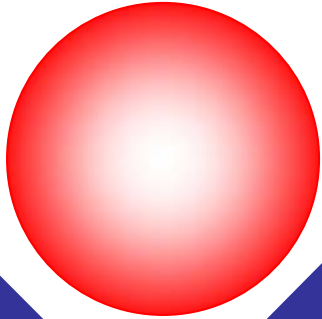


A Second life for Water



# EVAPORATORS

*More than a machine, a solution*

CONCEPTION  
CONSTRUCTION  
SALE  
RENT  
EXPLOITATION

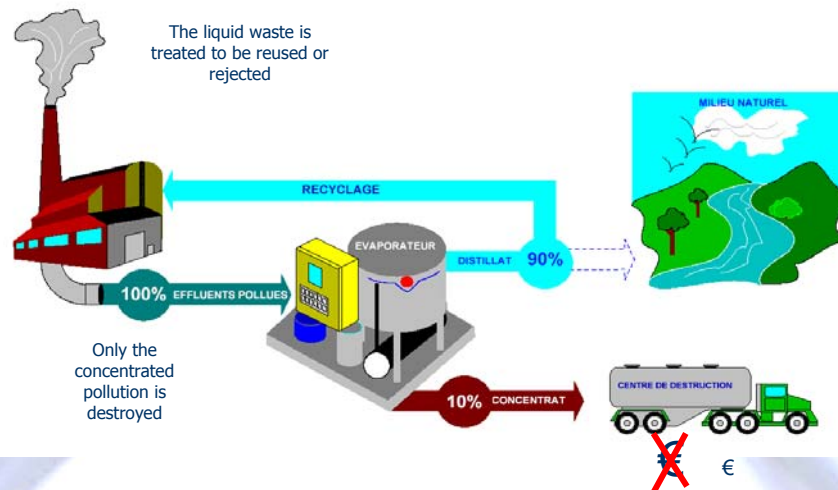


*Waste water treatment*

# What is the Evaporation ?

The evaporation is a thermal process which, from a solution, allows separating two liquid phases: a distillate and a concentrate.

Applied to the treatment, this technique is used to reduce the volume of the liquid waste or to recycle baths of treatment.



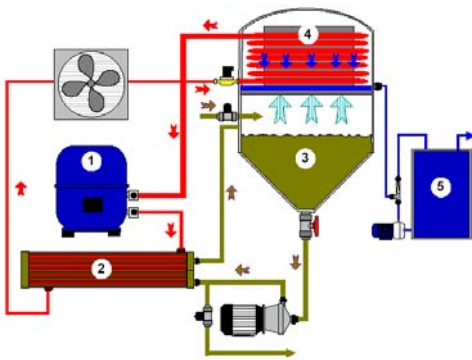
## THE PURPOSE OF the SYSTEM

The evaporator is a system conceived for the treatment of the aqueous solutions coming from various industrial processes and aims of:

- Reduce the volumes of industrial waste containing some water.
- Separate a liquid of its dissolved substances
- Concentrate at most an aqueous solution by extraction of water.
- Allow the **zero Discharge**, the recycling in process
- Reject the distilled water.
- Reduce the costs of destruction of the liquid waste.
- To Reduce the DCO
- To Allow the total separation of metals
- The system with scraper allows concentrations pushed of about 700 g/l

# Principles

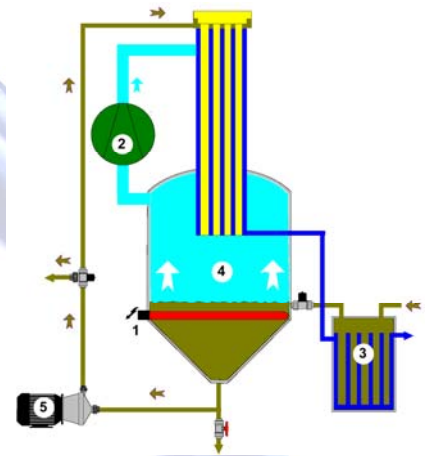
## HEAT PUMP



## MECHANICAL COMPRESSION OF VAPOURS

In this type of evaporator, the effluent, in the starting up of the installation, is warmed by an electric heating of supplement ① and the formed vapour is compressed by a compressor ② and reintroduced in the tubes of the heat exchanger to allow the heating of the effluent to be treated (90°C) which is brought at the head of the heat exchanger by the feed pump ⑤. Obtained vapours pass around the colder inner surface of the heat exchanger where they condense ④ and also they are used for preheating the entering effluent ③.

A refrigerated gas is compressed by a compressor ①, and then conveyed in the serpentine of the heat exchanger ②. It gives up then its energy to the effluent to be treated, what allows this last one to vaporize in the chamber of boiling ③ in a temperature of 35°C. The gas is generally precooled by a heat exchanger with air, then relaxed in the serpentine of the chamber of condensation ④, giving up its frigories and provoking the condensation of the dry vapours which are inhaled by the system of vacuum and collected in the tank of distillate ⑤.



# Technologies implemented



### ■ PAC : Heat pump

- EE : External exchanger
- EI : Internal exchanger
- R : Scraper

- Consumption : de 60 à 130 Wh/l
- Capacity 240 à 50 000 l/d



### ■ CMV : Mechanical Compression of Vapours

- Consumption : 80 Wh/l
- Capacity 2 000 à 8 000 l/d



### ■ TC : Thermo Compression

- Capacity 240 à 48 000 l/d

### ■ EC : Hot water

- M : Mono effect
- D : Double effect
- T : Triple effect

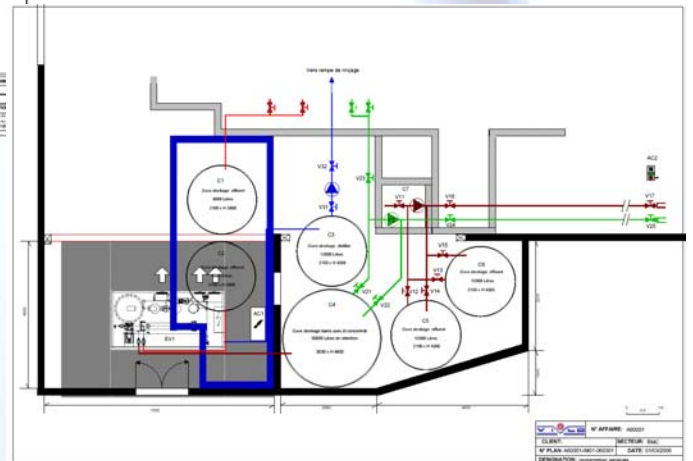
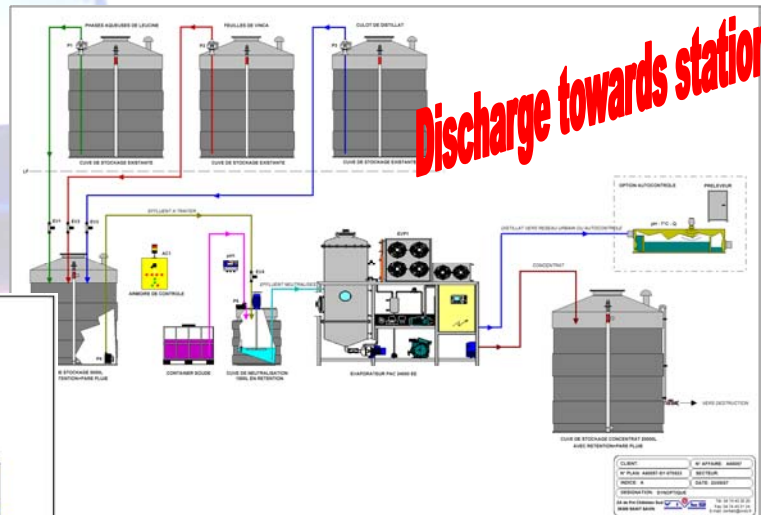
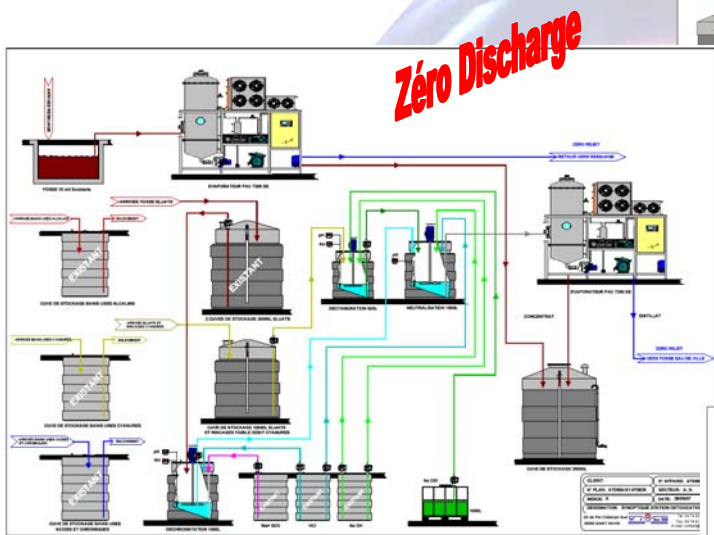
- Capacity 240 à 150 000 l/d





# EXAMPLES OF INSTALLATIONS

The distillate produced by our evaporators can be rejected towards a wastewater treatment plant, towards a natural environment or reused in process so allowing **the zero discharge** of your installation.



# Bal ance sheet economic

- Evaluation of the situation
  - Volume to be treated
  - Type of effluent to be treated
  - Purpose of the treatment
  - Norms to be respected
- Realization of an economic study
  - Cost of the current situation
  - Cost with system of treatment
  - Breakeven point
- Realization of a balance sheet of exploitation

**Bilan d'Exploitation**

Declaracion des Variables

Affaire N° : A70001-BE070112

VIVLO  
38 SAINT SAVIN

**EFFLUENT A TRAITER**

Quantite d'effluent a traiter	1 200	m <sup>3</sup> /an
Nombre de jour de traitement	300	jours/an
Volume a traiter par jour	4 000	lres/jour

**CHOIX EVAPORATEUR**

Type evaporaieur	PAC 4000 SAF
Taux de concentration (%)	90%
Capacite de traitement d'effluent par jour	1320

**Matériel**

**COÛT EVAPORATEUR**

Coût evaporaieur	40 000 €	par an	par m <sup>3</sup>
Temps d'amortissement	39	mois	
Coût mensuel	1 111 €		
<b>TOTAL Charges Annuelles Evaporaieur</b>	<b>12 333 €</b>		<b>11,1 €/m<sup>3</sup></b>

**COÛT PERIPHERIQUES**

Coût periphériques (lignes, accessoires, etc...)	2 000 €		
Temps d'amortissement	39	mois	
Coût mensuel	56 €		
<b>TOTAL Charges Annuelles des Periphériques</b>	<b>867 €</b>		<b>0,6 €/m<sup>3</sup></b>
<b>TOTAL CHARGE ANNUELLE DU MATERIEL</b>	<b>14 000 €</b>		<b>11,7 €/m<sup>3</sup></b>

**Exploitation**

**MAIN D'ŒUVRE INTERNE SUR SITE**

Annuel	
Temps	
Temps de controle	5 minutes / jour = 25 heures/an
Temps de Maintenance	4 heures / mois = 48 heures/an
Total heures	73 heures/an
Coût horaire Main d'Œuvre interne	€ / heure = 202 €
<b>TOTAL Main d'Œuvre Interne Annuelle</b>	<b>14 640 €</b>

**CONCENTRAT**

Volume concentrat produit	120	m <sup>3</sup>	
Coût destruction concentrat	150,0	€/m <sup>3</sup>	18 000 €
Surfactants boites	1,0		
Facteur de sur-concentration	120	m <sup>3</sup>	
Volume de boites a detruire			
Coût destruction des boites (m <sup>3</sup> )			0 €
<b>Coût d'elimination du concentrat</b>			<b>18 000 €</b>

**ENERGIE**

Volume de distillat produit (m <sup>3</sup> )	1050	m <sup>3</sup>	
Consommation electrique au litre de distillat	0,150	€/litre	
Consommation electrique (KWh)	157 500	KWh/an	
Prix du kWh	0,0448	€/kWh	
<b>Coût energie electrique</b>			<b>7 288 €</b>

**REACTIFS**

Consommation d'antimousse	0,0000%	de	1 200	m <sup>3</sup>
Quantite de reactif annuel	0	litres/an		
Coût du reactif au litre	10,00	€/litre		
<b>Coût antimousse</b>				<b>0 €</b>
% reactif 2	0,0100%	de	1 200	m <sup>3</sup>
Quantite de reactif 2 (litre)	120	litres/an		
Coût du reactif 2 au litre	5,00	€/litre		
<b>Coût reactif 2</b>				<b>600 €</b>
<b>Coût total annuel des reactifs</b>				<b>600 €</b>
<b>TOTAL Annuel de Fonctionnement</b>				<b>28 528 €</b>

**COÛT PIECES DE RECHANGE**

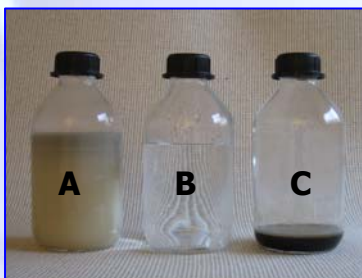
Operation	Qte	Coût	Total
Joints échangeur multi trous	1	188 €	188 €
Servomoteur mecanique pompe de circulation	1	1 500 €	1 500 €
Ecouvillon nettoyage échangeur	1	50 €	50 €
Manivelle pour valve d'elimination et decharge	1	448 €	448 €
Manivelle agit mouset capot side	1	202 €	202 €
<b>TOTAL Annuel des Pieces de Rechange</b>			<b>2 388 €</b>

**BILAN D'EXPLOITATION**

		par an	par m <sup>3</sup>
<b>TOTAL CHARGE ANNUELLE DU MATERIEL</b>	(pendant 36 mois)	<b>14 000 €</b>	<b>11,7 €/m<sup>3</sup></b>
<b>TOTAL COÛT D'EXPLOITATION ANNUEL</b>		<b>29 687 €</b>	<b>24,7 €/m<sup>3</sup></b>
	au lieu de :	144 000 €	120,0 €/m <sup>3</sup>

## RESULTS

To define in best the evaporator answering your need, we make tests of evaporation in laboratory in the conditions identical to the industrial process.



- A – Before treatment
- B – After treatment
- C – Residues to be destroyed

Affaire :	A	Provenance
Ref échantillon	A	
Nature échantillon	Effluents lessiviels et d'usinage	

Paramètres	Unités	Effluent	Distillat	Concentrat
pH		9,7	9,7	6,0
Densité	g/ml	1,006		<1,000
Couleur		Marron clair	Opalescent	
Odeur		Non plaisant	Peu plaisant	
Matière en suspension	mg/l	5320,0		
Solides décantables 2h	ml/l	<0,1		
Extrait sec à 105°C	%	3,64		
Extrait sec à 600°C	%	0,26		
Conductivité	µS/cm	5030,0	171,0	
DCO	mg/l	157500,0	675,0	
DBO5	mg/l	173,0	<15,0	
Chlorures	mg/l	336,0	<1,0	
Fluorures	mg/l	1,8	<1,0	
Sulfites	mg/l	<1,0	<1,0	
NTK	mg/l	840,0	86,8	
Azote nitrique	mg/l	70,5	<1,0	
Azote nitreux	mg/l	<1,0	<1,0	
Ammonium	mg/l	229,6	78,4	
Bore	mg/l	137,0	1,0	
Fer	mg/l	32,4	<0,1	
Cuivre	mg/l	2,0	<0,05	
Composés organiques extractibles totaux	mg/l	570,0	<1,0	
Solvants totaux comme n-hexane	mg/l	5241,0	16,0	
Détergents anioniques	mg/l	46,0	<0,2	
Détergents non ioniques	mg/l	288,0	<0,3	
Détergents totaux	mg/l	334,0	<0,5	
Phosphore total	mg/l	<1,0	<1,0	
Manganèse	mg/l	5,6	<0,10	
Nickel	mg/l	0,28	<0,1	
Aluminium	mg/l	0,4	0,15	

