



WASTE WATER TREATMENT &
ZERO LIQUID DISCHARGE PLANTS



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**UPDATING ON WASTE WATER RECOVERY TECHNOLOGIES.
Z.L.D. PLANT TOPICS AND OPERATING COST**

KNOWLEDGE, COMPETENCE, EXPERTISE

- **38 YEARS OF EXPERIENCE**
- Established in 1981
- **A YOUNG BUT HIGHLY QUALIFIED TEAM**
- Average age: **38 years**
- Graduated Employees: **41%**
- **GLOBALLY OPERATING AND GLOBAL THINKING**
- **NO LICENSED TECHNOLOGIES:**
- CIE designs and develops Technologies and products for its own use
- **Worldwide leader in ZLD with more than 45 ZLD fulfilled**



LEADER COMPANY IN WASTE WATER TREATMENT & ZLD PLANT

Aluminium Cans



Aluminium Extrusion



Coil coating



Steel & Galvanizing



Waste Water Plants specifically dedicated to METAL FINISHING LINES

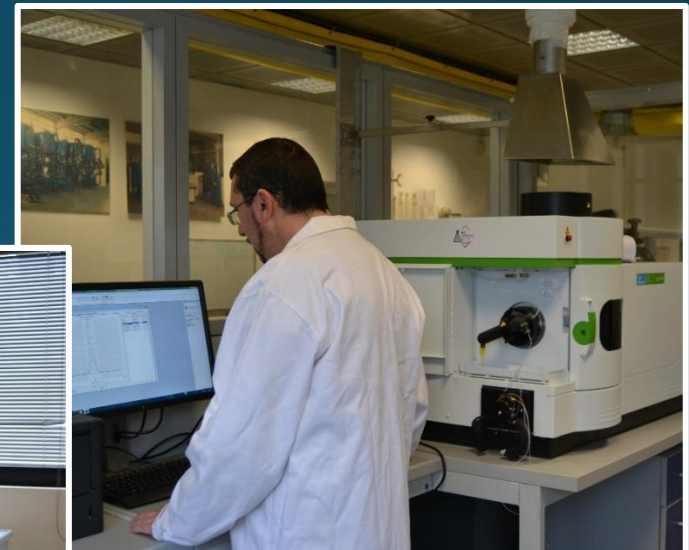
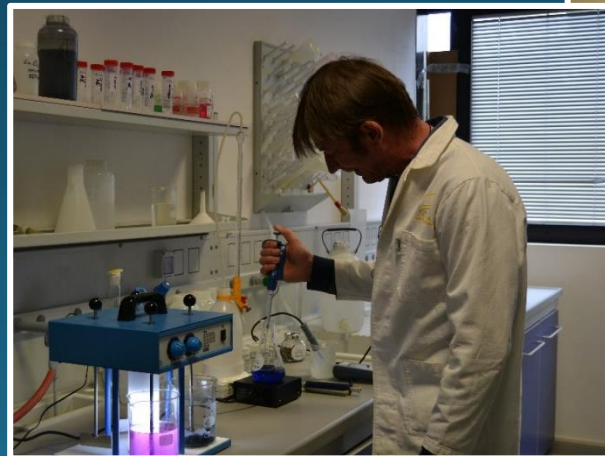
ACTIVITIES FOR METAL FINISHING LINES

- 1) REVERSE OSMOSIS UNITS
- 2) DEIONIZING AND MIXED BED UNITS
- 3) COALESCER DEOLING UNITS
- 4) CHEMICAL DOSING AND CONTROLLING UNITS
- 5) WASTE WATER PLANTS (*PUR-ALL* TECHNOLOGY)
- 6) ZERO LIQUID DISCHARGE (Z.L.D.) PLANTS
- 7) TELESERVICE AND TELEASSISTANCE



INTERNAL LABORATORY EQUIPPED WITH:

- Inductive coupled plasma (I.C.P.)
- Spectrophotometers with variable and fixed wavelength
- Nephelometer
- Thermoreactor
- Conductivity meter
- pH meter
- Titration station



LEADER IN CHEMICAL SPECIALTIES FOR WASTE WATER TREATMENT AND Z.L.D. PLANTS



PUROSORB

Specific powder products and blend for adsorption on WWTP of:

- ✓ COD < 150 ppm;
- ✓ Oils;
- ✓ Surfactants;
- ✓ Organic substances.

PUR-ALL

Chemicals Specially formulated for WWTP to remove:

- ✓ Sulphate < 50 ppm;
- ✓ Fluoride < 4 ppm;

PUROFLOC

Anionic Flocculants for WWTP:

- ✓ Medium and Heavy TSS concentration.

PUROSMO

Chemicals Specially formulated to manage:

- ✓ Ultra Filtration Units;
- ✓ Reverse Osmosis Units;
- ✓ Evaporators Units

POLLUTION QUALITY GENERATED BY CAN WASHER

Alluminium Washer Pollutant	Where The Pollution Come From?
Oils and grease	by cupper press, Body Maker and coolant
Surfactants	by oils and Acid Cleaner
Sulphates [SO ₄ ²⁻]	by Acid Cleaner
Fluorides [F ⁻] and Aluminium [Al ³⁺]	by surface etching
PO ₄ , NO ₃ , NH ₄	by treatment
pH	by Acid Cleaner

WASHER WASTE WATER QUALITY

FROM WHAT IT DEPENDS

- | | |
|--|-------------------------------------|
| • Washer Water Consumption | 30 – 60 m ³ /Million Can |
| • Alluminium Etching (Al ⁺³) | 3 – 6 mg/can |
| • Carry Over | 3 ml/can |
| • Reaction Product (g/l Al) | 1,5 - 2 |

TYPICAL COMPOSITION BASED ON - 60 m³/MILLION CANS

- | | |
|--|--------------------|
| • Aluminium (Al ⁺³): | 50 – 100 mg/l |
| • Sulphates (SO ₄ ⁼): | 500 – 375 mg/l |
| • Fluorides (F ⁻): | 100 - 200 mg/l |
| • Oils and surfactants (COD): | 1.500 – 2.500 mg/l |
| • pH: | 2.5 – 4,0 |

EUROPEAN STANDARD LIMITS

Parameters:	Unit of measure:	River discharge:	Discharge in Sewage:
pH		5,5 – 9,5	5,5 – 9,5
Total Suspended Solids	mg/l	80	200
BOD ₅	mg/l	40	250
COD	mg/l	160	500
Aluminium	mg/l	1	2
Sulphates	mg/l	1.000	1.000
Chlorides	mg/l	1.200	1.200
Fluorides	mg/l	6	12
Phospate as P	mg/l	10	10
Ammonium as NH ₄	mg/l	15	30
Surfactants	mg/l	2	4

LOCAL LEGAL LIMITS

The Local Legal Limits change from country to country. Local Legal Limit are very important In to define Effluent Treatment Plant process and its design.

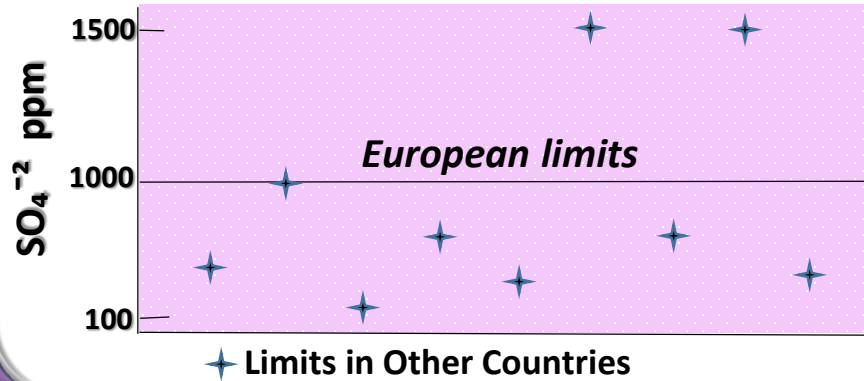
Local limits:

- Fluorides (often less than 4 ppm)
- Sulphates (often less than 300 ppm)
- COD (often less than 200 ppm)
- Surfactants (often less than 2 ppm)

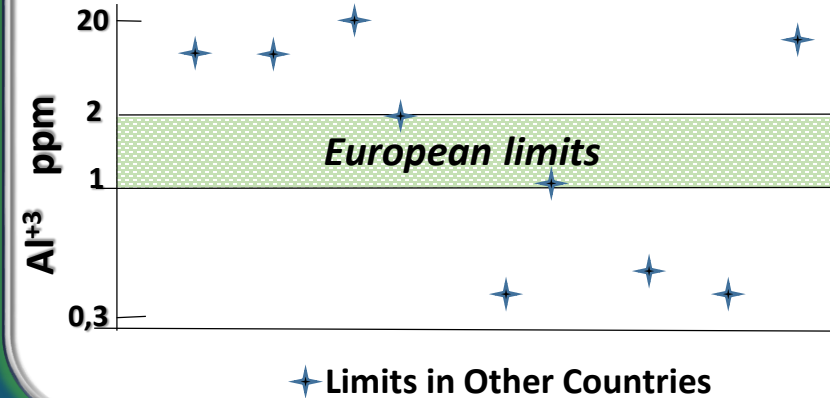


DISCHARGE LIMITS IN OTHER COUNTRIES

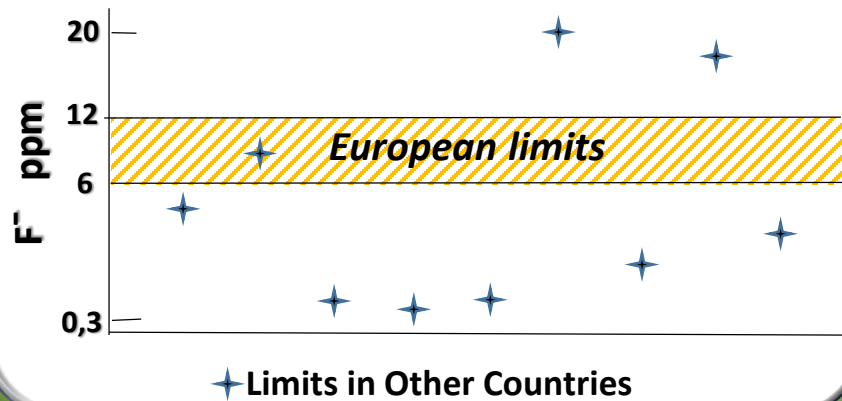
SULPHATES LIMITS (SO_4^{-2})



ALUMINIUM LIMITS (Al^{+3})

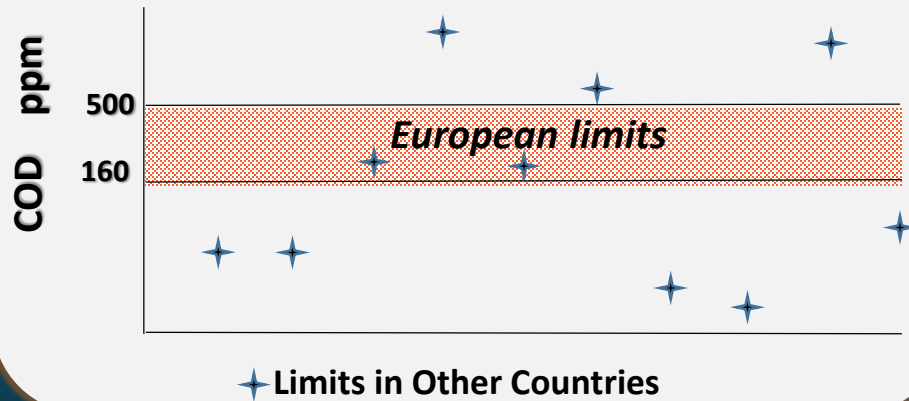


FLOURIDES LIMITS (F^-)

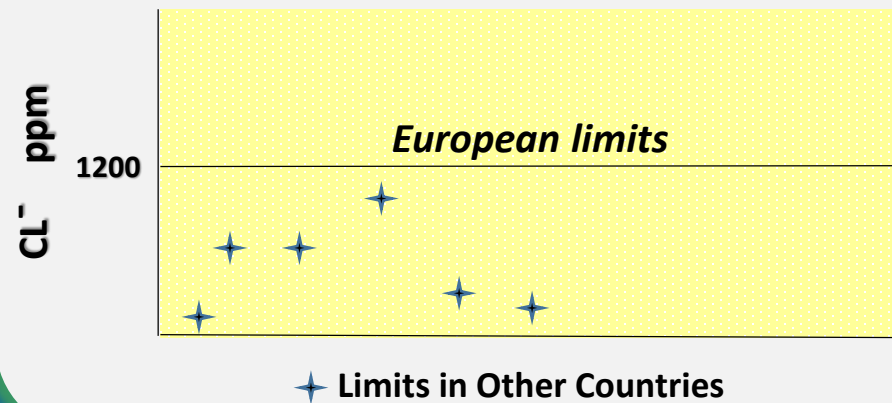


DISCHARGE LIMITS IN OTHER COUNTRIES

CHEMICAL OXIGEN DEMAND LIMITS (COD)



CHLORIDES LIMITS (CL⁻)



WASHER WATER REDUCTION EFFECT

mg/l \ m ³ /MC	60	30	15
Aluminum (Al ⁺³)	100	200	400
Sulphates (SO ⁻² ₄)	500	1.000	2.000
Flourides (F ⁻)	200	400	800

- No more Dilution effect – Directly proportional increase of Pollution
- Save Water Because cost effective – Increasing of Capex and Opex cost on Waste Water Stage

HOW TO ACHIEVE RESTRICTIVE LOCAL LIMITS

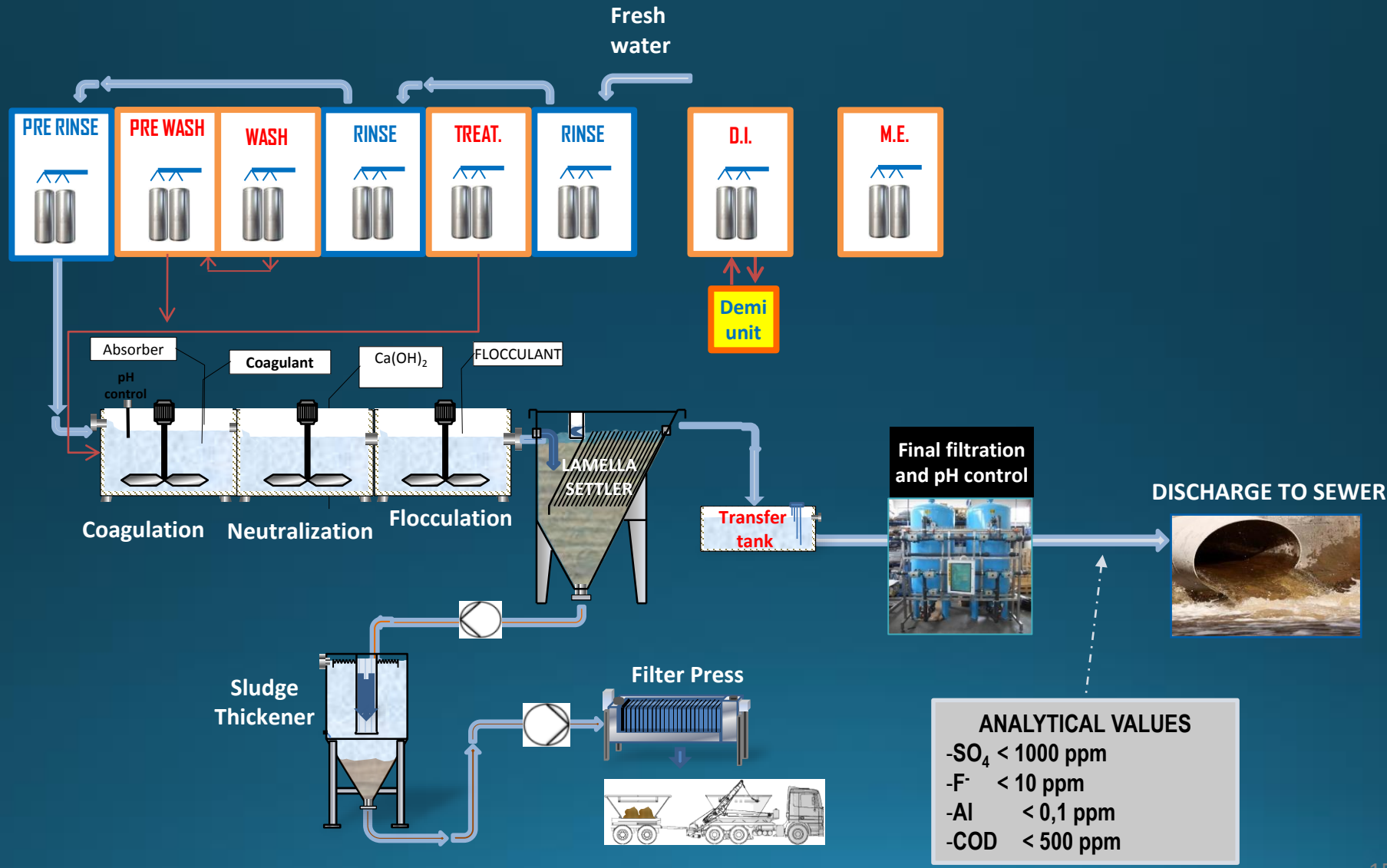
⇒ Use of U.F, R.O, I.X and special chemical-physical treatment

⇒ Use of Chemical Specialties to reduce COD, Sulphates, Flourides

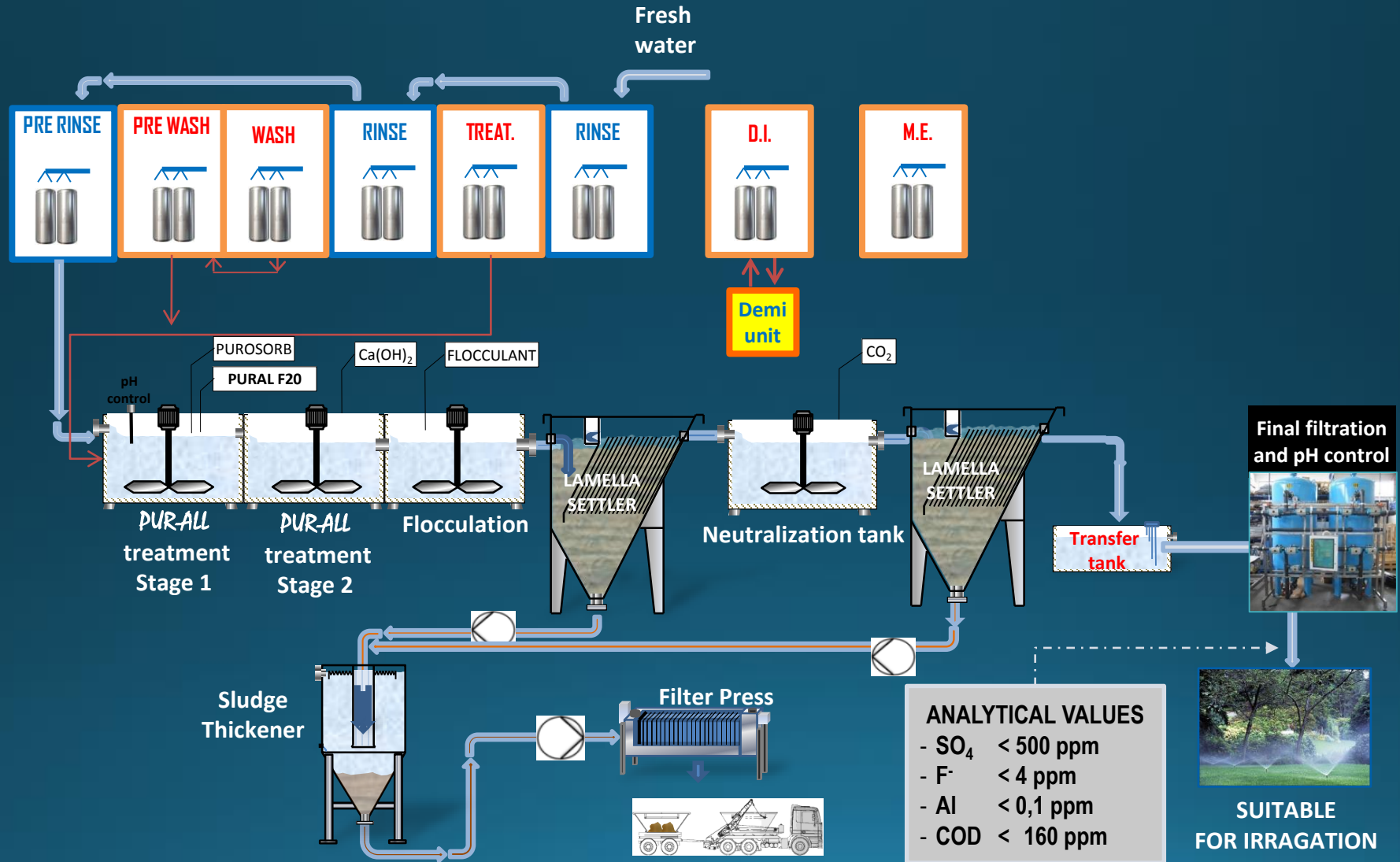
⇒ Increase of capital costs

⇒ Significant increase of operating costs

AVAILABLE STANDARD TECHNOLOGIES



SPECIAL CHEMICAL PHYSICAL PLANT - PUR-ALL NEW TECHNOLOGY



SPECIAL CHEMICAL PHYSICAL PLANT - PUR-ALL NEW TECHNOLOGY



PUR-ALL IS AN AVAILABLE TECHNOLOGY TO REDUCE SULPHATES AND FLUORIDES UNDER THE FOLLOWING LIMITS:

$$C.O.D. \leq 150 \text{ mg/l}$$

$$SO_4^{=} \leq 100 \text{ mg/l}$$

$$F^- \leq 3 \text{ mg/l}$$

PUR-ALL TECHNOLOGY IS BASED ON AN ADVANCED PLANT THAT, USING SPECIFIC CHEMICALS IS ABLE TO ABSORBE OIL AND WETTING AGENTS AND TO CO-PRECIPITATE SULPHATES AND FLUORIDES LIKE "TOTAL INSOLUBLE COMPLEX" WITH, APPROX, THE FOLLOWING COMPOSITION



PUR-ALL PROCESS IS DEVELOPED IN THREE STEPS:

STEP 1: ORGANIC TREATMENT STAGE. USING SPECIAL BLEND OF ORGSNIC ABSORBER AND ADDITIVE

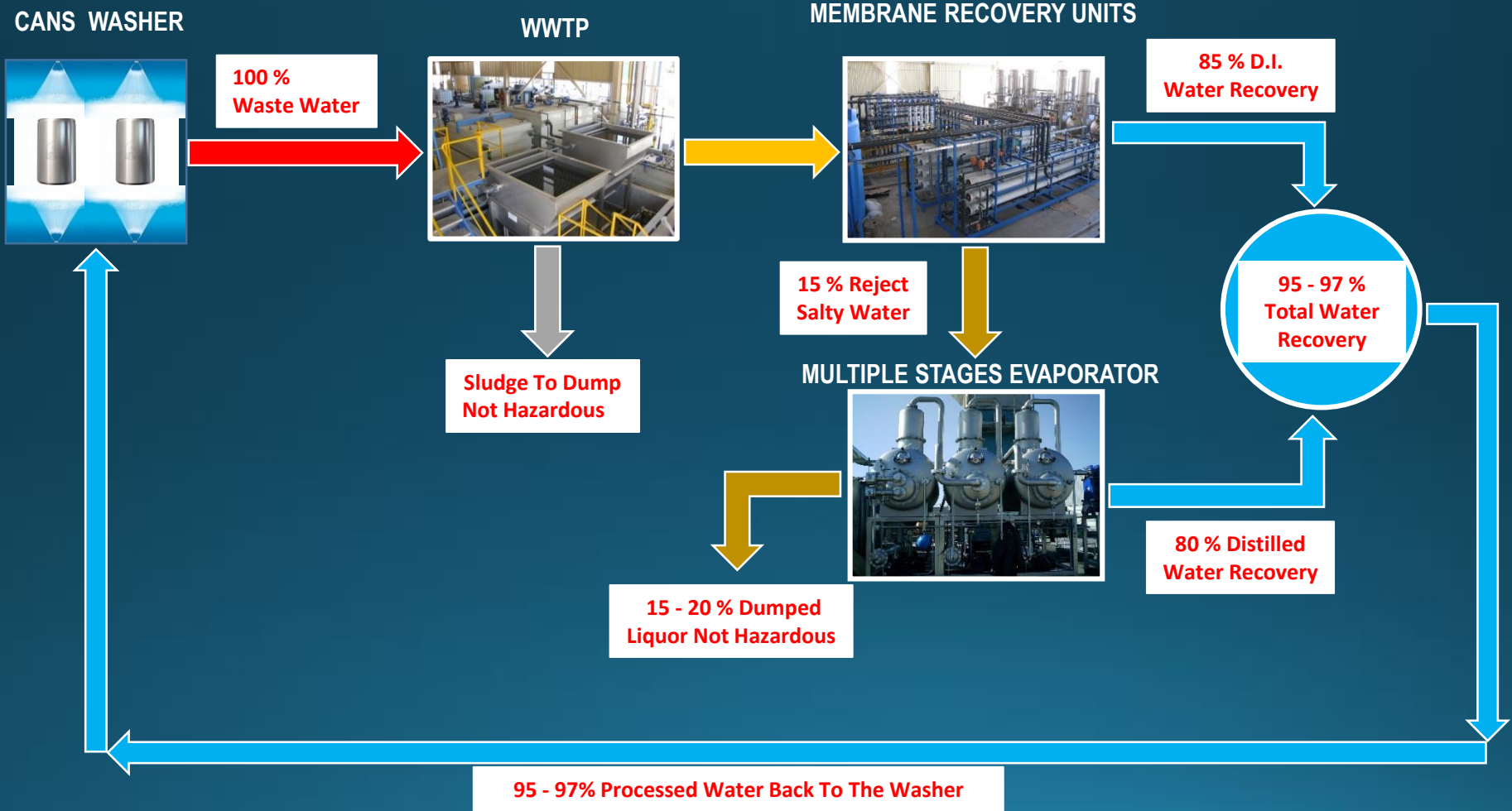
STEP 2: TREATMENT OF SO_4 WITH SPECIAL BLEND OF METAL OXIDES PLUS $Ca(OH)_2$ UNTIL THE PRECIPITATION OF $SO_4^{=}$ AND F^-

STEP 3: NEUTRALIZATION WITH CO_2 TO REMOVE RESIDUAL HARDNESS (THE EXCESS OF $Ca(OH)_2$)

WHY INSTALL A Z.L.D. PLANT

- ✓ Extremely restrictive local limits
- ✓ No available sewer
- ✓ No available water
- ✓ Expensive water cost
- ✓ 95 – 97 % Washer Water Reuse
- ✓ Environmentally friendly - Ethical Reasons
- ✓ Risk of dispute with local authorities
- ✓ Superior quality of reused water in comparison with Tap Water
- ✓ Possibility to plan installations independently of local legislation

Z.L.D. SIMPLIFIED FLOW DIAGRAM



Z.L.D. TECHNICAL DATA

Project Data:

Carry Over: **3 ml/can**
Aluminium Etching: **6 mg/can**
R.P.: **15 – 20**
Washer Chemicals **Free Ammonium**

Base Calculation: **1 Million Cans**

Washer Processed Water: **60 m³**
Water Reused with ZLD: **Up to 58,2 m³ (97%)**
Incoming Fresh Water: **1,8 – 2 m³**
Water to evaporate: **8 – 9 m³ ONLY**

Waste Sludge to Dump: **150 - 170 Kg**
Evaporator Liquor to Dump: **1,6 – 1,8 m³**

Z.L.D. BENEFITS

Quality of water to be reused:	
pH	5.5 - 7.5
λ	<50 $\mu\text{s}/\text{cm}$
Cl^-	< 3 ppm
CO_2^-	< 5 ppm
Ca^{+2}	NO
SO_4^{-2}	NO
F^-	NO

Expected quality and composition of sludge:	
$\text{Al}(\text{OH})_3$	< 22.5%
Organics	< 10%
H_2O	to 100

NOT HAZARDOUS

Expected quality and composition of liquor waste:	
Na_2SO_4	3% ÷ 5%
NaCl	0,5% ÷ 1%
NaF	1,5% ÷ 2%
H_2O	To 100%
pH	7 ÷ 9
Al^{+3}	NO

NOT HAZARDOUS

- 1 - IT IS A TECHNOLOGY ABLE TO REUSE WASHER WASTE WATER BACK TO THE WASHER STAGE N° 5;
- 2 - WASHER STAGE N° 6 IN CLOSED LOOP WITH D.I. UNIT;
- 3 - FREE AMMONIUM CHEMICLAS REQUIRED;

ZLD SYSTEM BASED ON DIFFERENT TECHNOLOGIES. BY USING SPECIFIC CHEMICALS IS ABLE TO ABSORBE OIL AND WETTING AGENTS, TO COMPLEX SULPHATES AND FLUORIDES LIKE "SOLUBLE SALTS" AND PRECIPITATE ALLUMINIUM

PROCESS IS DEVELOPED IN FOUR STEPS:

- STEP 1: CHEMICAL PHYSICAL UNIT TO REMOVE ALLUMINIUM AND ORGANICS
- STEP 2: ULTRA FILTRATION UNIT TO REDUCE SUSPENDED SOLIDS
- STEP 3: REVERSE OSMOSI UNIT FOR PRIMARY RCOVERY OF WATER
- STEP 4: EVAPORATOR UNIT ON RO REJECT TO MAXIMIZE WATER RECOVERY

Zero Liquid Discharge

Chemical Physical Treatment Unit



Evaporator Recovery Unit



Zero Liquid Discharge

Demi & Mixed Beds Recycling Unit Duty Standby System

UF & RO Unit recovery section Duty Standby System



OPERATING COSTS OF DIFFERENT WWTP (WASTE WATER TREATMENT PLANT) COMPARED TO Z.L.D.

The operating cost of any WWTP:

- *Basic Chemicals (such as NaOH or lime)*
- *Chemical Specialties (Coagulants, Flocculants, Absorbers)*
- *Sludge disposal*
- *Power*
- *Fresh water*

Basic parameters for cost calculation:

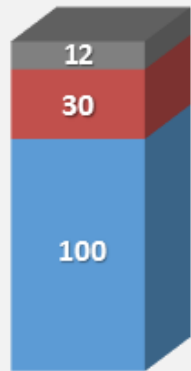
- *Water consumption: 40 m³/1 MCans*
- *Fresh water cost: 2,5 €/m³*
- *Aluminium Cans size: 330 ml*

OPERATING COSTS COMPARISON (BASED ON MILLION CANS) BETWEEN Z.L.D. AND WWTP AS FOR DIFFERENT LIMITS OF DISCHARGE

WWTP

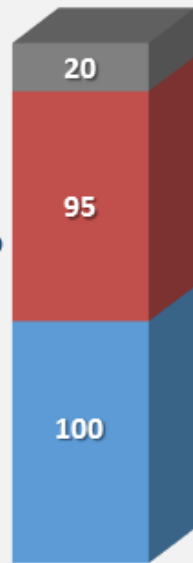
EUROPEAN LIMITS

WITHOUT LIMITS



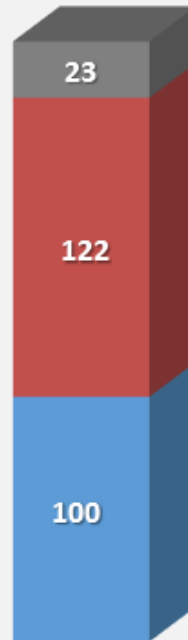
Tot 142 €/MlCans

Sewage



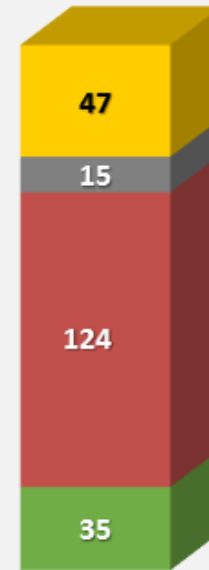
Tot 215 €/MlCans

Rivers and lakes

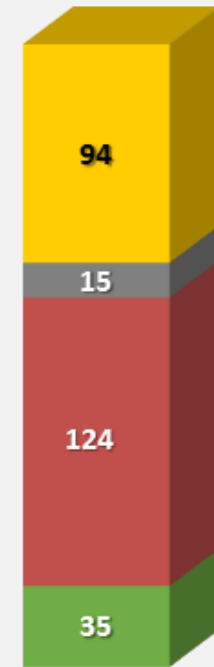


Tot 245 €/MlCans

Z.L.D TECHNOLOGY



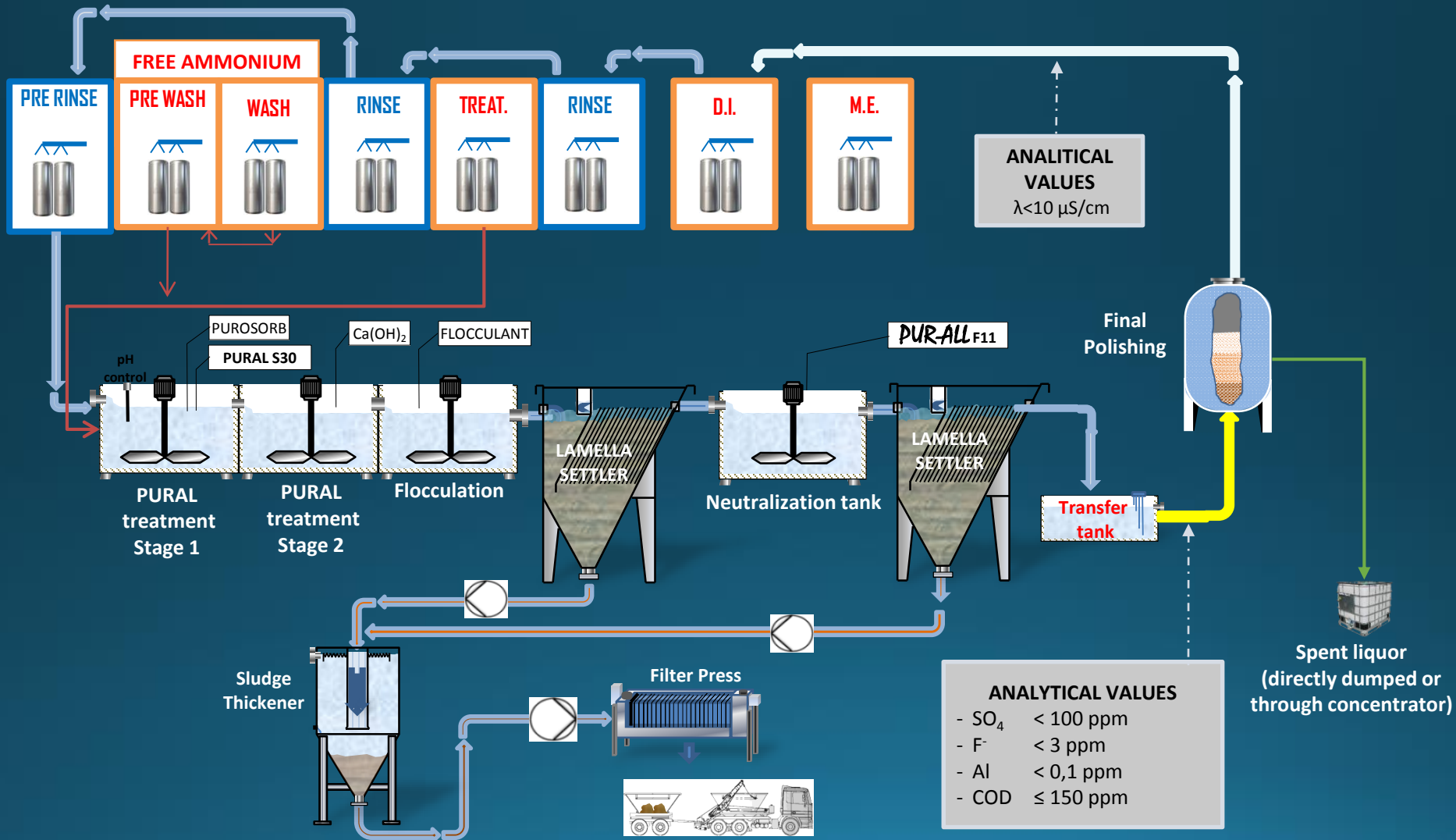
Tot 200 €/MlCans
(without Crystallizer)



Tot 247 €/MlCans
(using Crystallizer)

- = Water
- = Basic Chemicals
- = Energy
- = Sludge
- = Specialties

PUR-ALL ZERO ZERO NEW TECHNOLOGY

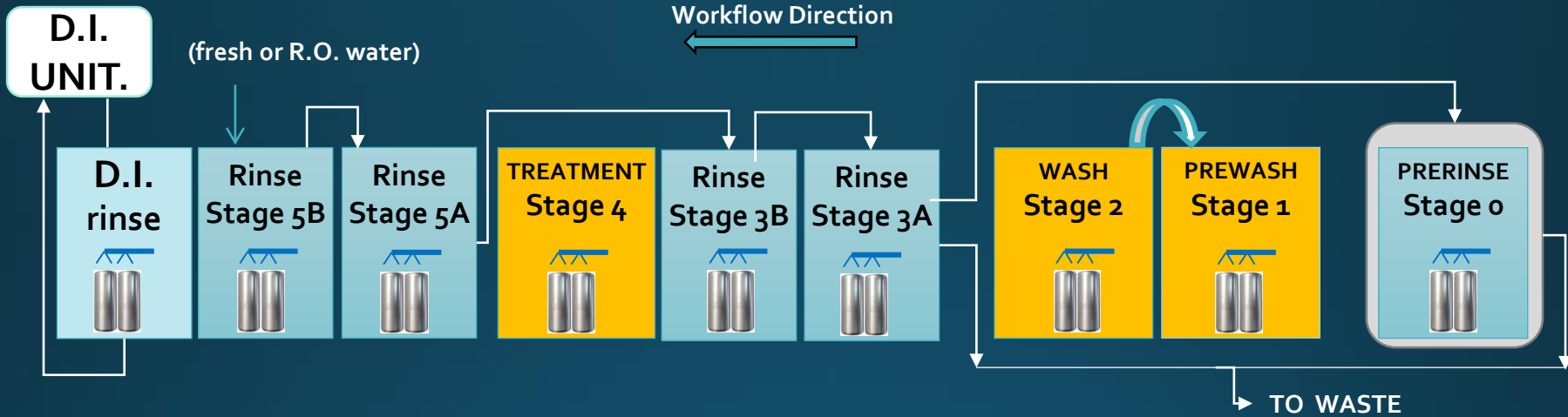


PUROCOOL (OIL REMOVAL SYSTEM)

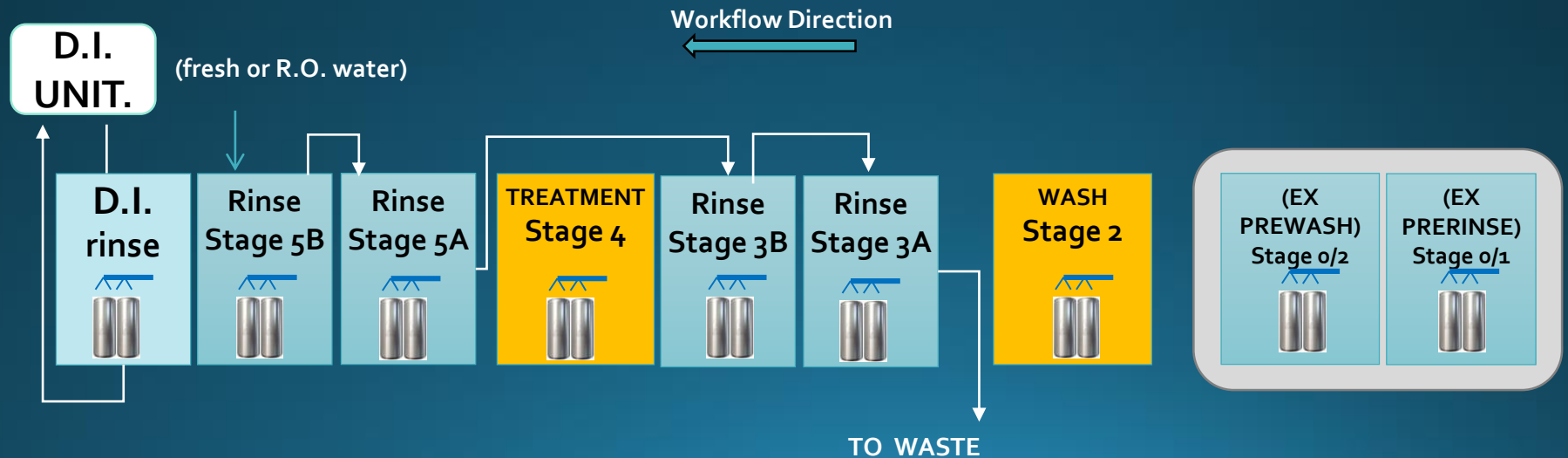
TECHNOLOGY TO REMOVE OILS AND COOLANT FROM CANS



CURRENT

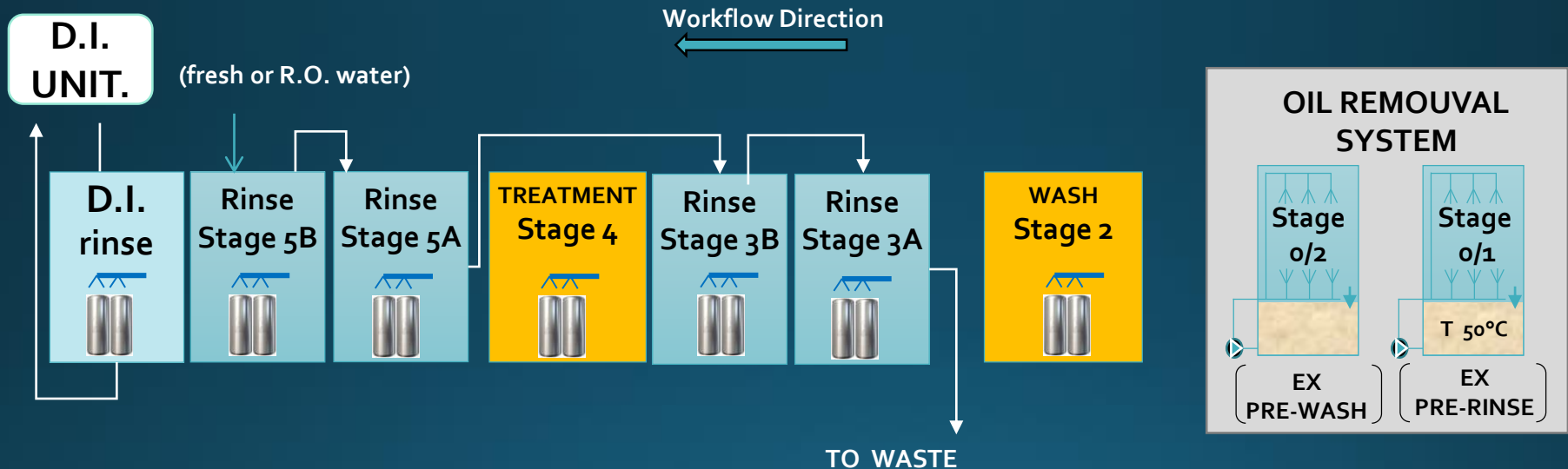


PUROCOOL



PUROCOOL (OIL REMOVAL SYSTEM)

TECHNOLOGY TO REMOVE OILS AND COOLANT FROM CANS



NOTE: - All rinses counterflow to Stage 3
 - Pre-Wash and Pre-Rinse dedicated to the Oil Removal System



**Thank you
for your attention
and
*Arrivederci !***

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