

Without any alternative

## Diesel engine in marine service for the past 100 years

***Vandal* meets *Hamburg Express*: Almost 100 years and approximately 93,000 HP lie between these two vessels. The *Vandal*, a Russian river tank, put into operation in 1903 and the *Hamburg Express*, one of the world's largest container vessels, built in 2002, have, however, one thing in common: they were and are equipped with diesel engines. Along with the *Petit Pierre* in France, the *Vandal* was one of the first vessels with this novel, self-igniting propulsion system in 1903. Three 3-cylinder engines delivered 620 HP, which enabled the 800-ton vessel to reach a speed of 8.3 sea miles. The *Vandal* earmarks the beginning of a development, which will not come to an end with the *Hamburg Express*. The container giant is equipped with the presently most powerful diesel engine, the MAN B&W twelve-cylinder engine of the 12K98MC type. The two-stroke propulsion engine of the size of a multistorey block delivers 93,360 HP.**

The history of the diesel engine as vessel propulsion system is a success story which can scarcely be compared to any other. The principle of the self-igniting engine, which the engineer, Rudolph Diesel, successfully realised for the first time in 1897, is presently still the basis for modern diesel technology.

“All technical systems follow the law of efficiency“, says Professor Dr. Wolfgang Lausch, Marine Division Director of the MAN B&W Diesel Group. Dr. Lausch: “Only if a new system proves to be more efficient than the existing one, will it be able to replace the old system. Transport by ship requires

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a system which propels the vessel quickly and reliably from point A to B, moves the highest possible load at low capital, maintenance and repair costs and pollutes the environment to a minimum. Now as before, the diesel engine is unbeatable in this respect.“

100 years ago, in 1903, not a single vessel was equipped with a diesel engine, although almost 6 years had passed since the successful launching of the new combustion engine of the former Maschinenfabrik Augsburg (later MAN) and Rudolf Diesel had already pointed out the possibility of using his engine for ship propulsion. The first diesel engines were, at that time, by far too heavy for marine applications and were probably not sufficiently efficient, reliable and convenient so that they were exclusively utilised for onshore power generation until 1903.

From 1903, there was no stopping the triumphant march of the diesel engine into the international marine sector. Already at the end of 1910, a total of 34 merchant vessels worldwide were provided with diesel engine propulsion, not to speak of the unknown number of military vessels, above all submarines. Also the first ocean-going vessel, *Selandia*, equipped with B&W four-stroke diesel engines (now MAN B&W), which went on her long maiden voyage “Copenhagen-London-Antwerp-Genoa-Singapore-Bangkok” in 1912, convinced shipbuilders worldwide to continue to focus on the reliable and economic diesel engines as marine propulsion of all types.

### **The diesel continues to dominate**

Everything indicates that alternative technologies will not push the diesel engine out of the marine sector in the near future. Even if new propulsion systems should supersede the economy of diesel engines during the next decades, it will be

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a long road to reach the necessary infrastructure. An alternative to diesel engines are gas turbines which are already in service in the marine sector and move navy vessels, high-speed ferries and various modern cruise vessels. With regard to transport ships, the advantages of gas turbines are faced with aggravating disadvantages: For calculation purposes, a usual shuttle tanker is taken as basis, with a load carrying capacity of 100 000 tons. Fuel and lube-oil requirements amount to 2.2 percent of the total cargo (0.6 percent more than in the case of diesel engines) and the engine maintenance costs amounting to US\$ 30 000 exceed the corresponding costs for diesel engines by approx. 50 percent. Most important are, however, the high fuel and lube oil costs, which amount to US\$ 520 000 and are twice as high as for diesel engine propulsion.

Although the fuel cell has not yet been fully developed as an alternative propulsion system for international shipping, the public makes it appear to be the technology of the future, above all due to its environmental compatibility. Quite a number of problems in connection with this fuel-cell technology must, however, still be solved during the next few years, independent of the fact that purchase costs have to be drastically reduced in order to be able to compete with conventional propulsion engines. Short-term application of fuel cells in the marine sector is only conceivable in niche markets, for example as a replacement for present-day diesel gensets which provide for on-board power supply.

Even if an area-wide infrastructure net will, some day, be available for hydrogen supply: Diesel engines are also able to burn hydrogen at a very high efficiency. This is the result of a theoretical and empirical study carried out over many years and which was presented by the Technical University, Munich,

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in cooperation with MAN B&W Diesel two years ago. As easily as the diesel engine formerly triumphed over the steam engine, the diesel will not disappear from the marine sector.

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