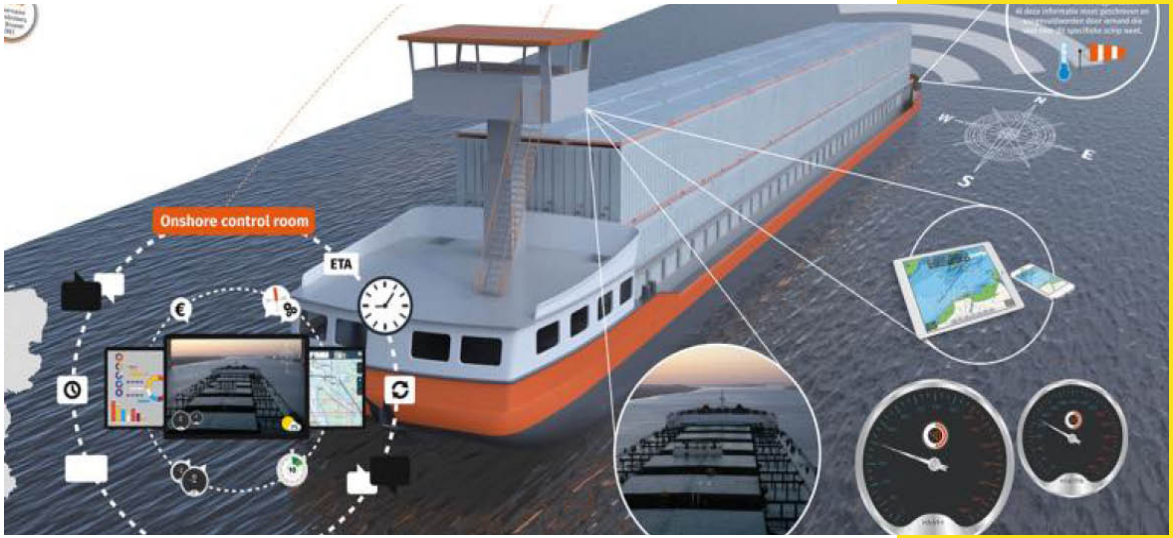
Rijkswaterstaat
Ministerie van Infrastructuur en Milieu

Smart Shipping

technical aspects

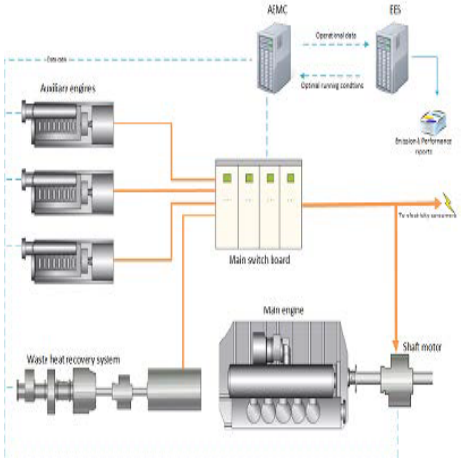


Content of the presentation

- Current state of the fleet
- Developments
- Challenges
- End remarks

Current state of the fleet

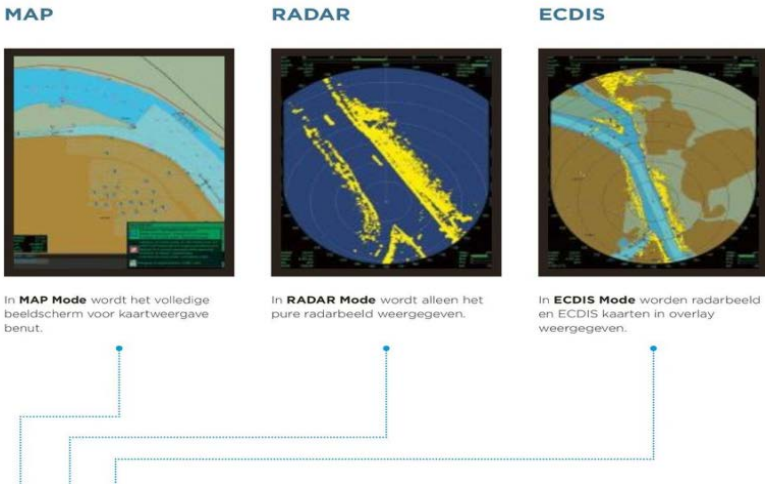
- Propulsion
- Navigation
- Communication
- Process monitoring

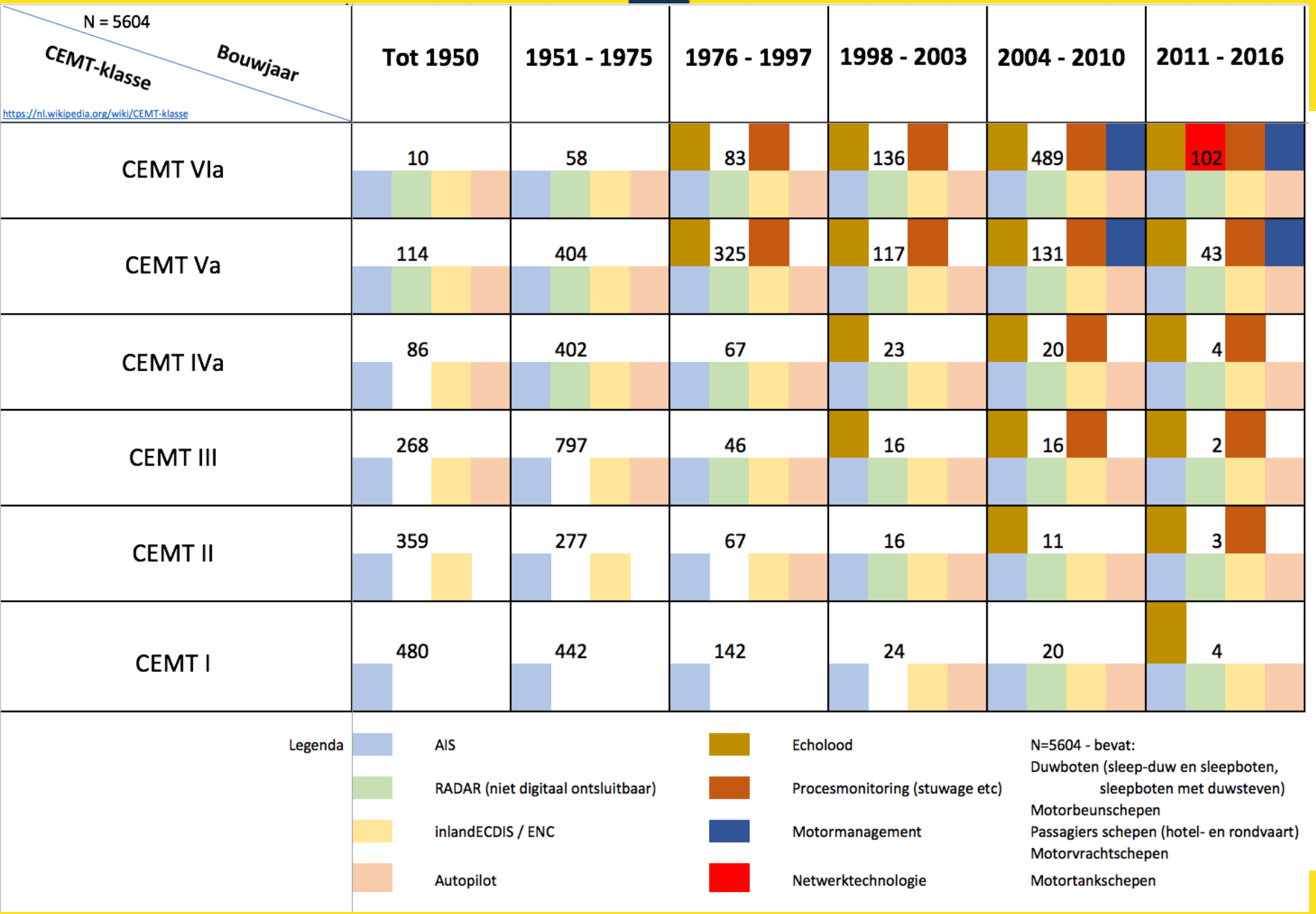


Improved technical systems

Less off-hire

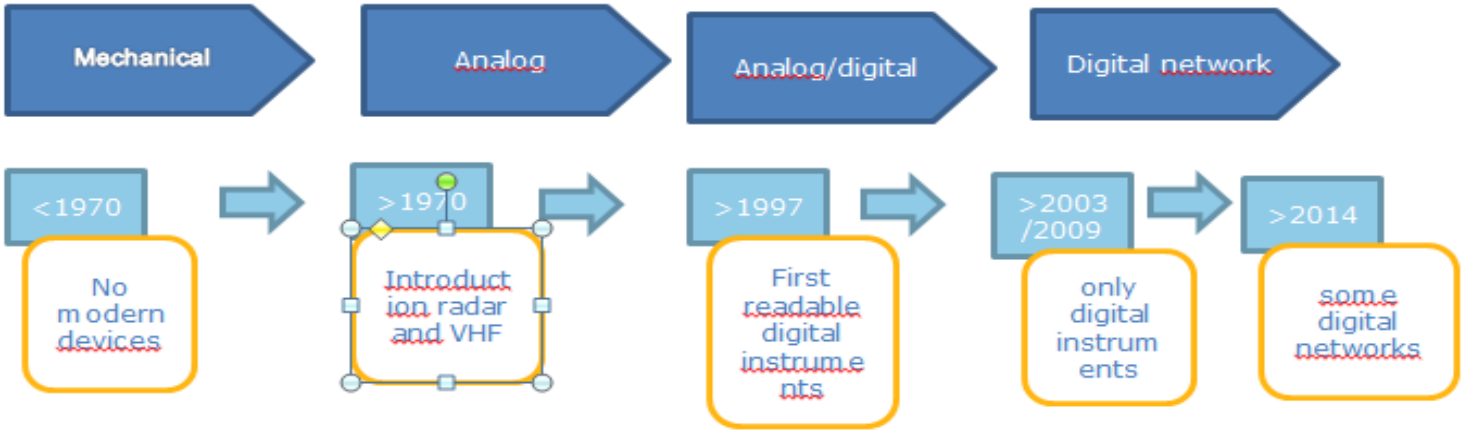
Better efficiency




N = 5604
CEMT-klasse
Bouwjaar
https://nl.wikipedia.org/wiki/CEMT-klasse
Tot 1950
1951 - 1975
1976 - 1997
1998 - 2003
2004 - 2010
2011 - 2016
CEMT VIa
10
58
83
136
489
102
CEMT Va
114
404
325
117
131
43
CEMT IVa
86
402
67
23
20
4
CEMT III
268
797
46
16
16
2
CEMT II
359
277
67
16
11
3
CEMT I
480
442
142
24
20
4
Legenda
AIS
RADAR (niet digitaal ontsluitbaar)
inlandECDIS / ENC
Autopilot
Echolood
Procesmonitoring (stuwage etc)
Motormanagement
Netwerktechnologie
N=5604 - bevat:
Duwboten (sleep-duw en sleepboten, sleepboten met duwsteven)
Motorbeunschepen
Passagiers schepen (hotel- en rondvaart)
Motorvrachtschepen
Motortankschepen

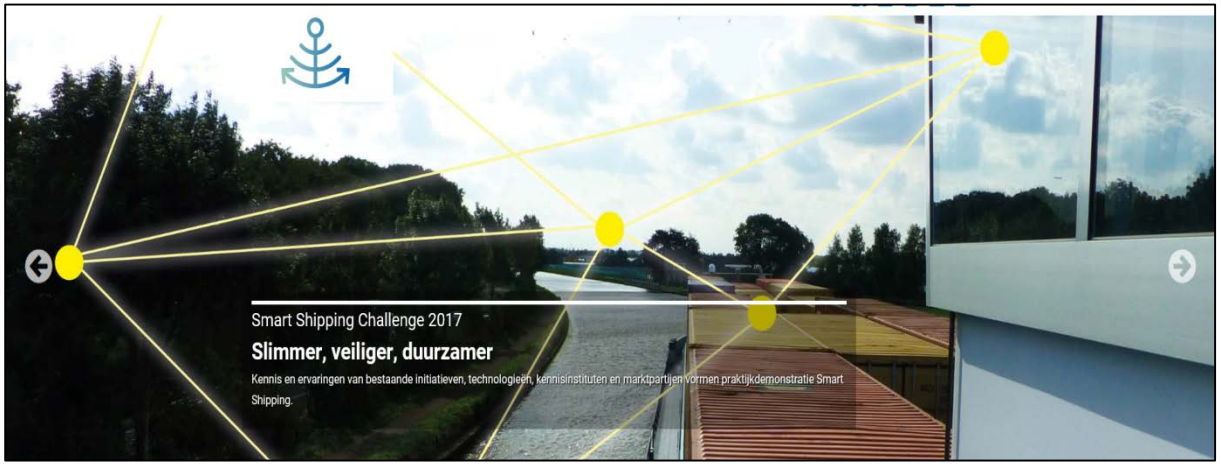
Level of technical equipment:

1. CEMT V/VI is provided with the most recent network technology
2. Digital conversion of CEMT IV/V/VI
3. CEMT I/II/III designed for mostly manual operation



Developments in technical aspects and functionalities

- Fleet and the environment
- Knowledge



Fleet and environment

Analog-digital conversion

- Available integrated network environment – in which navigation, propulsion, communication and process are combined – on the ship of the fleet is an logic and needed condition for the development of autonomous shipping.

Location & orientation

- Autonomous operations need an accurate and reliable and continuous presentation of the position in relation to other fairway users. With radar, Inland ECDIS, AIS, GPS, initiatives of CoVadem, there is a start . Question is if accurate positioning is enough for autonomous shipping ? Also thing of availability over the country borders

Fleet and environment

Communication-infrastructure

- Crucial part in autonomous shipping which will be more important every year when developments are made. Current telecom networks are not reliable enough and do not have enough capacity. Question is which level of safety is needed and which requirements we ask of the communication – infrastructure?

Sensors

- The development of sensors is going fast, it is not clear if they are suitable for a maritime environment. Beside this some sensors can be very expensive. And the certification of new systems and sensors is not clear.

Knowledge

Decision-making algorithms

- Autonomous shipping exist for a part of a computer with algorithms which make decisions in navigation about speed and direction in relation to the other fairway users and environment such as locks and bridges. However system integrators are missing. To develop this knowledge we need (an cooperation?) between the market and education (robotics).

Information-architecture

- Now it is not clear how the information architecture should consist of. Topics of; processes on the ship, interaction between ships (also not autonomous ships!), interaction with infrastructure and the link to logistic processes.

Open source standards

- In an environment of autonomous ships , tuning is needed between ships about navigation (now it is VHF). Standard in public communication are needed. Prefer to make standard with other (European) countries.

Challenges

1. Development of segmented ICT-applications and automation of processes can lead to isolation instead of integration of technic and systems on the ship and fleet. Exceptions are:
    - Inland ECDIS (navigation modus), AIS, Radar, Track Pilot
    - Cargo applications and the Dutch BICS
    - CoVadem; depth measurement, GPS and fuel consumption

2. Analog systems. Although after 2003/2009 more digital technics make their entrance at the ships, just 2% have digital integrated bridge systems at the ship in which data is central available.

3. Transition to autonomous shipping needs a big analog-digital conversion. A positive business case is not likely. The replacement of equipment lasts sometimes for more than 20 years. Each ship is unique and has different needs.

4. ‘System Integrators’ for functionalities for navigation, propulsion, communication and process monitoring offered together, are in inland shipping are not present . The business case is not always positive because group of costumers is not that larger.

End remarks

- There is not much experience with functioning of sensors in a maritime environment and in the case of inland shipping which locks or the exact place of the sensors on the ship itself.
- Integration of data is missing and also artificial intelligence is missing (algorithmic), thus ‘deep learning’ is not developed for different situations on the water.
- The market/ manufactures are waiting because of the limited consumers, development costs are high and is not yet an attractive business case.
- Insight in the current fleet; limited part of the current fleet is digital connected with sensors in a network which can be shared with other parties and can be used for autonomous shipping.