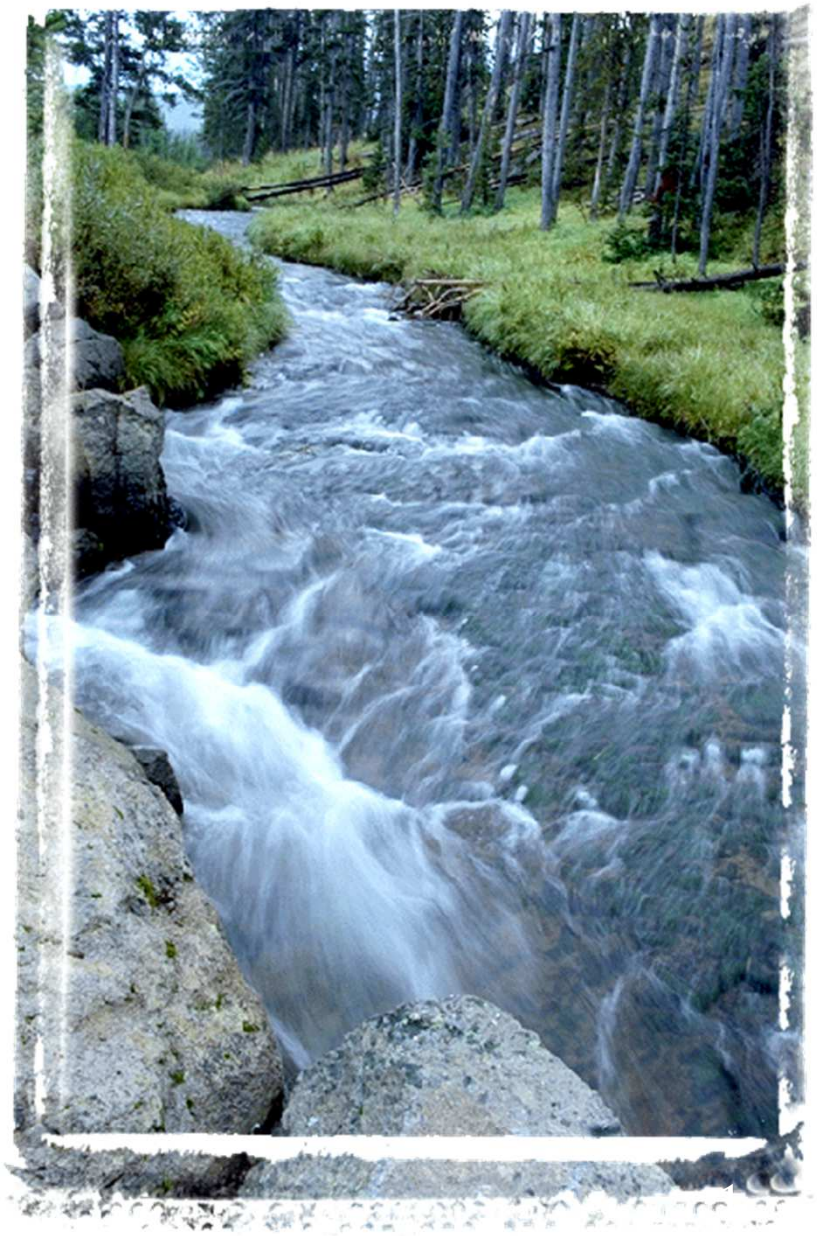
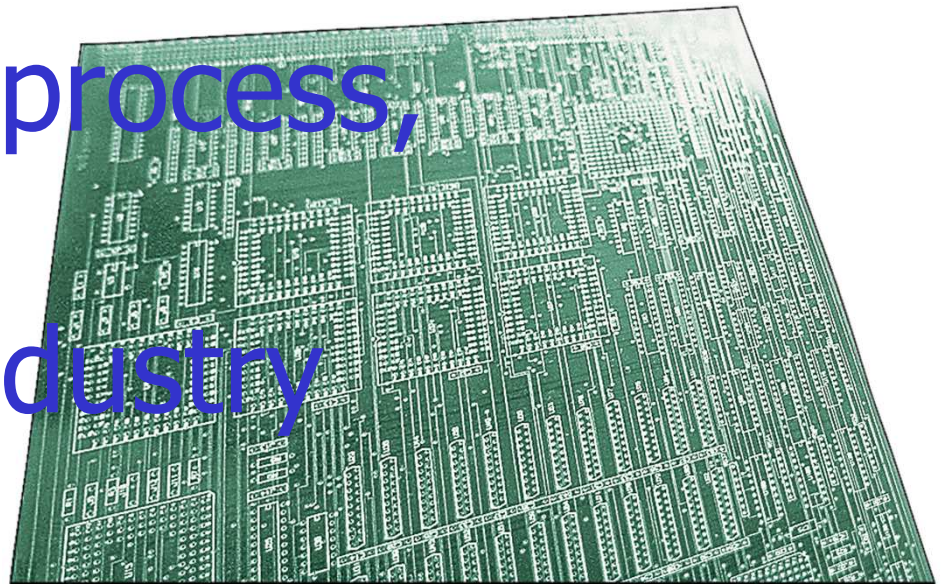
ANTIPOLLUTION TECHNOLOGIES FOR THE P.C.B. INDUSTRY



TECN. A.
antipollution technologies

Since 1988 Tecn.A. provides solutions for water, wastewater treatment and process, for the P.C.B. and galvanic industry



Although TECN.A. is a small company, its technical staff has more than 30 years experience in the field, with many important installations in Italy and all over the world.

Our technology, dedicated to the P.C.B. industry, is based on the treatment of process water using suitable processes in order to obtain the longest possible service life of the process water itself.

Tecn.A. holds more than 70% of the Italian P.C.B. wastewater market and has a good experience in PCB markets abroad, with installations in Russia, Egypt, Finland, France, Israel, Japan, Macedonia, Portugal, Spain, Taiwan, USA, UK

The customization of each system is at the base of Tecn.A.'s efforts, in a field where needs are so different from one client to another.

Tecn'A.s main specializations for P.C.B.

RINSES RECYCLE TREATMENT & ZERO DISCHARGE

PHOTO RESIST ULTRAFILTRATION

PRIMARY WATER TREATMENT

WASTEWATER TREATMENT

Recycle Treatment & Zero Discharge

Tecn.A.'s reverse osmosis technology applied to PCB rinses allows to operate a very high concentration, thus producing deionized water with no organic substances and an ultraconcentrate that is periodically discharged and handed over to a third party for disposal or, as an alternative, further concentrated prior disposal using evaporation methods.

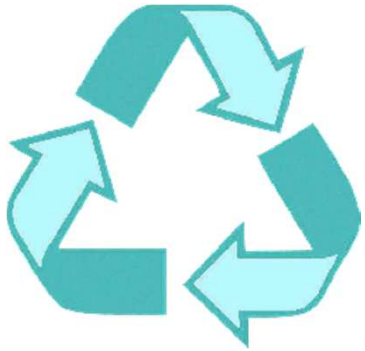
In this way "zero discharge" can be obtained.

The waste water from production can be divided in two streams:

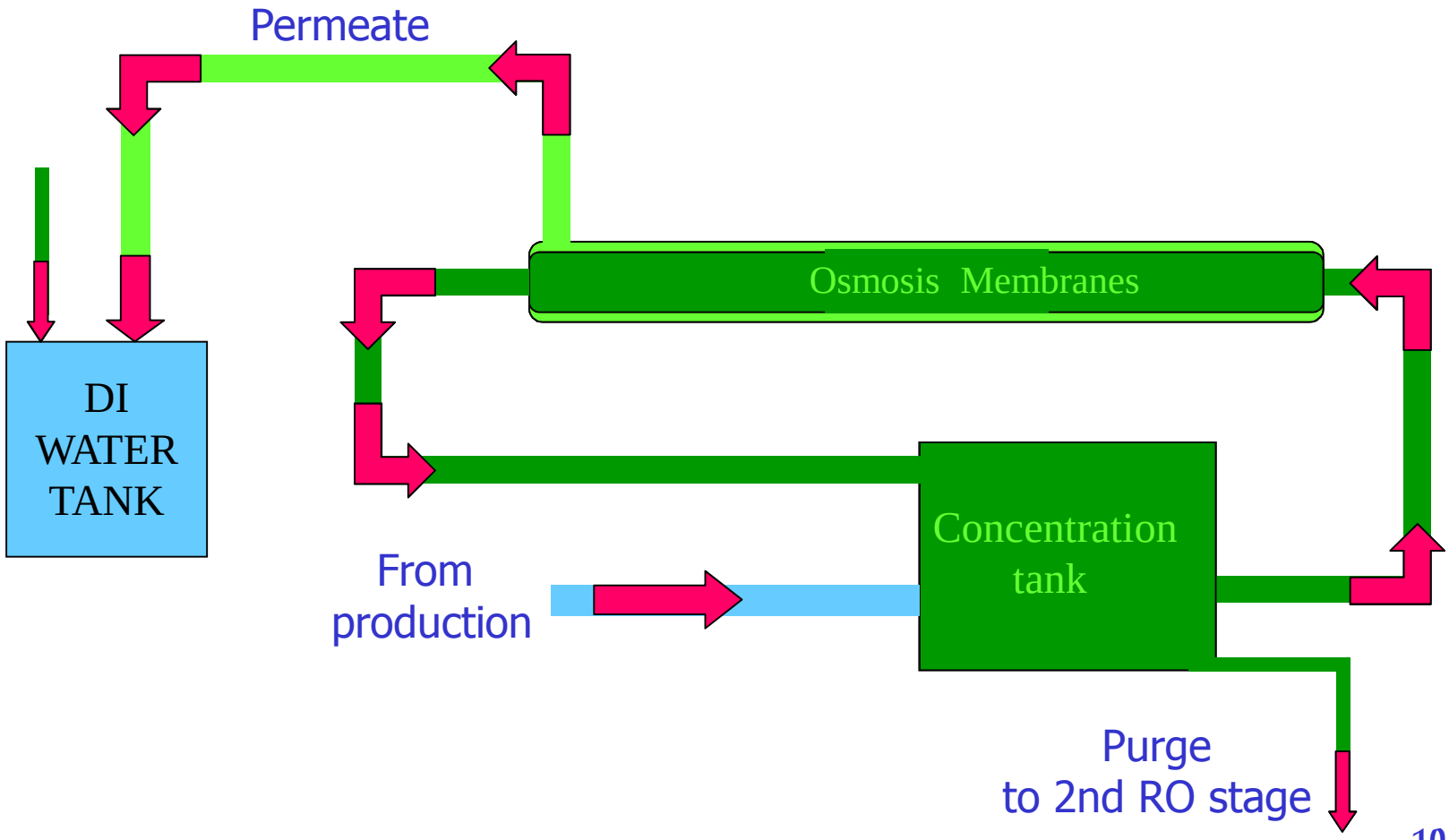
- The concentrates, highly polluted, are sent to the ETP/evaporator/off site disposal
- The rinses are sent to a UF section with hollow fiber membranes and then to RO unit.

<u>The % of reused water is up to 99% with 3 stage RO</u>

Fresh water replaces only the lost volumes.



How Tecn.A.'s RO system works in reuse mode



The complete system to reach the «zero discharge» is made of the following steps:

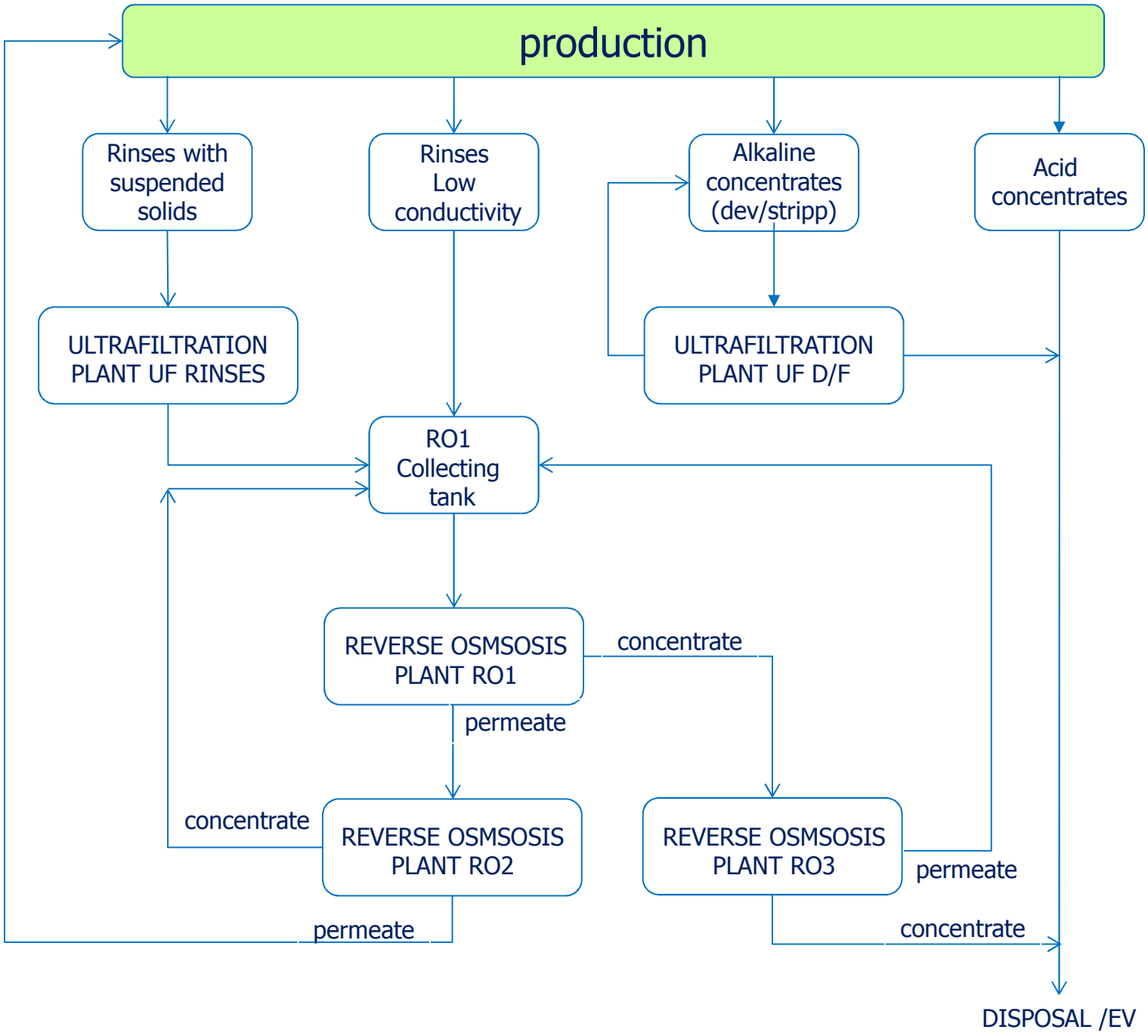
- **RO1 plant,** to treat the rinses and which produces:

✓ The permeate, i.e. water having a good degree of demineralization, that can be used directly or further demineralized by a *permeate second pass RO plant (RO2)* if a better quality is required

✓ The concentrate, containing all the polluting ions and with a higher salinity (conductivity), which is continuously "purged out" and further concentrated in a *concentrate second stage RO plant (RO3)*

- **RO2 plant,** that receives the permeate from RO1 and have the aim to produce a permeate of higher quality (conductivity less than 5 microSiemens), if necessary.

- **RO3 plant,** that receives the purged concentrate from RO1, working at a very high conductivity, to reduce at its maximum the concentrate discharged volume.


production
Rinses with suspended solids
Rinses Low conductivity
Alkaline concentrates (dev/stripp)
Acid concentrates
ULTRAFILTRATION PLANT UF RINSES
ULTRAFILTRATION PLANT UF D/F
RO1 Collecting tank
REVERSE OSMSOSIS PLANT RO1
concentrate
permeate
concentrate
REVERSE OSMSOSIS PLANT RO2
REVERSE OSMSOSIS PLANT RO3
permeate
permeate
concentrate
DISPOSAL /EV

Reverse Osmosis system for wastewater

Reverse Osmosis systems

RO1 – RO2 – RO3

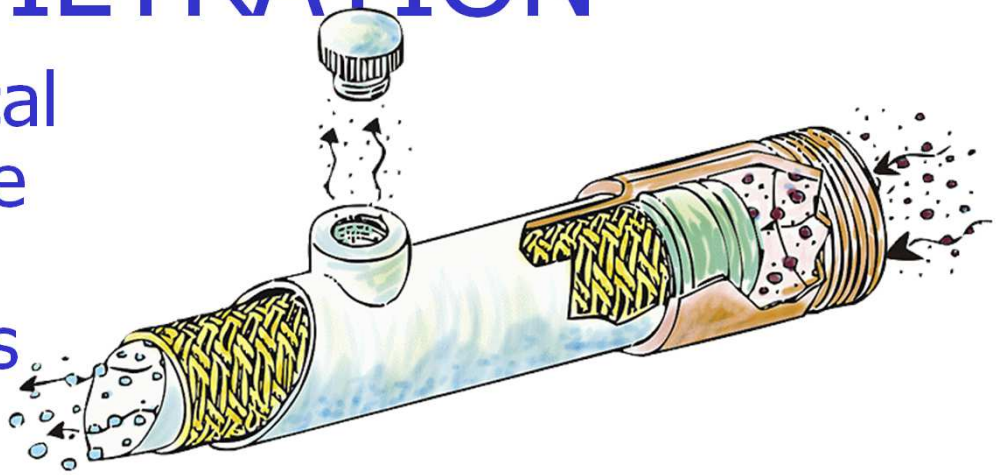
Ultrafiltration plant for rinses

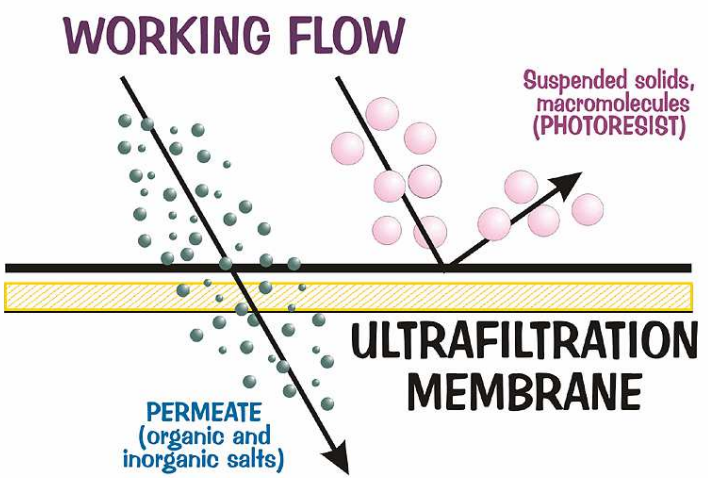
Ultrafiltration

Another important Tecn.A. application is represented by the use of ultrafiltration membranes to regenerate the spent solutions from photoresist and soldermask processes.

Description of ULTRAFILTRATION

- Ultrafiltration is a physical process of filtration done through special membranes , that allows to separate molecules smaller than 0.02 microns.
- This characteristic can be used for the separation of the photoresist from the developing and stripping fresh solutions (dry/liquid film and soldermask).



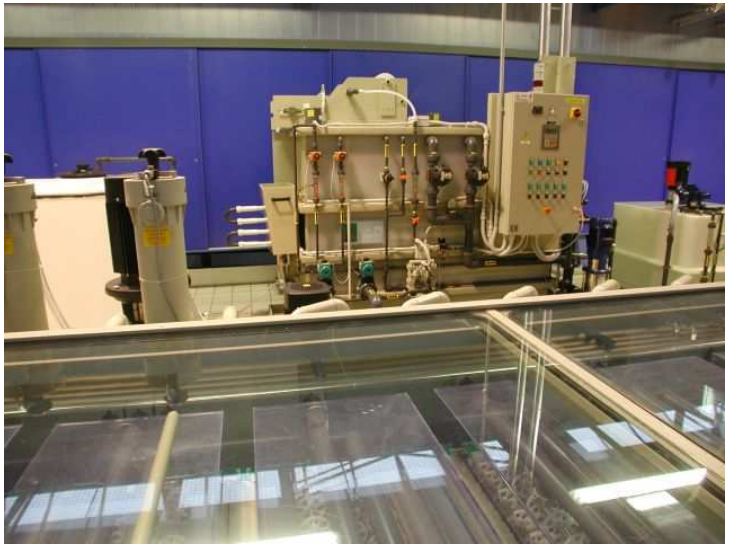


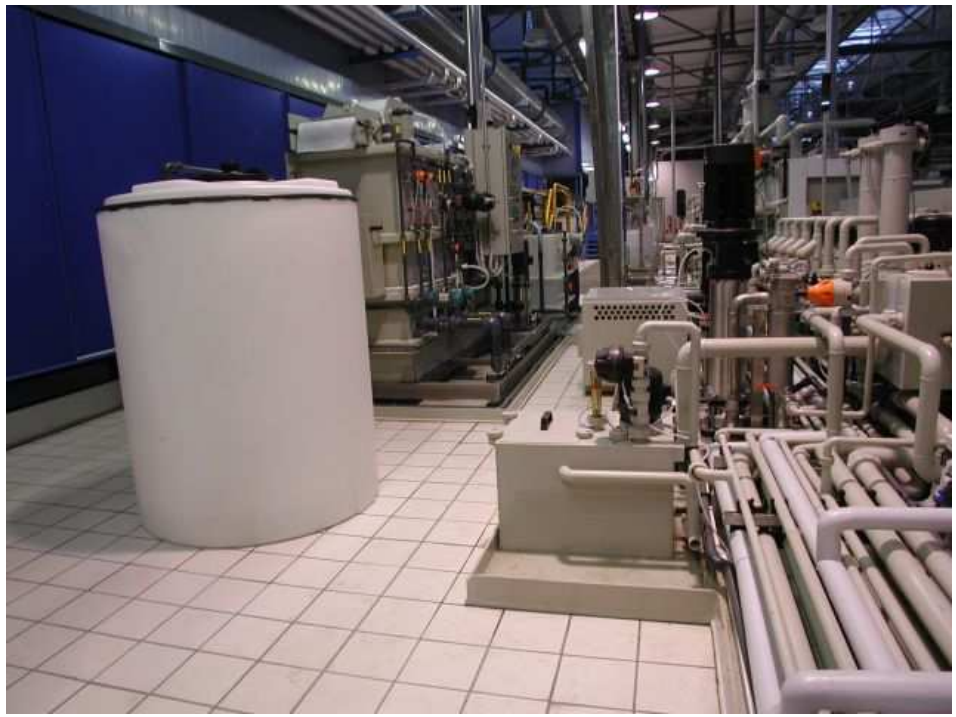
- Our company has developed ultrafiltration technology since 1991, reaching a very high level of perfectioning and standardization in the production with completly automatic systems, using tubular membranes of U.S. production, recognized from all the operators as the best available on the market.

Ultrafiltration's advantages

UF unit: chemicals recovery up to the 95%

Ultrafiltration has a very fast **ROI** especially in all processes of stripping, executed with a ready to use product which contains mono and diethanolamine



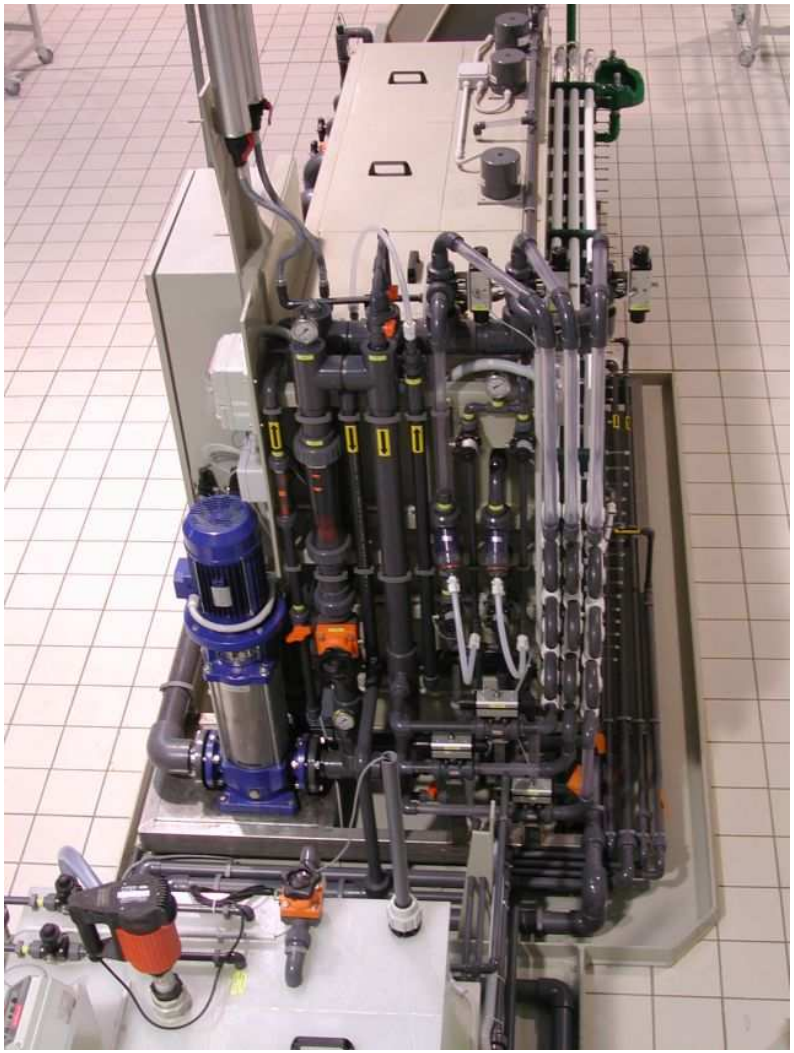


Recovery of stripping solutions

Operational Advantages

The reuse of the spent solution allows to have a higher feed&bleed flow rate without any additional cost, with the following advantages:

- A constant break point.
- A higher definition of the board paths during the development.
- The possibility of increasing the machine's speed.
- A considerable reduction of the maintenance on the machine (machine clean)



Environmental Advantages

Compared to the traditional ways of treatment (coagulation), ultrafiltration reduces or even zeroes the environmental impact of the developing and stripping processes, because

IT GENERATES VERY SMALL

AMOUNT OF WASTE.

Nothwithstanding it keeps a very low dry/film concentration in the machine

- The Ultrafiltration systems produced by Tecn.A. have a potentiality that varies from 25 lt/h up to 2.000 lt/h, thus covering a wide range of necessities.

Primary Water Treatment

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

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

Water having this high quality can be obtained by recycling through RO membranes the production rinses or, in case of no recycle, by treating the raw water with RO membranes.

Membranes always guarantee a high quality water without salinity, organics and bacteria.

Reverse Osmosis systems 4”

For small capacities

Reverse Osmosis systems 8”

For medium capacities

Reverse Osmosis systems 8”

For high capacities

Advantages of Reverse Osmosis

- Constant organic, inorganic and bacteriologic quality.
- Low running costs and easy maintenance.
- No use of chemicals

Tecn.A. RO systems have a potentiality that varies from 1 up to 100 m^3 /h

Ultrafiltration hollow fiber

Many waters need effective pretreatment before reverse osmosis (both primary water and waste water).

As pretreatment, we suggest Ultrafiltration, which represents the state of the art technology in the field.

Ultrafiltration (UF) membranes remove all suspended matter and also dissolved organic compounds.

Ultrafiltration hollow fiber

UF combined on RO skid

For small capacities

Ultrafiltration hollow fiber

UF for high capacities

Wastewater Treatment

- Being the Italian Regulations so very restrictive (0.1 ppm Cu max), has demanded the development of a refined technology in the field of industrial waste.
- The P.C.B. manufacturers (because of their numerous productive steps) generate waste which, in terms of complexity can be considered among the more difficult to treat.

This is mainly due to the presence of:

- HEAVY METALS
- NITROGEN COMPOUNDS
- ORGANICS AND SURFACTANTS

Wastewater solutions

- Tecn.A., having since a long time honed its skills in the P.C.B. field, has developed a keen and knowledgeable technology about depuration. In consequence of this it has added, together with the traditional chemical-physical depuration systems:
  - FENTON PROCESSES for organics and surfactants
  - SULPHIDE PRECIPITATION for highly complexed metal
  - SELECTIVE FILTRATION PROCESSES to remove the traces of heavy metals

Wastewater treatment plant

Traditional ETP plant with reaction tanks and selective ion exchange resins

Selective Ion Exchange Section

The removal of heavy metals is necessary to avoid high concentration in the discharge

Selective Ion Exchange Section

Multimedia filter, activated carbone filter and double pass selective ion exchange

Air treatment

Wet air scrubber to reduce air pollution, with chemical neutralization.

Throughput:

from 1000 to 20.000 Nmc/h

TECN.A.

antipollution technologies

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