

ARMORFLEX[®]

963XK161

Marine Clear Gel Coat

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Description

ArmorFlex[®] 963XK161 gel coat is a high performance product formulated for the marine industry. ArmorFlex[®] 963XK161 meets the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) for Boat Manufacturing and Reinforced Composites Construction.

ArmorFlex[®] 963XK161 possesses important construction application qualities, such as: resistance to porosity, tearing, and sag, consistent liquid properties, and good patchability. These characteristics result in the production of high quality parts.

Features and Benefits

- Superior weathering properties (compared to conventional gel coats)
- Blister resistance
- High-gloss BUFFBACK[®] characteristics
- Smoother sprayed film (less orange peel)

ArmorFlex[®] 963XK161 is developed for **marine** application and so it is specifically formulated for use in high performance FRP applications where exterior gel coats are used. Some examples include the addition of metal flakes or backing the clear coat with a solid color.

ArmorFlex[®] 963XK161 addresses the following special needs involving clear coats:

- Exterior durability—Surpasses previous commercial gel coats in their resistance to yellowing, fading, and loss of gloss.
- Flexibility—Excellent for reducing cracking and crazing.
- Application—Easy to spray with minimal air entrapment and good air release.
- Sag resistance—Sprayed films resist sagging and slumping.

ArmorFlex[®] 963XK161 only requires the addition of the proper amount of MEK-P catalyst to cure.

Typical Properties (77°F, 25°C)

Typical properties of ArmorFlex[®] 963XK161 are shown below. These values are listed for reference only and are not meant to be used for manufacturing control criteria. Not all batches will conform exactly to the

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numbers listed below due to variances in storage conditions, temperature, age, testing equipment (type and procedure), which have significant effects on the test results. Gel coats with properties outside of these ranges may perform acceptably.

Test	ArmorFlex® 963XK161
Viscosity ⁽¹⁾	4000 cps
Thixotropic Index (2/20)	6.5
Flash Point	79°F
Hazardous Air Pollutants	See MSDS
Volatile Organic Compound	43.7%
Weight per Gallon	8.81 lbs
Gel Time at 77°F with 1.5% DMM-9 ⁽²⁾	11.5 minutes
Lay-up Time	45 – 75 min, depending on product, gel time and temperature
Sag Resistance	No sag @ 20 mils

⁽¹⁾ Brookfield RVF #4 Spindle @ 20 rpm

⁽²⁾ Arkema Luperox® DDM-9 catalyst

Application

ArmorFlex® 963XK161 gel coat should be thoroughly mixed prior to use in order to obtain a uniform mixture. To obtain a properly mixed gel coat, the equipment requires sufficient horsepower relative to container size so that it achieves thorough circulation from top to bottom and out to the sides of the container. The agitator needs to be properly sized for the container and must allow for uniform mixing regardless of the liquid level in the container. Do not over-mix. Over-mixing breaks down the viscosity and increases the potential for sag. Air bubbling should not be used for mixing, as it is not effective and only serves as a potential for water or oil contamination. Several suitable types of mixing equipment and styles of agitators are available for both pails and drums.

In order to maximize the performance of the coating, it is essential that the spray equipment be well-maintained and regularly calibrated. Poorly maintained equipment and substandard application techniques negate the valuable properties of the marine clear gel coat. The equipment and application procedures must be monitored on a routine basis in order to ensure proper application and cure of the gel coat. Inquire about and adhere to all equipment manufacturers' recommendations.

ArmorFlex® 963XK161 can be applied with conventional air atomized or air-assisted airless spray equipment. Neither brushing nor rolling is recommended.

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Spray application of ArmorFlex® 963XK161 may require a different equipment set-up than what is used for higher VOC gel coats. Adjustments to pump pressure, delivery rate, tip size and atomization might be necessary. CCP does not recommend using fluid lines longer than 50 feet, or pumps smaller than 20:1 ratio.

To minimize VOC emissions, it is important to strive for good atomization, good fan pattern (no fingers or tails), and a uniform particle size of about 1/16", while maintaining the lowest pump and atomizing pressures as practical. Over-atomization of gel coat increases emissions due to more overspray, additional monomer and solids loss, and increased odors.

CCP recommends a gel coat delivery rate of no more than 2.5 pounds per minute with conventional air atomized equipment, and no more than 3 pounds per minute with airless equipment.

For optimum results, a uniform catalyst mixture must be achieved. Even when the equipment is properly maintained and calibrated, potential problems may exist due to poorly atomized catalyst, including: surging problems (gel coat or catalyst), poor tip alignment (catalyst to gel coat mix), contamination, and poor application procedures.

For best overall end performance properties, a wet film thickness of 18 ± 2 mils is ideal. Films less than 12 mils may not cure properly, might be hard to patch, show more print-through, and be more susceptible to water blisters. Films above 24 mils may pre-release, trap porosity, crack and are more subject to weathering discoloration. If water blisters are a great concern, (example: boat hulls), it is better to use 20 to 24 mils versus a thinner film. By using this level of thickness, sag, porosity and cracking might suffer. If weathering, (example: yellowing from sunlight on decks) is of great concern, thinner films (12 to 16 mils) would perform better. At a lower thickness, patchability, print through and blister resistance may be tricky.

The total film thickness should be sprayed in multiple passes (at least 3 times for 18 mils, and 4 times for 20 to 24 mils). If the film is built-up too quickly, it could result in sag and porosity issues. In order to avoid overspray settling on mold surfaces, begin spraying a pattern closest to the vapor/air exhaust. Then continue moving toward the opposite end of the mold. Maintain the recommended spray distances from the mold surface. These products should go on clear. If there is any frosty appearance, it indicates that the film thickness was applied too fast. Make sure to slow down during application as several passes are better than one.

De-lamination can occur if the gel coat is left in the mold overnight without being laminated. It is essential that the gel coat at least be *skinned* within 8 hours of being sprayed.

Proper mold maintenance is important. Although these gel coats have excellent patching properties, minimal repair work is always desirable. Sanding and compounding can hasten the chalking and loss of gloss of all gel coats. Metal flake should be patched with a special *patching thinner*, ArmorFlex® 963CA220.

For best results these high performance coatings require careful application procedures. Poor application will quickly negate the beneficial properties of these gel coats.

Metal Flake

Typical metal flake applications include a wet-on-wet approach. This means that an initial clear coat is sprayed onto the mold surface at 4 to 12 mils wet. Before the coating gels, a second coat of clear with metal flake is sprayed anywhere from 12 to 20 mils wet. Finally, a pigmented back-up color is sprayed at 5 to 12

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mils wet. This system works as long as no individual coat is cured before the next coat is applied. If a coat cures before the next coat is sprayed, alligating may occur.

Solid Color

It is advantageous to spray a clear gel coat followed by a solid color. This will protect against chalking and loss of gloss, but may affect color retention. Dark colors, such as black or red, show very little color change and are therefore better choices. Light colors, especially white, show maximum color change in exterior environments and should not be considered (even the superiority of the clear coating cannot overcome prolonged sunlight, and will eventually yellow). By contrast, metal flake applications show every little change, regardless of the metal flake color.

Occasionally, cosmetic problems occur during the application, such as:

- *Tearing:* The solid color slides and tears, leaving voids in the color. One cause of tearing is due to a thin film of clear gel coat. At least 6 mils of continuous wet film are needed. Another cause is the dried/cured status of the clear gel coat. The solid color should be sprayed while the clear coat is still wet.
- *Grainy surface:* Allow the clear coat more time to “flash”; generally, at least 5 minutes is needed. Special spray methods can also help, such as using finer atomization or slower delivery rates.

The clear coat helps reduce cracking by combining strength plus stretch. Maximum protection occurs at wet film thicknesses of 8 to 12 mils. Films less than 8 mils have less strength. Films greater than 12 mils have less stretch.

Isophthalic gel coat can be used as the back-up color. Lower cost, good blister resistance, and more flexibility (less stress cracking) are several advantages to using an isophthalic gel coat backup.

Cure

It is recommended that the gel time be checked in the customer's plant because age, temperature, humidity and catalyst will produce varied gel times. All data referencing gel or cure applies specifically to Arkema Luperox® DDM-9 catalyst. Syrgis Norac NOROX MEKP-9, NOROX MEKP-9H, Akzo Nobel CADOX L-50a and CADOX D-50 are expected to yield similar performance. Luperox® DHD-9, NOROX MEKP-925, NOROX MEKP-925H, and Chemtura HP-90 may yield slightly shorter gel and cure times.

The ideal catalyst level should be 1.8% at 77°F, and should not exceed 3% or fall below 1.2% for proper cure. Normally, the gel coat film is ready for lamination in 45 to 90 minutes. This time element is dependent on material temperature, room temperature, humidity, air movement, and catalyst concentration. Note: ArmorFlex® CLEAR 963XK161 has a tendency to air dry and so the lay-up times may be deceiving. If the lay-up time is checked by the finger method, slight pressure and rubbing should be used.

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Caution

- ArmorFlex® 963XK161 is not compatible in the liquid state with isophthalic gel coats or resins. Spray and pumping equipment must be completely clean of these products before ArmorFlex® 963XK161 can be used.
- Do not add any material, other than the recommended methyl ethyl ketone peroxide, to this product without the advice of a representative of the CCP. Under no circumstances should glycerin be added.
- It is important that only clear gel coats designated as marine or metal flake should be used. Marble clears are more rigid, and the light stabilization system is not adequate for metal flake application.

Storage Limitations

ArmorFlex® 963XK161 has a shelf-life of 90 days starting from date of shipment from CCP to the customer, and only when stored at 73°F or below, in a closed, factory-sealed, opaque container, and out of direct sunlight. The usage life is cut in half for every 20°F over 73°F. Totes of product can have even shorter usage life—66% of that for drums.

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COMPOSITES SAFETY INFORMATION**(October 2011)**

All sales of products manufactured by CCP Composites US (CCP), and described herein, are made solely on condition that CCP's customers comply with applicable health and safety laws, regulations and orders relating to the handling of our products in the workplace. Before using, read the following information, and both the product label, and Material Safety Data Sheet pertaining to each product.

Most products contain styrene. Styrene can cause eye, skin and respiratory tract irritation. Avoid contact with eyes, skin and clothing. Impermeable gloves, safety eyewear and protective clothing should be worn during use to avoid skin and eye contact. Wash thoroughly after use.

Styrene is a solvent and may be harmful if inhaled. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Extended exposure to styrene at concentrations above the recommended exposure limits may cause central nervous system depression causing dizziness, headaches or nausea and, if overexposure is continued indefinitely, loss of consciousness, liver and kidney damage.

Do not ingest or breathe vapor, spray mists or dusts caused by applying, sanding, grinding and sawing products. Wear an appropriate NIOSH/MSHA approved and properly fitted respirator during application and use of these products until vapors, mists and dusts are exhausted, unless air monitoring demonstrates vapors, mists and dusts are below applicable exposure limits. Follow respirator manufacturer's directions for respirator use.

The International Agency for Research on Cancer (IARC) reclassified styrene as Group 2B, "possibly carcinogenic to humans." This revised classification was not based on new health data relating to either humans or animals, but on a change in the IARC classification system. The Styrene Information and Research Center does not agree with the reclassification and published the following statement: Recently published studies tracing 50,000 workers exposed to high occupational levels of styrene over a period of 45 years showed no association between styrene and cancer, no increase in cancer among styrene workers (as opposed to the average among all workers), and no increase in mortality related to styrene.

Styrene is classified by OSHA and the Department of Transportation as a flammable liquid. Flammable products should be kept away from heat, sparks, and flame. Lighting and other electrical systems in the work place should be vapor-proof and protected from breakage.

Vapors from styrene may cause flash fire. Styrene vapors are heavier than air and may concentrate in the lower levels of molds and the work area. General clean air dilution or local exhaust ventilation should be provided in volume and pattern to keep vapors well below the lower explosion limit and all air contaminants (vapor, mists and dusts) below the current permissible exposure limits in the mixing, application, curing and repair areas.

Some products may contain additional hazardous ingredients. To determine the hazardous ingredients present, their applicable exposure limits and other safety information, read the Material Safety Data Sheet for each product (identified by product number) before using. If unavailable, these can be obtained, free of charge, from your CCP representative or from: CCP Composites US, P.O. Box 419389, Kansas City, MO 64141-6389; 816-391-6053.

FIRST AID: In case of eye contact, flush immediately with plenty of water for at least 15 minutes and get medical attention; for skin, wash thoroughly with soap and water. If affected by inhalation of vapors or spray mist, remove to fresh air. If swallowed, get medical attention.

Those products have at least two components that must be mixed before use. Any mixture of components will have hazards of all components. Before opening the packages read all warning labels. Observe all precautions.

Keep containers closed when not in use. In case of spillage, absorb with inert material and dispose of in accordance with applicable regulations. Emptied containers may retain hazardous residue. Do not cut, puncture or weld on or near these containers. Follow container label warnings until containers are thoroughly cleaned or destroyed.

FOR INDUSTRIAL USE AND PROFESSIONAL APPLICATION ONLY. KEEP OUT OF REACH OF CHILDREN.

CCP COMPOSITES US**WARRANTIES, DISCLAIMERS AND LIMITATION OF LIABILITY (Rev. 10/11)**

Seller warrants that: (i) Buyer shall obtain good title to the product sold hereunder, (ii) at Shipment such product shall conform to Seller's specifications; and (iii) the sale or use of such product will not infringe the claims of any U.S. patent covering the product itself, but Seller does not warrant against infringement which might arise by the use of said product in any combination with other products or arising in the operation of any process. **SELLER MAKES NO OTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, EVEN IF THAT PURPOSE IS KNOWN TO SELLER. ANY APPLICATION INFORMATION OR ASSISTANCE WHICH SELLER MAY FURNISH TO BUYER IS GRATUITOUS AND SHALL IN NO WAY BE DEEMED PART OF THE SALE OF PRODUCT HEREUNDER OR A WARRANTY OF THE RESULTS OBTAINED THROUGH THE USE OF SUCH PRODUCT.**

Without limiting the generality of the foregoing, if any product fails to meet warranties mentioned above, Seller shall at Seller's option either replace the nonconforming product at no cost to Buyer or refund the Buyer the purchase price thereof. The foregoing is Buyer's sole and exclusive remedy for failure of Seller to deliver or supply product that meets the foregoing warranties. Seller's liability with respect to this contract and the product purchased under it shall not exceed the purchase price of the portion of such product as to which such liability arises. Seller shall not be liable for any injury, loss or damage, resulting from the handling or use of the product shipped hereunder whether in the manufacturing process or otherwise. In no event shall Seller be liable for special, incidental or consequential damages, including without limitations loss of profits, capital or business opportunity, downtime costs, or claims of customers or employees of Buyer. Failure to give Seller notice of any claim within thirty (30) days of shipment of the product concerned shall constitute a waiver of such claim by Buyer. Any product credit received by Buyer hereunder, if not used, shall automatically expire one (1) year from the date the credit was granted. Notwithstanding any applicable statute of limitations to the contrary, any action by Buyer relation to a claim hereunder must be instituted no later than two (2) years after the occurrence of the event upon which the claim is based. All the foregoing limitations shall apply irrespective of whether Buyer's claim is based upon breach of contract, breach of warranty, negligence, strict liability, or any other legal theory.