

CRYOGENIC PAINT STRIPPING FOR INDUSTRIAL PAINTING

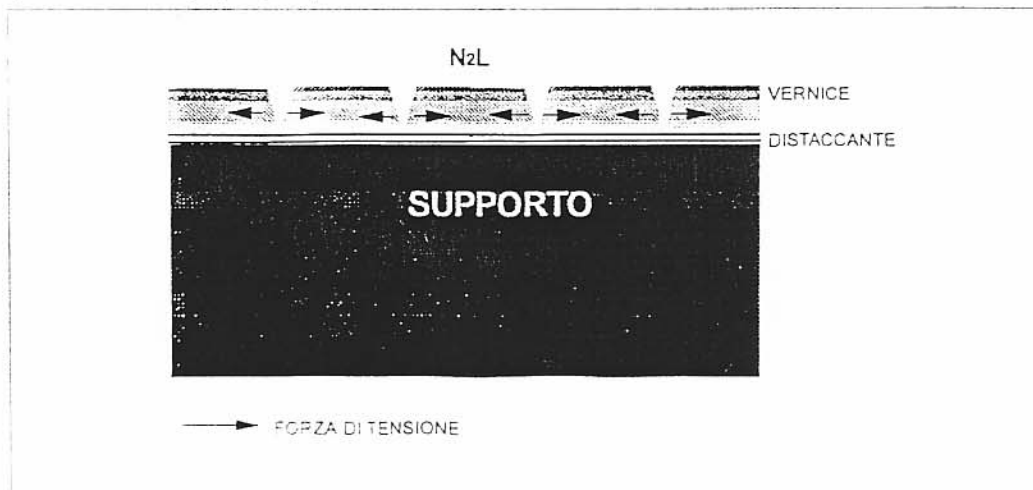
Cryogenic paint stripping

Cryogenic paint stripping is a technology based on the use of extreme cold liquid nitrogen (- 196°C) and of a special detaching agent.

It is used to clean painting supports and it offers two important advantages :

- it works totally respecting the enviroments, without either dangerous emissions in the atmosphere or toxic waste, taht are difficult to be disposed of.
- it respects at its best the trated supports witouht deforming or damaging them.

Paint stripping using a cryogenic fluid, that is at a low temperature makes use of the capacity of the fluid itself to cool and to crack the paint coating (fig. 1)



A paint coated support, immersed in liquid nitrogen, undergoes quick cooling, which leads to a reduction in the volume of the paint.

The paint shrinks much quicker than the support, also because it is in direct touch with the cryogenic liquid, while the support, that is insulated from the painting product is affected by the action of cold much slower, and it therefore undergoes an insignificant dimensional shrinking. The stress caused by such, different expansions causes cracks and fissures in the paint which breaks into pieces of various size and separates from its support; such effect is increased by the detaching agent.

Low temperatures make the paint more brittle, and therefore more easily fissured and more sensitive to impacts. To have the whole detachment of the coat, a slight mechanical action must be applied afterwards. Such action can be carried out in different ways, such as using either needle chisellers or swaging machines, shotblastings, beating masses, and with automatic, semiautomatic or manual plants.

The mechanical action can be weak and short, since what is needed is simply to remove the paint that has already been separated from the metal.

The sudden change in temperature is about 200° C, which therefore does not cause remarkable stress inside the parts. Then, it is towards low temperatures, so it does not lead to annealing of the metal parts.

DESCRIPTION OF THE CRIOGENIC METHODS

In order to remove painting product from metal supports, the supports to be treated must be immersed one by one or in small groups into liquid nitrogen. Such dipping makes the liquid nitrogen evaporate, which is followed by a considerable crackling since the painting product undergoes a thermal shock, which causes its cracking or flaw. The phenomenon takes about 10/20 seconds, then the evaporation of nitrogen slows down, since the part and the paint that are already cold, cede less heat to nitrogen.

Boiling is actually due to the great difference in the temperature between the cryogenic fluid and the support; as soon as the temperature of the support tends to the balance temperature of the cryogenic liquid, boiling comes to an end. The consumption of liquid nitrogen is between 1-1,3 lt of liquid nitrogen/kg of treated product, including the leaks for natural evaporation.

The part completely cools in a few minutes, usually from 1 to 3. Such period of time is directly proportional to the thickness of the coat of painting and inversely proportional to its thermal conductivity coefficient.

Once ebollition has come to an end, the support is taken out from liquid nitrogen, while the paint coat is removed through a slight mechanical action.

All the paints are brittle in front of the temperature of liquid nitrogen; the temperature at which it becomes brittle varies according to the kind of basic resin, wich can be: epoxy, epoxy-polyester, polyester, polyrethan, epoxyphenolic, acrylic and so on.

Moreover, the kind of application used does not matter, since it can be electrostatic painting either with powder or liquid, electrophoresis (anaphoresis, cataphoresis), airless painting, dipping, fluid bed painting (plasticization). Detachment can always be carried out and it is directly proportional to the temperature reached by the paint; the lower it is, the greater its becoming brittle and the easier the paint removal.

APPLICATION OF THE DETACHING AGENT

The detaching agent is a product to make the paint detachment easier as well as the constitution of more regular flaws.

This product has to be applied on clean surfaces before loading the parts on the painting chain; it is water-soluble and its formula enables it to remain inalterable both in the degreasing bathseither alkaline or with solvents, and in the phosphodegreasing baths, without contaminating them.