Economic Savings in the Plating Industry Through Recycling & Recovery of Metals from Sludge

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The economic study for recycling wastewater treatment sludge from the plating industry has the potential for multifaceted economic impacts on the industry.

These costs and/or saving relates to one of six basic areas, including: long term liability, cost of raw materials, cost of disposal, regulatory compliance, public relations and social responsibility.

As we enter the era of environmental responsibility who wishes to be known for his environmental consciousness, we must begin as an industry to take a more global view of the cost of waste management and disposal. It is the belief of this author that these needs can be best met and the related cost best minimized thought recycling rather than the traditional method of stabilization and landfill disposal.

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Introduction

As we start the new millennium the chemical industry in general and the surface treatment trade in particular, should contemplate handling two very important questions: energy cost and minimization of environment impact.

Organizations such as LIFE, ENVIRONMENT, the European Union Official Environment Centres -at national and regional or local level- as well as the US one belonging to the EPA (Environment Protection Agency) are fighting very hard for avoiding environment contamination from industry and to reduce energy costs already mentioned.

Therefore, it will be analyzed how the surface treatment industry can minimize environmental impact and save energy -both power and water- and what to do with the huge quantity of sludge produced in the trade by physical-chemical depurators.

It should be examined various electrochemical processes like anodizing, zinc plating, nickel plating, guilt plating and it will be found out the importance of energy saving and the use of Venturi's technology, ionic interchange columns (anionic and cationic), heavy metal recovery column (nickel, chromium, aluminium, etc.), inverted osmosis and evaporators.

This work is based in the recovery technics and the energetic saving practised in the surface treatment industry in the European Union.

First of all, we will review the European Union directives on environment and contaminated water recovery.

The surface treatment industry together with tanning, metallurgical and pharmaceutical industries, produce an important environment contaminating impact. For this reason, it is interesting to know the main points on water policy designed by the E. U.

Water Policy Principles in the European Union

.High level of protectionism.
.Principle of precaution.
.Preventive actions.
.Redress in the spot the harm produced.
.That who contaminates, has to pays for it.
.Integration.
.Use of scientific and technical data available.
.Diversity of environment conditions on the various communitarian regions-
.Costs/benefits.
.Economic and social development in the community and a balanced development in its regions.
.International cooperation.
.Subsidization.

Industrial Waste Water Discharge Policy

European Union 5th Environment Programme

Hydric Resources Management

Basic purposes:

.Contaminating prevention of continental sea water, emphasizing the importance of avoiding contamination in origin.

.The restoration of potability and natural characteristic to land surface and underground water.

.To secure the balance between offer and demand of water by rationally using and managing hydric resources.

European Directives on Water

Directive 76/466

- Define:

Aquatic medium, discharging products and contamination.

- General and Futuristic:

Indicates limited values of emission, measuring methods for analysis, aimed at quality objective and graduality.

- List I Criteria:

Toxicity, persistence and bioaccumulation

- List II Criteria:

Harmful effects for the aquatic medium

List II of Contaminating Substances

1. Substances included in the categories and groups indicated in List I for which no limits have been stated, except when the discharge of product is to underground water.

2. Substances or kind of substance included in the paragraph below and that though having harmful effect, they can be delimited to precise areas according to the characteristic of the receiving waters and their location.

3. a) The following metalloids and metals and their compounds:

Nickel	Antimony	Uranium
Copper	Molybdenum	
Vanadium		
Nickel	TitaniumCobalt	
Chromium	Tin	Thallium
Lead	Barium	
Tellurium		
Selenium	Beryllium	Silver
Arsenic	Boron	

b) Biocides and derivatives not included in the list I

c) Substances with a detrimental effect in odour and/or flavour of products for human consumption which origin is the aquatic medium as well as the compounds liable of causing them in the water.

d) Organsilicic compounds -toxic or persistent- that could originate them in the waters excluding the biological harmless or quickly transforming while in the water in inoffensive substances.

c) Phosphorus and elemental phosphorus inorganic compounds.

f) Mineral oils no persistent or hydrocarbon of no persistent petroliferous origin.

g) Cyanides, fluorides.

h) Substances with an unfavourable influence on oxygen balance, the following in special:

Ammonium
Nitrites

European Directives on Waters

Directive 91/1671

Object

To collect, treat and discharge sewage urban water and discharge and sewage disposal of industrial water from specific type of industry.

To protect the environment from the negative effect of sewerage discharging.

Definitions

Sewage water, urban agglomeration, sewage system, traitment, sludge.

Criteria

Definition of sensitive areas

Significant dates: 1993, 1998, 2000, 2005.

Tertiary special process for eliminating the P and N

To determine sewage disposal efficiency.

Behaviour of agriculture and food products discharge.

Sludge traitment

Recycling and Minimization of Chrome

After going through the European Union's general policy regarding water, industrial discharge, standards, contaminant substances and drainage and sewage disposal plans, let us centre in the different surface finishings. This is an ambitious project for economizing energy and sludge disposal which should be executed in a ten years period, that is, it will end on 2010, which is when the environment subventions from the E.U. administration will stop for the project.

At the moment the important question is the recycling, recovery and minimization of depurator's sludge or from surface treatment processes. Therefore, we will see some examples of new technologies already tested.

One of the most important contaminant in the trade is chrome VI. Many studies have been done for eliminating it. The optimum methods nowadays are by

precipitation, use of resin of ionic interchange and evaporation. But there are not applicable to continuous functioning processes which needs further research. Sludge of chrome VI which appear as chromic anhydride, potassium chromate and potassium dichromate have high oxidizing power. Because of this, there is a very strict regulations for industrial waste discharge of 0,1 mg/litre since the 1993 law, due to its toxicity effect. Therefore, one of the new technology methods is the rotatory discs, that is, by membranes separation in the feeding stage and by extracting it.

The separation principle is a double extraction liquid-liquid in aqueous, refining phase and in organic phase.

The aqueous phases completely miscible and particularly the organic phase unmiscible is what it is call membrane. The matter transference through the membrane is done by molecular diffusion being present or nor a chemical reaction. The technic admit using membranes of weak coefficient with the extractable solution.

Figure 1 has two identical compartments. In the lower part of one of them the two parts with the refining phase are separated and in the other part the extraction phase. Both phases are never in touch. The membrane in the intermediate phase in which the chrome goes through one phase to other with a good contact in the aqueous phase and the metal rotatory discs of each compartment are covered by an hydrophillic material (cotton thread). Both phases in the compartment of the extraction phase are coordinated between them and the membrane at that moment does not circulates. The system can work in continuous and in two aqueous phases

Characteristics

- Membranes without support.
- Double extraction liquid-liquid (aqueous/organic and organic/aqueous.
- Transference by molecular diffusion (with or without chemical reaction).
- Organic membrane with weak separation coefficient for the extracted solution.
- Possibility of using a complexing agent in the solution.
- Possibilities of multiple layers in applied series in continuous.

Applications and uses

Presently it is used for the elimination of contaminant molecules in liquid effluents, with a 90 per cent efficiency.

It is also used for the recovery of metallic cations.

It is applied in continuous diphase synthesis.

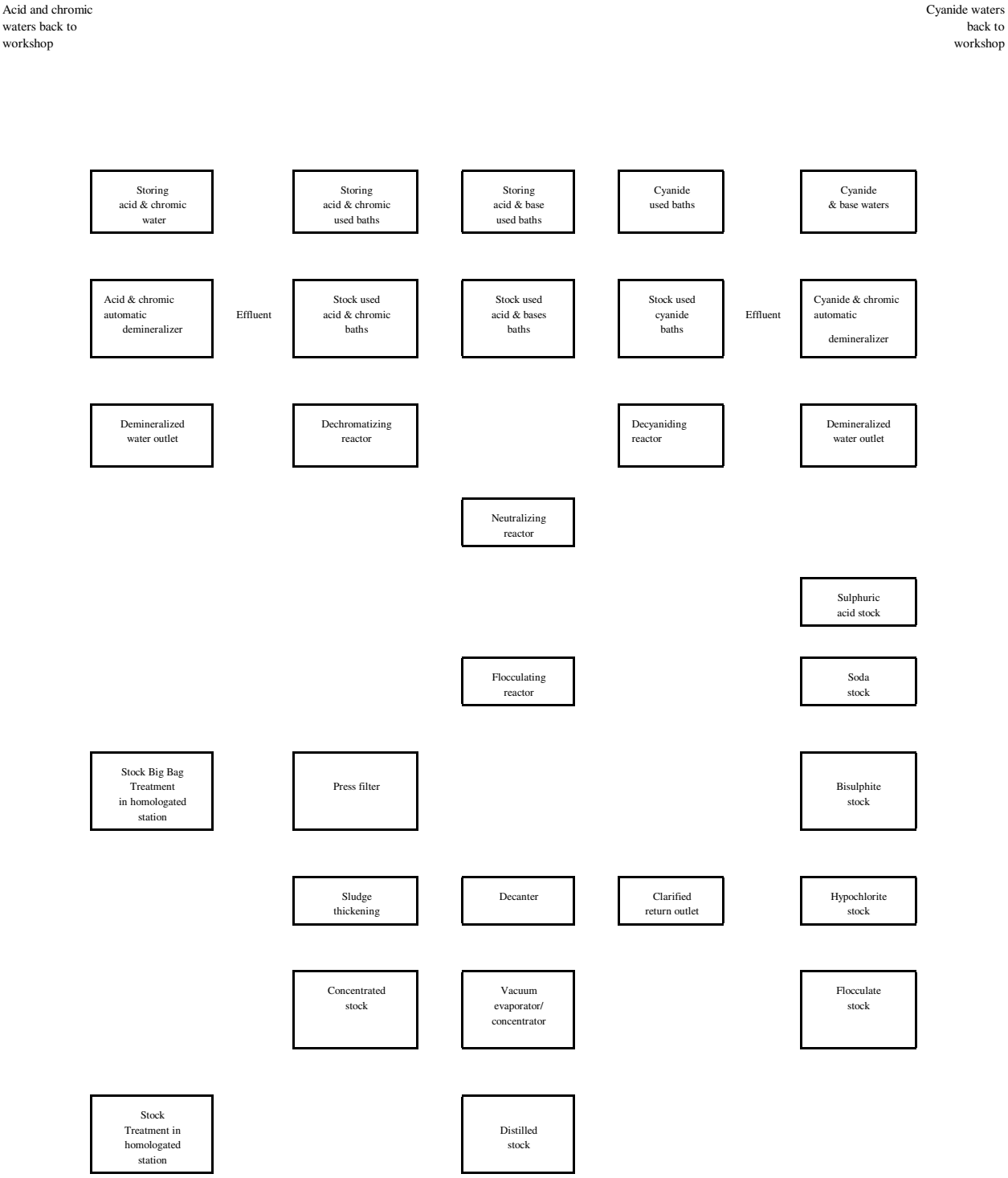
Conclusion

Minimization of solid waste.
Minimization of chromic washing water.
Energy saving: water, power, canon.

New Station for Effluent Treatment

It is important to minimize energy consumption and sludge in all type as commented in the explained and examined treatments. The aim should be " discharge zero" discharge". This meas to have a minimum of DCO, DQA non-decanted, DQO decanted, metallic discharge with a concentration limit, chromates inferior to 0.1 mg/litre, cyanides inferior to 0.1 mg/litre, fluorides inferior to 15 mg/litre, zinc, nickel and chrome inferiors to 1 mg/litre. Therefore, in order to achieve the "zero discharge" it should be used the functioning scheme of the table below , together with the parameters previously indicated.

Synoptic Table of Depurating Station 'Zero Discharge'



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