



# Maintenance in the Netherlands: Education & Research

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# Agenda

- Why Maintenance is an important activity
- Some Facts & Figures
- The education agenda (of Avans) for Maintenance
- The Avans research Topics in the area of Maintenance
- Summary



# Why Maintenance is important.....



**Loss prevention:** the reliability of ageing technical systems is under discussion (costs, environment, etc.)

**Safety:** When accidents occur, technical failures in combination with human mistakes, are often the determining factor.

**Top Priority:** High-quality maintenance and focus on safety and utilization is therefore essential!



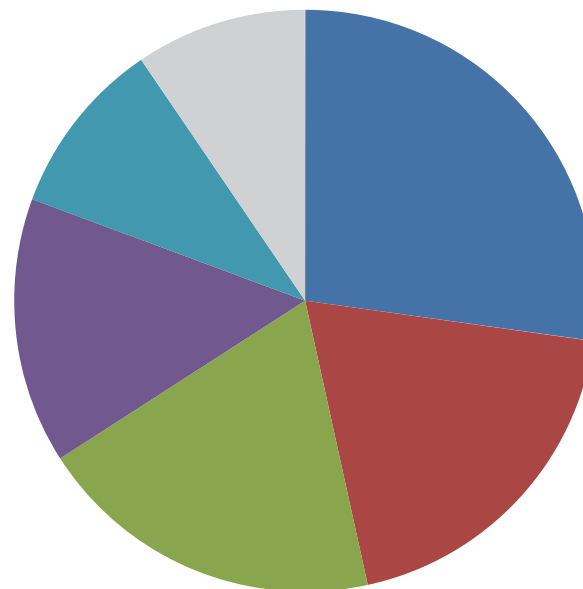


# Wide range of sectors

- Process Industry
- Energy
- Infrastructure
- Aviation
- Shipbuilding and shipping
- Discrete Production

260,000 - 300,000 maintenance professionals!

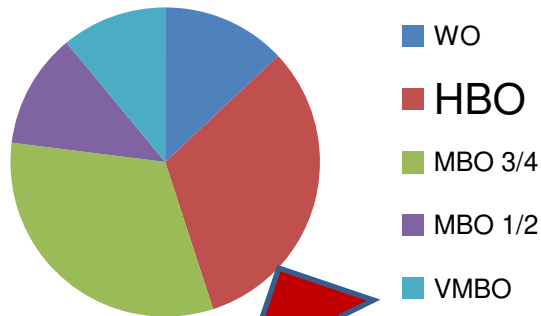
**size sector 2011: >€30 billion ! \*)**



- process
- infra
- building
- manufacturing
- fleet
- food/beverage



# Bachelor (HBO)?



260,000 - 300,000 maintenance professionals!

32%

## Main issues

- How do you organize high-quality, innovative and sustainable maintenance?
- How do you manage (maintenance) teams?
- How can you extend the life cycle of complex technical systems ("assets")?
- How can asset management improve the results of the organization?



# Key Topics in Maintenance

## Physical Asset Management:

- Decreasing investments -> Ageing Assets
- Higher output & effectivity -> Asset Utilization
- Safety first -> Asset Integrity
- Standards -> ISO 55.000 series for Asset Management (January, 2014)



## Key Topics in Maintenance (ii)

- Safety:
  - Decreasing tolerance for accidents in society
  - Costs of accidents increasing
- Professionals:
  - Retirement of baby boomers: loss of experience
  - Low interest for Technical studies in Society
  - Increasing demand for technicians

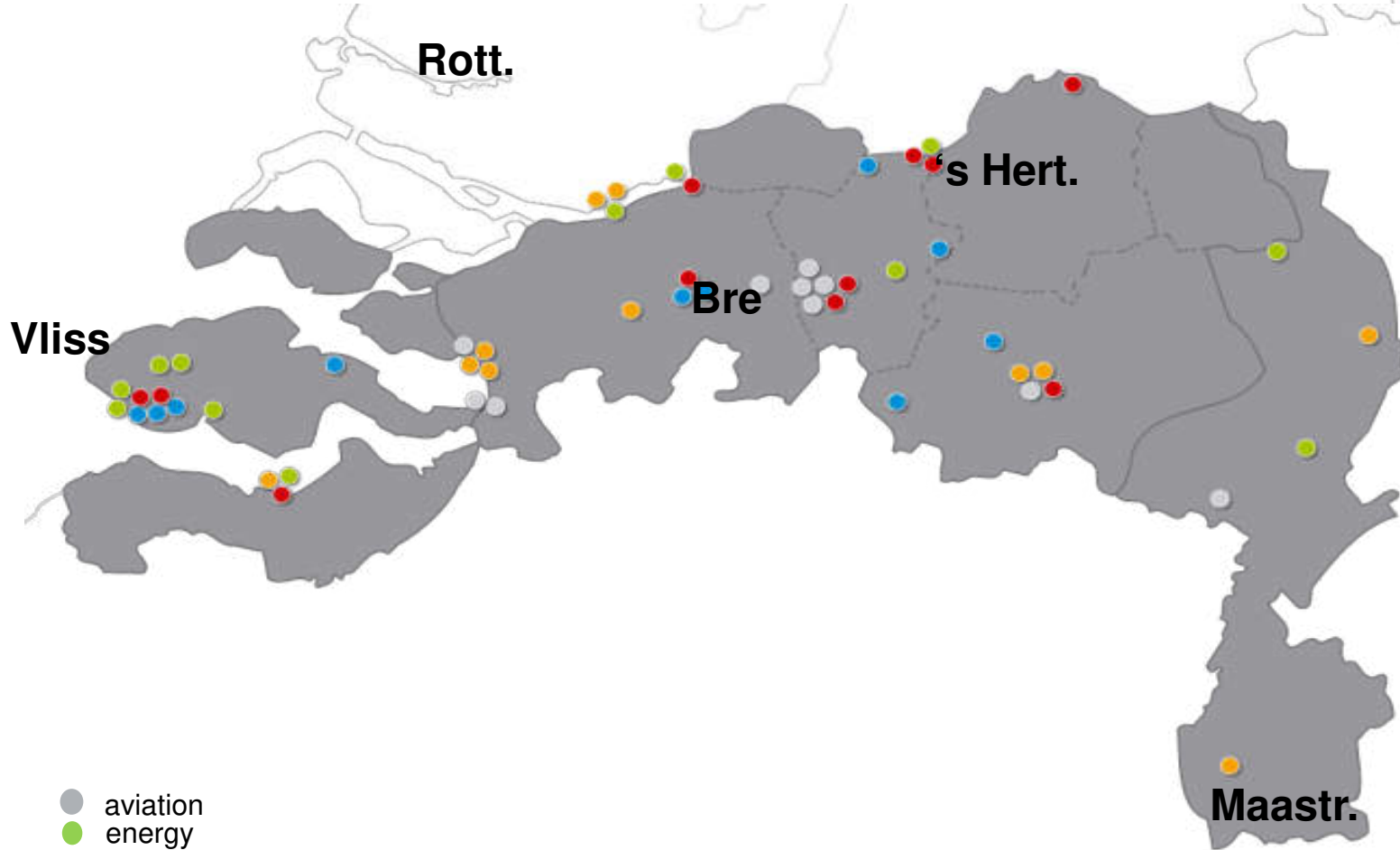


# Asset integrity & utilization

- Life Cycle Costs: 2/3 of Maintenance costs are determined in the Design stage.
- Process & Energy: Interruptions costs are multiples of Maintenance Costs (> 4x) due to:
  - Lost production,
  - Production of Waste & 2<sup>nd</sup> quality material during shut-down & Start-up and
  - If interruption is unplanned: costs of spills & cleaning, reputation damage and claims



# South NL: Location of industrial activities



- aviation
- energy
- infra
- maritime
- process

Onderzoek

Onderwijs

Maintenance

**Leerstoel Maintenance**

(x deeltijd hoogleraren gekoppeld aan innovatie gebieden)

**VML**  
(x deeltijd lectoren gekoppeld aan innovatie gebieden)

**V(W)O**  
(Technasia)

**Tech-mavo / havo**  
(Bèta profiel)

**BASISONDERWIJS**

**WO**

**HBO**

**MBO**

**VMBO**

PHD

Internationale, Academische Master

Professionele Master

**Bachelor IMM**

Associate Degree

Luchtvaarttechniek

MET

SA&I

Proces // AOT

Sector techniek oriëntatie op Maintenance

Belangstelling voor Techniek creëren

Maintenance Engineering Master

Asset Management Master

Master Lerarenopleiding  
Minor Maintenance

Voltijd

Deeltijd / duaal

**Vakgebieden**

- Elektro
- Werktuigbouw
- Mechatronica
- Installatie

**Werkgebieden**

- Engineering
- Construction
- Maintenance

**ARBEIDSMARKT**

**LOOPBAANDIALOOG**



## IMM in 2015

- IMM started in September 2011 with 7 students
- IMM will have 150 full-time students in 2015
- IMM staff:
  - 15 lecturers for teaching; 3 will be also responsible for research projects
  - 1 Lector: responsible for the research program
- IMM operates from Breda & Vlissingen.
- At least 10 companies will have special research agreements with IMM



## Research at IMM in 2015

The Research Program will be executed & supported by:

- 20 to 30 students (execution of work)
- 3 Lecturers + 1 lector (planning & control)
- At least 10 Companies
- Cooperation with at least 2 Universities



# Research Topics of IMM

## Asset Owners:

- Maintenance IT support systems
- Maintenance outsourcing
- Material Sciences: Physical & Chemical degradation phenomena like corrosion, Coating, etc.
- Safety & Reliability Topics



## Research Topics of IMM(ii)

### Consulting & Advisory companies:

- Maintenance & Engineering Practice improvement
- Maintenance IT support systems

### Service Providers:

- Safety & reliability Topics,
- Service Logistics,
- Shut down Management



## Summary

- Industrial Maintenance is an important activity in the Netherlands; 4% of its working force is active in Maintenance Activities, spending more than 30 billion euro's annually.
- 44% of the working force has a “Vocational Education Level; 32% has a Bachelor's Degree.
- Increasing lack people with a technical education is one of our Country's top priorities.
- In 2015 IMA will have more than 150 students, active also with a variety of research topics in the area of Maintenance.