

**MANAGING GLOBAL  
OFFSHORING STRATEGIES**

**– A CASE APPROACH**

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## CHAPTER 7

# MAN B&W Diesel - Managing Licensees in a Globalized World

*This case was prepared by Professor Torben Pedersen and Research Assistant Jacob Pyndt of the Copenhagen Business School. We thank MAN B&W Diesel for their helpful collaboration in developing this case. The case is developed solely as a basis for classroom discussion rather than to highlight effective or ineffective management in administrative situations. Some facts have been disguised to retain proprietary rights. Not to be used or copied without written permission from the authors. Instructors who wish to use this case may contact the authors at [tp.int@cbs.dk](mailto:tp.int@cbs.dk) or [jpyndt@deloitte.dk](mailto:jpyndt@deloitte.dk)*

*Over the last couple of years, Chinese shipyards have been gaining market shares. We need to adopt measures to safeguard our intellectual property rights in China. If we do not take our repercussions, we may jeopardize our position as the leading diesel engine developer in the world. With China's entrance into WTO, the issue at hand is even more evident.* These were the words of Mr. Peter Sunn Pedersen, executive vice-president of MAN B&W Diesel (MBD), a subsidiary of MAN AG in Munich, one of Europe's leading suppliers of capital goods for commercial vehicle manufacturing, mechanical engineering and plant engineering.

MBD's business model was based on selling licenses to engine manufacturers primarily based in Asia. MBD experienced a strong demand for its two-stroke engines in 2004 and, consequently, the licensees' order books were fully booked through 2006. In particular, the industry's manufacturing capacity in China was constantly being expanded. MBD's existing capacities only catered to half of the rapidly growing shipbuilding industry's demand.

Mr. Fritz Pape, vice-chairman of the executive board, added: *Despite positive market trends, we are faced with some challenges as regards to Hyundai. Being our single largest licensee, we need to follow closely its business operations. Although, we generally have had a very constructive relationship with Hyundai, I am a little worried about the prospects that their HiMSEN engine might have set in motion. Nevertheless, it forces us even more to be on the technological forefront on the development of diesel engines.* In 2004,

for the first time in Korea's history, Hyundai managed to build an in-house, medium-speed diesel engine named HiMSEN (Hi-Touch Medium Speed Engine). Although medium speed engines and the two-stroke type varied substantially in terms of size and construction techniques, the possible success of Hyundai's HiMSEN could trigger a feeling of "wanting more" among Asian producers, leading to the production of the enormous two-stroke engines in-house. Hyundai was MBD's biggest licensee constituting 25.8% of MBD's sales of two-stroke engines amounting to approximately DKK 500 million. Given Hyundai's status in combination of the company's recent in-house production development, the potential threat was both significant and evident.

Mr. Sunn Pedersen supplemented: *One way to address the issue could be to strengthen our relationship with the ship owners by enhancing our marketing efforts. If we can enforce our brand image by convincing them of the unique reliability and technological landmarks of our two-stroke engines, we may neutralize the effect of Hyundai efforts to initiate in-house production of two-stroke engines. Yet, at the same time, we need to find shipyards where we can expand business.*

Given these developments, it appeared that 2005 would be a very challenging year for MBD, which was somewhat paradoxical as the majority of shipyards experienced record earnings and orders in 2004. To sustain MBD's business model based on licensees, precautionary measures needed to be adopted to safeguard contractual agreements, particularly in China, and to mitigate the risk of Hyundai entering into in-house production of two-stroke engines.

## **Introduction to MAN B&W Diesel A/S**

The MBD group is the leading supplier of large-bore diesel engines for both marine propulsion and power stations with a unit output of up to 80 MW. With a market share of approximately 75%, the two-stroke and four-stroke engines, based on MBD's design and produced by their licensees are leaders on the world market with regard to the propulsion of large, ocean-going vessels. Moreover, the company is one of the leading suppliers of diesel power stations. The vast majority of MBD engines are produced by licensees, primarily in Asia, while production in Denmark supplies roughly 1% of the world market. The Group Division, with approximately 6200 employees and manufacturing plants in Germany, Denmark, England, and France

achieved an annual turnover of approximately 1.5 billion Euros<sup>1</sup> The parent company, the German MAN Group, has a turnover of approximately 15 billion Euro and 62,000 employees worldwide.

MBD operated primarily two interrelated business areas: 1) sale of licenses, and 2) services, including sales of repair parts and technical services. MBD generated revenue through the license royalties, which in turn increased the potential for the sale of services and components. Secondary business areas included onward sales (resale) of engines, component sales, and the introduction of new features for engines already in operation (see exhibit 1). Although these sources of revenue did not yield a high contribution margin, MBD's resale of engines, in particular, allowed the company to monitor the market, obtain important feedback and increase the foundation for repair part sales. The production of components was thought of as a service towards the licensees.

### *Historical Context - The Market for Shipbuilding and Diesel Engines*

Due to the petroleum crisis in 1973, the worldwide demand for ships fell, rendering it necessary to reduce the worldwide shipbuilding capacity. However, at that moment, the Korean shipbuilders entered into the international market, increasing the excess of supply; a move which had repercussions on the price of ships and extended the crisis' effects in the shipbuilding sector. European shipyards suffered from this situation in a special way: governments had to adopt measures that ultimately closed naval factories. The surviving European shipyards had to undertake important restructuring processes, based fundamentally on: (1) the externalization of their value chain activities, and (2) the subscription to cooperation agreements.

For European shipyards, the result was devastating (see exhibit 2). Measuring the number of ships over 200 GT produced, the European shipyards have gone from producing 819 ships in 1972 to 283 in 2003, while Asian shipyards increased production from 485 to 742 during the same period. The geographical re-orientation of the shipbuilding industry effected where various kinds of engines were produced. While the production of the largest two-stroke engines, which weigh around

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<sup>1</sup> This amount includes all manufacturing facilities in Europe plus participation in various companies, primarily in sales and service subsidiaries in Brazil, Greece, Hong Kong, India, Iran, Japan, Korea, and Malaysia. The income numbers listed in exhibit 1 refer to MBD's Danish operations.

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2200 tons and have a height of over 13 yards (see exhibit 3), largely followed the concentration of the shipbuilding industry in Japan, Korea and China, the production of the smaller four-stroke engine was relatively stable during the period 1960 to 2004 in Europe (see exhibit 2, graph 2).

As the producer of the first commercial diesel engine in 1904, B&W Diesel's history is long and prestigious. The company sold its first license in 1910 to Barclay Curle & Co., Glasgow, and initiated the production of diesel engines for vessels in Copenhagen at the same time. B&W Diesel became the leading builder of two-stroke engines, but like other European companies in the industry, it suffered heavily when the building of large vessels moved to Asia in the 1970's. Two epoch-making events marked the 1980's. In 1980, B&W Diesel filed for bankruptcy and was consequently acquired by MAN AG, which reorganized the diesel engine division. When the European market for two-stroke engine virtually disappeared during the 1980's, MAN Group AG lost a significant portion of their investment. In 1987, the company shifted its strategy from the in-house production of two-stroke engines to engaging licensees.

Although MBD's move, from production to a service-oriented company, constituted perhaps the only strategic avenue at the time, it was filled with uncertainty. By shutting down the production for two-stroke engines in Denmark, it was feared that important production know-how and learning effects would vanish. On a psychological level, shutting down production arguably hampered MBD's self perception in terms of the feeling of having production in the "backyard" where new ideas easily could be tested. In hindsight, the strategic shift was all but unwise. Together with Wärtsilä (former Sulzer), MBD's biggest competitor, MBD was one of only two companies that initiated sale of two-stroke licenses to Asian shipyards. Today, now joined by Mitsubishi whose market share is approximately 6-7%, they are the only players in the market. In regards to the loss of learning effects, Mr. Sunn Pedersen commented: *Of course you attain important learning effects from trial-and-error processes by producing in-house. Yet, in order to realize these benefits you need volume. It is doubtful to what extent learning effects materialize when you produce 1 percent of the world market.*

### *MAN B&W Diesel's Organization: 2005*

The two-stroke engine activities are located in Copenhagen, where R&D, development, design, and testing are undertaken by engineers and designers. The Danish division was headed by Peter Sunn

Pedersen, who had spent 25 years with the company. As a mechanical engineer with a PhD in diesel technology, he joined MBD's R&D department in 1980 and became the department's manager in 1996. He joined the executive board of MBD in Denmark and Germany on July 1, 2001. Mr. Sunn Pedersen had responsibility for the two-stroke business, including two-stroke sales, marketing, license and R&D/engineering (see exhibit 4).

What was unique about MBD was that, the majority of the company's production of two-stroke engines took place at the licensees in Japan, Korea, and China (92%). MBD's business model consisted of an international network of licensees in the large engine sector and worldwide product support with spare parts and repair services.

In order to strengthen its competitiveness, in 2004 MBD decided to restructure the Danish four-stroke business unit located in Holeby, Lolland. This strategic move included a gradual concentration of four-stroke engine activities in Frederikshavn and the phasing out of production in Holeby. The GenSet division was maintained in Holeby. With the new set-up, MBD's facility in Frederikshavn hosted the production of four-stroke engines for propulsion of small ships, complete propulsion plants with gear and propellers, and small two-stroke engines. The R&D, development, design, testing and service areas were still located in Copenhagen.

MBD produced various motor types within the markets of: i) marine power, including two-stroke engines, medium speed engines, high speed engines, GenSets, and propeller equipment, and ii) stationary power, including engines for power generation plants, such as those in areas without an interconnected electrical supply system. MBD's two-stroke engines were built around the MC and ME programs. While the MC program had been the world market leading two-stroke engine program since the beginning of the 1980's, embracing bore sizes 260 mm to 980 mm for propelling oceangoing ships of all types and sizes, the ME program was MBD's newest invention. As opposed to traditional diesel engines where fuel injection was done by camshaft, fuel injection and control of other vital parameters were performed electronically in ME engines. MBD's investments included approximately DKK 100 million, sixty engineers spending 215 man-years, and testing of the prototype of more than 10,000 service hours. The company launched the engine type in 2003 in front of 300 ship owners, shipyard representatives and other business associates from 29 countries. Mr. Sunn Pedersen commented: *This is the first fully commercial step on the way to realizing a long-term vision in our company, the intelligent engine. This event marks the greatest*

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*technical step forward in the technology of large marine diesel engines since our company introduced turbo-charging of such large two-stroke engines in 1952. Technically speaking, the ME engine represents an entirely new innovation which can improve fuel oil economy, which is more gentle on the environment, and which is more reliable in operation (various press releases, www.manbw.com).*

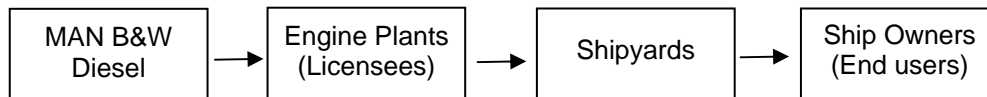
Indeed, two years after the introduction, it seemed that MBD had revolutionized the market. Ole Grøne, vice-president for two-stroke sales and marketing, stated: *The ME order book now comprises far more than 100 engines, which we are very satisfied with. The ME concept has been accepted by our licensees in Japan and Korea, and now also in China and Europe. We can see that owners have taken to the ME engines, and have chosen them for a wide range of ship sizes and types. The first engines have now been in service for about a year, and we have received very positive feed-back. In particular, it has been noted how easy they are to operate, which was one of our main objectives (Diesel Facts 2005, customer magazine).*

With its market share oscillating between 70% and 80%, MBD had a stronghold in the market for two-stroke diesel engines (see exhibit 5). In an industry where volume was a key parameter, Mitsubishi struggled with a market share around 6%. Holding approximately 22% of the two-stroke market, Wärtsilä NSD (New Sulzer Diesel) was MBD's main competitor. Technically speaking, the engines of MBD and Wärtsilä were capable of similar performance. However, MBD managed to sustain a strong brand image, and was perhaps slightly more adaptive and versatile in cooperating with licensees. Ship owners acted rather conservatively when buying ships and engines. Considering the fact that stalled engines on large container vessels were an extremely expensive affair for ship owners (US\$50.000-100.000 per 24 hours), operational reliability was a decisive parameter in determining ship owners buying behavior. If ship owners had good experiences with an MBD engine, they needed strong incentives to swap supplier.

### *MAN B&W Diesel's Interconnected Web of Relationships*

MBD's business model required concerted efforts to navigate and nurture various kinds of relationships with stakeholders and customers, such as shipyards, ship owners, classification societies, authorities and suppliers (see exhibit 6). The production of an engine would typically begin with the ship owner placing an order with a shipyard, specifying what kind of engine to install. In continuation, these specifications were given to the engine plant. The licensee then built the engine

based on a license from MBD. Given that the propulsion engine was the single most important installation on board a vessel, amounting to approximately 1/10 of total production cost, all four steps were involved with each other.



Although ship owners were not the primary customers, their importance could not be neglected as they operated the engines following the purchase. Moreover, ship owners were the ones that placed orders at the shipyards. Hence, nurturing cooperative liaisons with ship owners was essential to maximizing MBD sales. In addition, the ship owners acted as the primary constituents through whom MBD could access information on market trends, allowing the company to adapt to or develop engines suited to the market of the future. Lastly, cooperating with ship owners allowed MBD to test a new engine or component on a ship in service. By testing in a real environmental setting, MBD could attain pivotal statistical data on endurance over a prolonged period, while the ship owners benefited from having frequent visits by MBD specialists during which they could discuss pertinent operational issues. MBD often had 200 ongoing projects on ships in service.

Naturally, the shipyards played an important role in MBD's business model as they ordered the engines for their new buildings from MBD's licensees. Since the main engine was the single largest component to be installed, shipyards gave substantial considerations to aspects such as vibration, noise, engine alignment and heat insulation. MBD strived to assist shipyards in addressing these aspects. According to senior vice-president Mr. Carl-Erik Egeberg: *Engines often have to be tailored to a specific engine room with respect to piping and galleries. Assistance can be given to the shipyards in determining whether, or not, top bracings should be employed, and, if so, what configuration would be the optimal solution* (Diesel Facts 2005, customer magazine).

### *Relationships between Licensor and Licensee*

The lion's share of MBD's diesel engines was produced by company's 14 licensees (see exhibits 7 and 8), while a small fraction, in particular the four-stroke engines, was maintained in-house at Alpha in Frederikshavn, Denmark (see exhibit 9). Running on full capacity,

Alpha produced 70 to 80 four-stroke engines annually. In comparison, STX in Korea produced 700 on MBD's license.

The relationships between MBD and the licensees typically consisted of 10 year agreements. The licensees bought what MBD denominated as a "Design Specification", which included a complete description of the particular engine, all detailed drawings necessary to undertake the production process, quality specifications and production recommendations. The Design Specification was derived from the contract between the licensee and the shipyard. Having bought the license, the licensees were given concessions to make improvements according to existing specifications. However, if licensees wanted to develop new features, they needed to formulate a "list of differences" document and then discuss it with MBD. MBD had to approve differences made, as changes could impact the functionality of spare parts. In addition, licensees were secured access to all updates arriving from MBD headquarters in Copenhagen.

Selling a license was not a one-time-event. MBD cooperated closely with its licensees during the production and commissioning of the engines. As the licensees undertook the production process, and thus possessed considerable production know-how, MBD strove to evaluate every suggestion put forth by the licensees aimed at facilitating cheaper or easier production without compromising the reliability of the engines. To secure support and maximize performance of the production process, MBD had permanent site offices on the licensees' production locations, staffed with 2 to 5 production, operational and design experts from Copenhagen on rotational basis. Licensee staff members were also sent to Copenhagen to engage in technical discussion and training.

A license agreement also specified sales territories in which engine plants were allowed to sell. Normally, these concessions were linked to the specific country in question, but in some instances allowances were given to a Korean licensee to sell in an outlying territory like Taiwan. MBD was allowed to sell engines everywhere.

Engineering, together with R&D, was responsible for collaborating with MBD's licensees (see exhibit 4). While the two design departments were in charge of creating design specifications for the licensees, the engineering service department's main tasks included maintaining contact with shipyards, classification societies, authorities and suppliers, as well as handling the construction of maintenance tools and procedures. Communication channels between the design and engineering department had been established to incorporate potential restrictions or changes in new engine designs. Production support assisted both the licensees during production and the shipyards

during installation, updating production recommendations and quality specifications on a continual basis. Lastly, the department of operations was responsible for assisting the licensees and shipyards during commissioning and the handling of guarantee claims.

It was one thing to sell the critical know-how to licensees who undertook the production process, but another to maintain and service the engine when it was operational. A critical element of the licensee relationship, and a source of revenue for MBD, was service and spare parts (see exhibit 1). MBD operated 20 service centers in strategically wise locations, such as main ports accessible for vessels with large two-stroke engine installments, on six continents (see exhibit 10). By being represented across the globe, MBD could offer technical service to large vessels with MBD engines regardless of their location. These services typically included the overhaul of engines and installation of spare parts, as well as technical assistance for troubleshooting, in which case MBD went onboard to identify and solve mechanical problems. In addition to the service centers, MBD had a net of 55 authorized repair shops and 48 spare parts agents that, in some locations, functioned in juxtaposition with the service centers. It was MBD's belief that by providing access to authorized repair shops and spare parts around the globe, the use of unauthorized repair parts would be minimized. In addition, the network would provide the necessary technological know-how to conduct overhaul operations.

## **Hyundai Heavy Industries (HHI)**

Launching Korea's shipbuilding industry in a small village in 1972, Hyundai Heavy Industries (HHI) has grown into the world's leading shipbuilder. For a long time, HHI was part of the conglomerate Hyundai Group. However, in 2002 it went independent, striving to become the world's leading company in the heavy industries field. Today, HHI consists of six business divisions: 1) Shipbuilding, 2) Offshore & Engineering, 3) Industrial Plant & Engineering, 4) Engine & Machinery, 5) Electro Electric System, and 6) Construction Equipment.

Constituting 46.6% of sales, HHI's shipbuilding division was by far the largest business area (see exhibit 11, graph 2). As the world's largest shipbuilder, it was capable of building virtually all types of ships, and operated nine large-scale docks and six huge Goliath Cranes. The division's major clients included European ship owners, such as the Danish conglomerate AP Møller and Hapag-Lloyd of Germany. Despite fierce competition from Japanese and Chinese

shipbuilders, HHI's shipbuilding division benefited from the booming shipping industry, which led ship owners to increase investment in shipbuilding in response to the increasing quantity of containers transported, in particular, to and from China. Specifically, HHI's shipbuilding division received new orders for 104 ship or 6.9 million Gross Tonnes in 2004, with a total value of US\$8.5 billion. The growth in order-intake resulted in HHI's largest backlog of unfinished or unfilled orders ever, with 213 ships worth US\$14.0 billion. This created a stable workload for HHI through 2007 next three years (HHI annual report 2004). For instance, in October 2004, HHI received the single largest vessel order in Korean shipbuilding history from British Petroleum (BP) for eight liquefied natural gas carriers (LNG) worth US\$1.5 billion. The carriers which were to be installed with dual fuel diesel electric engines each measured 288 meters in length, 44.2 meters in width and 26 meters in depth and traveled at a maximum speed of 20 knots.

Although the Engine & Machinery division comprised only 8.3% of the group's total sales in 2004, it was the world's largest marine diesel engine manufacturer with a 35% share of the global market. The division built roughly 150 two-stroke engines a year. Moreover, combining its two decades of experience in engine building, Hyundai developed Korea's first in-house, medium-speed diesel engine named, HiMSEN in 2004. Besides two stroke, four stroke, and HiMSEN engines, the division's major products included propellers and crankshafts, marine steam turbines and turbochargers, diesel power plants, industrial robots, and industrial and marine pumps. From the perspective of MBD, Hyundai's Engine and Machinery division and the Shipbuilding division were critical in terms of filling MBD orders.

In 2004, the increase in the construction of large-size containerships led to a strong demand for engines. The increasing demand for ships in general would keep HHI's shipbuilding division busy for the next three years but it also added pressures to raw materials costs. Driven by a strong demand for steel in 2004, HHI experienced a 70% increase of the price of steel plates. As steel plates normally constituted 18% of a shipbuilder's total costs, it could impact operating margins considerably.

After reporting net losses in 2001 and 2002, HHI registered a net profit in 2003 of US\$109.1 million and US\$35.2 million in 2004. To restructure the organization and improve operating margins, Yu Kwan Hong was appointed CEO in March 2004. Mr. Yu had a reputation as Korea's top turnaround expert. He had overhauled HHI's most problematic divisions: the construction-equipment division between 1999 and 2002, and then Mipo Dockyard, HHI's ship repair subsidiary

between 2002 and 2004. In terms of HHI's general operations, Mr. Yu needed his skills in managing the company's weak business model. While shipbuilding, engine and machinery, and construction equipment (HHI's core business lines) all had experienced robust growth in operating profitability, the non-core business areas like industrial plant, offshore and engineering, and electro/electric systems were largely non-profitable (see exhibit 11).

### *MAN B&W Diesel and Hyundai Heavy Industries*

MBD's relationship with Hyundai began in 1976, and by 2004, the company was the largest MBD licensee, with 25.8% of total sales of two-stroke engines. The company was the largest marine diesel engine builder with around 35% of global market share, maintaining an annual engine production capacity of 7.2 million bhp (brake horsepower) for marine and stationary uses. Evidently, the positive development in the shipbuilding market and, particularly for large-size tankers and container vessels strengthened the demand for two-stroke engines and, thus, MBD's core business.

The relation between MBD and HHI carried many connotations. HHI was simultaneously a customer, a collaboration and development partner, a competitor (in selling component/spare parts), and a supplier (MBD buying components and engines). Throughout the years, MBD managed to nurture and balance this complicated, yet lucrative, business relationship. MBD's abandonment of in-house production of two-stroke engines in 1987 had made cooperation with licensees even more critical.

Despite the constructive relationship, MBD was concerned that HHI would liberate itself gradually in order to initiate in-house production of two-stroke engines based on its own design specifications. Historically, there had been some talk among HHI executives of launching their own production of two-stroke engines, but these considerations had not materialized into concrete actions. According to MBD representatives, this was due to the high quality of MBD engines and the conservative purchasing behavior of ship owners. MBD enjoyed a solid brand image which created substantial barriers to entry. However, with order books filled for the next three years, HHI could introduce its own two-stroke engine risk-free. They could offer their in-house version at a lower price and, if customers declined it, they could always rely on their position as an MBD's licensee.

Recent developments consolidated HHI's position as the world's leading engine manufacturer and gave rise to concerns within MBD as how to take further precautions to preserve access to the world's

largest shipyard. In August 2000, HHI commenced production of HiMSEN four-stroke engine. HHI had traditionally built medium-speed diesel engines on MBD's license. However, the HiMSEN engine was developed as the division's proprietary model, incorporating valuable experiences and technical know-how derived from two decades of manufacturing diesel engines. Following type approval certificates from eight classification societies in 2001/2002, the engine was selected as a "world-class product" by the Korean Ministry of Commerce, Industry and Energy, a selection which underlined the high level of quality. HiMSEN engines and MBD's two-stroke engines differed substantially in size and horsepower. Still, HHI's success with the HiMSEN engine, which sold 600 units in a short period of time, could trigger a feeling of expanding capabilities and resources among HHI executives, which may then begin developing in-house versions of two-stroke engines.

MBD estimated that to restart full-scale production of two-stroke engines in Denmark, an investment in the range of US\$70-80 million would be required. A volume of 20 engines per year must be reached to reach break-even. At the same time, for HHI to initiate proprietary two-stroke production, the company would need critical resources in terms of financing and technological knowledge. HHI would have to pool resources from its existing business divisions to facilitate the expansion. With respect to the financial issue, the situation was more doubtful. Specifically, the restructuring of the ailing conglomerate suffering from reckless expansion with business divisions bleeding red ink to a more focused company had to deliver results for HHI to support investments (see exhibit 11).

## **Intellectual Property Rights Protection in China**

With growing sales of licensees to China, MBD was increasingly concerned with how they could safeguard design specifications. As such, selling licenses as a means of subsistence was a fragile business construct. 25 years ago, MBD did not consider filing for patents to be an effective way of protecting intellectual property rights (IPR). This way of thinking had certainly changed. MBD obtained approximately 25 basic patents on a yearly basis. The patent protection of technical solutions helped to ensure the company's leading position in relation to engine-building competitors and unauthorized spare parts suppliers. MBD established its own patent department that, apart from administrating the company's patent portfolio, also monitored and reacted to the patent activities of its competitors. The current patent

portfolio consisted of roughly 160 different systems of patent applications, which had been disseminated into more than 600 national patent applications or patents in over 30 countries (MBD annual report 2003).

In fact, MBD was capable of filing for a larger number, but each new idea needed to pass the “commercialization test” - if it did not appear that the idea would be commercialized within the short or medium term, MBD would simply publish it in an unknown newspaper. By publishing the idea, it hampered competitors’ efforts to take that specific patent. Over the years, MBD had closed one Danish production due to violations of MBD IPR. In addition, MBD had already received a forewarning years ago as Mitsubishi actually initiated production back in the 1960’s on the basis of a single-engine license sold by MBD. Mitsubishi held approximately 6% of the global two-stroke license sale.

However, when expanding engagement with Chinese licensees, MBD felt that the conventional battery of patent and trademarks were insufficient. Although, China’s central government was working relentlessly to fight the lack of regard for commercial property protection, by modernizing trademark, patent and copyright laws in a manner similar to international standards, poor enforcement at the local levels largely rendered these progresses ineffective. It was not expected that these inconsistencies would improve in the short term as local officials directly or indirectly profited from illegal production and sales. Reports published by consulting firms stated that no industry could feel safe operating in China. For instance, a recent survey carried out by the Commercial Times found that 56% of vehicle users in China had found counterfeit components in their vehicles, which underlined the scope of the problems and the necessity of handling the issue.

What caught MBD’s attention in particular was the high level of counterfeit sophistication in which local incumbents imitated valuable design elements or production features. As opposed to direct piracy, where local manufactures replicate an established foreign product and try to fool the customers into believing that they are buying the original item, the high end imitation was much more difficult to identify and, thus, complicated litigation.

For MBD, the stakes were indeed high. The company’s three licensees in China comprised together close to 10% of MBD’s total sale of two-stroke licenses, and the percentage was expected to substantially due to the Chinese engine plants’ competitive prices and the Chinese central government declared ambition of being the number one shipbuilding nation in the world by 2015. Apart from the direct loss of revenue, the indirect cost of hurting brand equity appeared

more devastating. If, for instance Chinese licensees were to market copycat engines based on MBD's design specifications, MBD's strong brand image may be diluted on the market.

Protecting IP rights in China, MBD faced the challenge of shifting from ad hoc and piecemeal efforts resulting in fire brigading to a more pre-emptive, proactive and comprehensive process. MBD needed to find the balance between following the market in low cost regions versus protecting IPR. This question was how this could be done. Within the executive board, there was a sentiment that to start dealing with these issues, MBD needed to diligently gain an understanding of the company's inherent vulnerabilities. Discussing potential protection mechanisms, MBD operated with four methods: 1) product protection, 2) process protection, 3) HR methods, and 4) legal protection. While the legal safeguards would always be in play, one way to strengthen this mechanism was to work more closely with law enforcement and customs authorities. HR remedies, such as signing non-disclosure agreements with key personnel or increasing compensation, did not constitute a real option, as MBD - a licensor - did not enjoy ownership of the power plants. Product protection meant adopting measures that obscured attempts to attain full functionality if replicated or if opened for re-engineering. These measures could also involve maintenance protections, i.e. services that required authorization. Lastly, process production measures focused on the methods of manufacturing. The possibilities here included working with licensees on customized designs in order to monitor the process, or more dramatically, to compartmentalize the entire production process and/or leave a vital production step/component out of the Chinese licensees' facilities. In fact, MBD maintained the production of key components within the two-stroke business, including the production of fuel pumps, high-pressure pipes, exhaust valves, piston crowns, FIVA valves, cylinder covers, fuel valves and Alpha lubricators, in Denmark. However, over the years the licensees had developed similar production capabilities and were now competing directly with MBD in this area. Nullifying IP violation risks was not a straightforward task, partly because MBD was also dependent on the licensees for their pivotal knowledge of production process optimization and their suggestions for other kinds of improvements that MBD subsequently implemented in new engine designs and specifications.

## **Suggested Literature**

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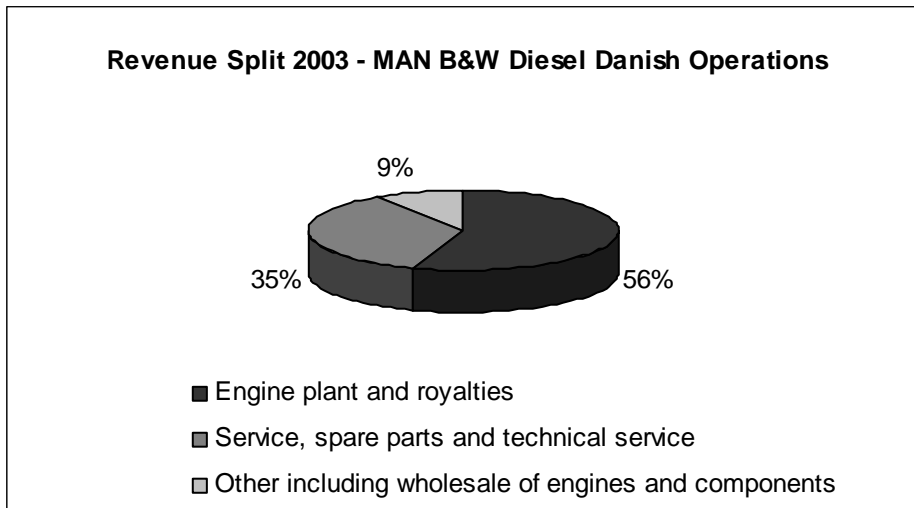
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*Exhibit 1: MAN B&W Diesel A/S Danish Operations - Financial Highlights 1999-2004*

<b>MAN B&amp;W Diesel A/S - Financial highlights and key ratios 1999-2004</b>						
	<b>99/00</b>	<b>2000<sup>2</sup></b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
<b>Revenue from sales (DKK million)</b>	3140	1682	3937	3675	3552	4350
Result from operating activities	210	129	498	379	334	257
Financial items	6	3	8	(1)	3	6
Taxes	(65)	(42)	(142)	(104)	(94)	(65)
<b>Result of the year</b>	151	90	364	274	243	198
Total assets	2149	2031	2492	2126	2223	2496
Cash flows from operations	165	34	355	295	451	232
Investments in tangible assets	88	33	75	73	45	40
Dividend	120	60	446	200	180	373
Shareholders' equity after dividend	1004	1034	952	1025	1086	912
New orders	3746	2644	4493	2871	4941	6340
Orders in hand	2390	3337	3850	2540	3884	5874
<b>Key Ratios (%)</b>						
Return on sales	7	8	13	10	10	6
Return on equity	16	18	35	38	32	26
Equity ratio	47	51	38	48	49	37
R&D ratio	11	9	9	10	10	9
Average number of personnel incl. trainees	2283	2258	2354	2308	2249	2322
Revenue from sales per employee (DKK '000)	1375	1490	1672	1592	1579	1873

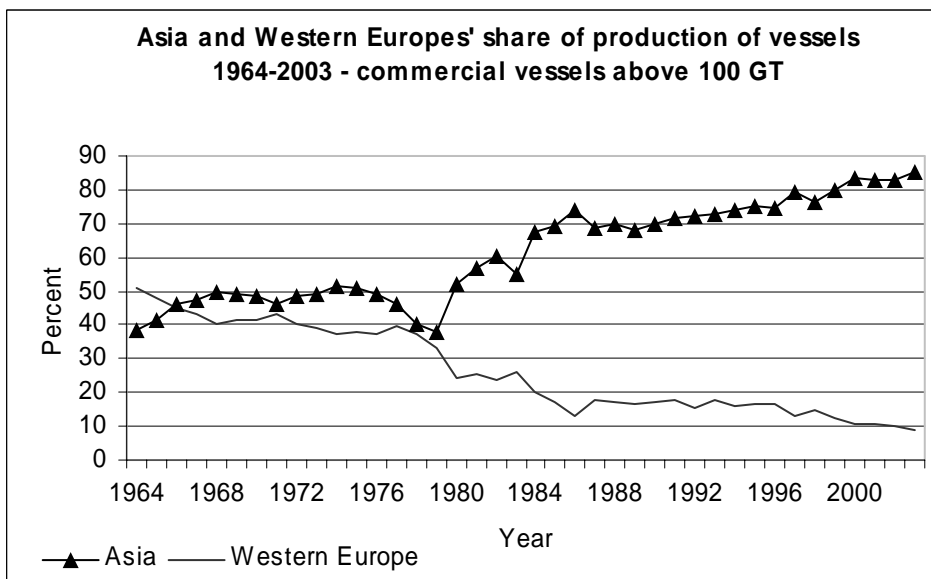
<sup>2</sup> The period includes six months (1/7-31/12 2000).

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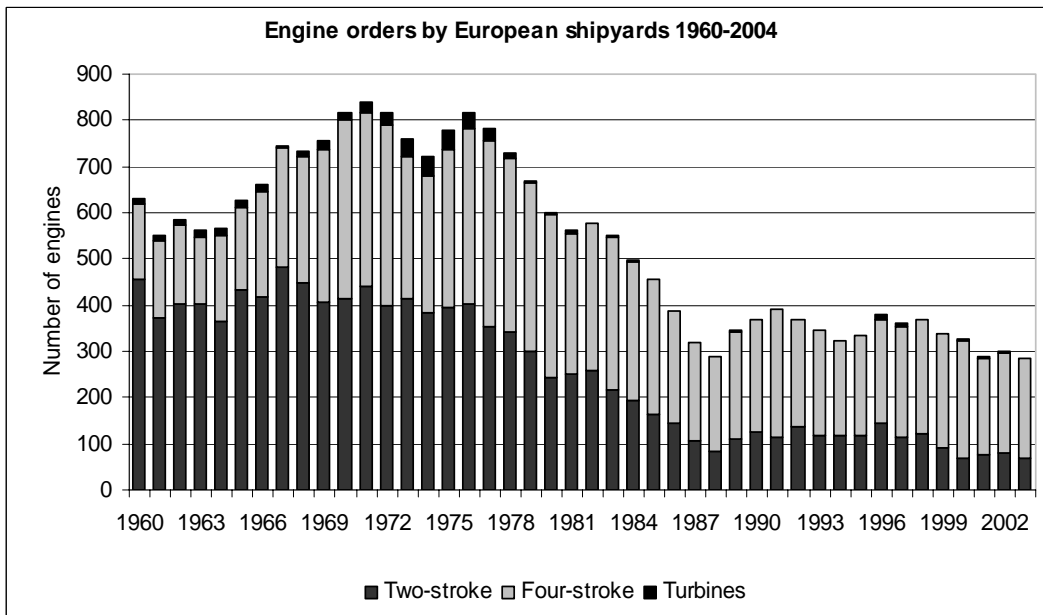


*Source: Annual reports, various issues*

*Exhibit 2: Prime Shipbuilding Countries & Engine Preferences 1960-2004*

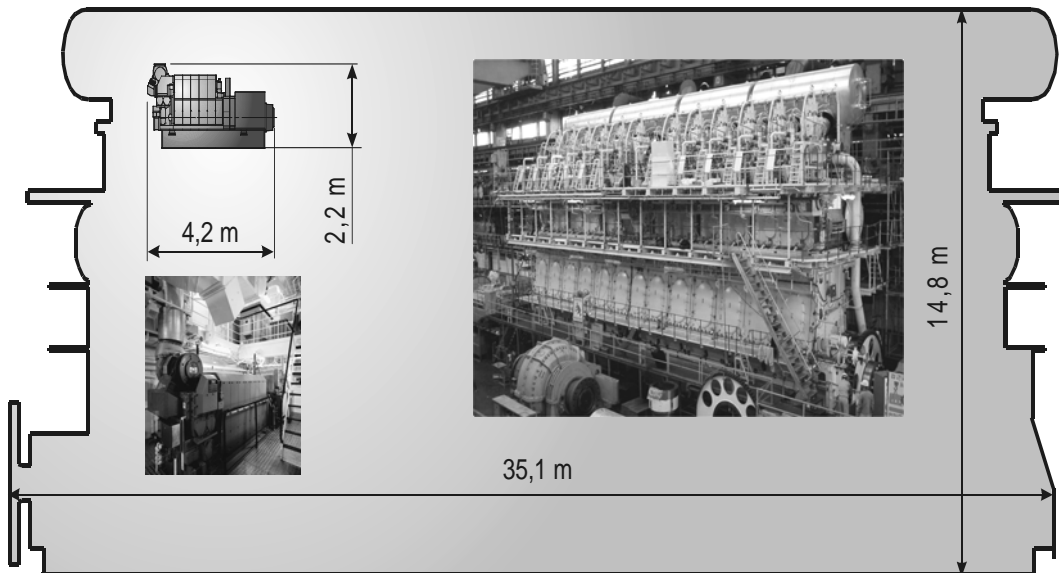


*Source: Lloyd's Register "World Fleet Statistics"*



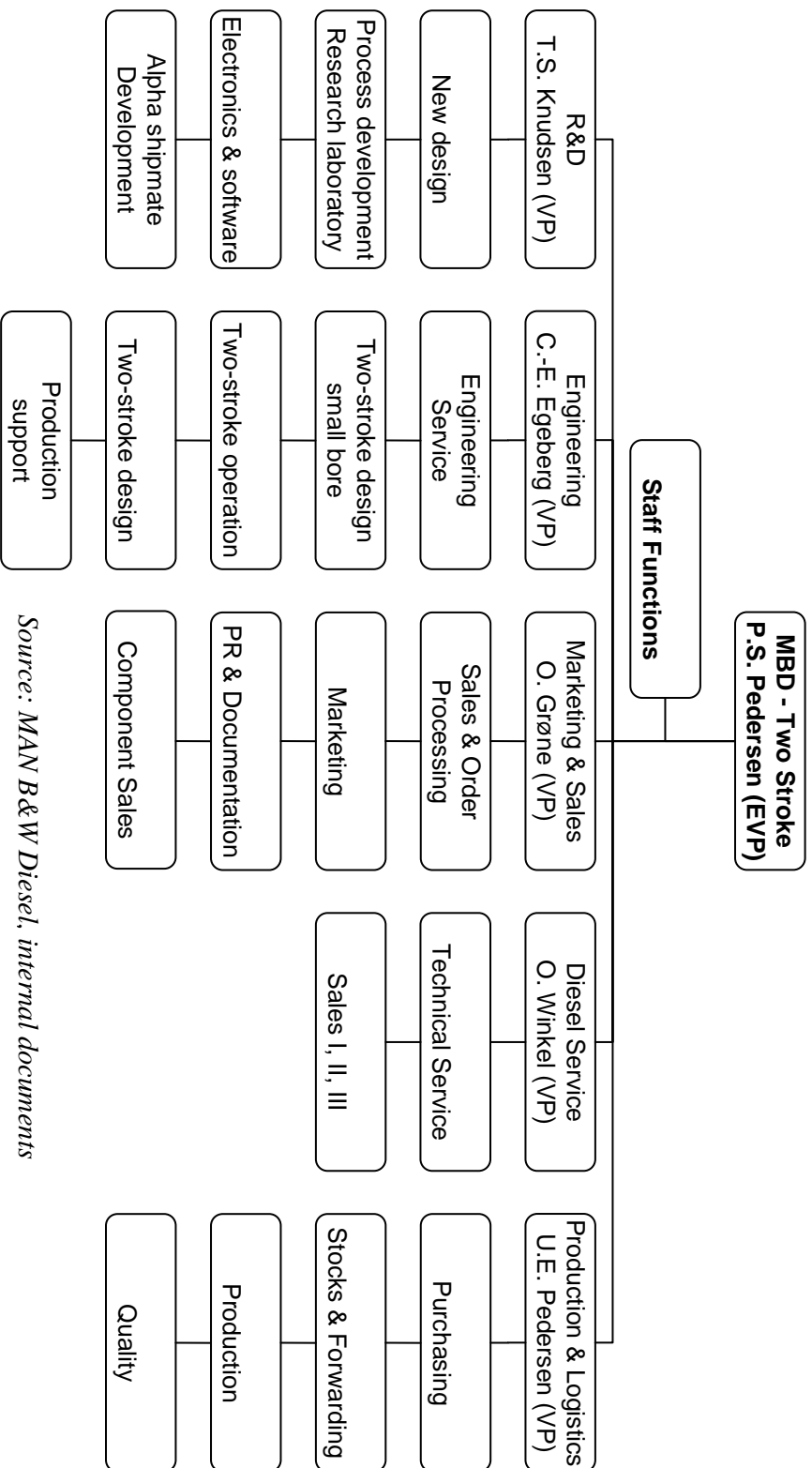
Source: Lloyds' Register /Fairplay

Exhibit 3: Engine Power Dimensions from 450 kW (5L16/24) to 102.960 kW (18K98MC)



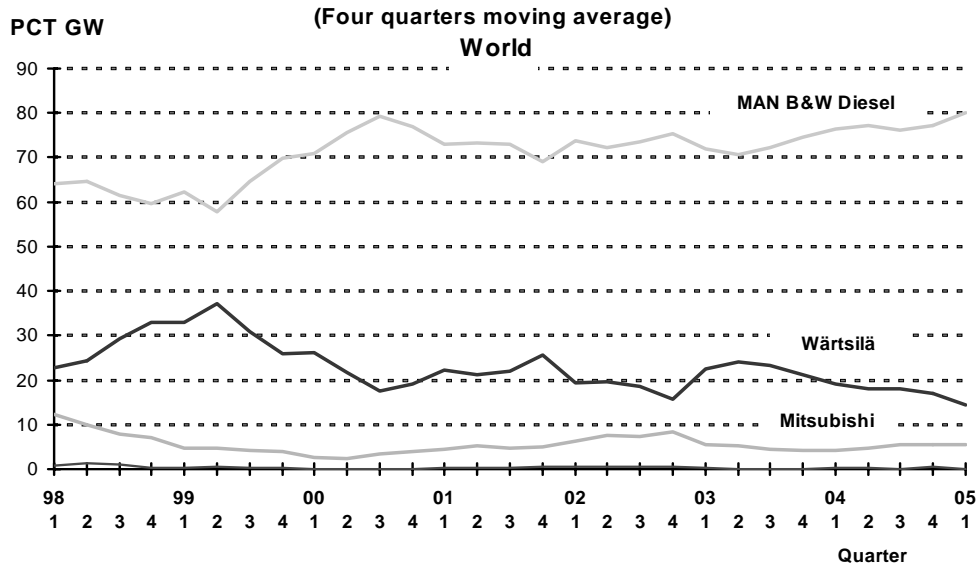
Source: MAN B&W Diesel, internal presentation

Exhibit 4: Organization MAN B&W Diesel A/S Two-stroke Business Unit



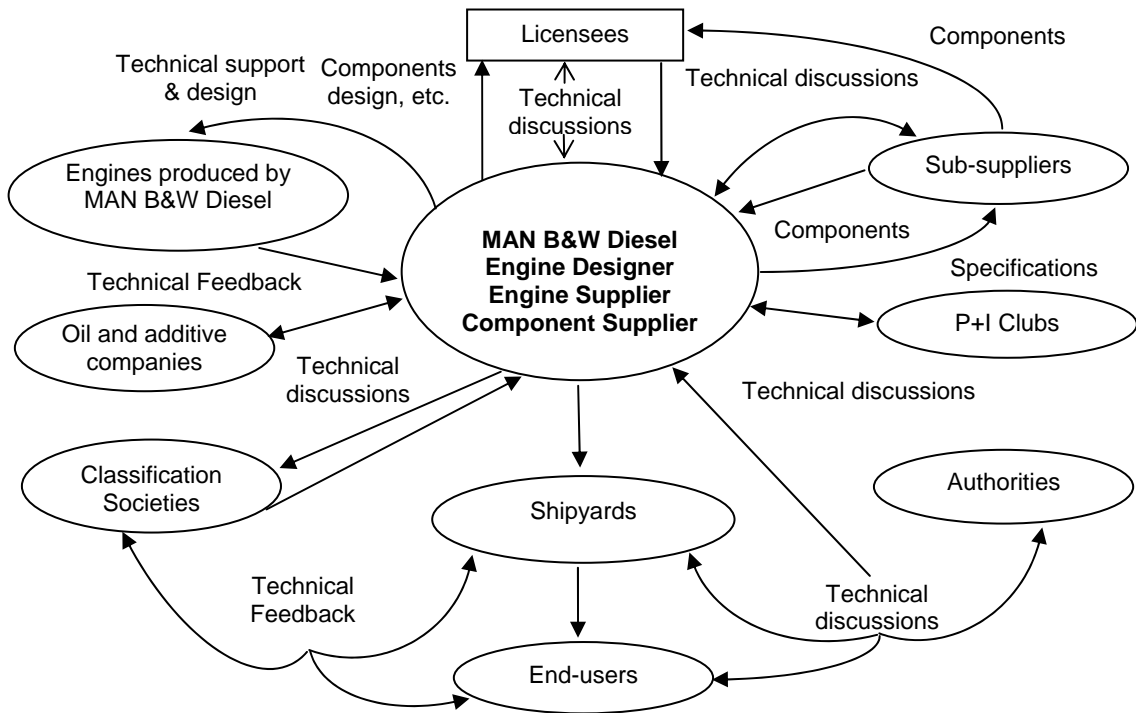
Source: MAN B&W Diesel, internal documents

Exhibit 5: MAN B&W Diesel A/S Market Share 1998-2005



Source: Lloyd's Register-Fairplay

Exhibit 6: MAN B&W Diesel's Web of Interests



Source: Diesel Facts

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*Exhibit 7: MAN B&W Diesel A/S – Overview of Two-stroke Licensees*

<p><b>China</b> Hudong Heavy Machinery (WT) 1980 ▪ Shanghai HHM 1994 Dalian Marine Diesel Works (WT)1980 Yichang Marine Diesel (WT)1989</p>	<p><b>Croatia</b> Uljanik (MF) 1954 Split (MF) 1984</p>
<p><b>South Korea</b> Hyundai Heavy Industries (MF, WT)1976 Doosan Engine Co. (MF, WT)1983 STX Engine (MF) 1984</p>	<p><b>Japan</b> Mitsui 1926 ▪ Makita 1981 Hitachi (WT) 1951 Kawasaki (MF) 1981</p>
<p><b>Poland</b> Cegielski (MF, WT, WF) 1959</p>	<p><b>Russia</b> Bryansk (MF) 1959</p>
<p><b>Spain</b> IZAR-Manises (MF, MT) 1941</p>	<p><b>Explanation</b> MF = MAN B&amp;W Diesel Four-stroke licensees WT = Wärtsilä Two-stroke licensees WF = Wärtsilä Four-stroke licensees MT = Mitsubishi Two-stroke licensees</p>

*Exhibit 8: Order books of MAN B&W Diesel's Licensees as of March 2005*

<b>Licensee</b>	<b>kW</b>	<b>Share (in percent)</b>
Alpha	313,810	1.3
Bryansk	76,860	0.3
Cegielski	1,054,404	4.4
Dalian	640,490	2.7
Doosan Engine Co.	5,229,000	21.7
Hitachi	1,397,830	5.8
Hudong	1,329,445	5.5
Hyundai	6,229,710	25.8
Kawasaki	1,139,020	4.7
Manises	225,330	0.9
Mitsui	3,743,175	15.5
Split	213,300	0.9
STX	2,006,930	8.3
Uljanik	228,020	0.9
Yichang	284,760	1.2
<b>Total</b>	<b>24,112,084</b>	<b>100</b>

*Source: MAN B&W Diesel, internal presentation*

*Exhibit 9: MAN B&W Diesel- Overview of European Locations and Functions*

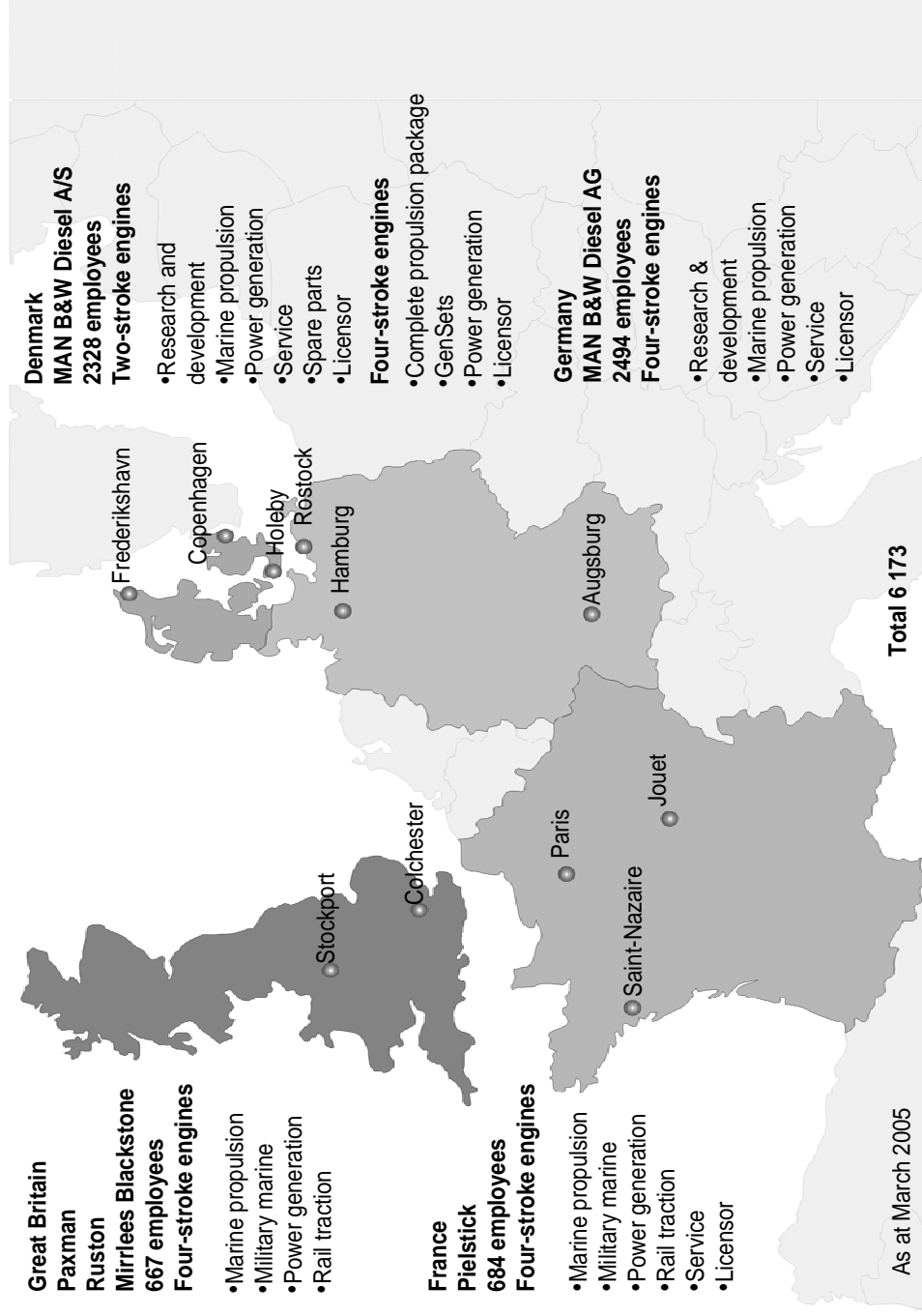
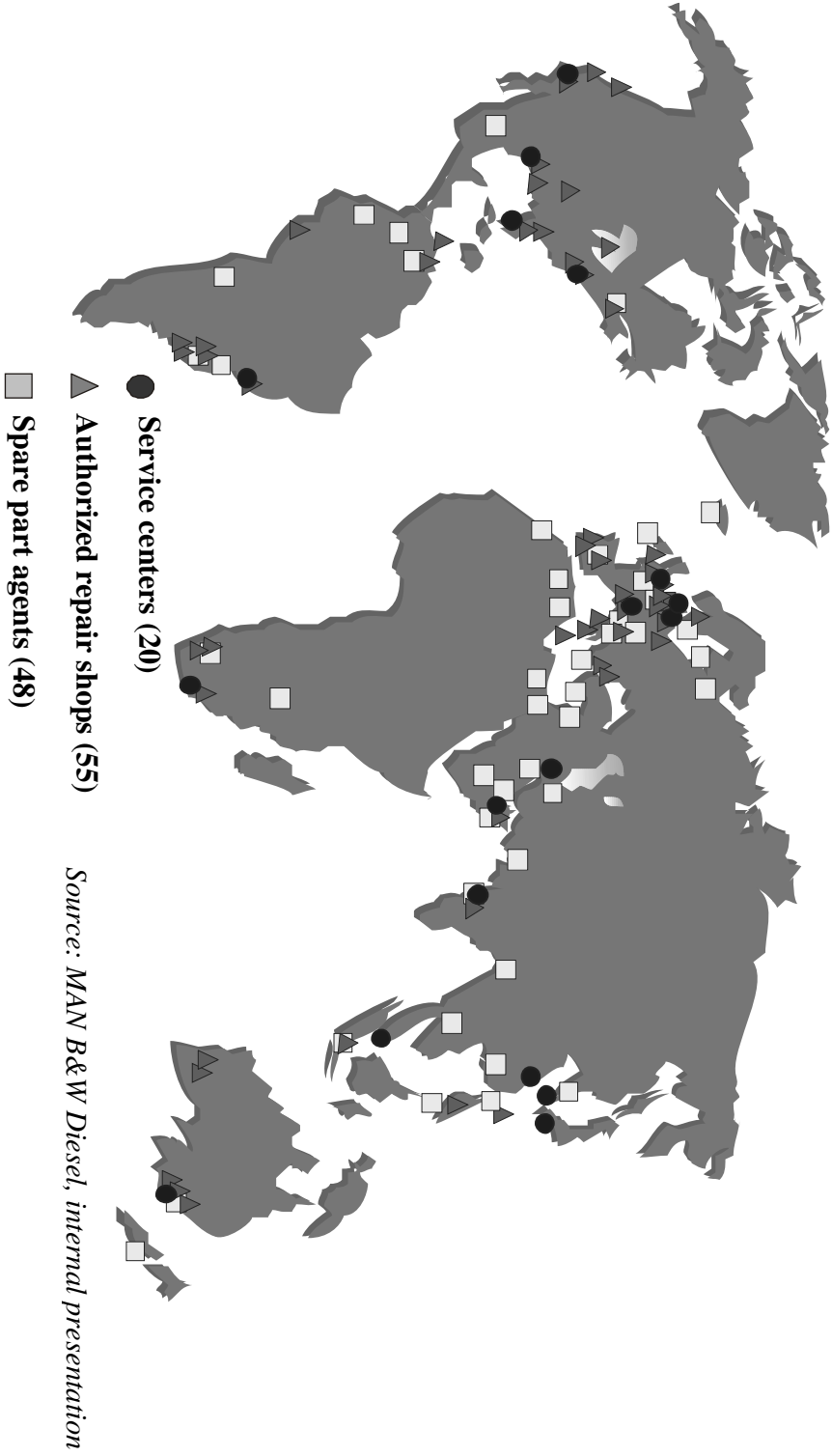


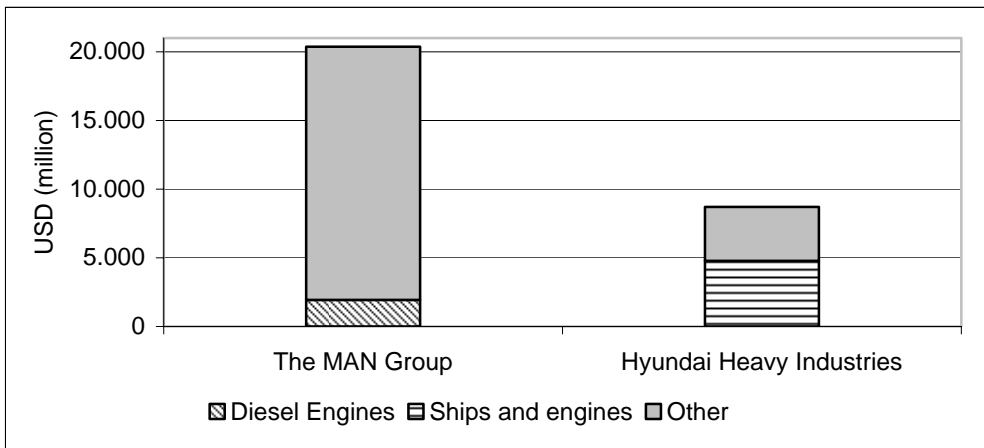
Exhibit 10: Worldwide Overview of MAN B&W Diesel's Service Centres and Repair and Spare Part Agents



*Exhibit 11: Hyundai Heavy Industries – Trends of Operating Profits and Sales 2002-2004. Comparison of Business Divisions*

<b>Hyundai Heavy Industries - Financial highlights and key ratios 2002-2004</b>						
<b>(US\$ million)</b>	<b>2004</b>	<b>Change y/y &amp; margin (%)</b>	<b>2003</b>	<b>Change y/y &amp; margin (%)</b>	<b>2002</b>	<b>Change y/y &amp; margin (%)</b>
<b>Shipbuilding</b>						
- Sales	4053,84	12.6	3600,69	1.4	3552,02	-2.0
- Operating profit	-73,96	-1.8	224,28	6.2	267,20	7.5
<b>Offshore &amp; Engineering</b>						
- Sales	1448,07	22	1187,39	-11.3	1339,34	39.7
- Operating profit	-1,92	-0.1	-1,05	-0.1	-39,76	-3.0
<b>Industrial Plant &amp; Engineering</b>						
- Sales	588,91	-6.1	627,04	-30.9	907,17	60.8
- Operating profit	-112,28	-19.1	-120,81	-19.3	31,23	3.4
<b>Engine &amp; Machinery</b>						
- Sales	719,39	4.5	688,25	21.9	564,48	-3.6
- Operating profit	58,34	8.1	69,36	10.1	66,30	11.7
<b>Electro Electric Systems</b>						
- Sales	789,90	0.04	790,29	-6.4	844,03	-3.7
- Operating profit	-10,54	-1.3	-20,98	-2.7	36,88	4.4
<b>Construction Equipment</b>						
- Sales	990,13	22.3	809,73	67.5	483,52	29.5
- Operating profit	42,92	4.3	96,57	11.9	47,52	9.8
<b>Others</b>						
- Sales	113,05	4.7	107,97	5.6	102,22	-7.5
- Operating profit	3,45	3.1	15,62	14.5	13,70	13.4
<b>Total Sales</b>	<b>8703,30</b>	<b>11.4</b>	<b>7811,36</b>	<b>0,2</b>	<b>7792,78</b>	<b>9.9</b>
<b>Total Operating Profit</b>	<b>-93,98</b>	<b>-1.1</b>	<b>262,98</b>	<b>3.4</b>	<b>423,07</b>	<b>5.4</b>

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*Source: Hyundai Heavy Industries & The MAN Group, annual reports 2004*