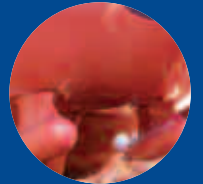




Intershield® 163 Inerta® 160

Abrasion Resistant Low Friction Ice Coating



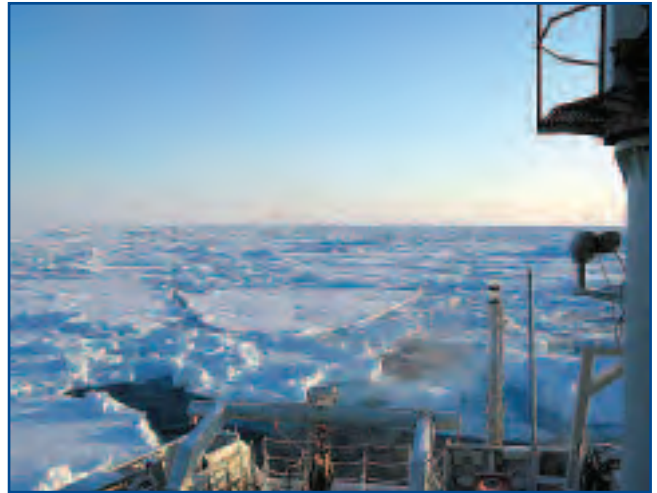
Introduction

Vessel operators who trade in ice face a number of difficult challenges:

- Extremes of low temperature
- Severe abrasion
- Ice adhesion to the outside shell

Traditional anticorrosive systems, including standard pure epoxies, are unable to offer a solution to these challenges. **Intershield 163 Inerta 160**, an abrasion resistant ice coating developed over 30 years ago, has established an unrivalled in service performance reputation. Specifically designed for operators that trade in the Baltic Sea region, Intershield 163 Inerta 160 has been specified and used successfully on over 700 vessels trading in ice including;

- Ice breakers with the potential of trade in multi year ice
- Ice class vessels that trade in first year ice



Intershield 163 Inerta 160: unrivalled in service performance in ice conditions.





'Fesco Sakhalin' built in Aker Finnyards.
Intershield 163 Inerta 160 from Newbuilding.

Ice Abrasion

Because of the severe ice abrasion experienced, class societies stipulate that vessels trading in ice should have increased steel plate thickness, generally referred to as the 'increment due to abrasion and corrosion due to ice trading'.

Some class societies however, such as Lloyds Register, DNV and the Russian Maritime Register of Shipping, recognise the benefit of applying a specialist, low friction, ice resistant coating on the hull. Not only do such coatings aid the passage of the vessel by virtue of low frictional resistance but they also protect the steel from corrosion by providing a physical barrier to the elements.

First Year Ice Thickness	Finnish-Swedish Ice Class	American Bureau of Shipping	Bureau Veritas	Det Norske Veritas	Germanischer Lloyd	Lloyds' Register of Shipping	Nippon Kaiji Kyokai (Class NK)	Registro Italiano Navale	Russian Maritime Register of Shipping
1.0m	IA Super	IAA	IA Super	ICE-IA*	E4	1AS	IA Super	IAS	ULA, UL, LU7, LU5
0.8m	IA	IA	IA	ICE-IA	E3	1A	IA	IA	L1, LU4
0.6m	IB	IB	IB	ICE-IB	E2	1B	IB	IB	L2, LU3
0.4m	IC	IC	IC	ICE-IC	E1	1C	IC	IC	L3

Table 1: Equivalent class notations for first year ice trading vessels.
Finnish Maritime Administration - Bulletin No. 16/27.11.2002.

Ice Class Vessels

'Ice class' is a term applicable to vessels operating in first year ice conditions where a fairway channel, cut by an ice breaker, is continuously frozen and broken by the passage of shipping. The class notation of an ice class vessel influences many factors e.g. plate thickness, degree of hull strengthening, machinery output, shaft system, propeller, rudder and steering gear and corrosion protection. The thickness of ice that vessels are allowed to operate in depends upon this class notation.

All of the major Classification Societies have their own designations for ice class vessels (See Table 1) but there have been recent attempts at standardisation. The Finnish-Swedish Ice Class Rules for example are now becoming the accepted standard at Newbuilding, even for trade in Russian waters.



Intershield 163 Inerta 160
Resists ice adhesion.

For vessels trading in first year ice, such as that found in the Baltic Sea, the application of a recognised abrasion resistant ice coating can actually result in an approved reduction in total steel plate thickness.

Lloyd's Register **RECOGNISED ABRASION RESISTANT ICE COATING**

Certificate No: **MND0210051717**

The product below is recognised as an abrasion resistant ice coating for ships intending to navigate in ice conditions.

Providing the coating is applied in way of the ice belt of ships intending to navigate in first-year ice conditions and is maintained in good condition during service, the thickness of steel plating in way of the ice belt may be reduced by up to 1 mm in accordance with relevant Rules and Regulations.

The recognition is subject to Lloyd's Register being informed of any changes in and modifications to the product's formulation or specification and the product being used in accordance with the manufacturer's instruction and with the relevant requirements of Lloyd's Register's Rules and Regulations.

Manufacturer: International Paint Ltd
Stonegate Lane
Felling, Gateshead
Tyne & Wear, NE10 0JY
United Kingdom

Product name: Intershield 163 Inerta 160

Product colours: ERA160/ERA161 White
ERA162/ERA161 Red
ERA163/ERA161 Black

Film thickness: Minimum 500 µm

Surface cleanliness: Sa 2.5 (ISO 8501-1)

Blast profile: Minimum 75 µm

Valid until: 30 June 2010
Date of issue: 25 June 2005


Jian-Zhong Zhang
Surveyor to Lloyd's Register (EMEA)
A member of Lloyd's Register Group

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Optimum Protection

To get the optimum level of protection from a specialist, abrasion resistant coating, it is advisable to coat the complete underwater hull up to 0.5m above the Load Water Line (LWL).

Because of the way ice breaks under pressure, ice breakers in particular benefit from complete coating of the underwater hull.

Generally, all parts of the hull could be in contact with ice whether it is during the initial ice break, or the subsequent impact of large ice inclusions as the vessel proceeds.

Whilst ice class vessels trading in first year ice do not require complete coating of the underwater hull they should as a minimum be coated in the 'ice-belt' region (see Diagram 1).

“We have used Intershield 163 Inerta 160 for many years on our ice strengthened vessels and we have noticed that this paint, which is more than a paint, applied at newbuilding is a good investment due to Low Friction and Abrasion Resistance in ice conditions.”

Markku Lumme, Senior Technical Advisor,
Shipmanagement, Neste Oil Shipping

Intershield 163 Inerta 160 at Newbuilding.



'Sotka' - Intershield 163 Inerta 160 'a good investment'.

The ice belt region of a vessel is well defined by the class societies and is not necessarily a region of uniform dimensions. Diagram 1 shows the ice belt for a vessel trading in first year ice.

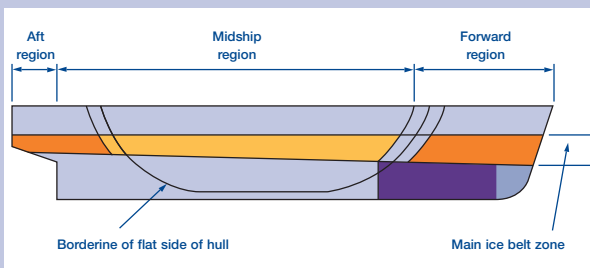
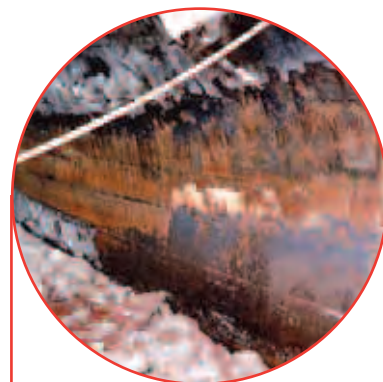


Diagram 1.

Traditional abrasion resistant anticorrosive systems, including pure epoxies, are unable to offer the protection required in either the ice belt or on the complete underwater hull.



Typical ice damage.

Intershield 163 Inerta 160

Intershield 163 Inerta 160 is a proven, high performance abrasion resistant coating especially designed for ice going vessels.

Key system features include:

- Smooth surface assists ice slip
- Resists ice adhesion to the coatings surface
- Low frictional resistance controls fuel costs and improves operating efficiency
- Abrasion resistant - controls mechanical damage and hull roughness, saving on future maintenance and repair costs
- Up to 2.5 times the impact and erosion resistance of standard epoxies
- Designed for operation in temperatures down to -50°C (-58°F)

Abrasion Resistance

Research has shown that a steel hull with a traditional anticorrosive system trading in ice, can, as a result of abrasion and subsequent corrosion, experience an increase in Average Hull Roughness (AHR) in the first year from 100 to 225 microns resulting in an increase of 4% in the power required to maintain the same vessel speed.

Specially formulated to withstand ice impact and abrasion,

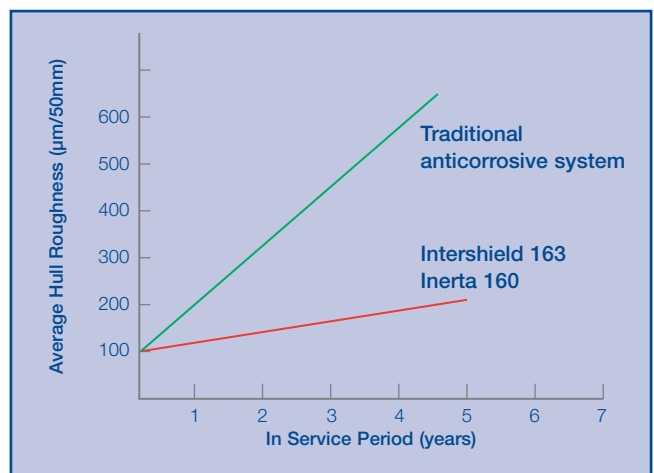
Intershield 163 Inerta 160 has a proven track record in controlling surface roughness (see Graph 1).

'Kalla' after 2 years in service.



'Urho' after 5 years in service.

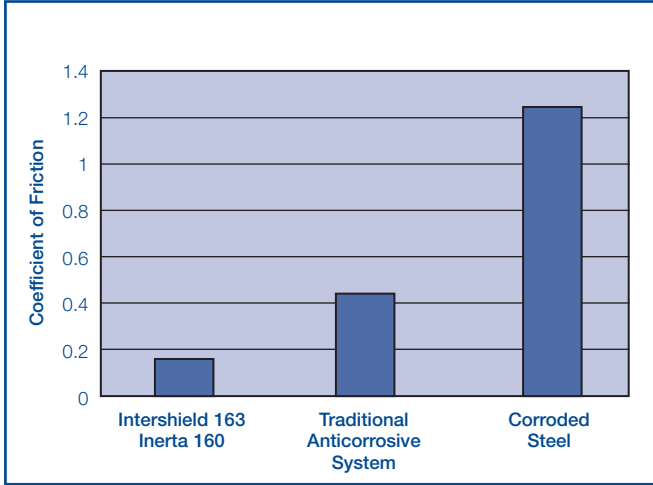
- First, Classification Society recognised abrasion resistant ice coating
- Good mechanical properties and flexibility under bending stress, extension and compression
- Good cohesive strength
- Allows reduction in steel thickness at the ice belt leading to reduced overall vessel weight and improved fuel efficiency
- 30 year, >700 vessel proven track record
- Low VOC



Graph 1: Average Hull Roughness (AHR).

Fricitional Resistance

Increasing hull roughness has a significant effect on the efficiency of a vessel moving through water and ice. The **Intershield 163 Inerta 160** coefficient of friction has been measured and compared to a traditional anticorrosive system and corroded steel with a surface roughness of 100 microns.



Graph 2: Coefficient of Friction.

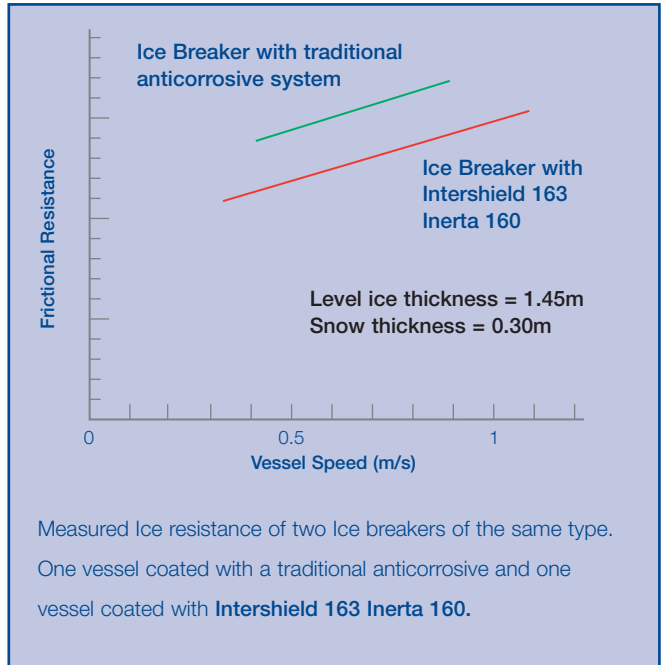


'Silja Serenade' after 2 years in service.

The abrasion resistance and low frictional resistance of **Intershield 163 Inerta 160** has a beneficial effect on reducing vessel power consumption and therefore fuel consumption. Research has shown that it is possible to achieve an annual fuel saving of 7 to 10% with a typical vessel trading in ice in the Baltic region if the vessel is coated with **Intershield 163 Inerta 160** compared to a traditional anticorrosive system.



'Otso' - Intershield 163 Inerta 160 from Newbuilding.



Measured Ice resistance of two Ice breakers of the same type. One vessel coated with a traditional anticorrosive and one vessel coated with **Intershield 163 Inerta 160**.

Graph 3: Performance comparison.

Intershield 163 Inerta 160 provides the ultimate protection for vessels trading in ice. The application of **Intershield 163 Inerta 160** ensures that vessels benefit from excellent abrasion resistance, low frictional resistance and low ice adhesion each contributing significantly to reducing operating costs and increasing efficiency.

International Paint Ltd is part of Akzo Nobel, the Netherlands based company serving customers throughout the world with healthcare products, coatings and chemicals. Consolidated sales for 2004 totalled EUR 12.7 billion. Akzo Nobel currently employs approximately 61,000 people in more than 80 countries.



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Intershield® 163 Inerta® 160



Product Description

A high solids, low VOC, two pack epoxy abrasion resistant coating especially designed for ice-going vessels. Low ice adhesion. Low frictional resistance.

Features

- Smooth surface

- Low frictional resistance

- Abrasion resistant

- Designed for operation in temperatures down to -50°C (-58°F)

- Class recognised as an abrasion resistant ice coating

- 30 year, >700 vessel proven track record

- Low VOC* (40g/ltr EPA Method #24, 30g/kg SED[■])

Benefits

- Assists ice slip
- Resists ice adhesion to coating surface

- Controls fuel costs and improves operational efficiency

- Controls mechanical damage and hull roughness, saving on future maintenance and repair costs

- Allows operation in the harshest of ice conditions

- Reduction in steel plate thickness is allowable

- Proven performance

- Control of solvent emissions

* VOC = Volatile Organic Compounds.

■ EU Solvent Emissions Directive (Council Directive 1999/13/EC).

Intershield® 163 Inerta® 160



Intershield 163 Inerta 160 - ultimate performance in the harshest of environments.

Vessel Area

Underwater Hull
Ice Belt
Propeller

Surface Preparation

Newbuilding:

Abrasive blast clean to Sa2½ (ISO 8501-1:1998). If oxidation has occurred between blasting and application of Intershield 163 Inerta 160, the surface should be reblasted to the specified visual standard. A blast profile of 75 microns minimum is required.

Major Refurbishment:

Abrasive blast clean to Sa2½ (ISO 8501-1:1998). If oxidation has occurred between blasting and application of Intershield 163 Inerta 160, the surface should be reblasted to the specified visual standard. Surface defects revealed by the blast cleaning process, should be ground, filled or treated in an appropriate manner. A blast profile of 75 microns minimum is required.

Product Data

Colour	Limited colour range
Volume Solids (ISO 3233:1998)♦	95% ±2%
Film Thickness	Wet – 526µm (20.7mils) Dry – 500µm (19.7mils)
Theoretical Spreading Rate (at stated volume solids and typical film thickness)	1.90m²/lit at 500µm DFT 77 sq.ft/US gallon at 19.7mils DFT
Drying/Overcoating Times @ 25°C (77°F):	
Touch Dry (ISO 1517-1973)	5 hours
Hard Dry (ISO 9117-1990)	48 hours
Min Overcoating time	3 hours
Max Overcoating time	This product is not normally overcoated. If antifoulings are to be applied, consult International Paint.
Pack Size	30 litres
Thinner	Do Not Thin
Cleaner	GTA822 or GTA220

♦ ASTM D-2697 - North America.

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