# Maintenance management in the digital era

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# Agenda

01 The digital context

02 Maintenance types

03 Maintenance in the digital era

- (1) technologies
- (2) condition monitoring & condition-based maintenance
- (3) service agreements & benefits

04 Industry examples

05 Closing Thoughts



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# OCEANKING Key Facts

**33** years successfully supporting the Greek shipping community (**established in 1989**)

**We** **provide technical and commercial services** of high added value, quality and reliability, **in co-operation with the companies we represent**

**Wide** **portfolio of representations** (Engine Room & Propulsion, Deck/Hull, Electrical/Electronics, Cryogenic tech for LNG, Eco & Digitalization technologies)

**40+** **people with strong technical & commercial** background

**350+** **shipping companies in our customer base**, serving their newbuilding projects & after sales needs

**>3,000** **Greek vessels** carry equipment sold by us & our Principals



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# 01

# The digital context

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# Waves of Digital (r)evolution

## Digitization

Conversion of physical info to digital form

## Digitalization


Improvement of current practices

## Digital Transformation

New practices, new business models
...new revenue streams



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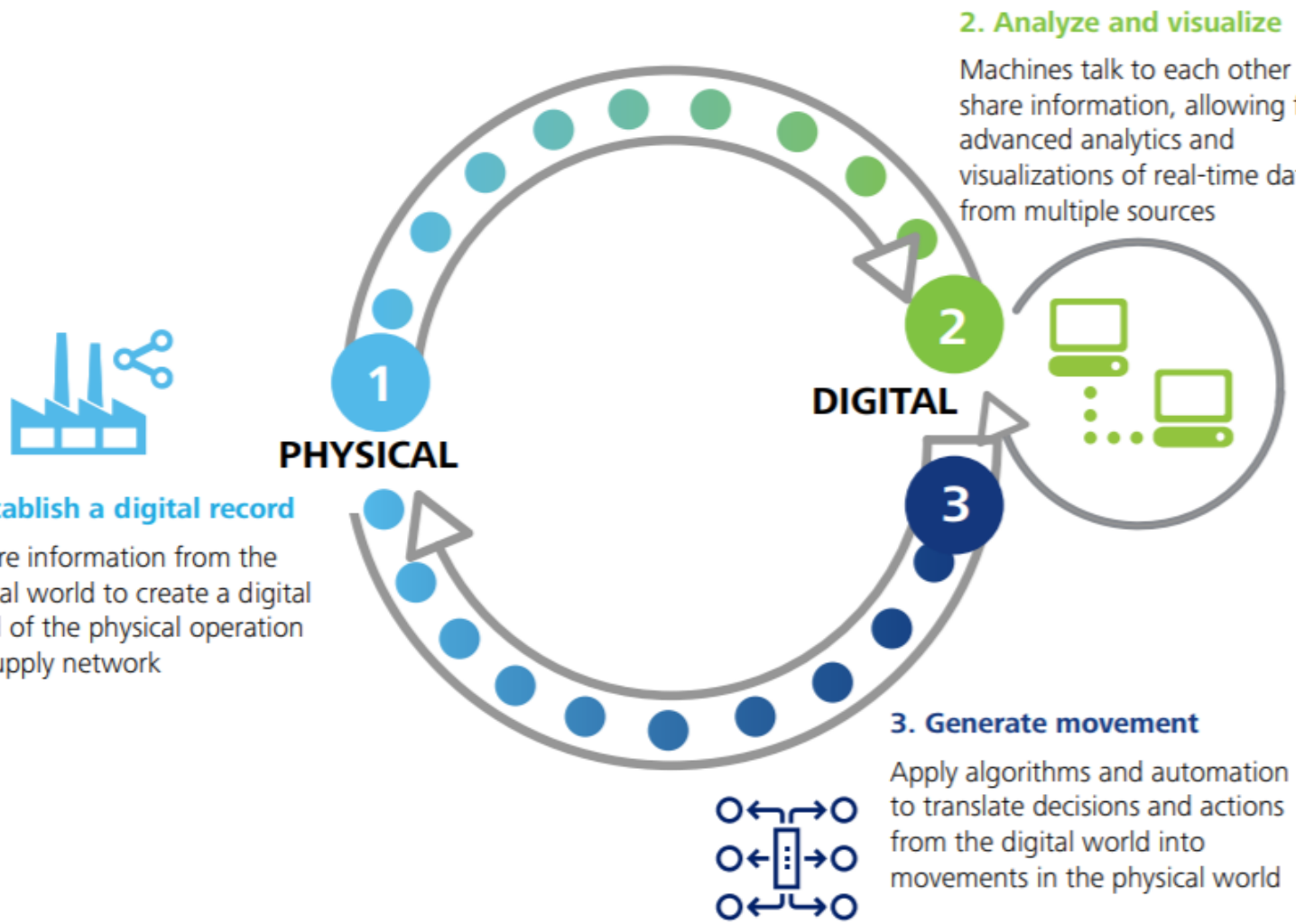
# Digital Transformation – shipping 4.0



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# 02

# Maintenance types

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# Maintenance evolution

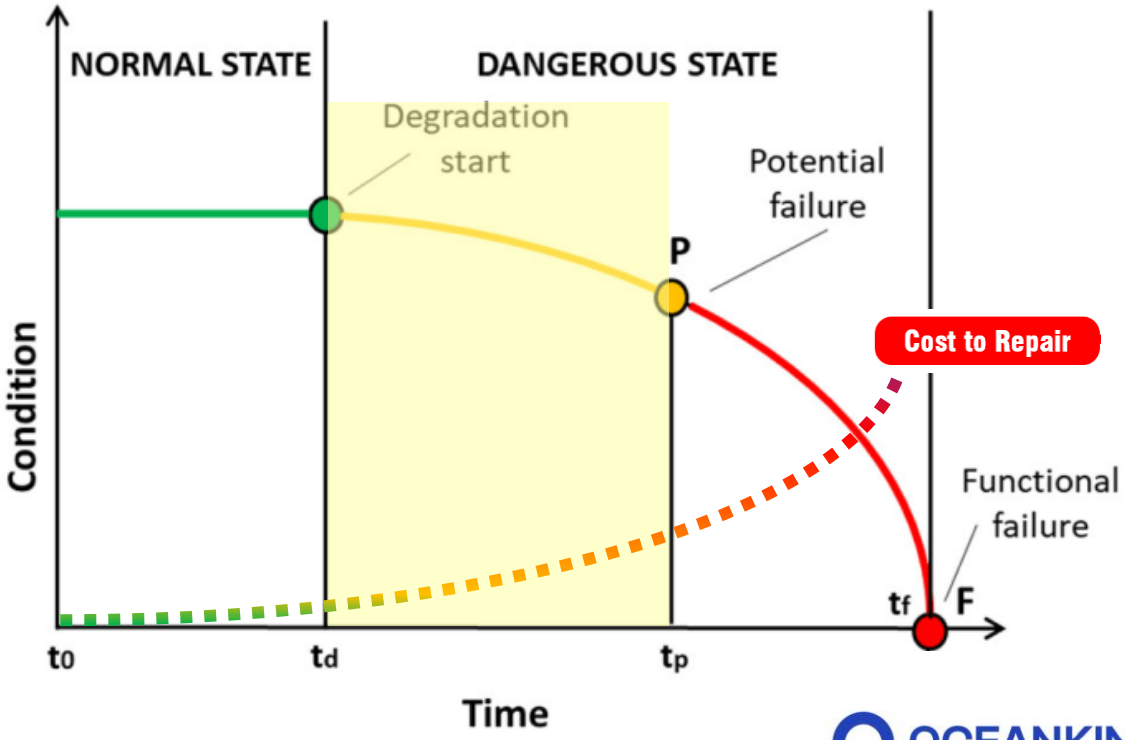
## Breakdown maintenance

- A policy of equipment repair only after it has failed
  (...*or, if it doesn't break don't touch it*!)


- Minimizes maintenance cost
- Low staffing
- Simple to understand and manage when maintenance is needed

## Preventive maintenance

- Calendar-based planned maintenance
- Usage-based planned maintenance
- Combination of the above
- Condition-based maintenance



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# 03

# Maintenance in the digital era

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# Maintenance in the digital era

## Technologies (for Industry 4.0)

- Internet of Things (IoT) / Wireless Sensors
- Edge Computing
- High-speed communications (VSAT)
- Cloud Computing
- Big Data / Artificial Intelligence (AI) / Machine Learning
- Others (Simulation, VR/AR, Drones, etc.)




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# Maintenance in the digital era

## Condition Monitoring and Condition-Based Maintenance (CBM)

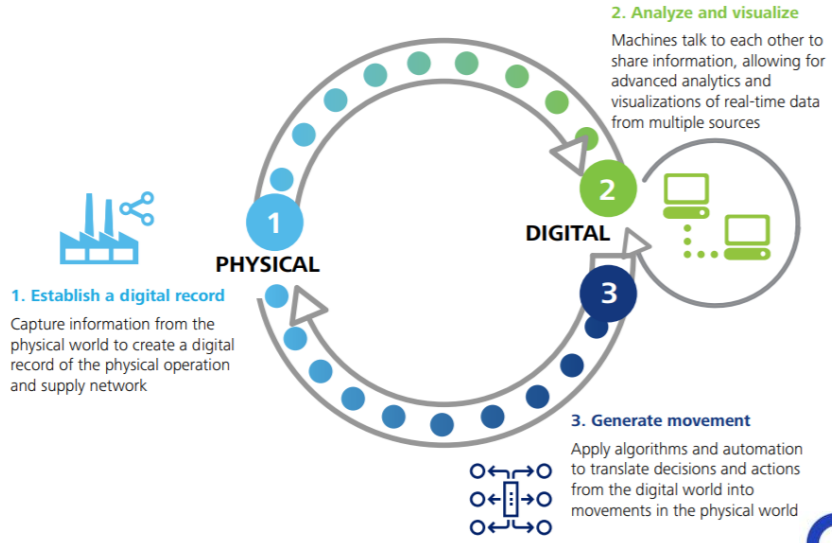
### Condition Monitoring

- Initially: Manually gather data and turn to specialists
- Now: Automatic/High frequency Data collection


- Visualization / Situational awareness
- Analysis (Data meets human – Digital twins):
  - Simulation or simple engineering principles
  - Expert knowhow-based
  - AI/ML-based
- Big component of CBM

### CBM

- Following findings from condition monitoring analysis, maintenance is performed when warranted
- Relies on the actual asset condition & provides:
  - Early prevention of faults / downtime
  - Prolongation of service intervals
- Can be approved by Class to replace planned maintenance (for some equipment)



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# Maintenance in the digital era

## Service Agreements & Benefits

## Service Agreements

- Relying on condition monitoring & CBM the equipment manufacturers can offer the so-called “Service Agreements” (Equipment as a Service)


- A contract between the maker and the user that dictates the monitoring/maintenance process and guarantees (at a minimum):
  - uptime
  - spare parts (availability and cost)
  - service attendance
- Combines unique expertise with cutting-edge technology

## Benefits

- Users:
  - **Peace of mind through early prevention of faults, reduced downtime & prolongation of service intervals**
  - Prevention of secondary damages
  - 24x7 support to crew and office personnel
  - Administrative work burden makers’ side
  - **Move from CAPEX to an OPEX – Predictable cost structure – Reduction of TCO**
- Makers:
  - **Move from CAPEX to an OPEX – Predictable revenue stream**
  - **Continuous relation with customers**
  - **Operational knowledge feeding back to R&D**
- Other players that may benefit:
  - **Classification societies**
  - **Flags**
  - **Other service providers**



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# 04

# Industry examples

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# Industry examples

Service agreements → Turbo Marinecare

## Welcome to Turbo MarineCare

Service agreements for marine customers operating two-stroke engines who want financial predictability

# Industry examples


### ✓ What is SMARTLINK?

SMARTLINK is a compressor monitoring programme providing you with a complete data insight of the compressed air production at your site.

### ✓ How does SMARTLINK work?

Once the SMARTLINK programme is installed it gathers, compares and analyses data on the fly. When needed it sends you warnings by e-mail or text message.

### ✓ Why should I install SMARTLINK?

SMARTLINK allows you to intelligently assess the performance of your compressed air systems and avoid unplanned downtime and repair costs..

# Industry examples

GEISLINGER®
POWERTRAIN SOLUTIONS. BUILT TO LAST.

## KEY FEATURES OF GEISLINGER DIGITAL SOLUTIONS

- TREND ANALYSIS
- FLEET MANAGEMENT
- AUTONOMOUS OPERATION
- ANOMALY DETECTION
- CONNECTIVITY
- SAFETY & SUPPORT
- DIGITAL TWIN
- REPORTING

### ANOMALY DETECTION

For detecting operational anomalies and short-time deviations from the expected performance, the Geislinger Analytics Platform provides an anomaly detection.




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# Closing Thoughts

05

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# Closing thoughts

01 New maintenance management / equipment lifecycle

02 New business model (makers, users, service providers)

03 Not a question of if, but when

04 Key component of autonomy / reduced crew on-board

05 Vision towards self-audit (monitoring, detection, servicing, recording/blockchain)

06 Ernest Hemingway anecdote



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# Thank you!

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