The Application of C&G Vacuum Evaporators in Surface Finishing Industries

The galvanic industry, with its surface treatments, generates a polluted wastewater which cannot be discharged into the environment.

C&G has over 30 years experience in this sector. In the 1970s we developed the technology of “zero discharge” to resolve the problems galvanic companies were facing around Firenze of water shortage in the summer months and to respect the stringent environmental laws regarding discharge into the environment.

The choices in a galvanic factory are fundamentally three:

1. **No ionic exchange** system is present,

a) *When the water contains cyanide without chrome*: all the discharge water is pre-treated to bring it to a pH of about 10.5 or11 and cyanide is removed through oxidation using $NaClO_2$ (sodium hypochlorite). It is then precipitated, decanted, neutralised and sent to a **vacuum evaporator,** to be able to re use the distillate water. With a plant of 20000 litres/day wastewater, about 1000 litres of concentrate will have to be taken away for disposal while 19000 litres of pure water will be available for re use.

b) *When the water contains chrome without cyanide:* all the discharge water is pre-treated to bring it to a pH of about 2.5 or 3, and chrome is reduced from Hexavalent Cr to Trivalent Cr through $Na_2S_2O_5$ (Sodium disulphite). It is then precipitated, the pH is brought to 8.5 or 9 , it is decanted, neutralised and sent to a **vacuum evaporator,**
and the distillate water can be re-used. Again with a plant of 20000 litres/day wastewater, about 1000 litres of concentrate will have to be taken away for disposal while 19000 litres of pure water will be available for re use.

1. The use of an **ionic exchange** system to treat the water from the various washes, which allows a better quality and quantity of water for the galvanic washes. The eluates from the regeneration of the ionic exchange system are treated following the above distinction between the cyanide and chrome waters. They are then sent to the **vacuum evaporator**
, so the final discharge is guaranteed to be within all environmental limits for whatever final use is foreseen for it.
The concentration of the regeneration water is about 20 times. Therefore using an ionic exchange system combined with a final evaporator 100% of the water used in the process can be recuperated, thus guaranteeing a constant high level of clean water for the rinses, and a constant quality of product. However, we cannot recover the raw materials present using this system, as the eluates from the regeneration contain not only the raw material but other salts and pollutants in general.

1. Raw materials such as nickel, chrome and copper are very expensive today, and the tendency in Europe is to design factories that allow a total recovery of both the raw materials used and the process water. A **vacuum evaporator** allows this, but it is essential to know the layout of the industrial line. A separate smaller evaporator is placed on the various lines, chrome, copper, zinc and nickel, so that the material can be completely recovered. This allows a recovery of the investment in a short time, as the customer saves not only on the cost of the raw material recovered, but also on the cost of the chemical-physical wastewater treatment present.

It should be noted that the economic return depends on the level of drag-out present: the higher the value, the sooner the purchase costs of the vacuum evaporator will be covered.