Case: MAN Diesel & Turbo

**Challenge**
The computers that provide human machine interface (HMI) to the engine controls on board ships have to be extremely reliable. And the environment at sea, with big variations in temperature, vibration and humidity, itself places huge demands on the electronics.

**Solution**
Beijer Electronics’ robust EPC industrial computer has passed MAN Diesel & Turbo’s comprehensive tests without any problems. Reliable supplies of a high-quality product approved by the leading classification associations make it perfect for customized use on board.

**Result**
MAN Diesel & Turbo has found a reliable supplier of an important component of the engine control system. Beijer Electronics facilitates the installation work by supplying ready-configured EPC computers – and is also an active partner in the development work itself.
Quality requirements drive

MAN Diesel & Turbo

It is no accident that MAN Diesel & Turbo uses industrial computers from Beijer Electronics as human machine interface (HMI) for the company’s giant B&W engines. The choice was based on a very thorough evaluation and negotiation process, in which suppliers from all over the world were compared against each other. On board ships, reliability is absolutely crucial, so all components in the redundant control system have to be of the highest quality.
A large proportion of all ships plying the oceans are propelled by MAN Diesel & Turbo. With around 12,500 employees, the company is the leading supplier of two- and four-stroke engines for maritime use and for installation in power stations, for example.

In recent years, demand for electronically controlled B&W two-stroke diesels has risen sharply. Advanced control systems that manage fuel injection and compression contribute to better fuel economy and reduced emissions.

**Special requirements at sea**

With the progressive tightening of environmental requirements, ship owners are also increasingly interested in installing electronic control in existing vessels. As a bonus, modern control systems also facilitate operation and maintenance by the crew, including lubrication of the engines.

At sea, reliability takes the highest priority. Downtime costs big money. To prevent and avoid problems, the engine control system consists entirely of carefully selected, high-quality electronic components such as computers. Vital functions are also duplicated.

Since the summer of 2011, robust industrial computers from Beijer Electronics have been used in the onboard systems. In the first six months or so since deliveries started, around 150 computers from the EPC series have been commissioned: “Without a single complaint,” stresses Kennet Palm, Head of Hardware Development at MAN Diesel & Turbo, who is responsible for all the hardware used in the control electronics.

**Industrial computers for tough jobs**

The industrial computers that Beijer Electronics supplies to MAN Diesel & Turbo for its engine control systems are anything but throwaway devices. These EPC boxes are specially designed and made for maximum reliability in the most demanding environments.

Private PC buyers are mainly concerned with performance and low price. The occasional ‘blue screen’ may be irritating, but it is not a major problem. It is quite different at sea – particularly on a big tanker or freighter hundreds or even thousands of miles from port.

When MAN Diesel & Turbo chooses components for its electronic control systems, reliability combined with a long service life is crucial.

“We build engines with a lifetime of 30 years, which have to work day in, day out in a tough maritime environment with all that this implies in terms of heat, humidity and vibration,” explains Kennet Palm, emphasizing that of course factors like purchase cost and warranties are not irrelevant either.

**The technology in brief**

- The Beijer Electronics EPC box is a robust, maintenance-free and well-protected industrial computer for tough environments. In purely technical terms, it is built around Intel processors with Windows XP Embedded. Fanless processors keep the temperature down and reduce wear. The industrial computer is IP20-rated according to DIN EN 60529.
- Plenty of connections make for great flexibility. Parallel and serial ports are standard, along with USB 2.0 sockets and 100 Mbps Ethernet. MAN Diesel & Turbo has chosen flash disk for data storage. The alternative is a traditional vibration-tolerant hard disk.
- Beijer Electronics’ EPC series is certified by the ABS (American Bureau of Shipping), Bureau Veritas, DNV, Germanischer Lloyd, Lloyd’s Register and the Russian Maritime Register of Shipping.
Reliable supplies a must
A secure supply of products and spare parts, with ‘just in time’ delivery, is just as high on the list as quality:

“To guarantee the supply of components, we made a decision at the group level to have two, or preferably three, alternative sources for every key product that we need.”

Kennet Palm and his colleagues leave no stone unturned in their constant efforts to identify the best and most reliable products on the market. They search the world for computers, screens and other hardware for the control system.

Tests leave nothing to chance
The adoption of Beijer Electronics as one of very few PC suppliers to MAN Diesel & Turbo has been a lengthy process. The EPC boxes have been tested, methodically and very thoroughly, over a long period.

Niels Torres Engel and Thomas Lehnemann, who are responsible for research and reliability, leave nothing to chance. For their rigorous testing, they have a small ‘torture chamber’ at their disposal in the company’s Research and Development division.

“Among the formal requirements, the products have to be type-approved by the leading maritime classification associations,” says Niels Torres Engel, explaining that, after the preliminary screening, the different computers are installed in test beds to confirm their compatibility, performance and quality.

Ready for a harsh environment
In the engine room of a ship, it can get really hot. That is why checks are made to ensure that the computers will still work in 70-degree Celsius temperatures. The EPC boxes from Beijer Electronics met this challenge – as well as the vibration and humidity tests.

“By ‘stress testing’ the products, we pick up any faults that might not show up at first.”

Thomas Lehnemann stresses the importance of ensuring that manufacturers do not make any sudden design modifications. Even minor changes to components can affect the programs running in the computer.

“We perform constant spot-checks to ensure that the equipment supplied is up to the mark, and we are in constant contact with our partners,” he says.

Responsive collaboration
The partnership with Beijer Electronics is described as personal, relaxed and good. As Kennet Palm says, if communication with the suppliers isn’t working, it doesn’t matter how good the products are:

“We feel that our wishes are listened to and we get all the help we need.”

Niels Torres Engel agrees. He freely admits that MAN Diesel & Turbo could be described as a ‘difficult’ customer:

“Although we’re not buying vast quantities of industrial computers, we are extremely fussy about the quality of what we get.”

Not just that the collaboration works well; it also saves time because all EPC boxes are supplied pre-configured.

Customized solution
The computers supplied are ready to use right out of the box. The operating system and the relevant drivers and programs are already installed by Beijer Electronics before delivery.

This close dialogue has brought improvements in the onboard systems, which also increases safety. If a control computer should fail – against all the odds – the crew on board can re-install the operating system and programs.

This backup copy used to be held on a CD, but unfortunately the mechanisms in the CD drives could not always cope with the vibration they were exposed to. The EPC boxes introduced the idea of restoring from a USB stick, a much more robust solution.

“It is a pleasure to work with suppliers who suggest ideas that provide value and inspiration,” conclude Kennet Palm, Thomas Lehnemann and Niels Torres Engel.

A mechanical giant
All development, both electronic and mechanical, of MAN Diesel & Turbo’s two-stroke engines is carried out in Denmark. Although some special parts are still made in Denmark, the engines are now built under license in countries like Korea and China by partner companies such as Hyundai Heavy Industries – physically close to the shipbuilding yards that buy the engines.

The electronic control systems manage enormous forces. The engines may output up to 115,000 horsepower and weigh up to 2,000 tons. The cylinders, between six and fourteen in number, have a stroke length of almost five meters. A mechanical efficiency of over 50 percent – the best cars achieve 25 percent – makes for high energy efficiency.