CRYOGENIC PAINT REMOVING PROCESS

During the painting process coatings begin to appear on the transportation hooks, on the supports, on the chamber's floor, which in the long run becomes uneasy and needs to be removed.

We will first quickly describe the existing solutions, and then show the cryogenic paint removing process, the liquid nitrogen. Two stages are required to cool it down to the embrittlement temperature of the paint and to begin the grit blasting process. We will explain in detail the first industrial application at the Talbot de Poissy factory, belonging to the PSA group.

We will also examine how the plant is managed and how the process is working.

THE PRESENT SOLUTIONS

Different systems are presently used, such as burning or chemical pickling.

BURNING

Burning can be either directly carried out, often producing huge black, sometimes even stinking puffs of smoke, or indirectly, when you happen to have destructions due to pyrolysis, especially in the already existing plants, a device to treat smoke is really required.
In both cases, the temperature of the parts to be treated is so heightened to create uncontrollable stress, strains, changes in the mechanical features; most of the times, the process is completed by brushing and washing.

CHEMICAL PICKLING

Chemical pickling is often used. The parts to be pickled are dipped into a bath of soda, or acid, or of methylene chloride; the dipping time depends on the thickness of the coating to be removed. But what about eliminating the mud and avoiding the problems due to solvents in the working area

CRYOGENIC PAINT REMOVING

The process consists in cooling the paint enough to make it brittle; it can therefore undergo a mechanical treatment to remove it from the part.
The strong adhesion between the metal and the paint needs to be won by the cold.
Such adherence depends on many factors: surface of the part, kind of paint.
The difference between the coefficients of expansion of the cooled materials will cause microfissures in the paint coating while the mechanical treatment will strip the paint from the part.

THE TECHNIQUE OF THE CRYOGENIC PAINT REMOVING

Let's have a look at the two stages: cooling and mechanical treatment.

COOLING

The cooling is carried out dipping the part into liquid nitrogen, source of refrigeration units.
Vaporizing, 1 litre of liquid nitrogen, can actually provide 38,3 Kcal. At about -196° C, the cold gas still contains some refrigeration units to recover.

The cooling time depends on different factors:

- thickness of the paint coating to cool

- size of the parts to clean

- final level of the temperature to reach, which is often related to the temperature of vitrification of the paint.

Since the thermal conductivity of the paint is really lower than that of the part (which is normally made of steel), the paint begins to be seen as insulating in

comparison with the material, whose dipping or cooling times will be the longer, the ticker the coats of paint are.
The consumption will practically be about 0.6 litres, for each Kilo of parts to treat.

THE MECHANICAL TREATMENT

Once the parts are cooled, the paint has to be stripped from the part.
Referring to occasional appliances they can also be handmade.
In the described example, the plant is self-acting. The cooled parts are slowly rotating, undergoing grit blasting for a variable time.
The grit-blasting time is estimated so that all the surfaces of the part undergo many direct, as well as indirect impacts.
A mixture of flakes of paint and grit is gathered in the lower part of the grit blasting machine. Separation is carried out to enable to recycle the pure grit.

INDUSTRIAL PLANT TALBOT

The Talbot factory in Poissy is provided with a chemical pickling plant to clean the small scales according to the painting plants.
The exhalation of toxic vapours in the working area, drawing off the muds, the working conditions to improve, led to look for a different solution and the technical department of Talbot PSA, had been working out a solution of cryogenic paint removing .

The parts to clean, shall be put in a 2.15 metre-high cylinder with a 1.60 m diametre.
The average weight of the painting support to treat ranges from 50 to 100 Kg.; the plant is self-acting, with 24 cycles per hour.

The plant consists of three parts:
- cooling section
- grit blasting machine
- conveyer, connecting the different sequences.

THE COOLING SECTION

The parts are carried overhanging through a cooling tunnel. A sliding door, with quick opening and enclosure limits the heat entering.

The following stage is dipping the painting support into a tank full of liquid nitrogen. The dipping time depends on the average thickness of the paint to embrittle.

One litre of liquid nitrogen that vaporizes produces 680 N-litres of gas; which is partly sent back in the precooling tunnel before beeing collected at the level of the passing trolleys to be sent outside.

During the dipping stage the sliding doors must be closed in order to lose the least refrigeration units as possible. The dipping time is around the second, depending on the kind of part to strip and on the materials, plus the rise and descent time of the mobile equipment.

The dipping tank is a Dewar tank, that is with double, insulated covering with pearlite in a vacuum. The parts, which are in touch with the liquid nitrogen are made of stainless steel.

The Dewar tank is provided with an insulated, removable cover, which is lowered during the interruption time, in order to limit the leaks due to evaporation.

The tank is provided with a device for the quick draining and a basket can be manoeuvred from outside, to pick up, as a deep-fryer, the parts and the flakes of paint that are going to be stripped.

The liquid nitrogen is automatically fed from a tank, which is outside the department and connected to the dipping tank by a pipe in a vacuum.

The level of the liquid nitrogen is kept even by a series of 4 resistance drills connected to the control console of the level, which controls an automatic valve on the feeding line. Two drills control the level (maximum and minimum), and the other two control the alarm (high and low).

The cooled part is conveyed to a waiting room, before entering the grit blasting room. Both the access door to the grit blasting machine and to the waiting room shall not be open together in order not to cool the grit blasting machine.