

2nd completely revised edition!

The new Diesel Engine Book

DIESEL I ENGINES

for ship propulsion and power plants

FROM 0 TO 100,000 kW

2nd revised edition



Kees Kuiken

DIESEL II ENGINES

for ship propulsion and power plants

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Target Global Energy Training

DIESEL ENGINES

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This second edition of a two-part book on diesel engines is intended for all who work with diesel engines for maritime propulsion and power generation:

- Maritime training institutes and maritime universities
- Maintenance and reconditioning companies
- Shipping companies deep-sea, inland, towage, dredging and heavy-load cargo
- Insurance companies, classification bureaus, surveyors
- Shipping industry suppliers, suppliers of engine parts, fuel and lubricating oil
- Engine manufacturers and dealers
- Power Plants

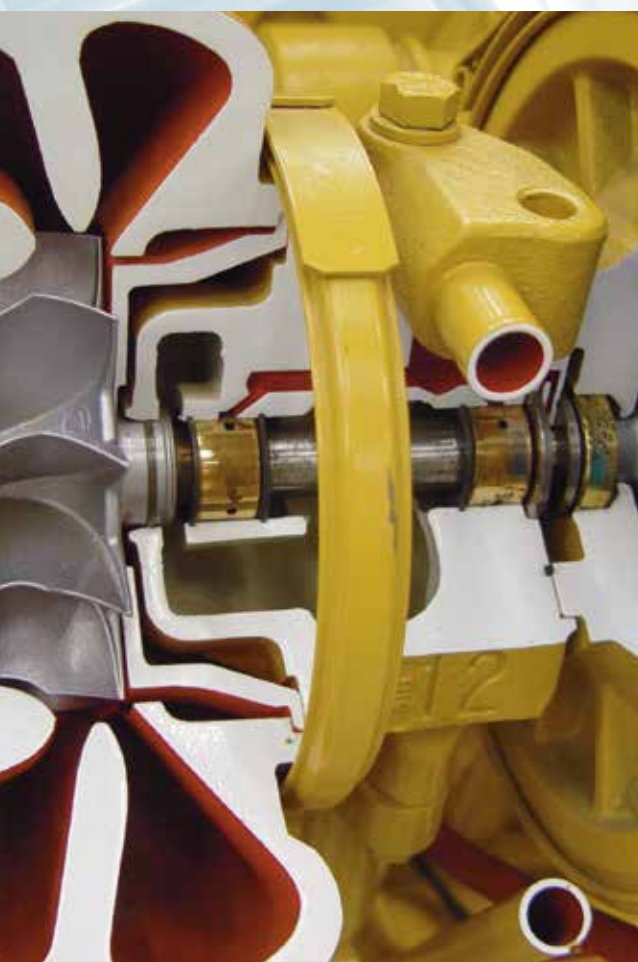
When compiling this book, a practical approach was chosen using ample authentic graphic material with detailed explanations allowing the reader to gather pertinent information without laboriously going through the main text.

Important subjects: common-rail systems, emissions, materials, casting and forging of parts, vibrations, propellers, fuel problems, dual-fuel engines, reconditioning, regulations for testing diesel engines.

Leading companies and institutes have contributed to the realisation of this book by providing information, photographs and interviews. Ninety per cent of the more than 2000 pictures are in colour.

The English edition is used by a large number of well-known Maritime Institutes and companies, i.a.

Companies: ABB (Switzerland), ABC (Belgium), Alfa Laval Benelux (The Netherlands), Atlanship S.A. (The Netherlands), Bolier MaK (The Netherlands), Brittany Ferries (France), CMA Shipping (France), Caterpillar MaK (Germany), Cummins Holland (The Netherlands), DNV (Worldwide), Detroit Diesel (The Netherlands), Discom Silencers (The Netherlands), DNV Petroleum Services, (The Netherlands), Germanische Lloyd (Worldwide), Goltens Rotterdam (The Netherlands), Goltens (Dubai), JR Shipping (The Netherlands), Kelvin Hughes Limited (United Kingdom), Kristen Navigation (Greece), Lauritzen (Denmark), Lloyd's Register (Worldwide), Machine Support (The Netherlands), Maersk Ship Management (The Netherlands), MAN Diesel & Turbo – Prime Service (Denmark), MAN Diesel AG (Germany), Mark van Schaick Crankshaft Repair (The Netherlands), Paul Klaren OEM Parts (The Netherlands), S.M.T. Seaway Supply (The Netherlands), VAF Instruments (The Netherlands), Wagenborg Shipping (The Netherlands), Wärtsilä Service Stations (Worldwide), Wärtsilä (Switzerland).



Maritime Institutes: Chalmers Maritime Academy (Goteborg, Sweden), Faroese Maritime Engineer College (Faroer Islands, Denmark), Gdynia Maritime Academy (Poland), Kalmar Maritime Academy Kalmar (Sweden), Maine Maritime Academy (Pleasant St. Castine, USA), Maritime Academy Geneva (Italy), Maritime Institute Antwerp (Belgium), Maritime Institute Michiel de Ruyter (Flushing, The Netherlands), Maskinmesterskole Aarhus (Denmark), Maskinmesterskole Fredericia (Denmark), Maskinmesterskole Lyngby (Denmark), Massachusetts Maritime Academy (Buzzards Bay, USA), Norwegian Training Institute Manila (Philippines)

Since the first edition over 5000 books have been ordered.

Preface to the second completely revised edition

Based on feedback from various users of the first edition of this book, including companies in the diesel engine field, maritime institutes and shipping companies, we decided to add a number of topics to the second edition. It became apparent that many users had an interest in certain subjects, but were not in the position to visit these particular businesses to learn how certain components are manufactured or repaired. Therefore, the following topics have been added:

- The manufacture of pistons, valves, cylinder liners and gear drives for the larger four-stroke and two-stroke crosshead engines. *MAHLE GmbH, Märkisches Werk GmbH, M. Jürgensen GmbH & Co KG and others.*
- A damage report of a four-stroke medium-speed diesel engine. *Target.*
- A report on the manufacture of crankshafts. *Maschinenfabrik Alfing Kessler GmbH.*
- The excessive wear on cylinder liners in two-stroke crosshead engines, called 'scuffing'. *Maersk.*
- Slower sailing larger vessels to save fuel, the so-called 'slow steaming'. *MAN Diesel AG*
- Future improvements in propulsion efficiency and the reduction of CO₂ emissions by ships. *MAN Diesel AG.*
- A third example in ship propulsion; a vibration analysis for two engines driving a single propeller. *Wärtsilä Switzerland Ltd.*
- An overview of the market share 2010 of diesel engine manufacturers worldwide. *MAN Diesel AG.*
- The Hercules Project, a collaboration between various parties, including the engine manufacturers for the purpose of improving efficiency and reducing emissions. *Target.*
- A new thrust measurement system. *VAF Instruments B.V.*
- The theoretical background of and damage to bearings. *Bearing Group, Miba Gleitlager GmbH.*
- A new method for the alignment of amongst others, engines and shafts. *SKF Marine Service Centre.*
- Additional theoretical calculations for the aeration of engines. *Maritime Institute 'Willem Barentsz'.*
- Additional theoretical calculations of the efficiencies of engines. *Maritime Institute 'Willem Barentsz'.*
- Improvements to both images and text. *Target.*

Both volumes consist of 568 pages each.

Price of one book (two parts), 2013, € 145,- exclusive of packing and shipping costs. Discounts for orders over 25 books. Maritime Institutes and Technical Schools up to 20% discount. Both parts will be sealed and delivered in heavy-duty carton packaging at cost price.



3.2.12 Special air compressor




3.2.12.1 Special air compressor
 This special compressor is used for the production of compressed air. It consists of a compressor and a storage tank. The compressed air is used for various purposes, such as for the production of compressed air for the engine.




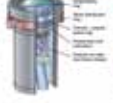





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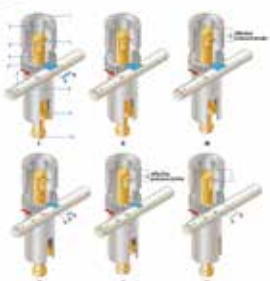
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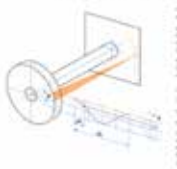
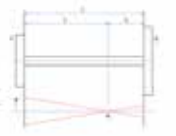
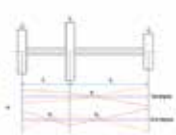







3.2.15 Special air compressor
 This special compressor is used for the production of compressed air. It consists of a compressor and a storage tank. The compressed air is used for various purposes, such as for the production of compressed air for the engine.








11.17 Example 2: Jet fuel splashes

1. **Problem description:** The task is to analyze the splash behavior of jet fuel under various conditions. The experimental setup includes a nozzle, a fuel tank, and a collection tray.

2. **Experimental results:** The results show the splash height and diameter for different nozzle diameters and fuel temperatures. The splash height increases with nozzle diameter and decreases with fuel temperature.

3. **Conclusion:** The splash behavior of jet fuel is significantly influenced by the nozzle diameter and the fuel temperature. Higher temperatures result in lower splash heights, while larger nozzle diameters result in higher splash heights.

11.18 Example 3: Jet fuel splashes

1. **Problem description:** The task is to analyze the splash behavior of jet fuel under various conditions. The experimental setup includes a nozzle, a fuel tank, and a collection tray.

2. **Experimental results:** The results show the splash height and diameter for different nozzle diameters and fuel temperatures. The splash height increases with nozzle diameter and decreases with fuel temperature.

3. **Conclusion:** The splash behavior of jet fuel is significantly influenced by the nozzle diameter and the fuel temperature. Higher temperatures result in lower splash heights, while larger nozzle diameters result in higher splash heights.

11.19 Example 4: Jet fuel splashes

1. **Problem description:** The task is to analyze the splash behavior of jet fuel under various conditions. The experimental setup includes a nozzle, a fuel tank, and a collection tray.

2. **Experimental results:** The results show the splash height and diameter for different nozzle diameters and fuel temperatures. The splash height increases with nozzle diameter and decreases with fuel temperature.

3. **Conclusion:** The splash behavior of jet fuel is significantly influenced by the nozzle diameter and the fuel temperature. Higher temperatures result in lower splash heights, while larger nozzle diameters result in higher splash heights.

11.20 Example 5: Jet fuel splashes

1. **Problem description:** The task is to analyze the splash behavior of jet fuel under various conditions. The experimental setup includes a nozzle, a fuel tank, and a collection tray.

2. **Experimental results:** The results show the splash height and diameter for different nozzle diameters and fuel temperatures. The splash height increases with nozzle diameter and decreases with fuel temperature.

3. **Conclusion:** The splash behavior of jet fuel is significantly influenced by the nozzle diameter and the fuel temperature. Higher temperatures result in lower splash heights, while larger nozzle diameters result in higher splash heights.

11.21 Example 6: Jet fuel splashes

1. **Problem description:** The task is to analyze the splash behavior of jet fuel under various conditions. The experimental setup includes a nozzle, a fuel tank, and a collection tray.

2. **Experimental results:** The results show the splash height and diameter for different nozzle diameters and fuel temperatures. The splash height increases with nozzle diameter and decreases with fuel temperature.

3. **Conclusion:** The splash behavior of jet fuel is significantly influenced by the nozzle diameter and the fuel temperature. Higher temperatures result in lower splash heights, while larger nozzle diameters result in higher splash heights.

11.22 Example 7: Jet fuel splashes

1. **Problem description:** The task is to analyze the splash behavior of jet fuel under various conditions. The experimental setup includes a nozzle, a fuel tank, and a collection tray.

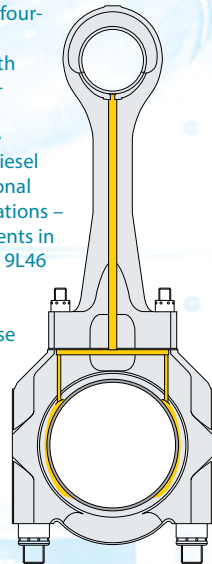
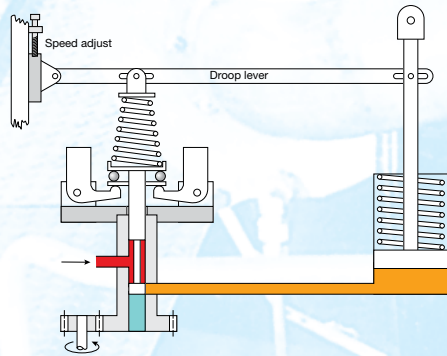
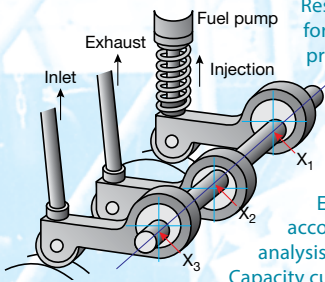
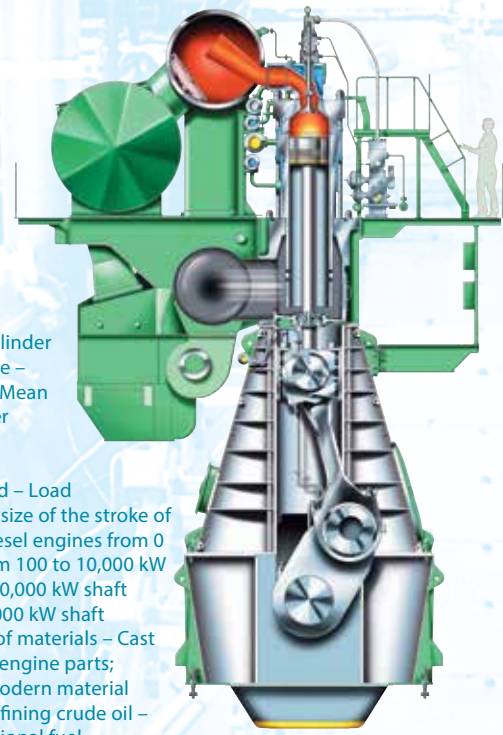
2. **Experimental results:** The results show the splash height and diameter for different nozzle diameters and fuel temperatures. The splash height increases with nozzle diameter and decreases with fuel temperature.

3. **Conclusion:** The splash behavior of jet fuel is significantly influenced by the nozzle diameter and the fuel temperature. Higher temperatures result in lower splash heights, while larger nozzle diameters result in higher splash heights.



Book 1

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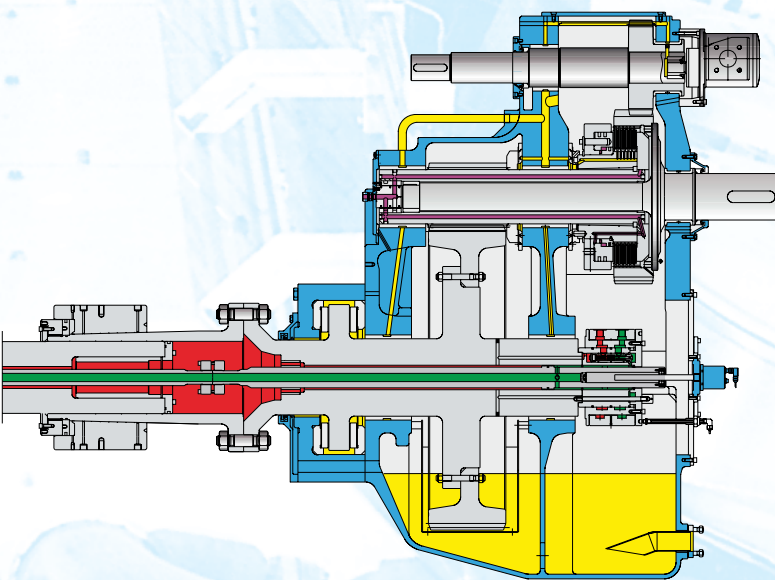
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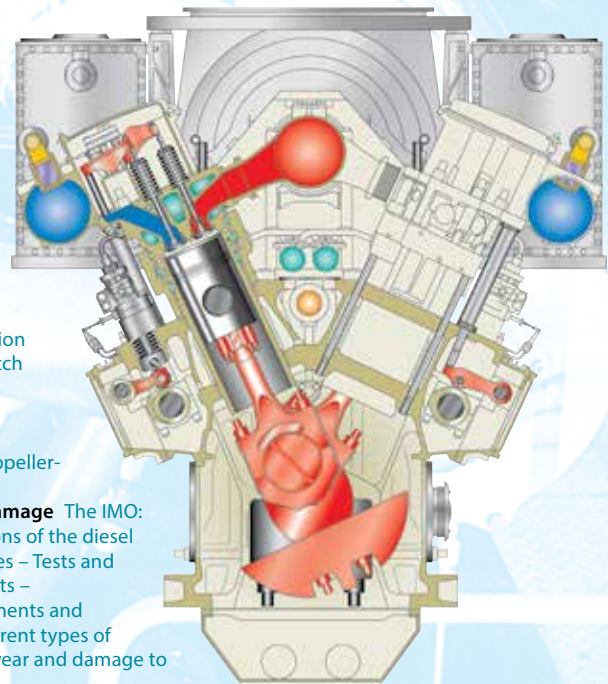
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The author

Kees Kuiken started his career in 1963 by enrolling as a marine engineering student at the Hogere Zeevaartschool, Terschelling, The Netherlands.

After graduation he joined the United Dutch Shipping Company (Verenigde Nederlandse Scheepvaartmaatschappij, VNS).

In 1978, he went on to become a lecturer in marine engineering at the Hogere Zeevaartschool in Delfzijl and Groningen, and also worked in the mechanical engineering and operational technology departments. His was passionate about building a large and advanced practical lab for both intermediate and higher maritime education, as well as for trade and industry.

In 1995 he founded the European Training Centre for engine technology, the ETM, an educational foundation.

In 2000, he left regular teaching and established Target Global Energy Training.

The company conducts training sessions worldwide in diesel- and gas-engine technologies, gas- and steam turbines, compressors and cogeneration.

Furthermore, Target provides solutions for a myriad of technical problems and publishes books and manuals.

All the training programs are tailor-made and given on location.

In 2008 the first edition of the English version came on the market, 'Diesel engines for ship propulsion and power plants', and now in 2013 the second English version of this book.

This book can be ordered directly from
Target Global Energy Training.
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For additional information:
www.targettrainingcentre.nl
www.dieselengines.nl
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