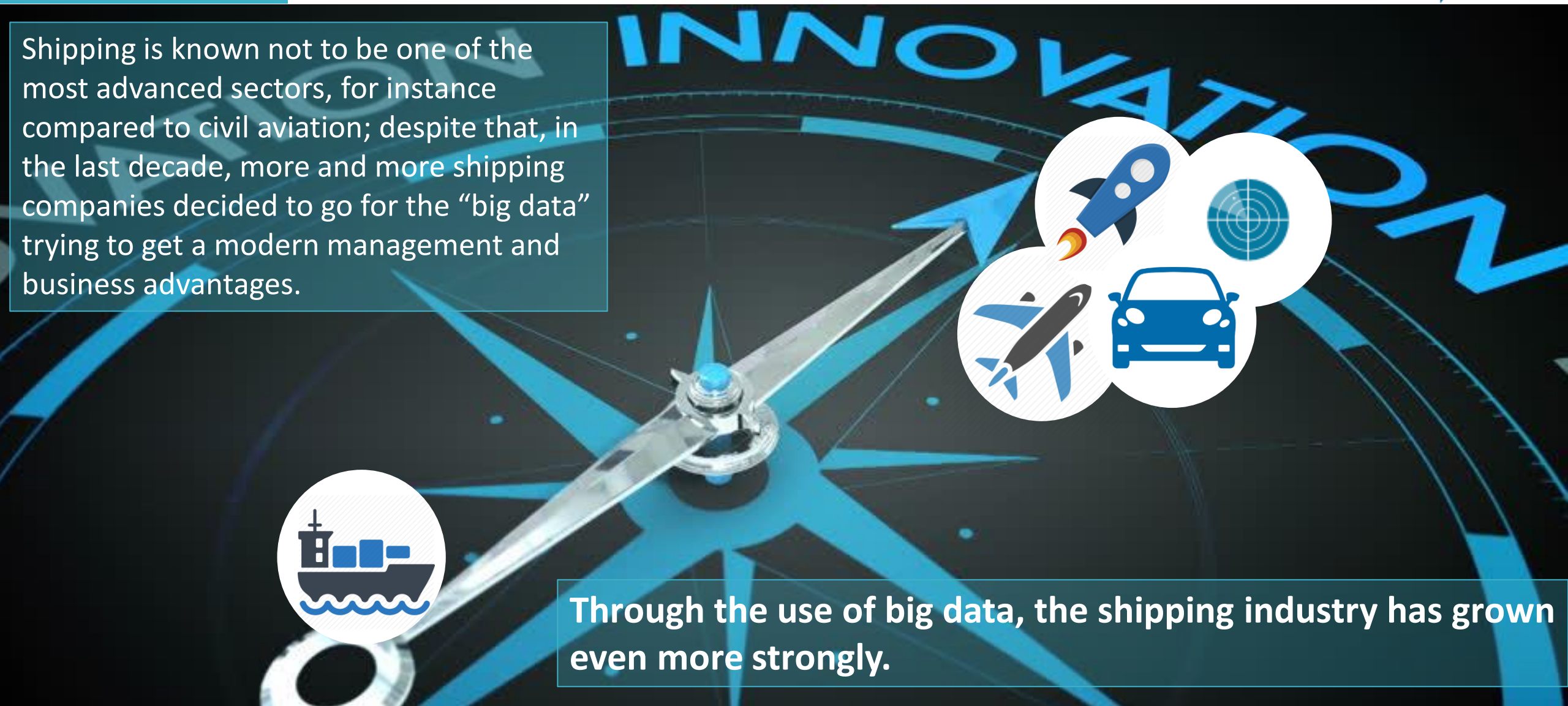
Data Driven Fleet Performance Management

RINACube OPTIMUM

The world's most valuable resource is no longer oil, but data

Shipping technology has always trailed in the wake of other more innovative industries

Shipping is known not to be one of the most advanced sectors, for instance compared to civil aviation; despite that, in the last decade, more and more shipping companies decided to go for the “big data” trying to get a modern management and business advantages.



Through the use of big data, the shipping industry has grown even more strongly.

By using advanced data-processing techniques, shipping will become more efficient.

Is your fleet really efficient?

- A ship might sail for months with a **rope accidentally tied around the propeller**, heavily impacting on the fuel consuption, **without the crew being aware**. Similarly, **hull and propeller fouling**, or the main engine needing cleaning and maintenance, can heavily **compromise** the ships' **energy performance**.

- **Interventions** to fix these and other comparable issues **can be costly** and need to be **accurately planned** taking inot account the **ships' schedules** and **cost-benefits** of any initiative.

Vessel Monitorig to Enhance Ship Performance

DATA COLLECTOR

- Navigation, Automation, Sensors
- Manual Input
- External Data

EFFICIENCY TARGETS

- Realtime Monitoring
- Traditional Methods
- Machine Learning

ANALYTICS

- Drydock Planning
- Intervention Analysis

BIG DATA USAGE
Propulsion Targets Computation

SHIP4

22° 15' 33.36" N 110° 0' 38.76" W

Sun, 12 Mar 2017 09:55:00 GMT

Route Planning no

Route Explorer 0

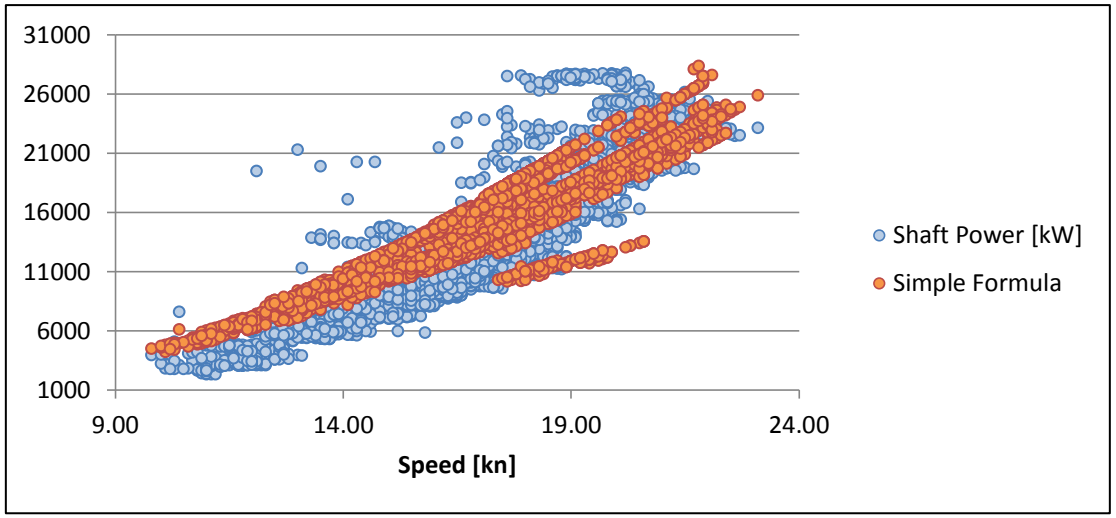
Description	Value
Speed over ground	19.055 kn
Course over ground	0 °
Propulsive Power	23924 kW (-10% target)
Shaft RPM	n/a
ME Consumption	4.469 kg/h (-17% target)
ME SFOC	187 g/kWh (-7% target)

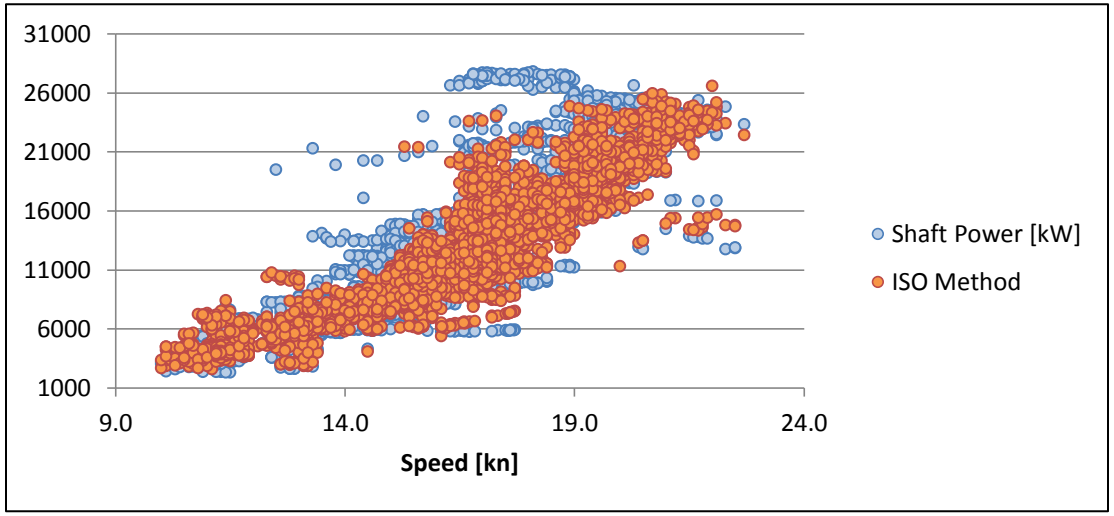
TARGET:
Propulsive Power

SHIP VARIABLES:
- Speed Trough Water
- Loading Condition (Displacement/Mid Draft)
- Trim

ENVIRONMENTAL VARIABLES:
- Sea State
- Wind State
- Sea and Wind Relative Directions

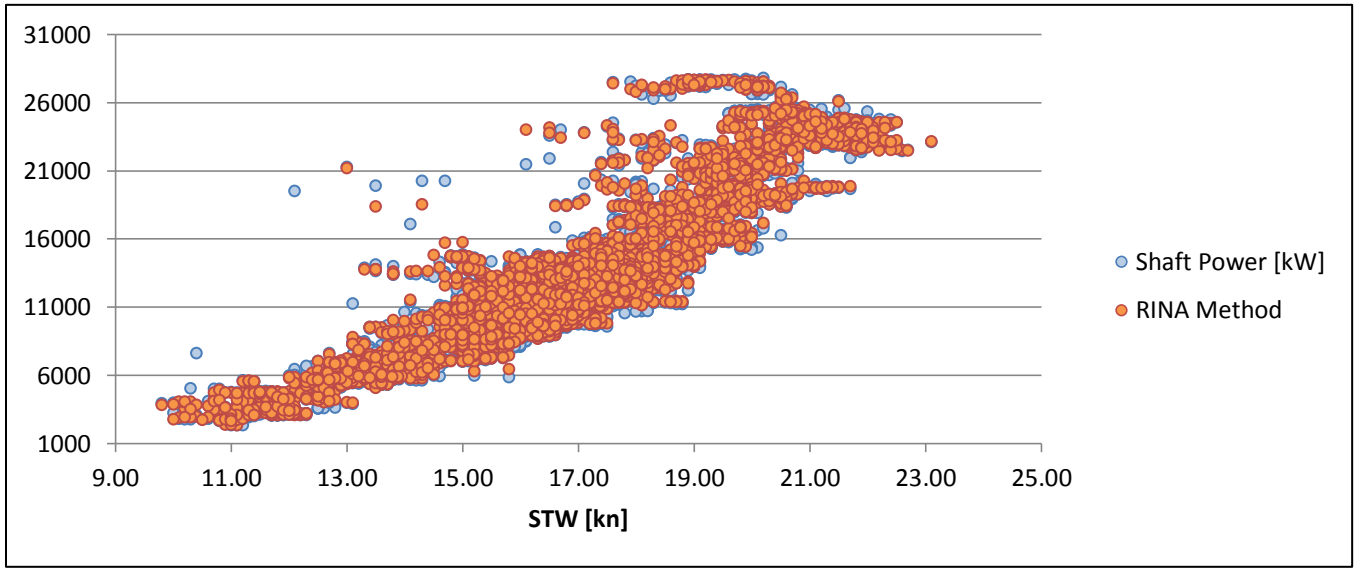
Comparing different methodologies of targets computation



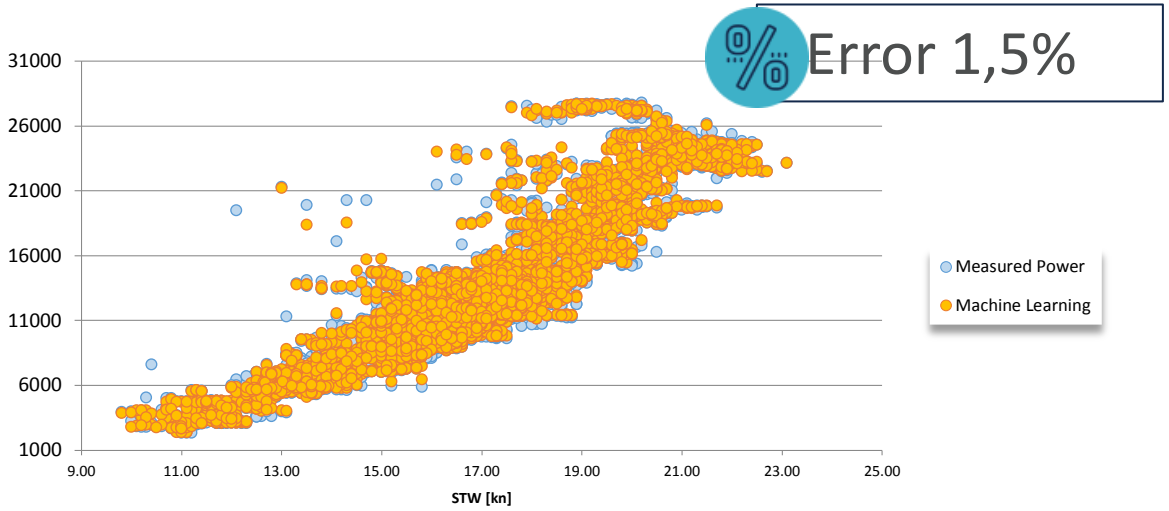


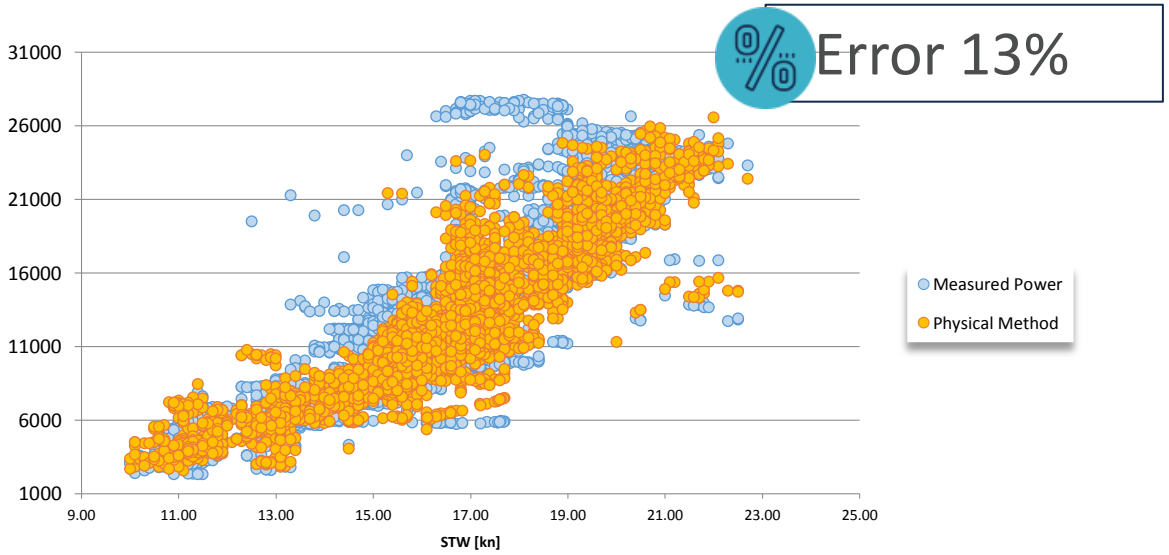
Three Methods:

- **"Simple" Multivariable Regression**
- **Method based on ITTC**
- **Machine Learning**



Propulsive Power Prediction





MACHINE LEARNING:

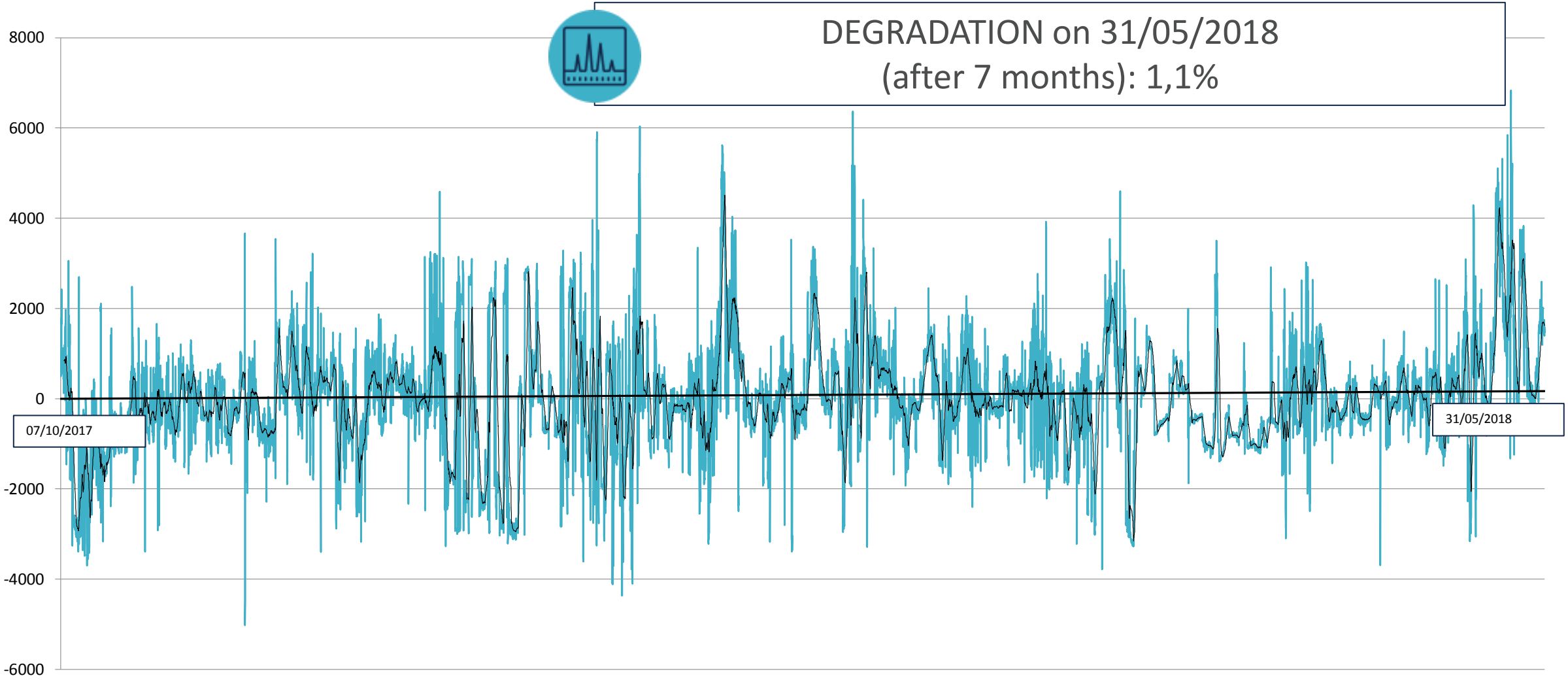
- Based on recorderd data (at least 3 months, 5 minutes detail)
- Importance of dataset completenss
- Data previously analyzed and fileterd

PHYSICAL METHOD:

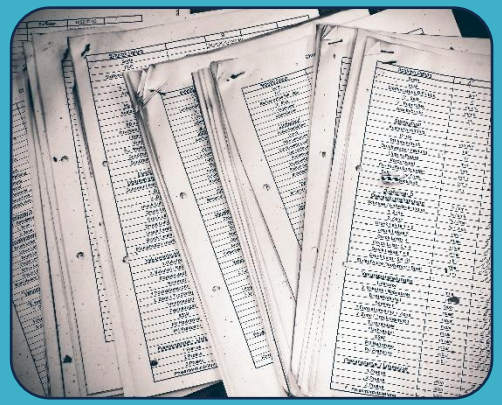
- Based on Noon Reports
- Based on Ship Characteristics (Tank Tests, Open Water Propeller Diagram, ...)
- Inspired by ISO 15016 / ITTC

Degradation and Intervention Analysis

DEGRADATION ANALYSIS
Target & Measured Power



INTERVENTION ANALYSIS
Manual Input & Automatic Data Acquisition



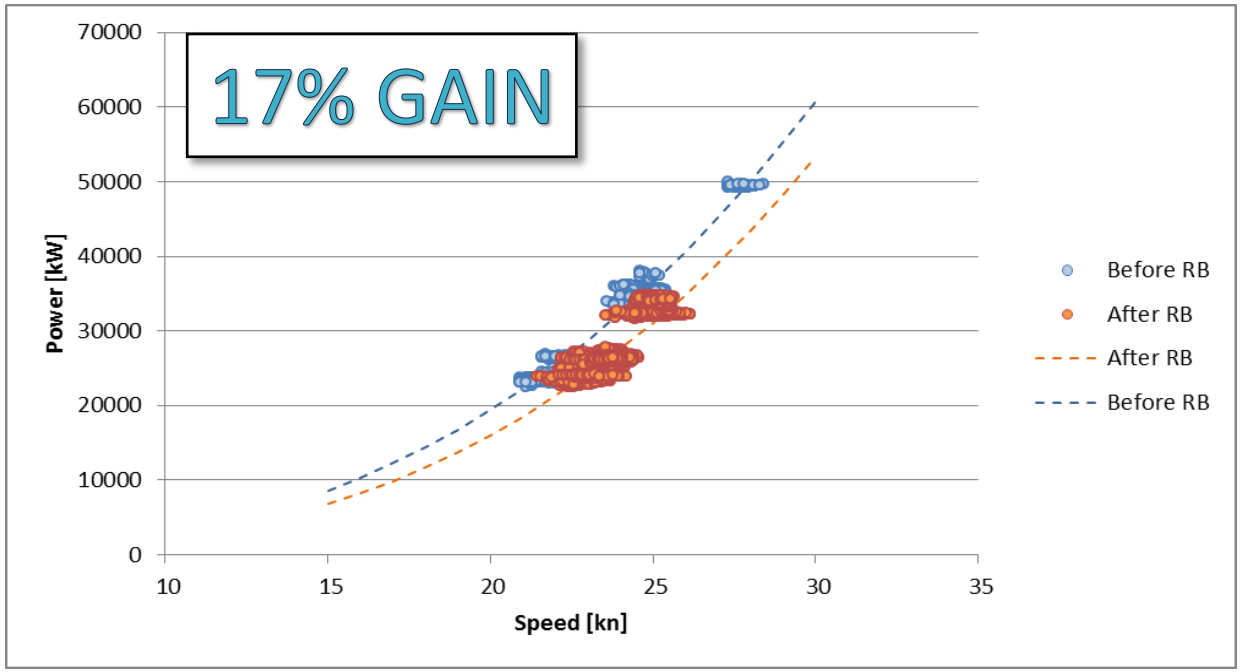
MANUAL INPUT

- Data retrieved once a day
- Prone to human error

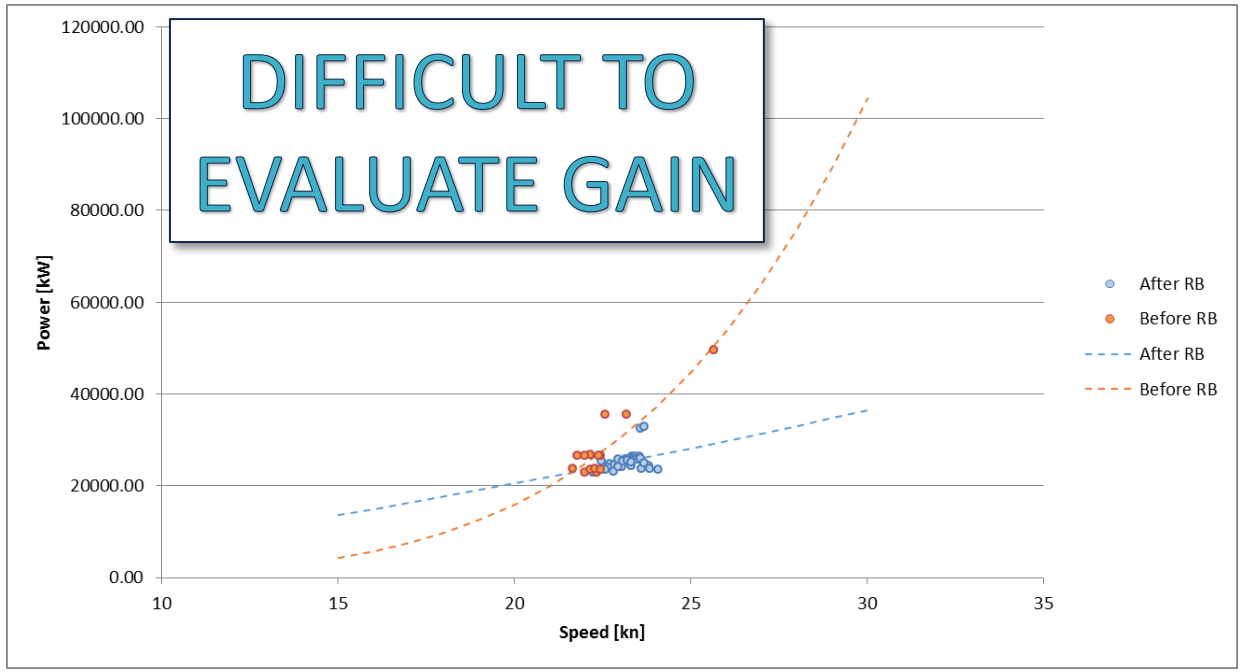
AUTOMATIC DATA ACQUISITION

- Data retrieved every 5 minutes
- No / limited human intervention

INTERVENTION ANALYSIS
Manual Input & Automatic Data Acquisition



ADA result



MI result

ANALYSIS CONDITIONS:

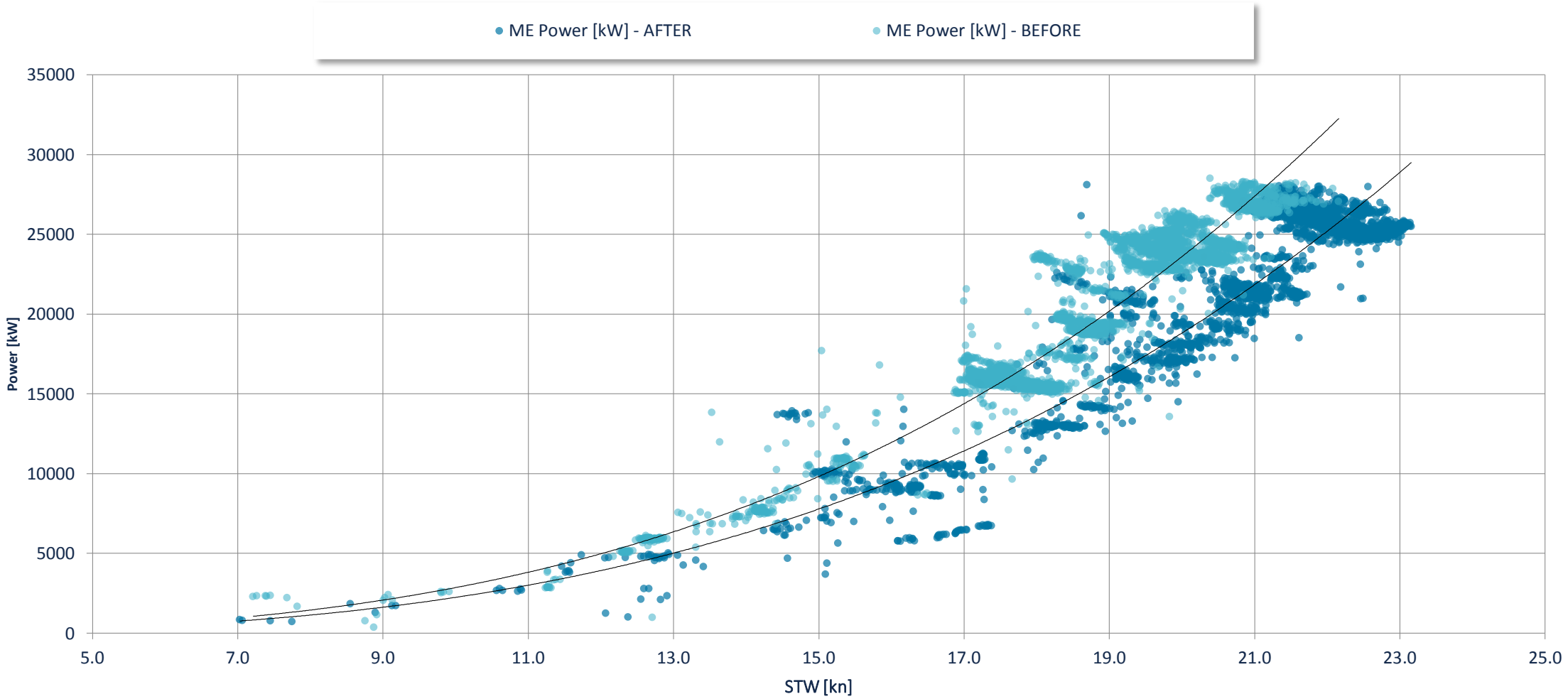
Before = Three months before reblading

After = Three months after reblading

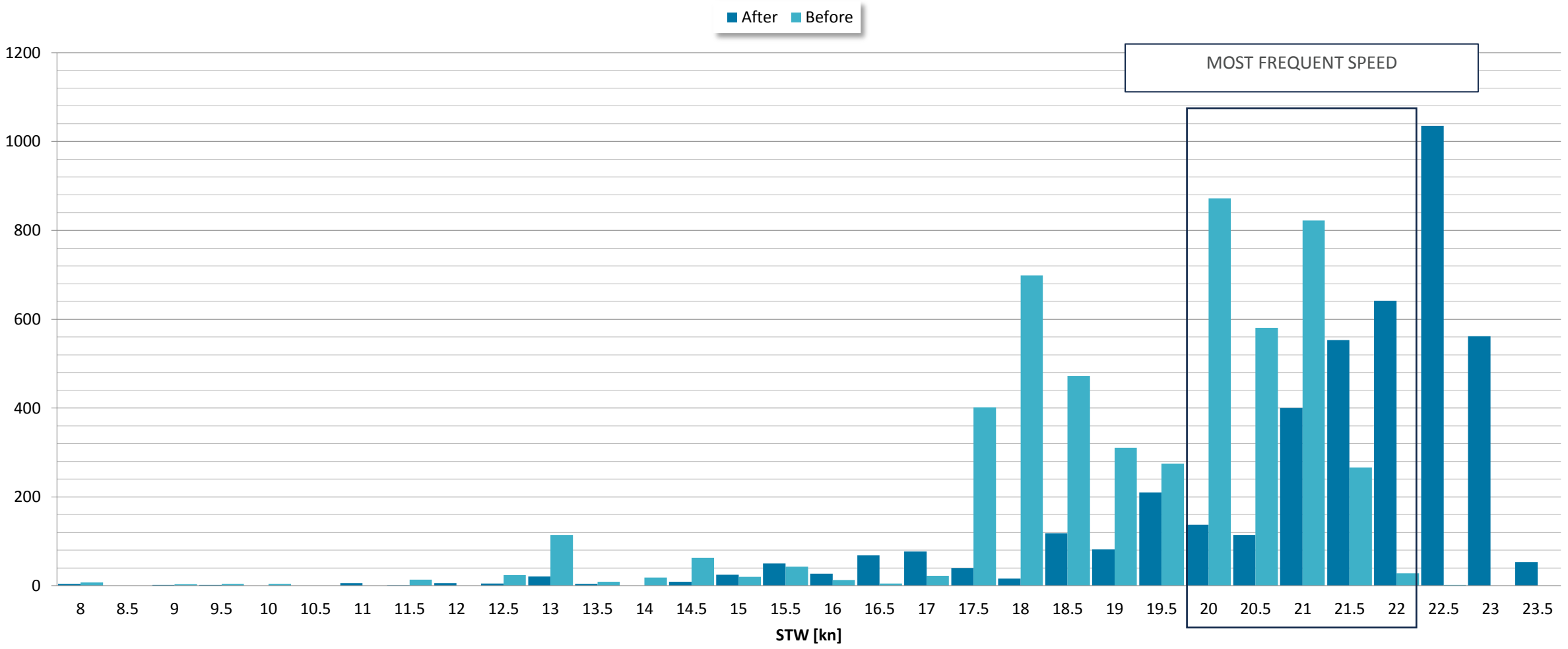
BF ≤ 4

24500–2% ≤ Displacement ≤ 24500+2%

REBLADING PAYBACK
Before & After - Comparison at different speed



DRY DOCK ANALYSIS
Before & After - Speed Profile



DRY DOCK ANALYSIS
Before & After - Payback

HP: Dry Dock Cost 1’000’000$

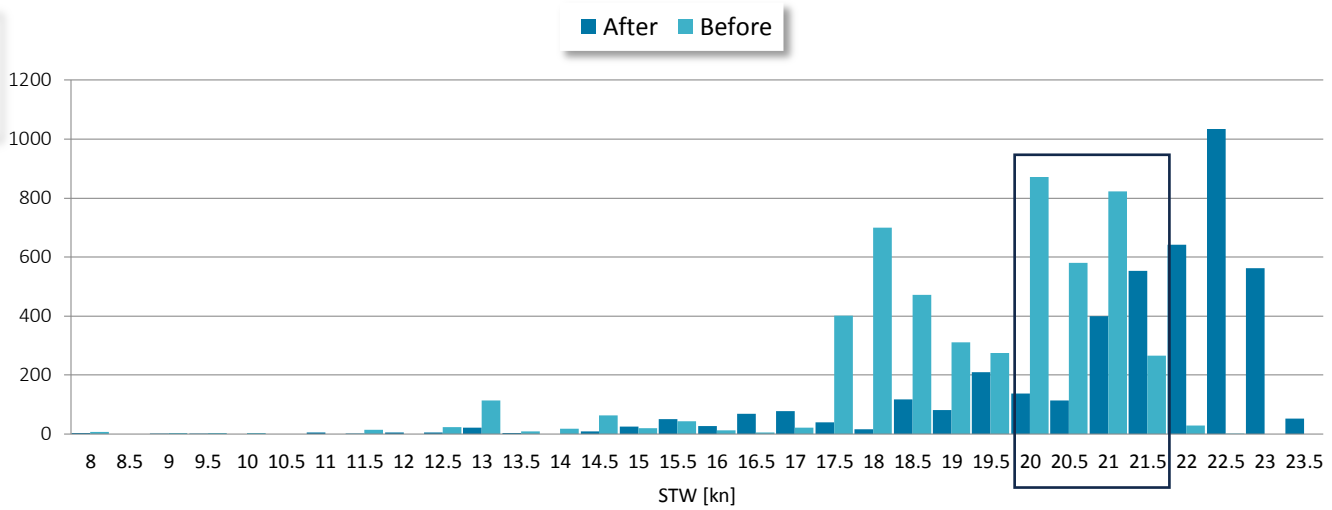
FUEL CONSUMPTION:
127 t/Day @ 21 kn

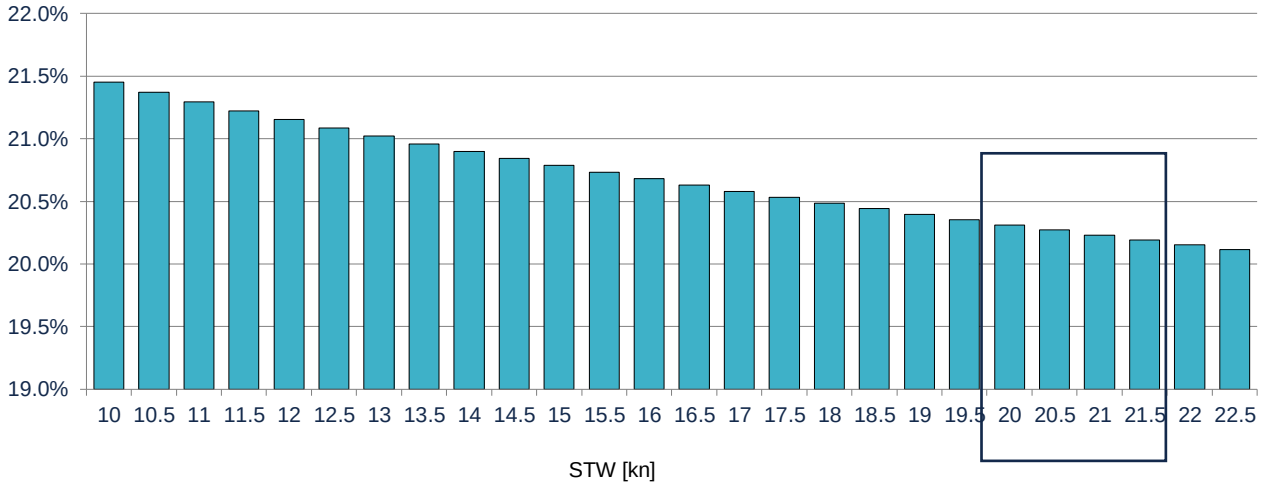
FUEL SAVING:
25 t/Day @ 21 kn

CO_2 SAVING:
78,6 t/Day @ 21 kn

PAYBACK TIME:
90 Days @ 21 kn

(IFO380 price on 31/05/2018: 450 $/mt)





RINACube - OPTIMUM

OPTIMUM is the brand new fleet performance management tool on RINACube digital platform that can be used to set up a Fleet Operation Center. It offers the opportunity to increase safety, regulatory compliance and operational efficiency of your fleet anywhere, anytime; with a combination of hardware equipment, software packages and fleet intelligence you will be able to provide support to your fleet from ashore in the most effective way.

Thank you for the attention.
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