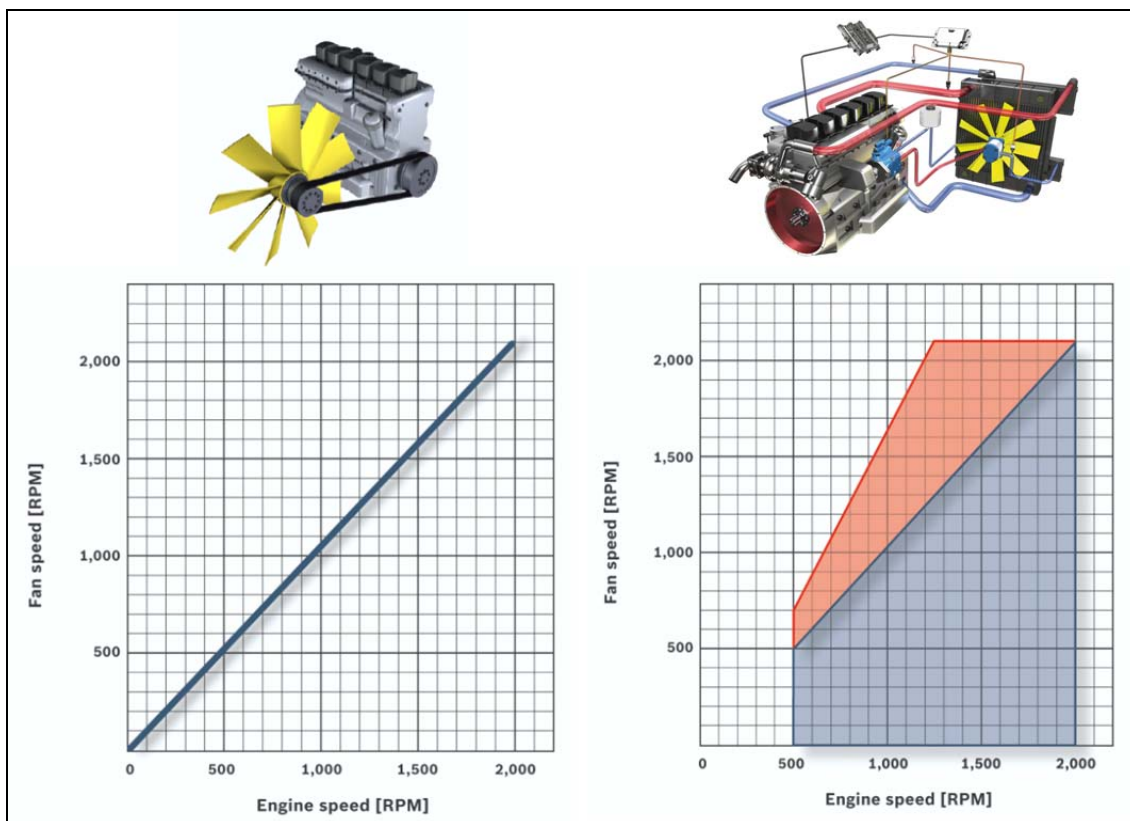
The Rexroth system solutions feature a CAN-bus-enabled control unit, specially optimized for the fan drive, that evaluates all the important temperature parameters for coolant, oil, charge air, and exhaust gas recirculation. This electronically controlled hydrostatic fan drives reliably keep combustion engines at their optimum operating temperature, even under the most difficult of application conditions. This enables mobile equipment, buses and commercial vehicles to comply with strict emissions regulations for exhaust gas and noise. Rexroth system solutions with axial piston pumps, external gear motors, polymer and steel tanks, valve technology, sensors and mobile electronics provide exactly the cooling output needed, regardless of the speed of the combustion engine, and even reduce fuel consumption by up to five percent.



**Figure2: Hydraulic schema of hydrostatic variable fan drive system**

In Figure2 the A10VO ED electronically controlled variable pump supplies an external gear motor that drives the fan. Its compact design requires only little installation space. Rexroth has developed specially the ED control for fan drives. The electro-hydraulic pressure controller controls the system pressure as it is needed and according to the valve current that the electronic controller specifies. If current is interrupted, for example because of a cable break, the pump will immediately generate maximum pressure and so prevent the combustion engine from overheating.

For the conventional belt drive shown in Figure3 the fan speed is proportional to the combustion engine speed. That means the max. fan speed = max. cooling is only available at the max. engine speed. The hydrostatic fan drive system controls steplessly the fan independent of the combustion engine speed from minimum to maximum and generates additionally maximum fan power even at low combustion engine speeds.



**Figure 3: Fan Speed diagram of belt drive and hydrostatic fan drive system**

Required cooling capacity may increase by 15 to 40 percent related to the change-over to Euro 6 or TIER 4 final respectively. Moreover this results in about 20 percent higher space requirement for the radiator. Rexroth hydrostatic fan drives compensate for these changed conditions and play a significant role in modern engine systems. The combustion engine and cooler are decoupled mechanically so that vehicle manufacturers can select an optimum position for the cooler and therefore use previously unusable installation space.

The electronically controlled hydrostatic fan drives from Rexroth reduce fuel consumption by up to five percent compared to uncontrolled fan drives and help to achieve the emission level Euro4/5/6 and Tier3/ Tier4.

### **Option for reverse fan function and standstill**

The reversing block function module is available as an optional extra. When the reversing block is installed, the fan changes the rotating direction at defined intervals and cleans the cooler fins. This ensures optimum cooling at all times even during operation in very dirty environments such as construction sites or agricultural applications. The Rexroth BODAS electronic controllers, which are specially designed for tough applications, are vibration-resistant, shock-resistant up to 25g and function without a reduction in performance in a temperature range of -40°C to + 85°C. They have a high electromagnetic compatibility of 100V/m and can communicate with other systems via CAN bus.

*Bosch Rexroth AG is one of the world's leading specialists in the field of drive and control technologies. Under the brand name of Rexroth the company supplies more than 500,000 customers with tailored solutions for driving, controlling and moving. Bosch Rexroth is a partner for industrial applications and factory automation, mobile applications and using renewable energies. As The Drive & Control Company, Bosch Rexroth develops, produces and sells components and systems in more than 80 countries. In 2009 Bosch Rexroth part of the Bosch Group, achieved sales of around 4.1 billion Euro with 34,200 employees.*