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September 2005

Intershield® 163 Inerta® 160
Abrasivation Resistant Low Friction Ice Coating

Worldwide Operations

Argentina                        Austria            Germany
Australia                       Belgium            Hong Kong
Bahamas                        Greece                Iceland
Bahrain                         Hong Kong           India
Brazil                          Bulgaria           Indonesia
Canada                          Chile               Iran
Colombia                        Croatia             Japan
Cuba                            Croatia             Kuwait
Cyprus                          Latvia              Lithuania
Denmark                         Luxembourg         Malaysia
Egypt                           Estonia             Malawi
Fiji                            Mexico              Netherlands
Finland                         New Zealand         Northern Ireland
France                          Northern Ireland  Norway
Germany                         Pakistan            Panama
International Paint Ltd        People’s Republic of China
International Paint Ltd        Peru                Philippines
International Paint Ltd        Poland              Portugal
International Paint Ltd        Qatar               Germany
International Paint Ltd        Republic of Ireland  Romania
International Paint Ltd        Russia              Singapore
International Paint Ltd        South Africa        South Korea
International Paint Ltd        Sri Lanka           Spain
International Paint Ltd        Sweden              Belgium
International Paint Ltd        Tanzania            Thailand
International Paint Ltd        Turkey              U.S.A.
International Paint Ltd        Ukraine             United Arab Emirates
International Paint Ltd        United Kingdom       Uruguay
International Paint Ltd        Vanuatu             United States
International Paint Ltd        Vietnam             United States
International Paint Ltd        Western Samoa       United States
International Paint Ltd        Yemen               United States

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.

Intershield 163 Inerta 160
an abrasion resistance ice coating which has established an unrivalled in service performance reputation.
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 750 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
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.

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.

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.

---

<table>
<thead>
<tr>
<th>First Year Ice Thickness</th>
<th>Finnish-Swedish Ice Class</th>
<th>American Bureau of Shipping</th>
<th>Bureau Veritas</th>
<th>Det Norske Veritas</th>
<th>Germanischer Lloyd</th>
<th>Lloyds’ Register of Shipping</th>
<th>Nippon Kaiji Kyokai (Class NK)</th>
<th>Registro Italiano Navale</th>
<th>Russian Maritime Register of Shipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0m</td>
<td>IA Super</td>
<td>IAA</td>
<td>IA Super</td>
<td>ICE-IA*</td>
<td>E4</td>
<td>1AS</td>
<td>IA Super</td>
<td>IAS</td>
<td>UL, UL, L, L5, L6, L7, L8, L9, L10</td>
</tr>
<tr>
<td>0.8m</td>
<td>IA</td>
<td>IA</td>
<td>IA</td>
<td>ICE-IA</td>
<td>E3</td>
<td>1A</td>
<td>IA</td>
<td>IA</td>
<td>L1, L4</td>
</tr>
<tr>
<td>0.6m</td>
<td>IB</td>
<td>IB</td>
<td>IB</td>
<td>ICE-IB</td>
<td>E2</td>
<td>1B</td>
<td>IB</td>
<td>IB</td>
<td>L2, L3</td>
</tr>
<tr>
<td>0.4m</td>
<td>IC</td>
<td>IC</td>
<td>IC</td>
<td>ICE-IC</td>
<td>E1</td>
<td>1C</td>
<td>IC</td>
<td>IC</td>
<td>L3</td>
</tr>
</tbody>
</table>

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

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.

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.
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)

Aberration 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).

- 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)
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.

Graph 2: Coefficient of Friction.

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.

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.
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Intershield® 163 Inerta® 160
Abrasion Resistant Low Friction Ice Coating

Intershield 163 Inerta 160: an abrasion resistance ice coating which has established an unrivalled in service performance reputation.
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.

www.international-marine.com
Intershield® 163
Inerta® 160

Vessel Area
Underwater Hull
Ice Belt
Propeller

Surface Preparation
Newbuilding:

Major Refurbishment:

Product Data

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

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