VCM’s bright future on the sea

Tests prove it: the flexibility and efficiency of ABB Turbocharging’s Valve Control Management (VCM) has important benefits for marine applications. Gas and dual-fuel engines are the special areas in which VCM has a most promising future.

Two words best describe the technical benefits of ABB Turbocharging’s Valve Control Management (VCM): flexibility and efficiency. To be precise, VCM allows engine valve timings to be varied at all engine loads to control engine emissions, while at the same time improving engine response, idling and starting behavior. The result is, above all, a significant fuel saving.

In 2009 ABB Turbocharging took up the challenge of applying this technology to large engines. To achieve this aim, it forged a development partnership with the German company Schaeffler, a proven specialist in the field. Schaeffler’s UniAir System is an electro-hydraulic, variable valve control system developed for smaller internal combustion engines and already running in hundreds of thousands of cars.

Fast load changes enabled

The results of the engine tests that ABB Turbocharging has conducted have been extremely positive. In fact, as ABB Turbocharging VCM project leader Ville Pellinen notes, “In many respects, the results are better than we were expecting.” The operating principle of ABB’s VCM system distinguishes itself from other, existing solutions, in a number of ways. “We can vary the amount of air reaching the engine any time we like,” Pellinen adds. “Each cylinder is able to work differently thanks to the rapid variation in valve timings in every single engine working cycle.”

This VCM principle opens up a wide area of potential applications on marine engines – for example in offshore ships or passenger ferries. Generally speaking, VCM is of assistance wherever fast load changes are expected of engines on a regular basis. Pellinen continues: “VCM enables engine power to be changed by 50% within fractions of a second. And it also provides a tremendous power reserve at lower engine speeds. In the future, many vessels could be fitted with simpler fixed pitch propellers (FPP) instead of controllable pitch propellers (CPP). This would reduce both the first costs and the operating costs associated with the much more expensive and complex CPP alternative.”

In addition, ABB Turbocharging’s tests show that VCM considerably improves gas and dual-fuel engine combustion. Efficiency increases of 1.5% – corresponding to a 3% lower fuel consumption – have already been demonstrated on engines with VCM. In combination with ABB Turbocharging’s high pressure, high efficiency two-stage turbocharging Power2, VCM also enables a further

VCM: Benefits at a glance

- Significant fuel saving
- Especially helpful in marine applications with frequent and fast load changes
- Increased tolerance of different fuel qualities and ambient conditions
VCM is of assistance wherever fast load changes are expected of engines on a regular basis.

increase in engine power and additional operating robustness. Gas and dual-fuel engines with “diesel-like” performance are within reach with very strong, controlled Miller cycle combustion. The high pressure, efficiency and flexibility of Power2 and VCM complement each other here.

VCM compensates for low gas quality

Currently, only about 60% of the worldwide liquefied natural gas (LNG) supply is of a high enough quality to allow full power operation on the current generation of gas engines. Further, gas quality is expected to diminish in the future. In the worst case, a bigger engine will need to be installed in order to compensate for the reduction in power potential due to low gas quality. “In some cases VCM even allows an engine with fewer cylinders to be used. That, of course, also translates into a saving in first and operating costs,” Pellinen says.

Political decisions that increase the relevance of LNG are on the way. The limitations for oxides of nitrogen (NOₓ) and sulfur (SOₓ) in Northern Europe, the USA and Canada are boosting the use of gas or dual-fuel engines, since commercial LNG is not just a “low-NOₓ” fuel, but also a “no-sulfur fuel”. LNG is set to be an economically viable alternative to liquid fuels by 2020/2025 – when it is planned to introduce worldwide limits – especially when compared with the alternative of relatively expensive diesel oil and aftertreatment equipment. Also, the EU is set to provide LNG refueling points for maritime and inland waterway transport at 139 ports in the Trans-European Transport (TEN-T) core network by 2025/2030. This is an important step for both the shipping industry and the harbors themselves. For VCM project leader Pellinen it goes without saying that “ABB Turbocharging is equipped to face a future in which the significance of LNG will grow.”