Best Practice in Fuel Efficiency Data

RINACube OPTIMUM

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 into 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 & MONITORING

- Drydock Planning
- Intervention Analysis

Propulsive Power Targets Computation

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

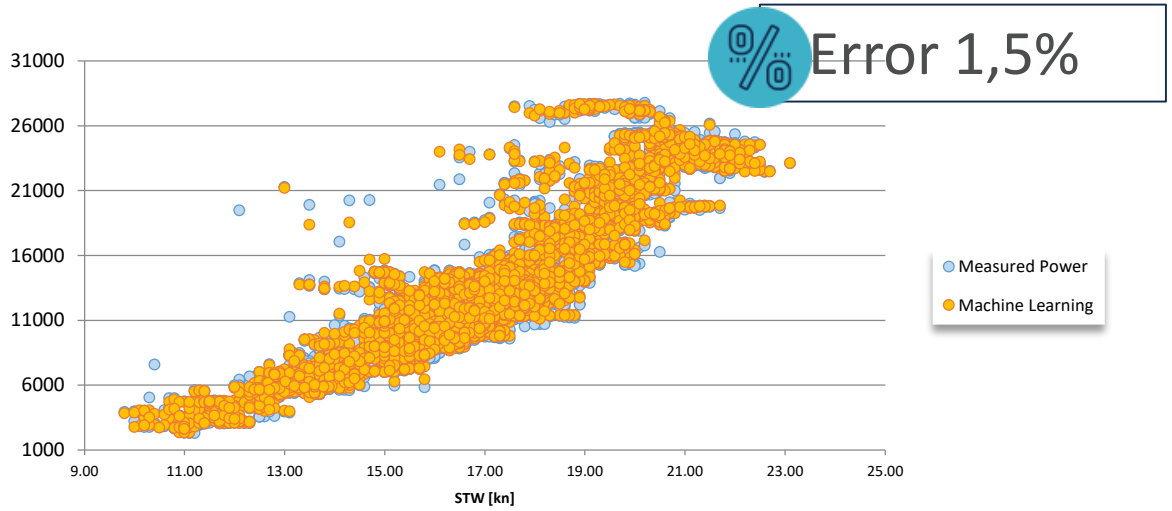
Description	Value
Speed over ground	19.055 kn
Course over ground	0 °
Propulsive Power	23924 kW (-10% target)
Shaft RPM	n/a
ME Consumption	4.469 kg/h (-17% target)
ME SFOC	187 g/kWh (-7% target)

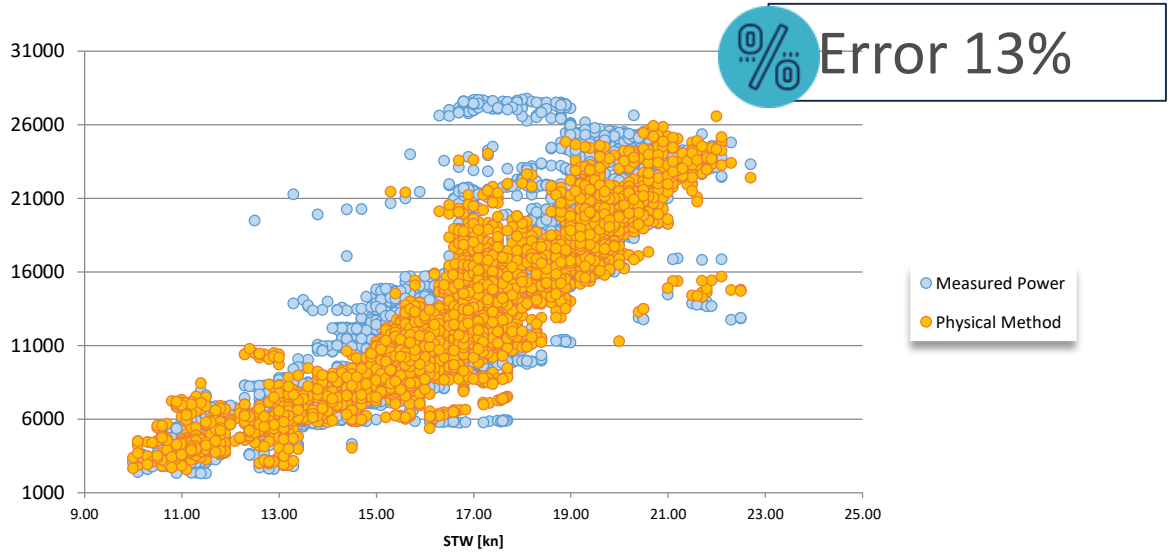
TARGET:
Propulsive Power

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

ENVIRONMENTAL VARIABLES:
- Sea State
- Wind State
- Sea and Wind Relative Directions
- Water depth
- Water density

Propulsive Power Prediction





MACHINE LEARNING:

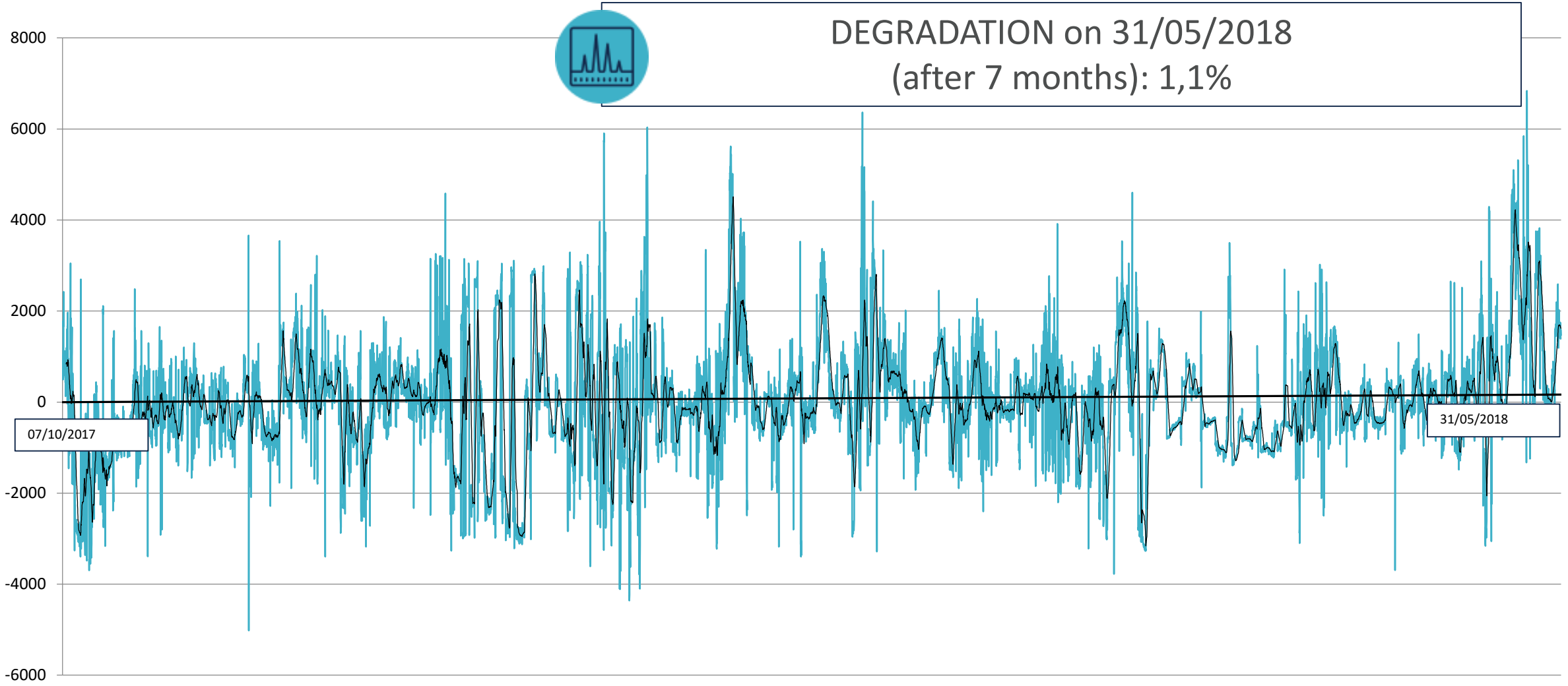
- Based on recorderd data (at least 3 months, 5 minutes detail)
- Importance of dataset completenss
- Data previously analyzed and fileterd

PHYSICAL METHOD:

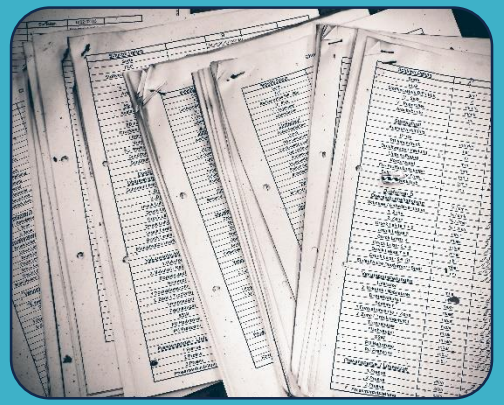
- Based on Ship Characteristics (Tank Tests, Open Water Propeller Diagram, ...)
- Model as by ISO 15016 / ITTC

Degradation and Intervention Analysis

DEGRADATION ANALYSIS
Target & Measured Power



INTERVENTION ANALYSIS
Manual Input & Automatic Data Acquisition



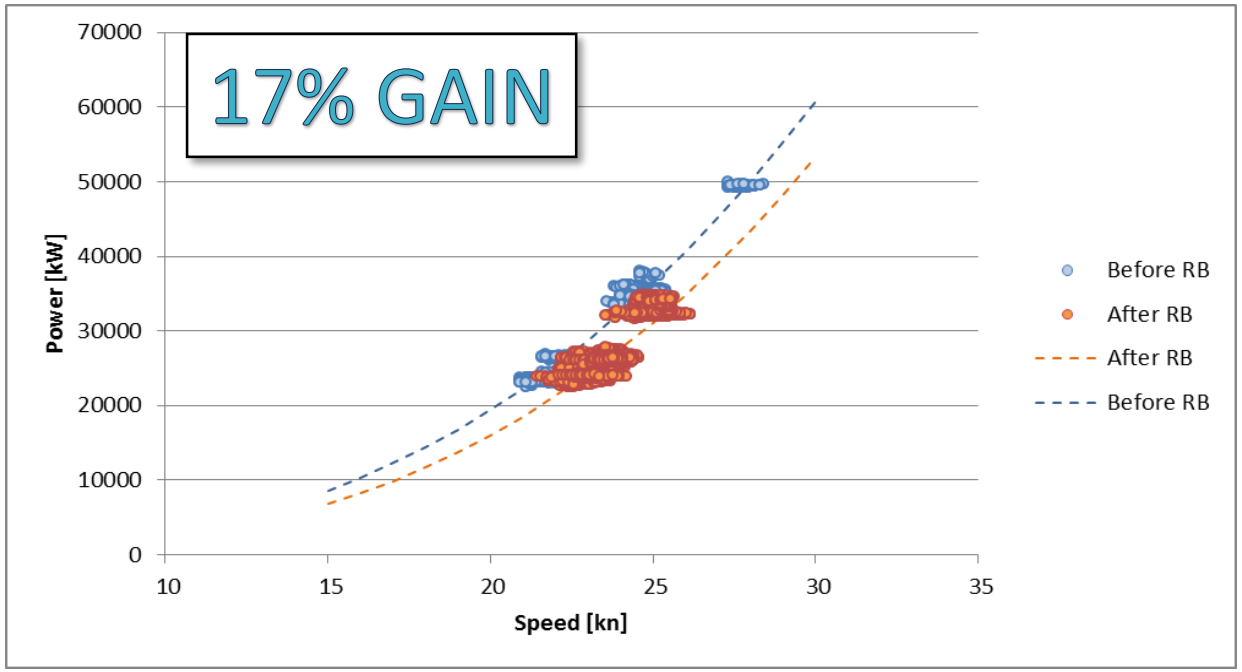
MANUAL INPUT

- Data retrieved once a day
- Prone to human error

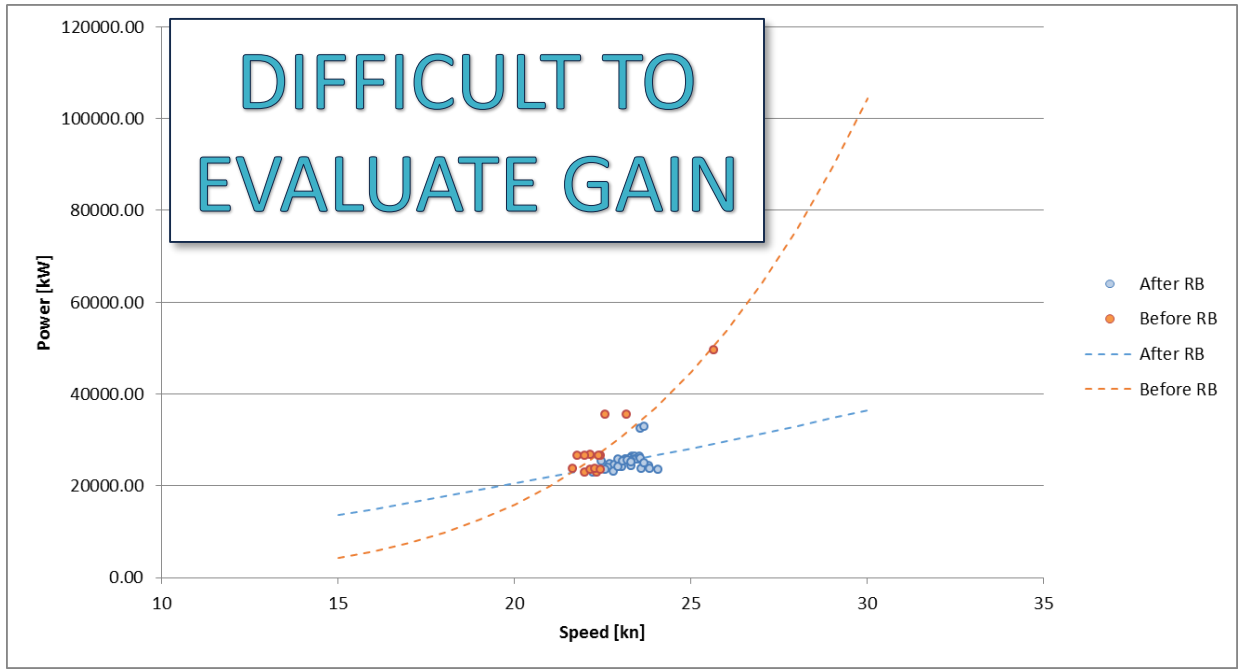
AUTOMATIC DATA ACQUISITION

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

INTERVENTION ANALYSIS
Manual Input & Automatic Data Acquisition



ADA result



MI result

ANALYSIS CONDITIONS:

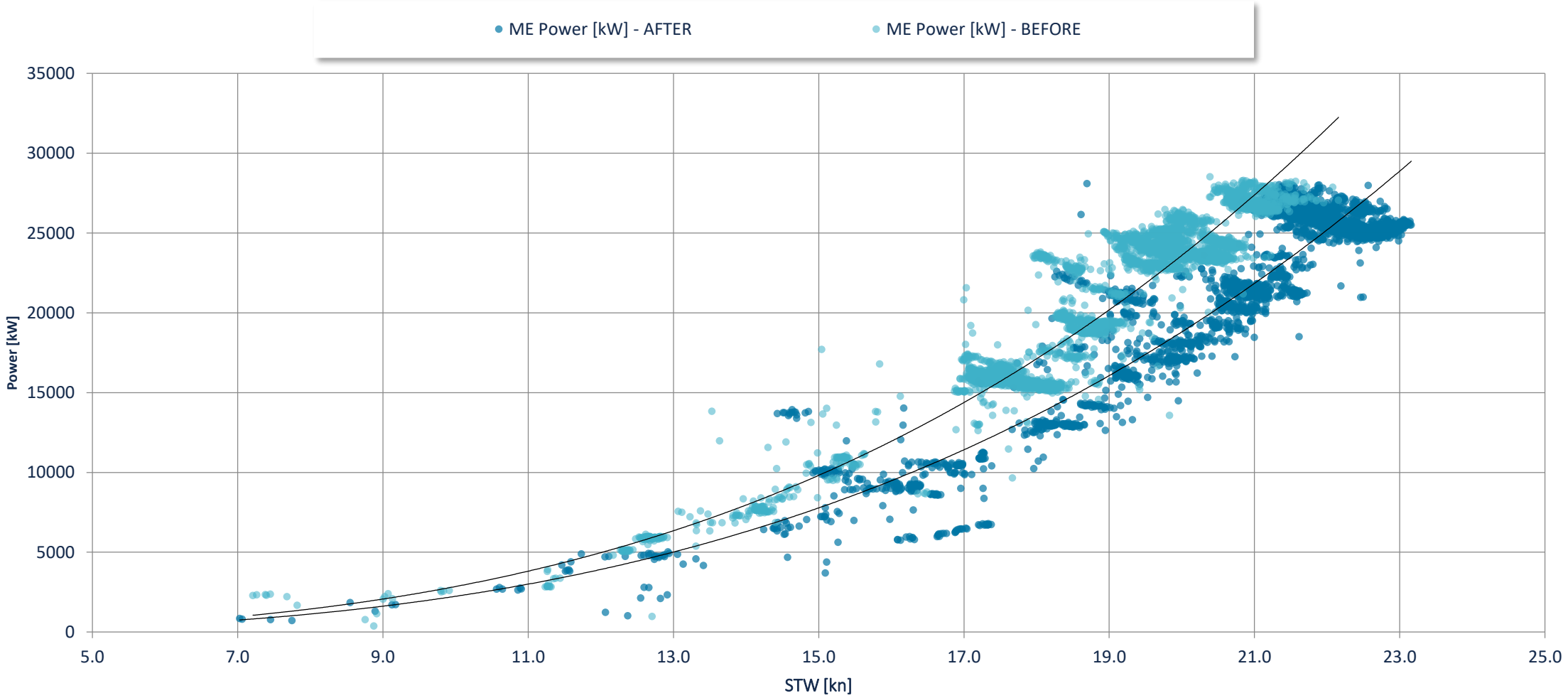
Before = Three months before reblading

After = Three months after reblading

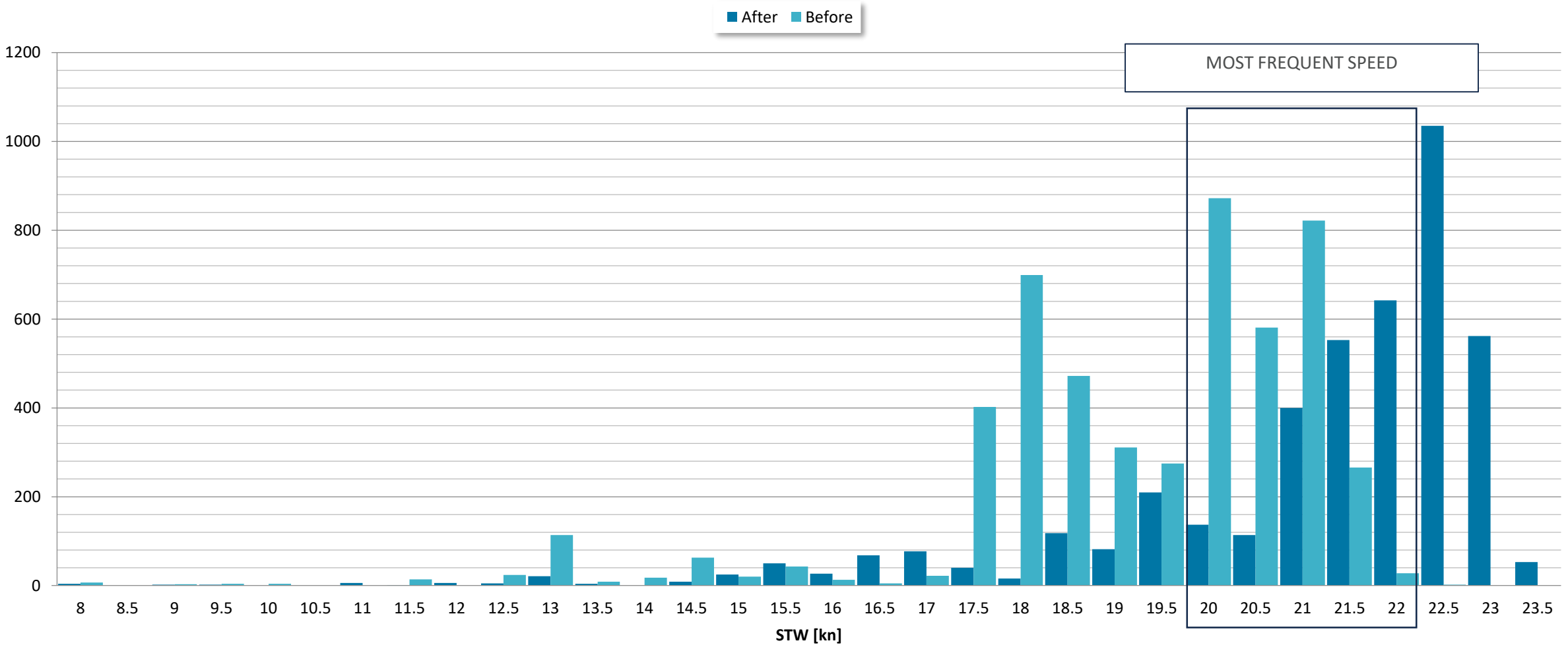
BF ≤ 4

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$

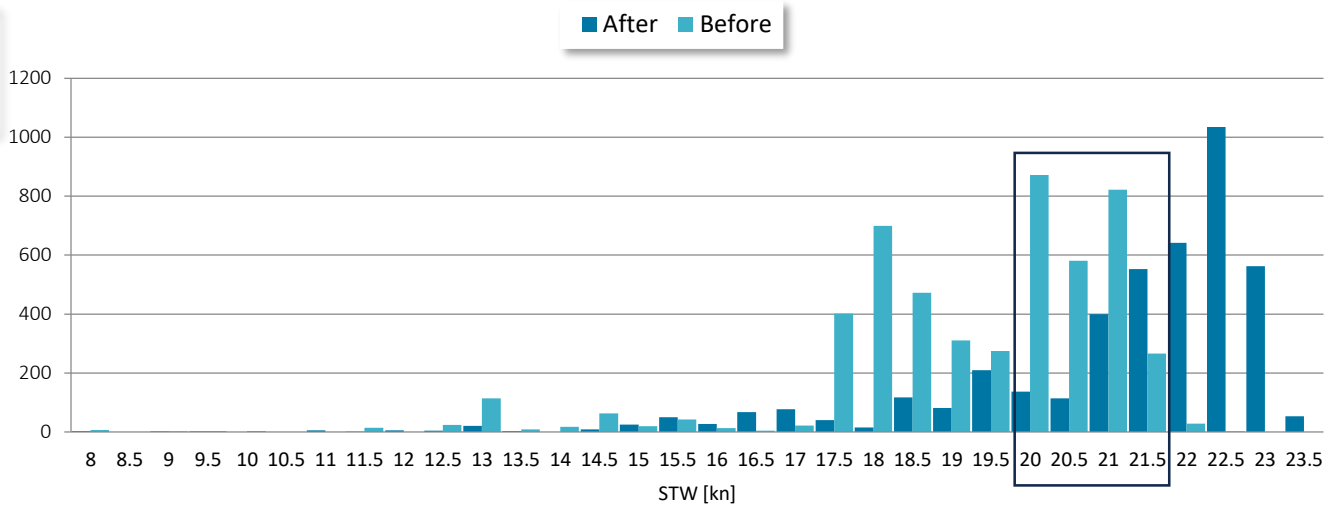
FUEL CONSUMPTION:
127 t/Day @ 21 kn

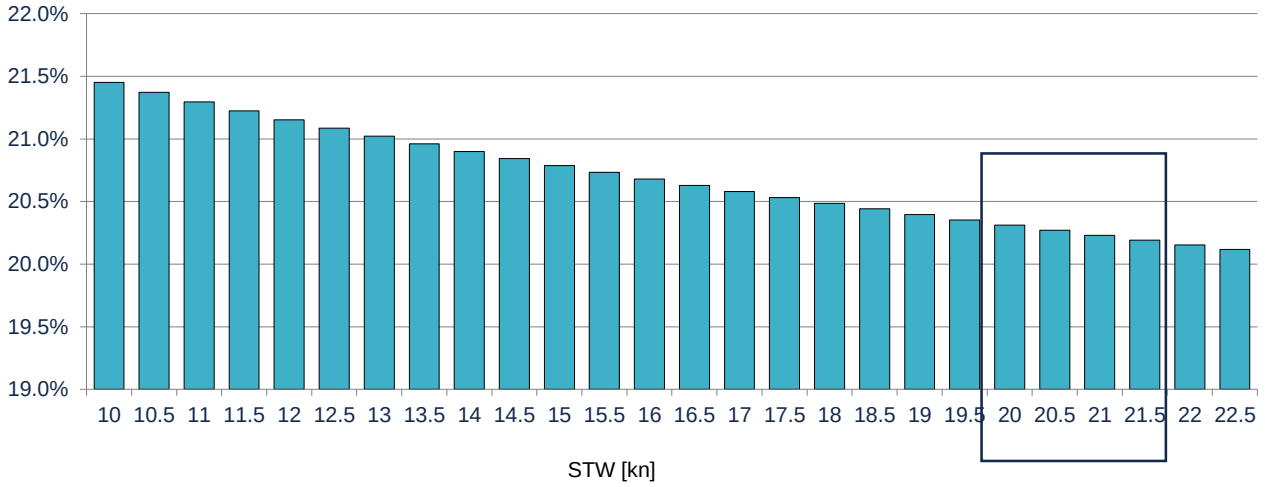
FUEL SAVING:
25 t/Day @ 21 kn

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

SAVINGS:

2% - Rule editor and alerting;

2% - Trim Optimization;

2% - Route Optimization;

??% - Safety and regulatory compliance;

??% - Data driven technical management

RINA CUBE

Thank you for the attention.
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