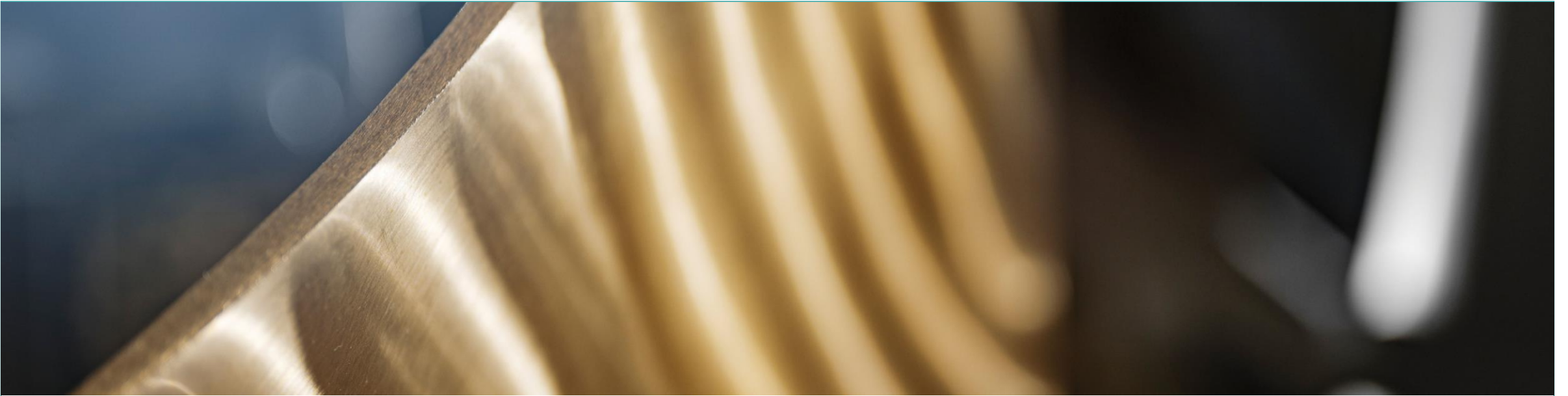


4.5.2022 / Hannu Jukola / Framtidens Sjöfart

Ice Behavior and Winter Challenges

PROPULSION PERSPECTIVE



Hannu Jukola

Naval Architect



- Master of Science, Naval Architect, TKK 1990
- Worked at Steerprop since 2000
- Multiple tasks in Hydrodynamics, R&D and Sales

Steerprop in Brief

Steerprop is the leading designer and manufacturer of azimuth propulsion solutions for the most demanding applications and toughest conditions. Since our founding in Finland in 2000, we have delivered fit-for-purpose propulsion units for vessels working in the arctic, offshore, tug, workboat and cruise industries.

Employs more than :

 **450**

Net sales:

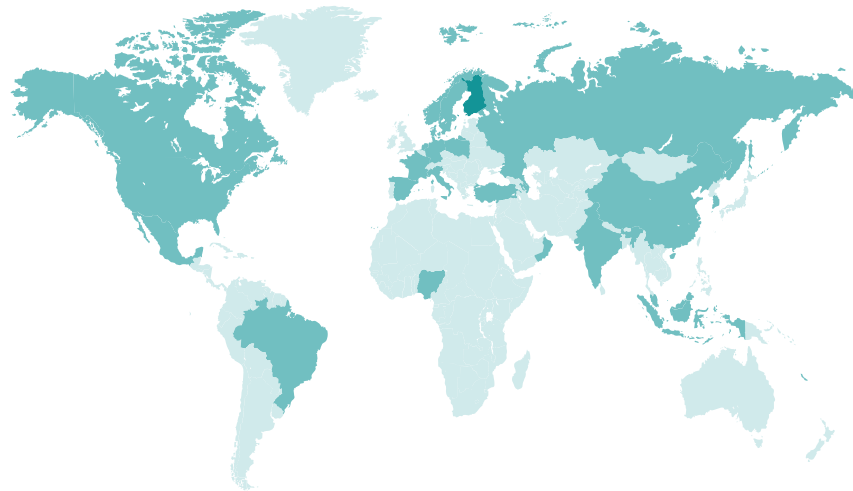
 **38.5 MEUR**

Units delivered :

 **close to 900**

Operates direct or with authorized distributors or agents in

more than 50 countries



Condition monitoring

 **in every delivery**

Operating hours in total :

 **over 10 million**

Steerprop propulsion units

 **in every third icebreaker**

Supporting Wide Range of Applications



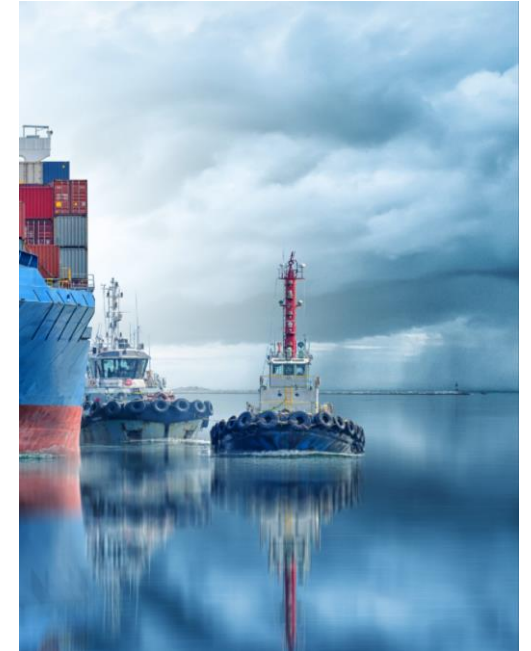
ARTIC



OFFSHORE



CRUISE & FERRY



**TUGS AND
WORKBOATS**

Resolve to Perform

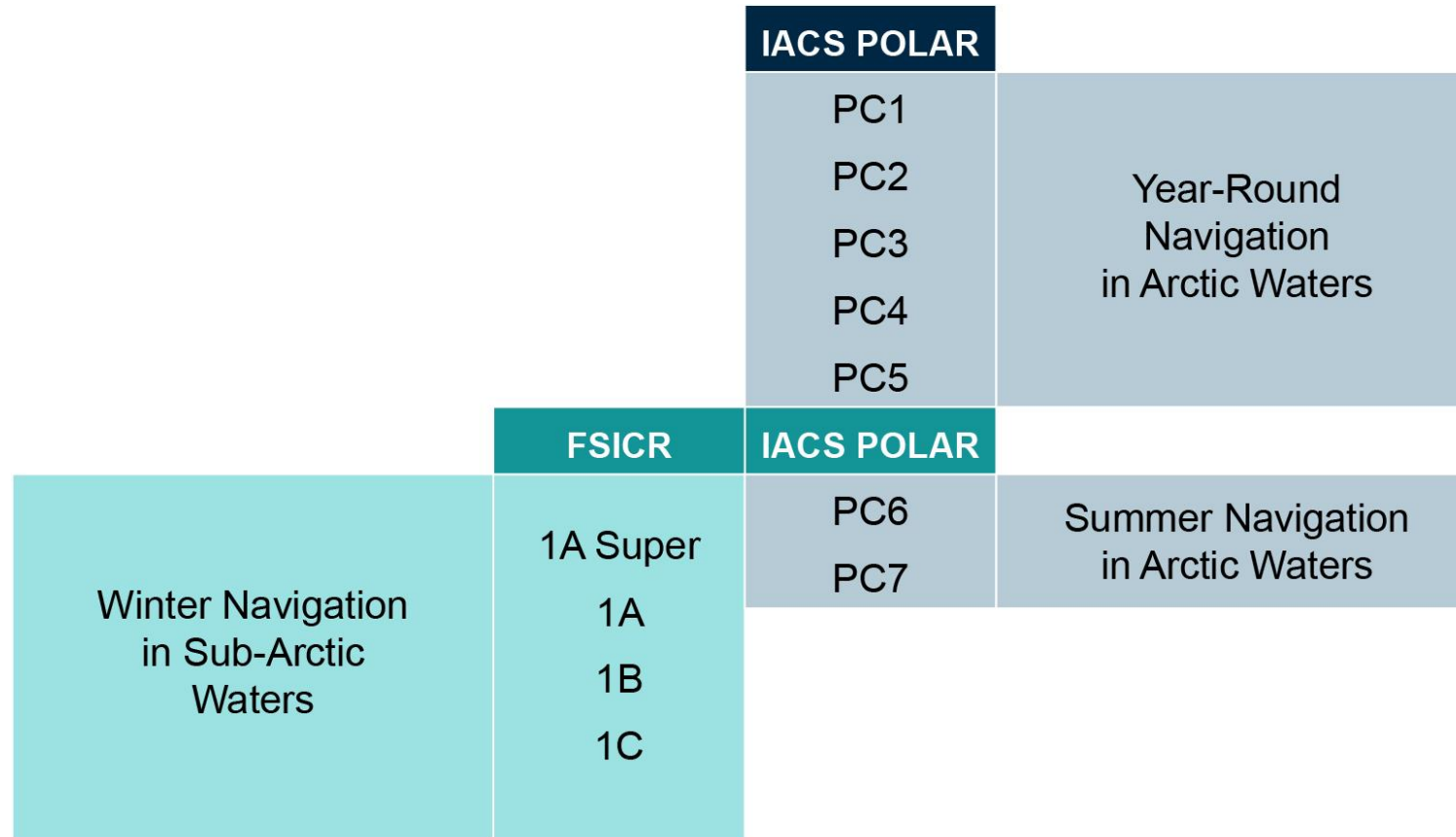
For the arctic conditions the propulsors need to be build for purpose taking into account ice conditions and operational area.

Steerprop has decades of experience in operating in harsh environment:

- Ice class dimensioning
 - Knowledge of ice class rules
 - Understanding of ice conditions and loads
 - Comprehension of structure behavior in Ice
- Worlds largest mechanical propulsors, 9MW RS icebreaker 7
- Operational experience from icebreakers both in Baltic sea and Arctic Ocean



Operational Area Dictates the Ice Class



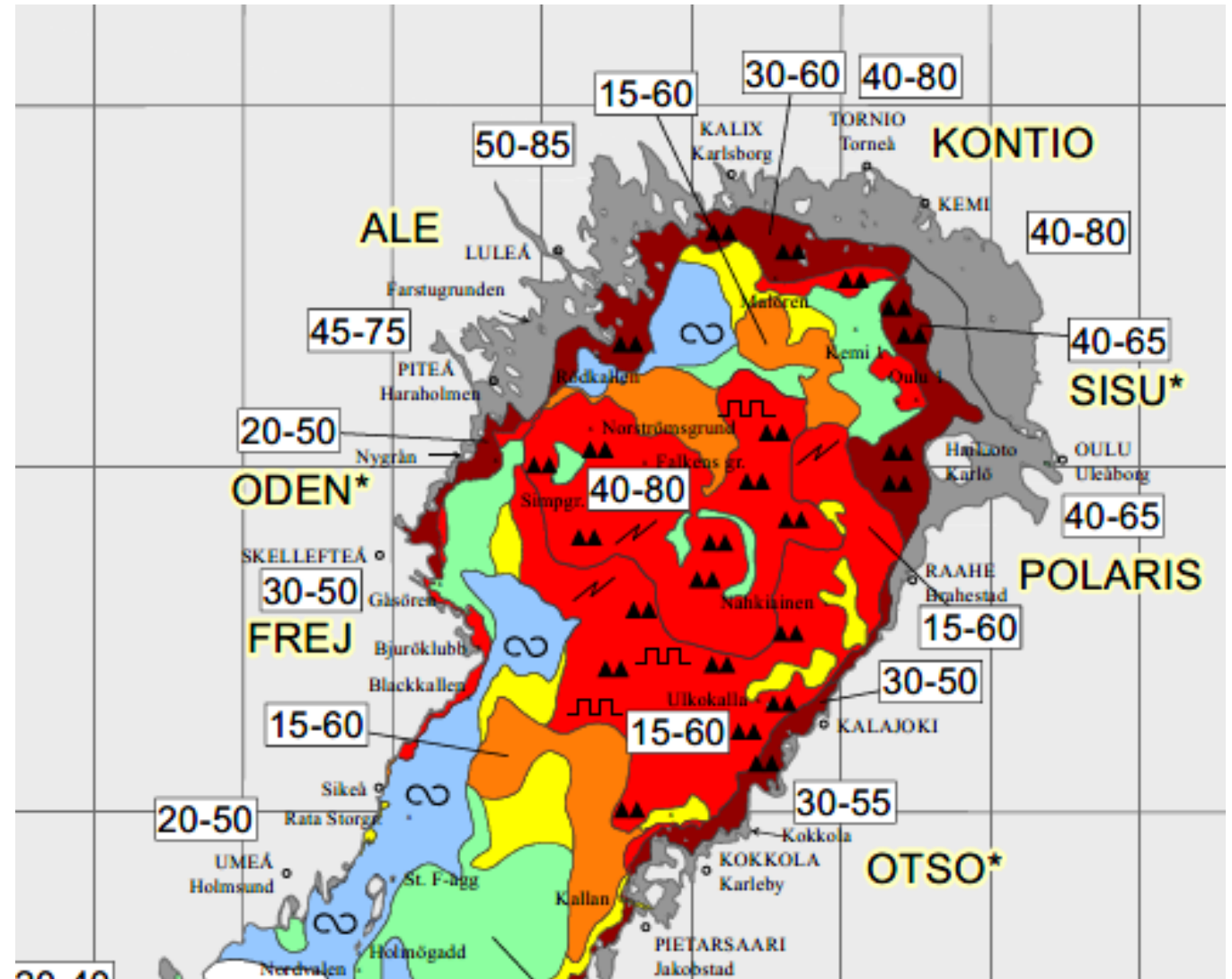


Operational Environment Poses Challenges

Ice Conditions

Varying ice conditions require different capabilities from icebreakers

- Ice breaking performance in level ice
- Efficient ridge penetration and clearing
- Channel widening
- Maneuverability



Picture: fmi.fi

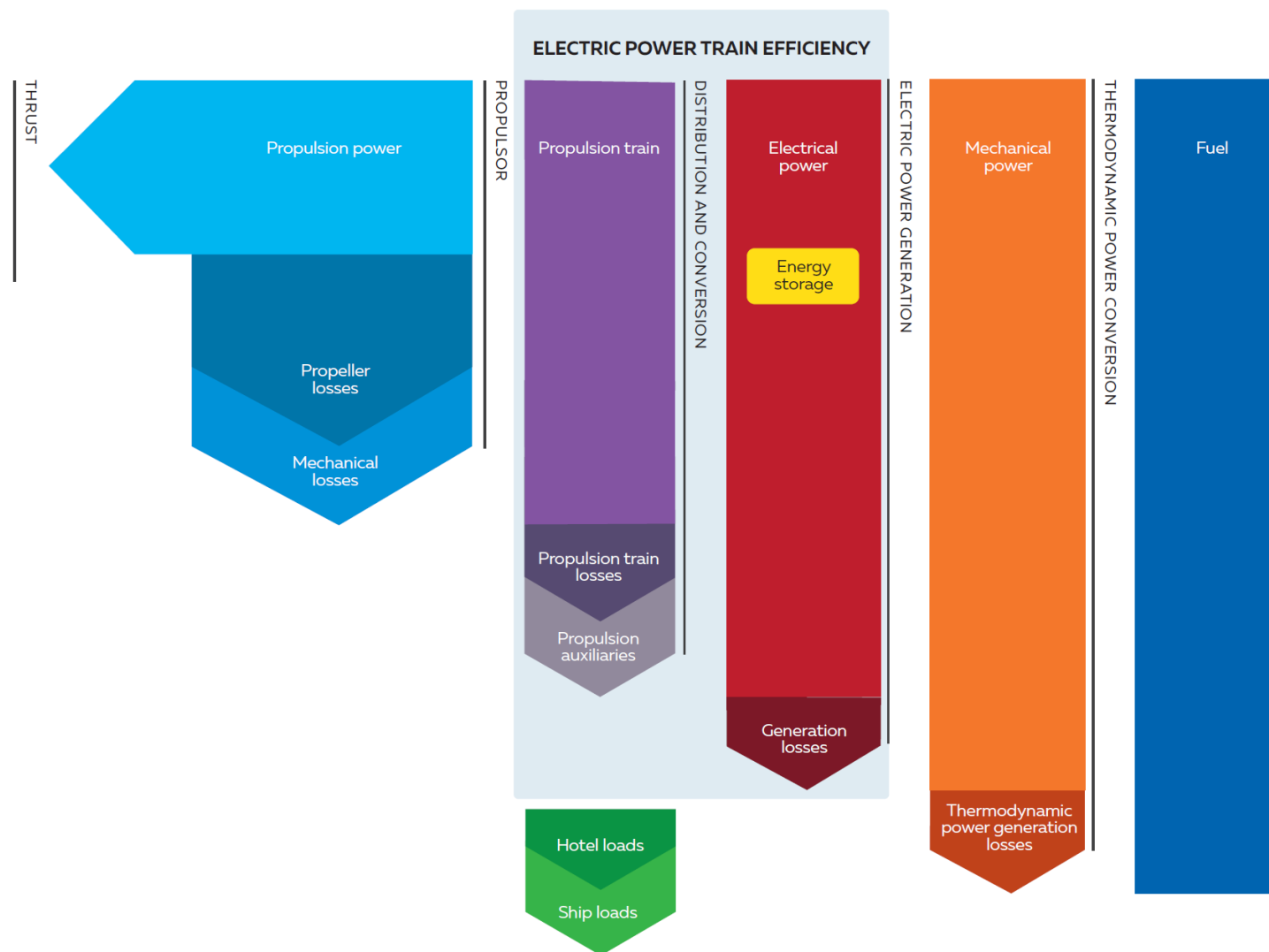
Energy Efficiency Design Index Impact



EEDI requirements lead to:

- Ships with less power
 - Poor ice-going capability
 - Need more icebreaker assistance
- Larger ships with wider beam
 - Carry more payload
 - Need more powerful or wider icebreakers
 - New icebreaking techniques i.e. channel widening with propeller wash

High Efficiency Equals Low Emissions





**Fit-for-purpose solutions are needed
in challenging conditions**

The Right Solution for the Purpose



PUSH-PULL CRP

- ++ High free running efficiency
- + Good bollard pull
- + Low underwater noise



OPEN PUSH OR PULL

- + PULL: ice milling
- Low bollard pull



DUCTED

- ++ Highest bollard pull
- Nozzle blockage in ice

Conflicting Requirements for Ice-going Tugboats

Ducted propellers are used in tugboats and offshore vessels that require high static pull.

Under certain ice conditions duct is prone to be blocked by ice resulting in complete loss of thrust.

Open propeller can be used

- No blockage
- Significantly lower thrust

CRP offers new possibility

- No blockage
- Thrust higher than with open propeller
- Improved free running efficiency



In addition to the correct dimensioning, equally important is to choose the right, fit-for-purpose propulsion for your application and ice conditions of the operating area.



STEERPROP

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