



MarineLINE®

Safely Line Your Chemical Tanker with MarineLine® Coating/Lining To Carry Hazardous Acids.

Proven acid carriage performance over many years of service.



Advanced Polymer Coatings is often asked about the carriage of acids in chemical carriers' tanks coated/lined with MarineLine®. In particular these aggressive cargoes include Inorganic Acids (Mineral Acids) and Organic Acids. Common acids include Phosphoric Acid and Super Phosphoric Acid, Acetic Acid and Sulphuric Acid 0-98%.

The answer is YES. MarineLine® coated/lined ships have carried all of these chemicals successfully for many years. Here is background on this enquiry:

REGULATIONS

Carriage of chemicals in bulk is covered by regulations in SOLAS Chapter VII - Carriage of dangerous goods and MARPOL Annex II - Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk.

Both Conventions require chemical tankers built after 1 July 1986 to comply with the **International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk** (IBC Code), as shown here in the section dealing with APPROVED LINING.

Chapter 15 of the IBC Code (2007 edition) for **Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk** for lining approved for use with acids reads as:

15.11.2 Proposals for lining steel tanks and related piping systems with corrosion-resistant materials may be considered by the Administration. The elasticity of the lining shall not be less than that of the supporting boundary plating.



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TECHNICAL REPORT

POINTS OF INTEREST & INTERPRETATIONS

The phrase *considered by the Administration* points out that the IBC code does not define if a coating or lining should be approved for use in carrying acids, it is the Administration (or Flag State) that makes this approval. The Flag State has the authority and responsibility to enforce regulations over vessels registered under its flag, including those relating to inspection, certification, and issuance of safety and pollution prevention documents. There are a large number of chemical tankers, registered to different flag states that are currently providing acid carriage service throughout the world.

Thus, the only institute that can make comments on the coating/lining is the Administration. In some cases class societies will act on behalf of the administration. Currently there are no known lists of approved or non-approved linings and or coatings. Currently The American Bureau of Shipping (ABS) has conferred “Certificate of Design Assessment” designation for the MarineLine® coating system to line and protect tanks in marine chemical tankers, and ABS has also approved MarineLine®-coated vessels for carriage of Sulphuric, Phosphoric, and Acetic Acids. In addition, Bureau Veritas (BV) has approved MarineLine®-coated vessels for acid carriage service.

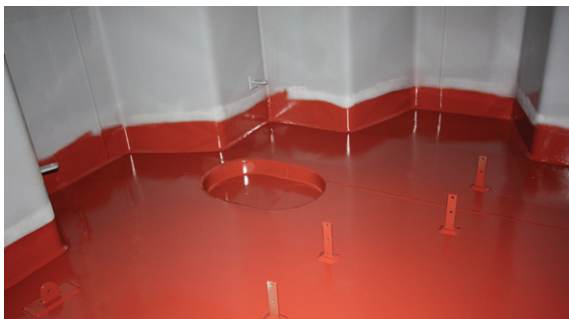


*American Bureau of Shipping (ABS)
“Certificate of Design Assessment” for
the MarineLine® coating system.*

According to the INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES, in its April 2011(CC6 SC) interpretation for this IBC code Ch 15.11.2 is:

“Lining” is an acid-resistant material that is applied to the tank or piping system in a solid state with a defined elasticity property.

Note that both IBC and IACS make ‘no’ mention of a difference between linings or coatings, nor is there any definition in the IBC Code of what is ‘Solid’, nor is there a definition of ‘Lining’. The normal understanding is that lining and coating are the same. MarineLine®, as a solid coating, meets the lining criteria for an ‘acid-resistant material’, while MarineLine® also provides higher elasticity than carbon steel, thus meeting the second criteria presented by the IBC Code. (Note, the necessity of making the lining the same as the substrate’s (steel) elasticity as required by IBC Code 15.11.2, is between the Owner and Shipyard (IBC Code Ch 6). IACS continues to discuss this with IMO.



The MarineLine® two coat system, (left) Base coat and (right) Top coat, form an effective acid-resistant lining.

THE MARINELINE® SOLUTION

The IBC Code provides an international standard for the safe carriage by sea of dangerous and noxious liquid chemicals in bulk. In reviewing the current IBC Chapter 17 list of products against MarineLine®'s Chemical Resistance Guide, note that MarineLine® is resistant to more than 98% of these products listed for Type 1 through Type 3 ships. KEY is that MarineLine® is resistant to 22 of the 24 products listed in the most stringent ship type category, Type 1 chemical tanker. Only two of these product categories, under noxious liquids, may contain blends of chemicals, and/or various concentrations, and it is



recommended to contact APC for chemical resistance review prior to carriage. Please also note that the IBC Code requires specifications on stainless steel material for tanks and piping for some of these Type 1, Type 2, and Type 3 acid cargoes.

Coatings such as Phenolic Epoxies are not resistant to many of the acids and suffer from degradation and absorption of cargoes into the coatings causing purity issues and corrosion problems. In addition, Stainless Steel tanks have limitations as well, and for example cannot carry low or 'intermediate' concentrations which attack and corrode the stainless steel.

Upon request, APC can provide a lab test report of the resistance of MarineLine® 784 to Acetic Acid, and also other acids. Let APC show you how MarineLine® is the best material for the carriage of acids in chemical vessels. Contact your APC MarineLine® representative today for complete details. Note only some acids can be carried in cargo tanks with linings meeting the IBC Code Ch 15.11.2 requirements. For other acids, specific stainless material is specified for cargo tanks and pipings.

APC suggests that any questions regarding use of coating/lining for acid carriage, as per IBC Code 15.11.2 be directed to respective Class and Flag State for clarification.