PURAL: technology to reuse from 50% by Anodizing lines water and 100% by Painting lines water

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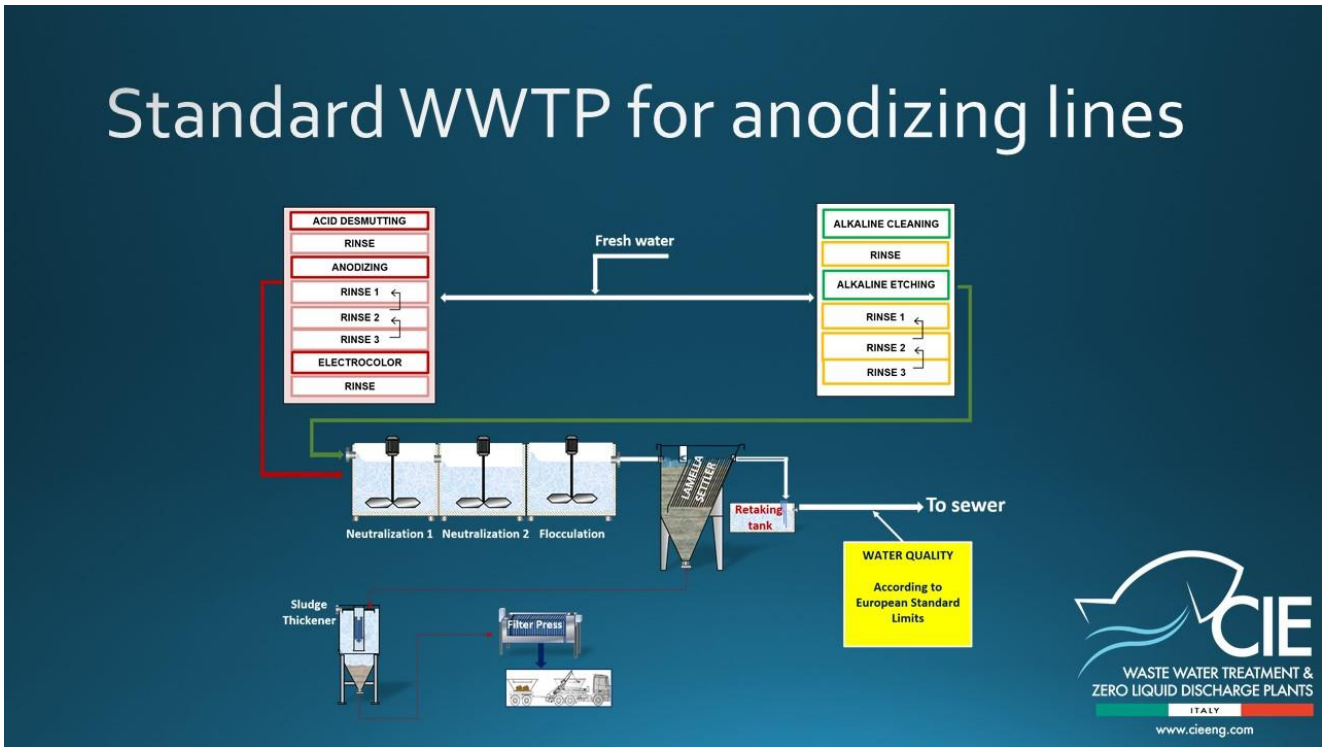
1) Preliminary approach

Waste Water Treatment Processes (W.W.T.P.) for Anodizing and Painting lines are usually equipped with continuous chemical – physical treatment based on lime neutralization.
The main pollutants to be removed are usually generated by H_2 SO_4 and NaOH used to Anodize. While for Painting lines additional Fluoride and Hexavalent Cr or Ti, Zr Fluoride components must be considered.

2) Standard W.W.T.P. technology (see flow chart n°1)

Very often, the standard W.W.T.P. are not able to achieve the limits required by local legislation, or even the more stringent European Standard Limits.
For example, using Standard W.W.T.P. for an Anodizing line, Sulphate limits can either be 500 ppm or 1000 ppm depending on where the waste water is discharged.
If the final water is to be sent to rivers, lakes or ground, Sulphate limits are 500 or lower.
A similar situation occurs with Fluorides. In fact, while European limits are 10 ppm, many local legislations require 6 or 4 ppm. In all these cases, Standard W.W.T.P. cannot guarantee such limits.
Some W.W.T.P. plant suppliers try to overcome the Sulphate and Fluoride problem with a separate treatment of concentrates (Anodizing bath dumps or Acid Recovery stream and Chromating or Cr free bath dumps).
This will generate only a small reduction of Sulphates and Fluorides and does not ensure meeting legislated limits.

FLOW CHART N°1



3) PURAL Technology (see flow chart n° 2)

PURAL is a revolutionary patented technology developed by CIE for waste waters from aluminum finishing lines. The PURAL process is able to deliver two extraordinary benefits to the aluminum finisher:

1. The recovery and the reuse of 50% - 80% of water
2. Achieving low limits of Sulphate and Fluoride discharge.

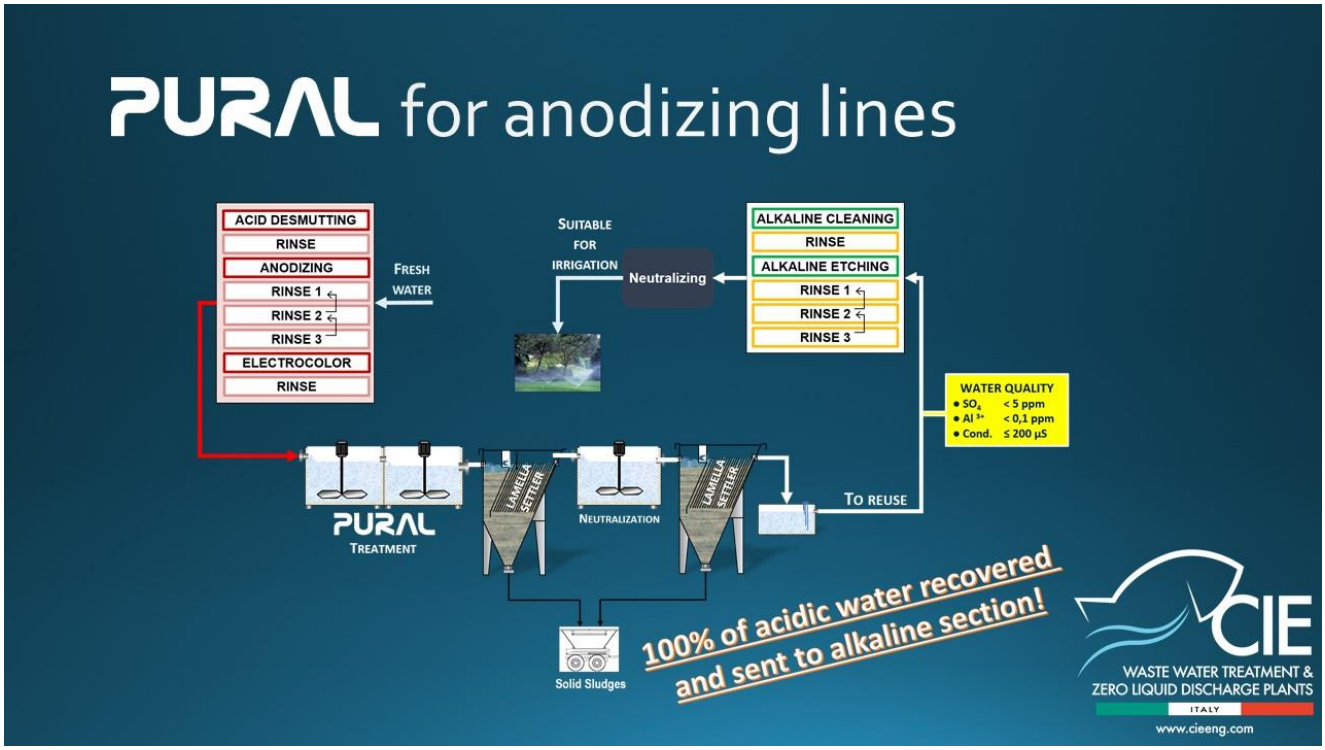
Anodizing rinses and bath dumps from the line are segregated and sent to PURAL section treatment where 95% of Sulphates and 98% of Fluorides are removed.
The resulting quality of treated water is suitable for reuse as showed in table 1:

Table 1

Water analysis after PURAL process	
Al	< 1ppm
SO_4	< 150 ppm
F^-	< 2 ppm
Cond.	< 400 ppm

This treated water can be sent to the Alkaline section without causing any deterioration of rinsing or product quality (see flow chart n°2)
The final waste water from the Alkaline section requires only a simple neutralization for Al precipitation and can be discharged easily meeting any Sulphate or Fluoride limits.
PURAL process can be applied to Anodizing, Painting lines or for lines where both these operations are used.

FLOW CHART N°2



4) Case History: TALEX (see flow chart n°4)

TALEX (Abu Dhabi) has three lines:

- One Anodizing line for 7 meters extrusions
- One Anodizing line for 11 meters extrusions
- One Painting line for 7 meters extrusions, Cr-free equipped.

The total production is:

- 650 sqm/h of Anodizing
- 700 Extrusions 7 meter per h

The plant works 24^{h}/day and the calculated total water consumption is approximately 50 m^3/h. Thanks to PURAL technology, the real water consumption is reduced to 25 m^3/h, with no effect on the rinsing performance. *This means a 50% water saving.*
According to flow chart n° 2, the final water (after final neutralization) discharged has the following parameters:

- Al < 0,5 ppm
- SO_4 < 150 ppm
- F^- < 2 ppm

The resulting waste water can be classified as "Water good to dump into rivers, lakes and ground" or can be used for irrigation.

FLOW CHART N°4

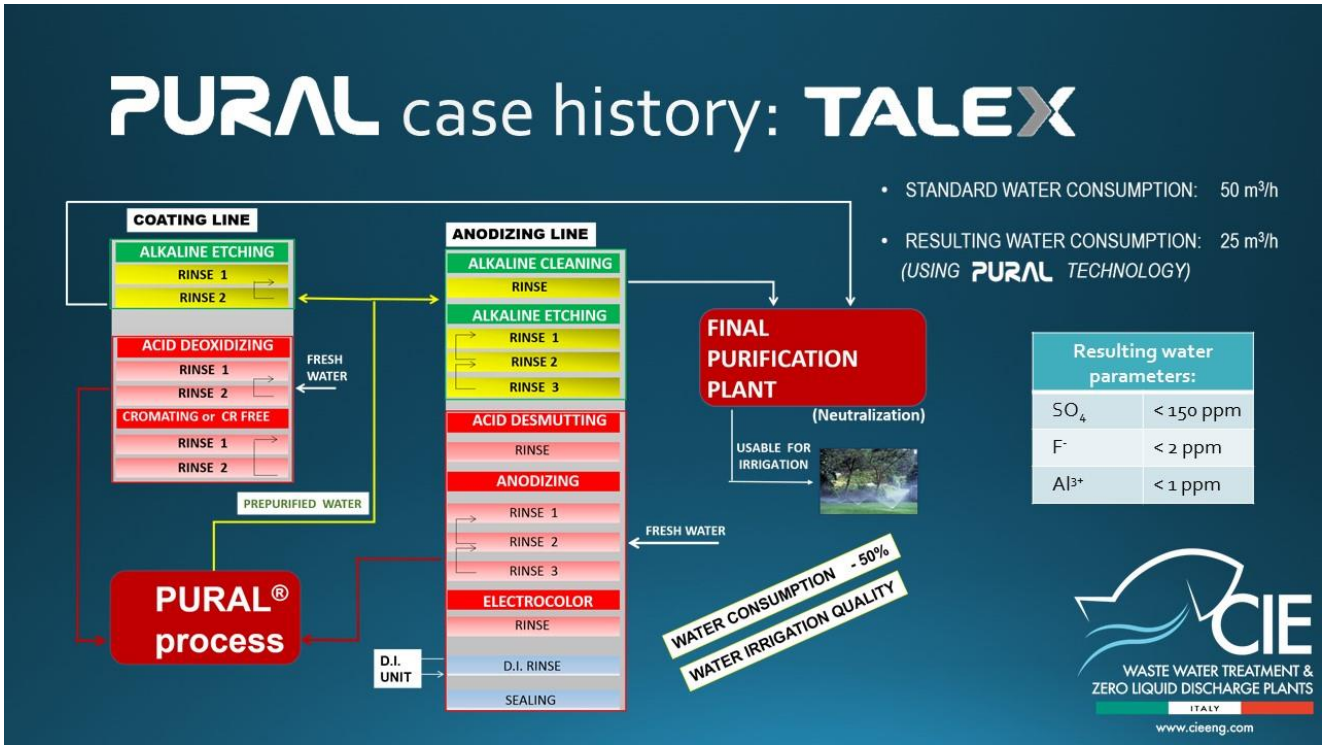


FIGURE N°1

FIGURE N°2

FIGURE N°3

5) PURAL ZEROZERO (see flow chart n°3)

Is the latest development of PURAL process. It is to be installed on Al painting lines equipped with Acidic cycle with Cr or Cr free conventional coating.
PURAL ZEROZERO realize the purification of waste water contanining Sulphates, Fluorides, Aluminum, Cr^{6+}, Ti or Zr salts by chemical treatment without using of U.F., R.O. and Evaporation and without generating any liquid liquor to dump.

FLOW CHART N°3

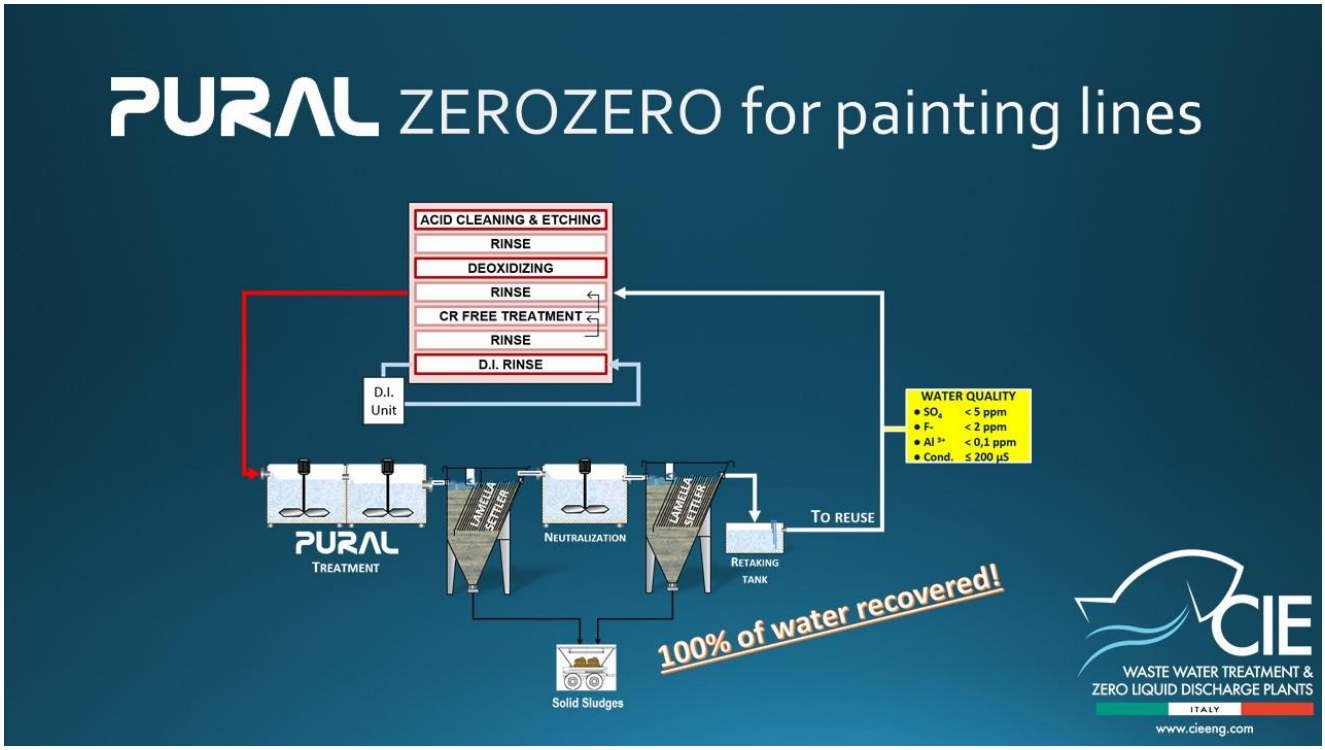
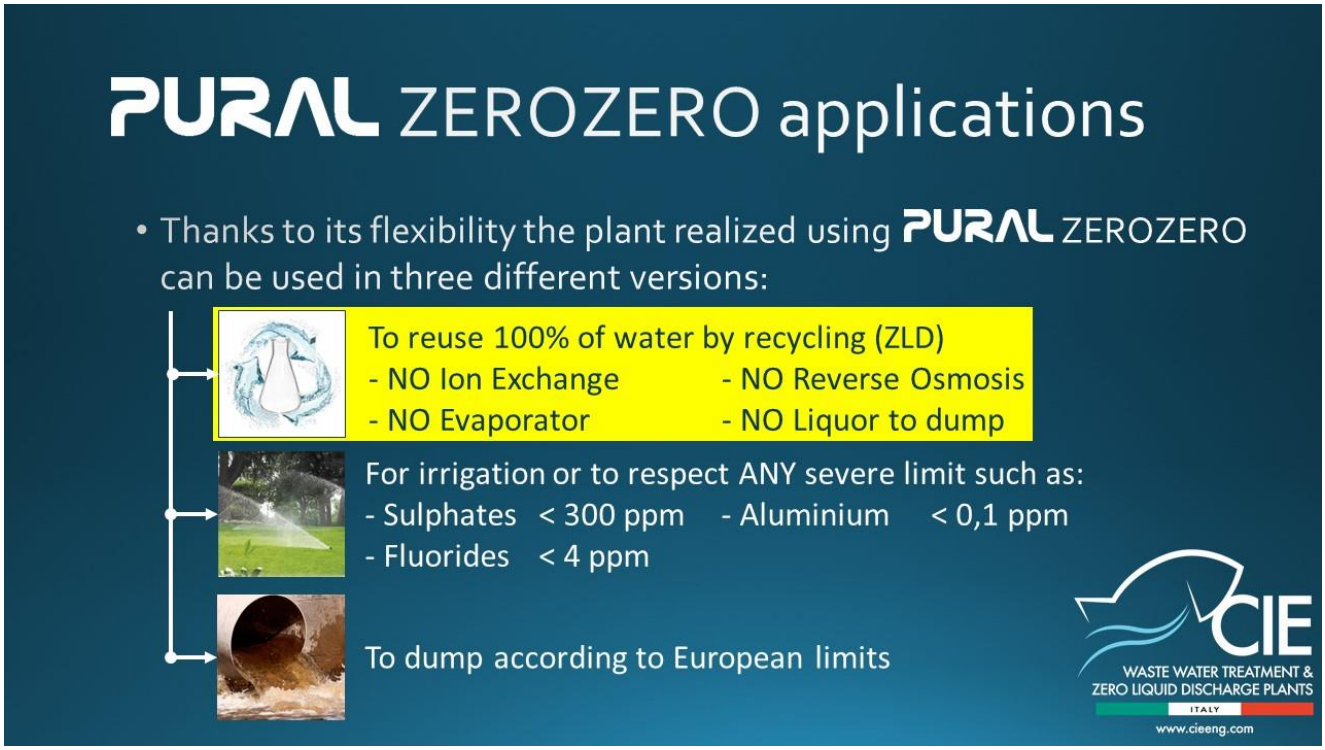


FIGURE N°4



For any different purpose it will be enough to use different chemical specialties developed by MST Chemicals (sister company of CIE).
The final result is a tremendous flexibility that leaves the customer to use PURAL ZEROZERO according to any need also after installation!

6) Conclusions

a) PURAL is the most advanced and proven process, for Anodizing lines, able to deliver two valuable benefits:

- 50% water saving
- Treated water that can meet severe limit legislation and be discharged into rivers, lakes or used for irrigation.

b) PURAL process can be expanded to Zero Liquid Discharge (ZLD) by addition of UF/RO and Multistage Evaporator for total water recovery. The additional units can be installed after initial PURAL installation.

c) PURAL ZEROZERO is the most updated technology for Aluminium Painting lines with maximum flexibility

- Dump water according to European limits
- Dumping water in rivers or lakes
- Total reuse of water (ZLD)

References:

PURAL Case History: TALEX (Abu Dhabi), GULF EXTRUSION (Dubai), ELVAL (Greece).