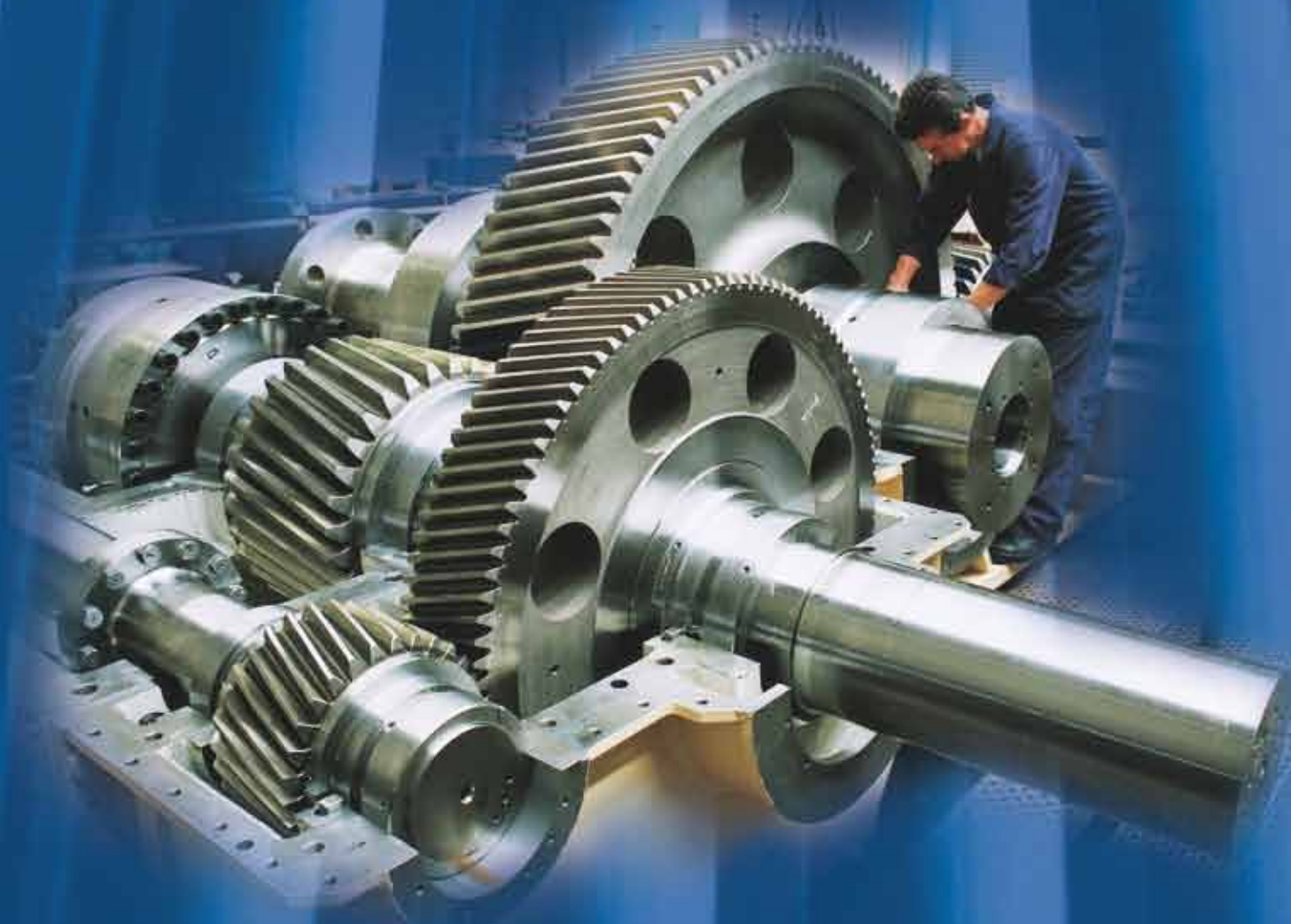


**DAMEN**

DAMEN SCHELDE GEARS

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**GEAR UP WITH OUR TECHNOLOGY!**



## GEAR UP WITH OUR TECHNOLOGY !

Damen Schelde Gears (DSG) is a technology driven company specialised in support, consultancy and problem solving for all technical and commercial aspect of gears and other rotating equipment.

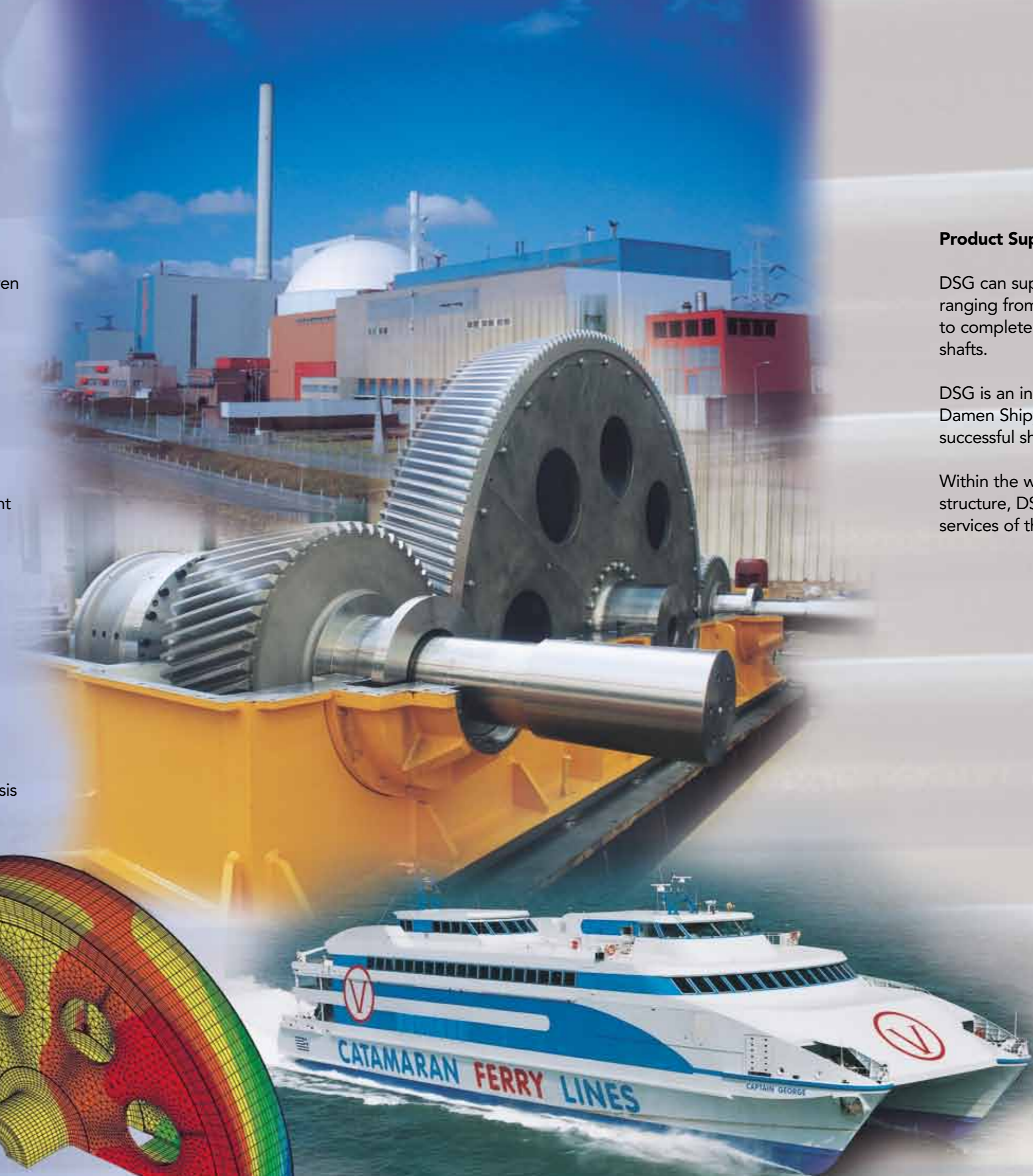
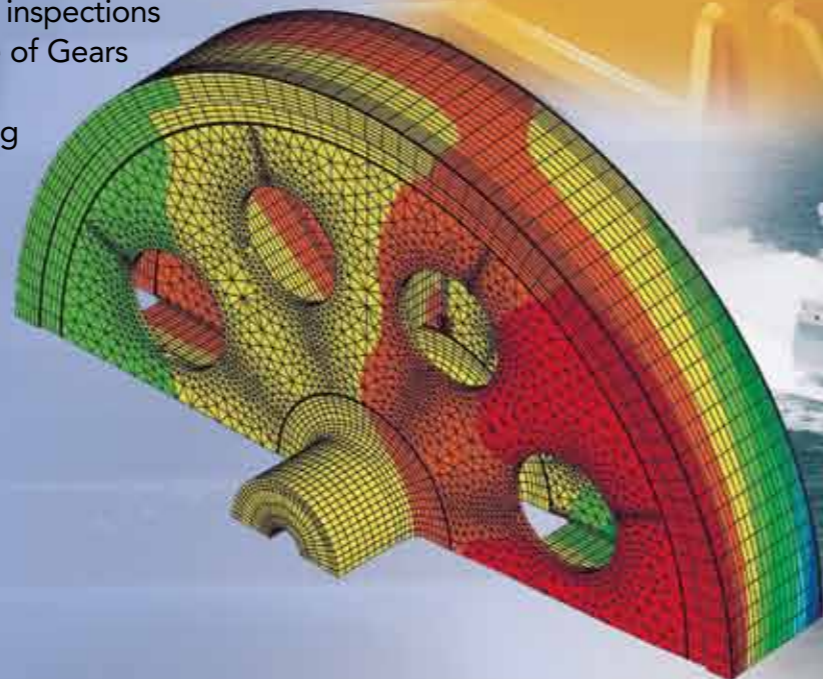
DSG has an extensive experience of more than 90 years in the design and production of main propulsion gears for naval and merchant marine applications.

Over the years more than 335 naval and merchant ships have been equipped with propulsion gears designs from DSG.

For gear designs, technical services, analysis and calculations our technical services include the following:

### Engineering and Field Services

- Gear Designs for Manufacture under License
- Consulting
- Design Review
- Specialised Structural Analysis
- Computer-based System Simulation and Analysis
- Vibration measurement and Analysis
- Gear Alignment and Overhaul Supervision
- Gear repair, overhaul and inspections
- Expertise on Performance of Gears
- Failure Analysis
- Assistance on Gear Testing



## Product Supply

DSG can supply all spare parts for gears ranging from simple instrumentation parts to complete gear wheels, bearing sets and shafts.

DSG is an independent company within the Damen Shipyard Group, one of the most successful shipbuilders in the Netherlands.

Within the wider framework of the Group structure, DSG has access to corporate services of the Damen Shipyard Group.

## Engineering

DSG has a team of highly skilled engineers specialised in the design of merchant marine and low noise naval propulsion gears. Our activities range from straightforward calculation and consulting services to complete gear designs for manufacturing under license.

In our designs and analyses we use engineering principles based on long years of practice in research and development, in designing, building and testing of gears and gearbox systems. Computers play an important role in the design of high precision and low noise gears. Finite element analysis (FEM) techniques provide the means to accurately evaluate the effect of applied loads on rotating components and casings. Software packages for the calculation of gear geometry and dynamic bearing displacement and specially developed in-house programs for tooth flank corrections are used to achieve the perfect gear design.

Our capabilities regarding computer analysis and simulation are not restricted to gear technology; our Computational Engineering Unit has extensive experience in the whole field of mechanics, covering mechanical, flexibility, thermal and dynamic analysis of structures, flow dynamics for gas and fluid covering fluid dynamics, heat transfer and transport analysis. Besides commercially available tools for FEM and CFD calculations we also have an extensive library of specialised proprietary software and codes for design and analysis.

With this technological capability we have an excellent basis to meet specific customer requirements and to achieve the most economic solutions.



## Gear Designs for Merchant Vessels

For merchant vessels DSG has an extensive design experience in standard SISO or DISO reduction gear designs for propulsion gears for a wide range of applications, for fixed as well as controllable pitch propulsion systems and waterjet propulsion systems on board of:

- Cruise Liners and Fast Ferries with diesel, gas turbine or electric drives
- Fast Catamarans
- Roll-on Roll-off vessels
- Tankers
- Containerships

Depending on the application, the gear system can be designed with features such as:

- Light-weight design
- Low-noise design
- Integrated main thrust bearing
- External thrust bearing
- Built-in wet plate friction clutches
- Built-in self synchronising clutches
- Integrated lube- and clutch control oil systems
- Instrumentation for unmanned machinery spaces
- Power take off / take in arrangements
- Turning gear
- Shaft locking system
- Shaft brakes for input and/or output shafts
- Resilient mounting system
- Integrated or external sump

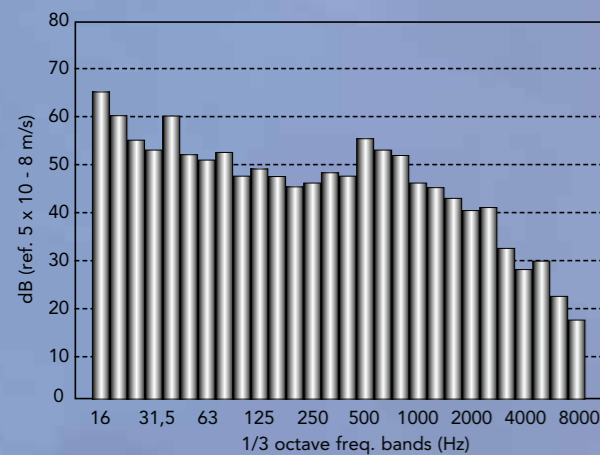
## Gear Designs for Naval Vessels

Our naval application experience covers the full spectrum of propulsion alternatives currently in use on board of naval vessels:

- Gears for all combinations of diesel, gas turbine, steam turbine and electric drive such as:
  - CODAD : Combined Diesel and Diesel
  - CODOE : Combined Diesel or Electric
  - CODOG /CODAG: Combined Diesel and / or Gas turbine
  - COGOG /COGAG : Combined Gas turbine and / or Gas turbine
  - Gear systems with a cross-connect gear

Our gear designs feature every aspect of modern technology essential to the development of a warship propulsion system: high efficiency and reliability, optimised weight, shock resistance, controlled acoustic and vibration characteristics and, of course, cost effectiveness.

We can provide transfer of technology and crew training for the development of national naval capabilities.



## Field Services

We operate around the world providing service onboard vessels or on plant location. Many years of experience in the field ensure thorough knowledge of applications and practical insight.

Our main activities are marine propulsion gear repairs, overhauls, inspections and failure analysis. Commitment to quality and class requirements, even for complicated tasks on site, is our key competence.

Vibration and acoustic measurements can be carried out, coordinated and evaluated on all type of rotating equipment. With our experience in the installation, commissioning and trials of marine propulsion gears we can assist during acceptance tests to several parties such as ship owners, shipyards, gear makers or classification societies. Our services include failure analysis, gear expertise and supervision of gear alignment, gear production, acceptance testing with load tests or no-load tests. We can also provide training of ship's crew for the proper operation and routine inspections of gears.

In Vlissingen (The Netherlands) we have a well equipped workshop for inspection and repair of gear parts. For new parts we have several manufacturing partners who work according our high quality standards gained by many years of cooperation.

# DAMEN

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