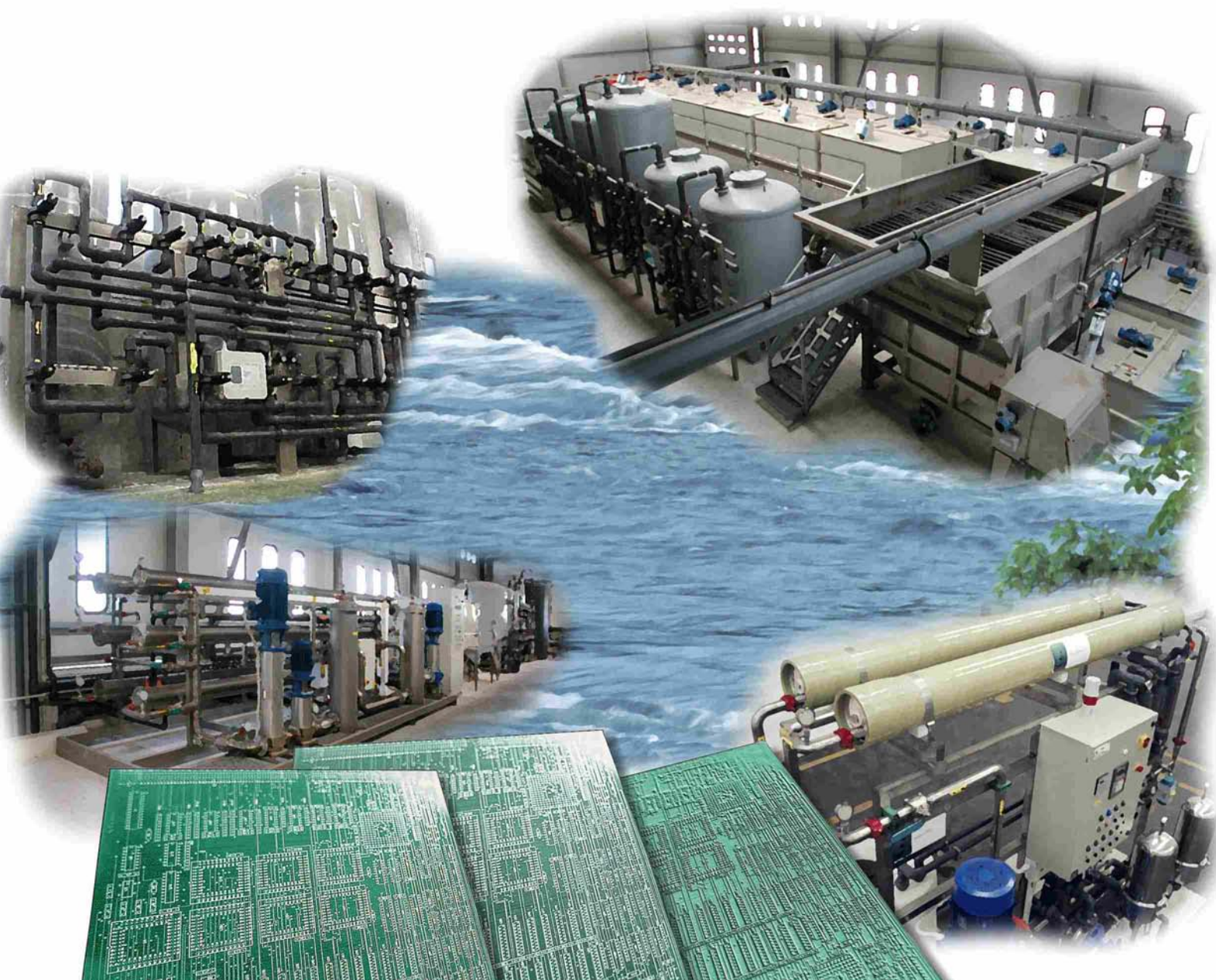


ANTIPOLLUTION TECHNOLOGIES FOR THE P.C.B. INDUSTRY





The Tecn.A. company, having since long honed its skills in the P.C.B. field, has developed a keen and knowledgeable technology about depuration.

The proposed solutions are finalized to the best relationship of cost / effectiveness, with total respect of the limits imposed by the law and with regard to the reuse of water and expensive chemicals.



TECN.A. 's main specializations for P.C.B.:

- ❑ WASTEWATER RECYCLE
- ❑ WASTEWATER TREATMENT
- ❑ ULTRAFILTRATION SYSTEMS
- ❑ REVERSE OSMOSIS SYSTEMS
- ❑ CUSTOMIZED SOLUTIONS

WASTEWATER RECYCLE

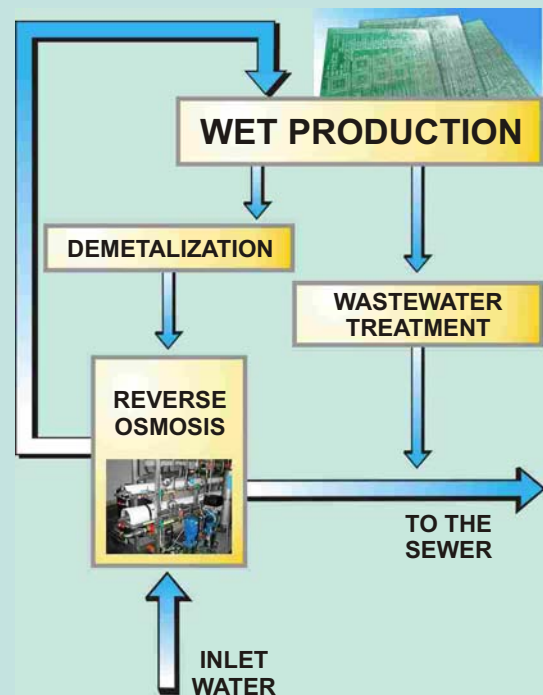
Certain rinse waters used in productive processes can be fully reused. We are all well aware that saving on water costs (aside from being environmentally correct), may lead to relevant savings or solve water shortage periods. This problem has already been partially solved in the last few years with Ion Exchange resins systems.

Tecn.A.'s proposed solution is the combination of Selective Ion Exchange and Reverse Osmosis systems.

The first session of treatment is demetalization with Selective Ion Exchange resins, that has the purpose of pre-processing the waste that needs to be recycled, so it becomes compatible with the subsequent session of Reverse Osmosis.

The second session of the treatment is the osmosis process itself, which in this application holds the double function of:

- Treating the waters coming from the session of demetalization, thus completing the recycling
- Deionizing the industrial primary waters needed to compensate the production wastewaters.



Demetalization section - 10 mc/h



Reverse Osmosis section - 30 mc/h

WASTEWATER TREATMENT



Being the Italian Regulations so very restrictive (0.1 ppm Cu - 160 ppm COD - 2 ppm surfactants), has made it necessary for the R&D department at Tecn.A. the development of a refined technology in the field of industrial wastewater treatment.

The P.C.B. manufacturers (because of their numerous productive steps) generate wastewaters which, in terms of complexity can be considered among the most difficult to treat.

This is mainly due to the presence of:

- HEAVY METALS (Cu) IN IONIC FORM OR AS A COMPLEX
- ORGANICS AND SURFACTANTS



Chemical-physical plant - 30 mc/h



Chamber filter press - mod. 800x800



CHEMICAL - PHYSICAL PROCESSES

SULPHIDE PRECIPITATION

Highly complexed substances may be found in the waters coming from circuit boards processing, and since the rate of precipitation of hydrates is not fully satisfactory, it may be necessary to proceed to the metal precipitation as well through sulphide.

The sulphide process uses the reaction among polluting metals which are contained in the wastewater and the sulphide ions, which become available thanks to the reactive sodium sulphide.

Consequently we see a double exchange reaction with formation of insoluble cupric sulphide. Its very low solubility makes the residual metal concentrations extremely low, even when strong complex agents may be found.

FENTON PROCESS

The organic and surfactant substances can be demolished (up to 90%) by the strong oxidation FENTON PROCESS, through the proportioning of ferrous ions and hydrogen peroxide, exploiting all the oxidative strenght of the radical OH^{\bullet} .



Wastewater treatment plant - 20 mc/h



INCLINED PLATE CLARIFIER

To obtain the separation of sludge from clear solution, Tecn.A. uses INCLINED PLATE CLARIFIERS which offer a considerable clarifying surface with a reduced footprint.

SELECTIVE ION EXCHANGE

When discharge limits are specially stricts it is not possible to obtain, using only the chemical-physical treatment, the complete knocking down either of the organic matters or of all the heavy metals. This is why it may become necessary to make a special filtration before discharging the waters.

The waters to be treated are first sent to a sand filter, then to an activated carbon filter and finally to the selective filtration section through sequential changeover (series) on two selective resin beds.

The selective resin, characterized by functional chelating groups, forms stable compounds with the heavy metals present in the solution, either in ionic or in complex form.

The consequent selective reaction allows the resin to "capture" exclusively the heavy metals as copper and lead, while the other not polluting ions (Na^+ , Ca^{2+} , K^+ , Cl^- , SO_4^{2-}) pass through and do not contribute to exhaust the resin.



Polishing Selective Ion Exchange System - 15 mc/h



All Tecn.A. systems are pre-mounted and tested at Tecn.A.'s facility before shipping to final user



Polishing Selective Ion Exchange System - 20 mc/h

ULTRAFILTRATION SYSTEMS

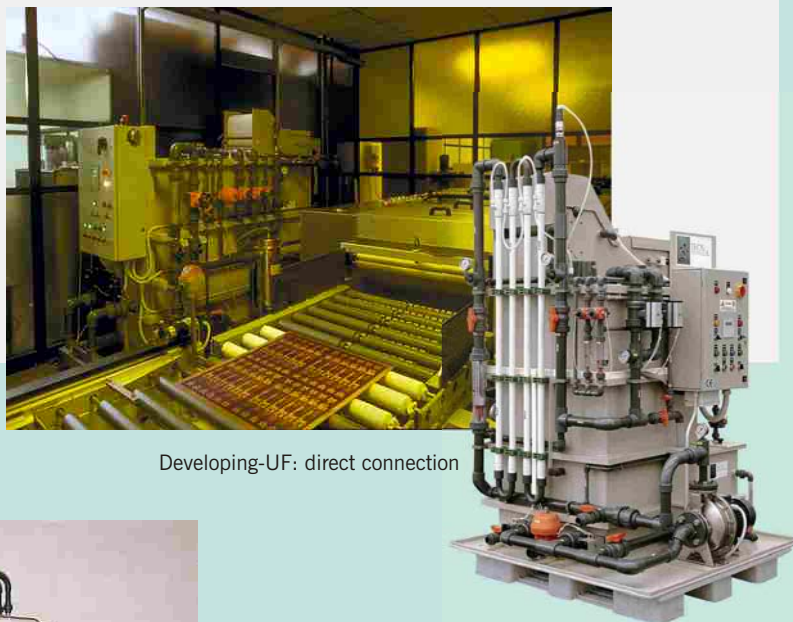
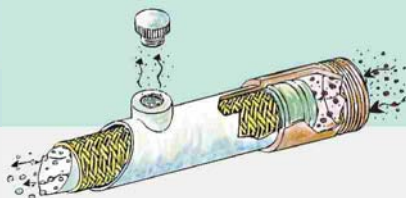


ULTRAFILTRATION TO REGENERATE SPENT SOLUTION

Tecn.A. has developed ultrafiltration technology since 1991, reaching a very high level of perfectioning and standardization in the production with completely automatic systems, using tubular membranes of U.S. production.

Two lines of systems to ultrafilter the photoresist are available, to provide better and more customized treatment solutions:

- Tecn.A. UF-DEV for the developing process (obtaining a recovery of at least 90%)
- Tecn.A. UF-STRIP for the stripping process (obtaining a recovery of at least 70%)



Developing-UF: direct connection

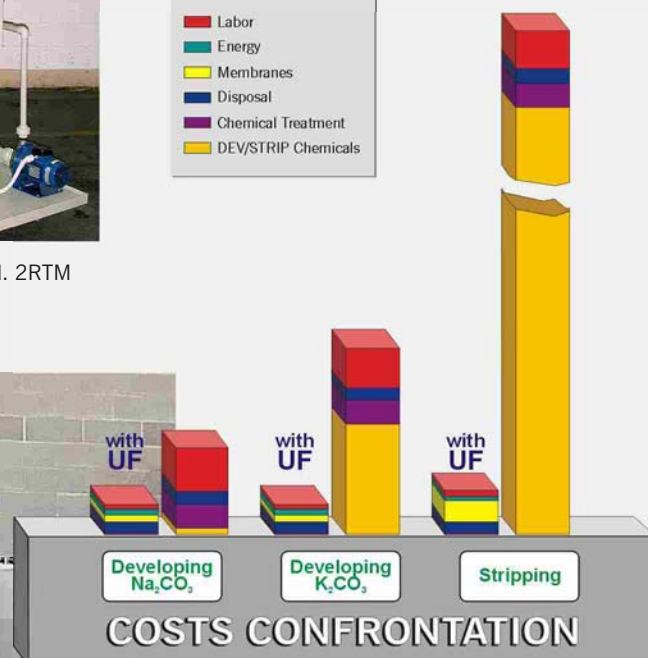


UF DEV unit - mod. 10 TA



UF STRIP/DEV unit - mod. 2RTM

UF STRIP unit - mod. 8 RTA



UF STRIP unit - mod. 10TA - with permeate storage tank

The very high ROI (Return On Investment) of UF STRIP systems (because of the recycling of very expensive industrial product) allows Tecn.A.'s clients to recuperate the price of the whole system in just a few months.

REVERSE OSMOSIS SYSTEMS

PRIMARY PROCESS WATERS

Almost all the P.C.B. production processes use water to wash the panels in the rinsing tanks and to prepare the concentrate bath solutions.

Water quality and a consistency in the purity are necessary to guarantee a high quality production.

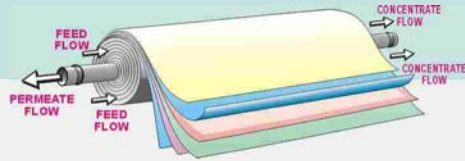
Moreover a very hard water with high percentages of calcium, used in alkaline processes (developing, etching, stripping, direct plating, electroless copper, HAL, etc.), produces scales, thus creating maintenance problems and ionic precipitations on the circuit boards.

With these things in mind it is clearly very important to pre-process the primary waters, before sending them to the productive chain.

Tecn.A.'s proposal to the P.C.B. Industries is: REVERSE OSMOSIS SYSTEMS

These systems can process water from a volume of 3 mc/h to values of 50 mc/h and are all pre-mounted on stainless steel skid, pre-tested in our factory and sent to the client this way.

What's more, these systems can be mounted in multiple passes for special needs of water economy, and higher level of deionization.



Reverse Osmosis unit - 5 mc/h



Reverse Osmosis unit - 7 mc/h



Reverse Osmosis unit - 15 mc/h



Paper band filter



Pre-packaged chemical-physical plant



Polypropylene Inclined Plate Clarifier



Air scrubber



Atmospheric evaporator



Automatic carbonate solution preparation



Copper separation and water recycle



Pre-packaged demineralizer system



Metering pumps case box



Polishing Ion Exchange filters



Cartridge filtration on skid



Mixed bed resins system



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