



## Staining of Liners

 **AlkorPlan**



*Rely on it.*

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All Swimming Pools will be subject to stains from a variety of sources – vegetation, insects, pool chemicals, sun-tanning and barrier creams, and oils, cosmetic preparations, air-borne pollutants and the myriad other things that can be tipped, dropped or blown into a swimming pool. Provided they are cleaned promptly there is little lasting damage. Liners manufactured from plasticised PVC are no different and can be permanently stained if not cleaned regularly and correctly.

This document sets out a number of common staining problems and explains their causes and treatments.

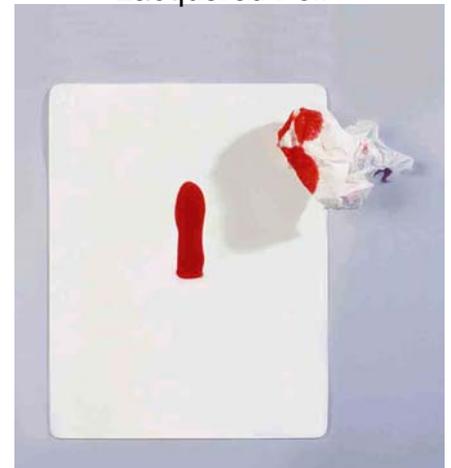
Alkorplan Printed and Reinforced Liner Membranes are coated with an acrylic lacquer which, in addition to protecting the print and reducing degradation from plasticiser loss and UV penetration, also gives excellent stain resistance. This is demonstrated by the test illustrated below:

Unlacquered Foil



A penetrative dye is painted onto samples of unlacquered and lacquered liner and left for 10 minutes. When it is wiped off the results show that the dye has been absorbed by the unlacquered liner while the lacquer has prevented any absorption in the other sample. This level of protection means that Alkorplan membranes are better protected than products without this level of protection.

Lacquered Foil



### Water Line Staining

In most cases, staining of the water line is a combination of :

- Photo-oxidation of the waterproofing membrane : the sun, water, chemicals, change the surface of the plastic material in an irreversible way.
- Atmospheric pollution : dust, smoke, residues of the combustion of fuels, will float on the water surface and will be driven by the wind towards one side of the swimming pool, where they will deposit onto the waterproofing membrane.



## ***Bleaching of Liners 3***

In the UK, the dominant wind direction is from the southwest. Atmospheric pollution will be deposited on the northeast walls. These are also the walls that receive the highest quantity of solar energy. These will typically be the sides where staining of the water line will be the worst, as the effects reinforce each another. Of course, the presence of buildings and trees will also have an influence.

Regular cleaning of the water line is the best way to prevent early degradation of the waterproofing membrane. Lacquered membranes have higher resistance to this kind of degradation and are easier to clean. Proprietary products specifically designed for cleaning PVC liners should be used to remove staining. Under no circumstances should solvents or abrasives be used on Alkorplan liners as they will remove the protective lacquer and any print.

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### **Yellow Staining**

During the swimming pool season of 2006, swimming pool membrane manufacturers became aware that yellow staining of the water line had become an increasing problem. These stains did not correspond in any way with the usual pollution of the water line, which is generally grey/black/brown in colour, and which is not too difficult to remove if cleaning is carried out on a regular basis. Grey staining is generally found on the downwind side of the pool.

The yellow stains have a very distinctive colour; they appear in less than two days and they are very difficult to clean. Several pool owners have stated that the stains appeared after people using sun cream had made use of the pool. RENOLIT laboratory tests have shown that the most probable cause of the staining is a reaction between sun cream and copper.

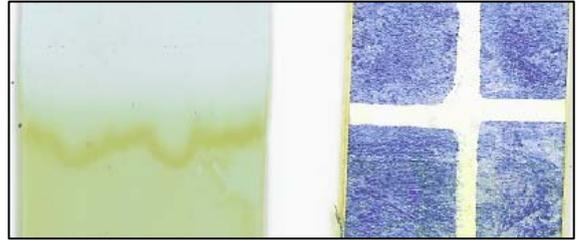


## Bleaching of Liners 4

Lacquered membranes are less easily stained than unacquered products, but there is still a possibility of some staining.



Liners that have come in contact with sun cream and chlorinated water



Liners that have come in contact with sun cream and chlorinated water that contains copper

The yellow stains dissolve in highly chlorinated water. So, theoretically it is possible to remove the stains by raising the water level above the stains and shock chlorinating the swimming pool water. In practice the stains dissolve rather slowly, so it can take several weeks before the stains have disappeared, and the high chlorine level could also attack the swimming pool membrane.

The yellow stains also dissolve in strong solvents, such as ethyl acetate. This solvent can **only** be used to remove the yellow staining on **plain unacquered liners**. Ethyl acetate **cannot** be used on printed products as this solvent will remove the lacquer and print.

A better method is to avoid staining by not using copper-based water treatment products. This is also the suggestion of the French standard NF T 54-804T1 : Plastics — Plasticised polyvinyl chloride) (PVC-P) reinforced membranes for inground swimming pools — Guidance for the installation, repair, use and maintenance) :

### **ATTENTION - The use of copper sulfate is prohibited**

This standard has been endorsed by the major manufacturers of swimming pool membranes (RENOLIT, DLW, Sika,..) and several distributors and installers.

Nowadays, In many European countries, copper sulphate is rarely used. As an algicide, it has been replaced by quaternary ammonium compounds, which have the added advantage of not colouring the swimmer's hair.

In France, the major manufacturers of swimming pool chemicals offer products without copper sulphate specially for liner pools. See :

<http://www.bayrol.com/en/swimming-pool-water-care-tips/pool-cleaning-care/index.html>  
[http://www.archwaterproducts.eu/contenu\\_hth.php?id\\_famille=91](http://www.archwaterproducts.eu/contenu_hth.php?id_famille=91)

Liner pools have no rough surfaces, such as the grouted joints in ceramic pools, therefore a liner pool does not really need an algicide : it is perfectly possible to maintain good water quality with only the use of chlorine tablets.

## ***Bleaching of Liners 5***

### **Black Staining on the Pool Walls and Floor**

The presence of bacteria behind swimming pool membranes can lead to the staining of liner membranes. In almost all cases this is due to bacteria producing "hydrogen sulphide" a colourless gas which migrates through the membrane and then reacts with dissolved metals (such as copper) in the swimming pool water.

While PVC is an excellent water barrier it is a poor gas barrier.



At first sight the solution seems simple : avoid the presence of bacteria behind the membrane or avoid the presence of metals in the swimming pool water; in both cases this would eliminate the formation of metal sulphides. In practice however, it is quite difficult to remove completely all bacterial activity behind the membrane. Nor is it possible to avoid the presence of a low quantity of metals salts in the swimming pool water.

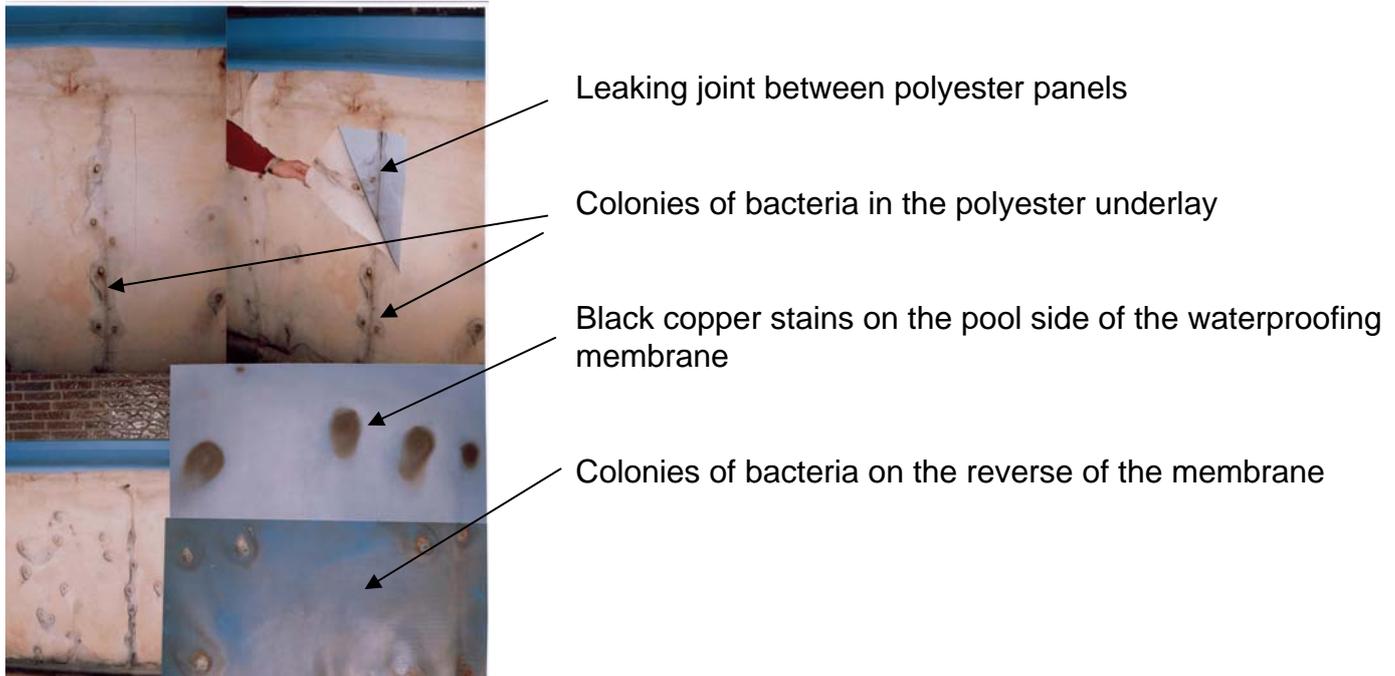
Experience tells us that it is better to keep both parameters on an acceptable level: there will be few problems with stains if the membrane is installed on a clean structure (old structures should be cleaned and disinfected before installation of a membrane) and if the metal level in the swimming pool is kept reasonably low. Metal salts such as copper sulphate should not be used as a swimming pool water treatment product.

Fortunately, these black copper stains dissolve in chlorinated water. However, as long as there are bacteria behind the liner producing hydrogen sulphide and as long as there is copper in the swimming pool water, the stains will continue to form.

## Bleaching of Liners 6

Example : this swimming pool is made of polyester panels with rubber joints. As the joints didn't resist the chlorinated water, the swimming pool had to be refurbished with an underlay (non woven polyester felt) and a liner.

Unfortunately, the leaking joints between the polyester panels allowed infiltration of ground water between the structure and the liner, which has led to the development of bacteria in the underlay.



### Suggested Treatment

1/ Identify the source of the copper (some anti-algae products contain copper, some "multifunctional" chlorine tablets contain copper,) and remove this source. These water treatment products should be replaced by products that do not contain copper)

2/ Backwash the filter and then add 40 ml of ALKORPLUS 81059 – Anti-Stain, to the skimmer.

Repeat 2/ at least once a week, the stains should disappear after a couple of weeks. The time taken for the removal of the stains depends on several parameters. Some pools give immediate results, others can take several months. It might be necessary to speed up the stain removal process by temporarily over-chlorinating the pool whenever possible. Care should be taken not to bleach the membrane and not to swim in water containing too much chlorine.

It is possible to treat the problem of bacteria behind the liner by over-chlorinating the pool water; removing the skimmer plate; and allowing about 100 litres of water behind the membrane. This method is only safe for reinforced membranes as there is a risk that wrinkles and folds could form when there is water behind an unreinforced liner.