Zentrale Entsorgungsanlage
Iserlohn

Brief Description of the
ZEA Central Disposal Plant at Iserlohn

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1. Introduction

The ZEA Central Disposal Plant (ZEA Zentrale Entsorgungsanlage) at Iserlohn dates back to 1963. After it was taken over by RWG Ruhr-Wasserwirtschafts-Gesellschaft mbH (a com-pany of the Ruhr Association), it was reconstructed and upgraded, during the period September 2002 to May 2004, to one of the most modern chemical-physical-biological waste and wastewater treatment plants in Europe. In 7 recycling modules, liquid industrial waste is regenerated, recycled or so pre-treated that the recovered materials can be fed to a subsequent recycling. State-of-the-art and innovative process technologies are used to maximise the recovery from the waste and minimise the amount of waste to be disposed of.

The following table shows which waste products can be recovered in the individual recycling modules:

Recycling module	Waste product
RM 1	Chromic acid
RM 2	Emulsions
	Cooling lubricants
	Oil/water mixtures
	Alkaline degreasing agents
RM 3	Alkaline cyanide-containing solutions
RM 4	Chemical nickel
	Alloy baths (Zn/Ni and Zn/Fe alloys)
RM 5	Sulphuric acid
	Nitric acid
	Nitric/hydrofluoric acid
	Phosphoric acid
RM 6	Acid pickling solutions
	Hydrochloric acid containing iron or zinc
RM 7	Metal-containing hydroxide sludge

2. The Individual Recycling Modules

2.1 Recycling Module 1

Chromic acid is used in industry for various applications (e.g. hard chrome plating, yellow chromating, black chromating etc.). This use gradually contaminates the chromic acid with foreign metals to a point where the acid is no longer usable and has to be disposed of.

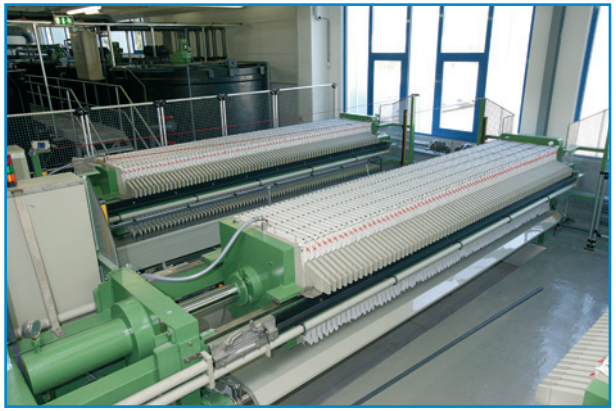
ZEA can take over such chromic acids and treat them in a cleaning plant. The chromic acid is first cleaned with an ion exchanger and then concentrated in an evaporation tower. The process results in a cleaned and concentrated chromic acid that can be used again as a product in industrial processes.

Delivery of waste-water by tanker

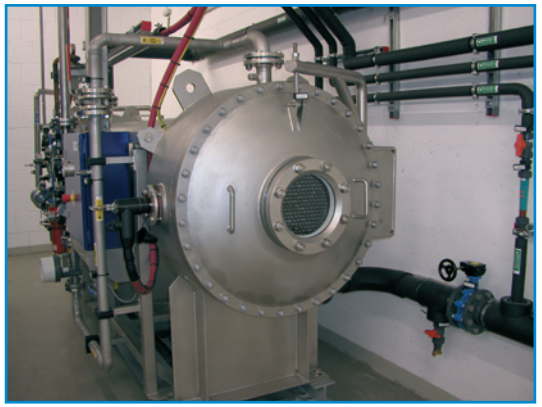
2.2 Recycling Module 2

Recycling Module 2 is used to recycle emulsions, cooling lubricants, oil/water mixtures and alkaline degreasing agents. The objective is the recovery of oil with a low water content from these waste products.

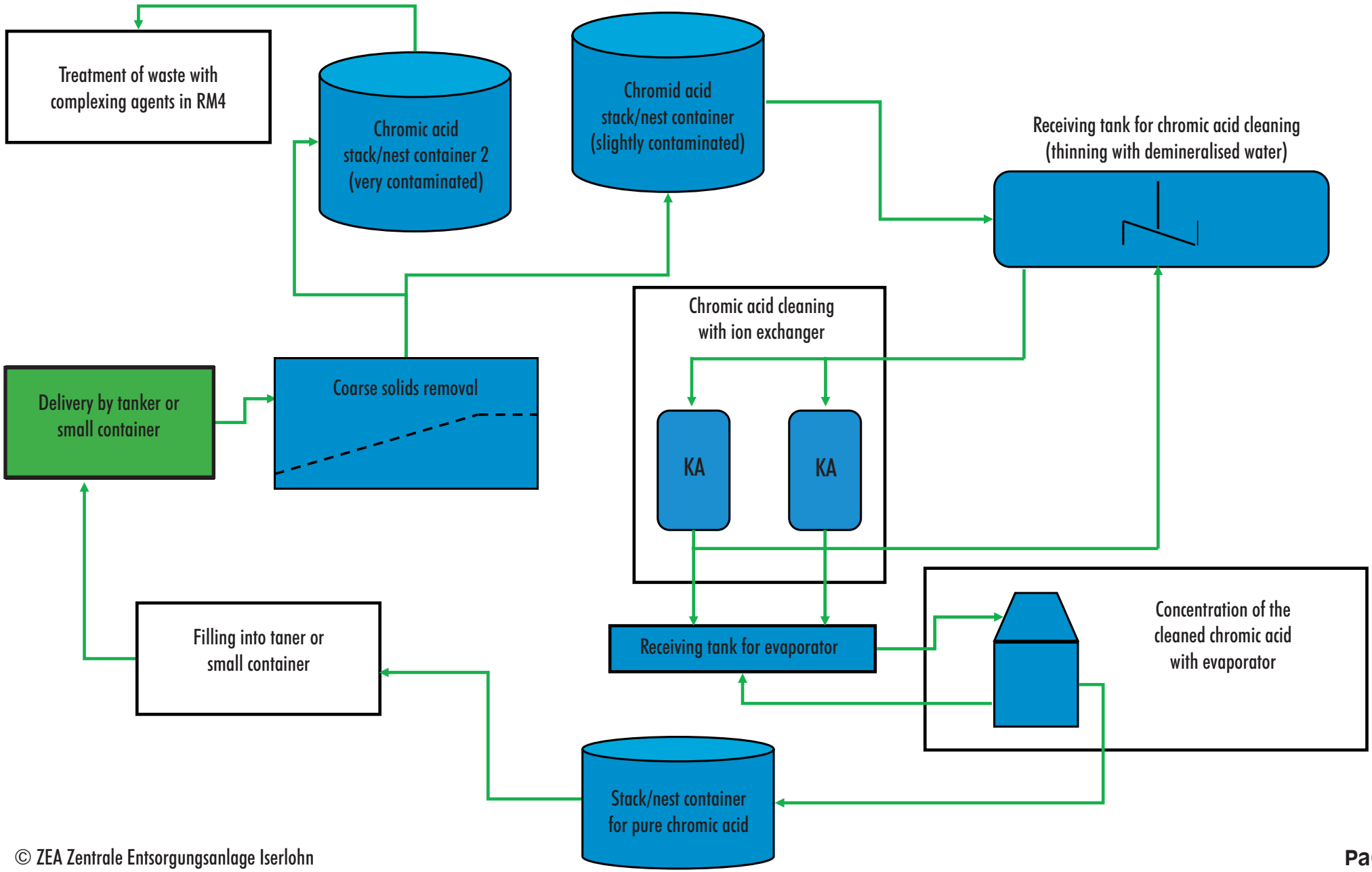
A 3-phase clarification decanter and the physical properties are used to separate the fractions, oil, water and solids. This process produces a high-quality oil, with a water content of less than 20 %, which can be refined in a refinery to a new-quality oil. The water still remaining in the oil is separated in 2 oil separators and then also recycled.



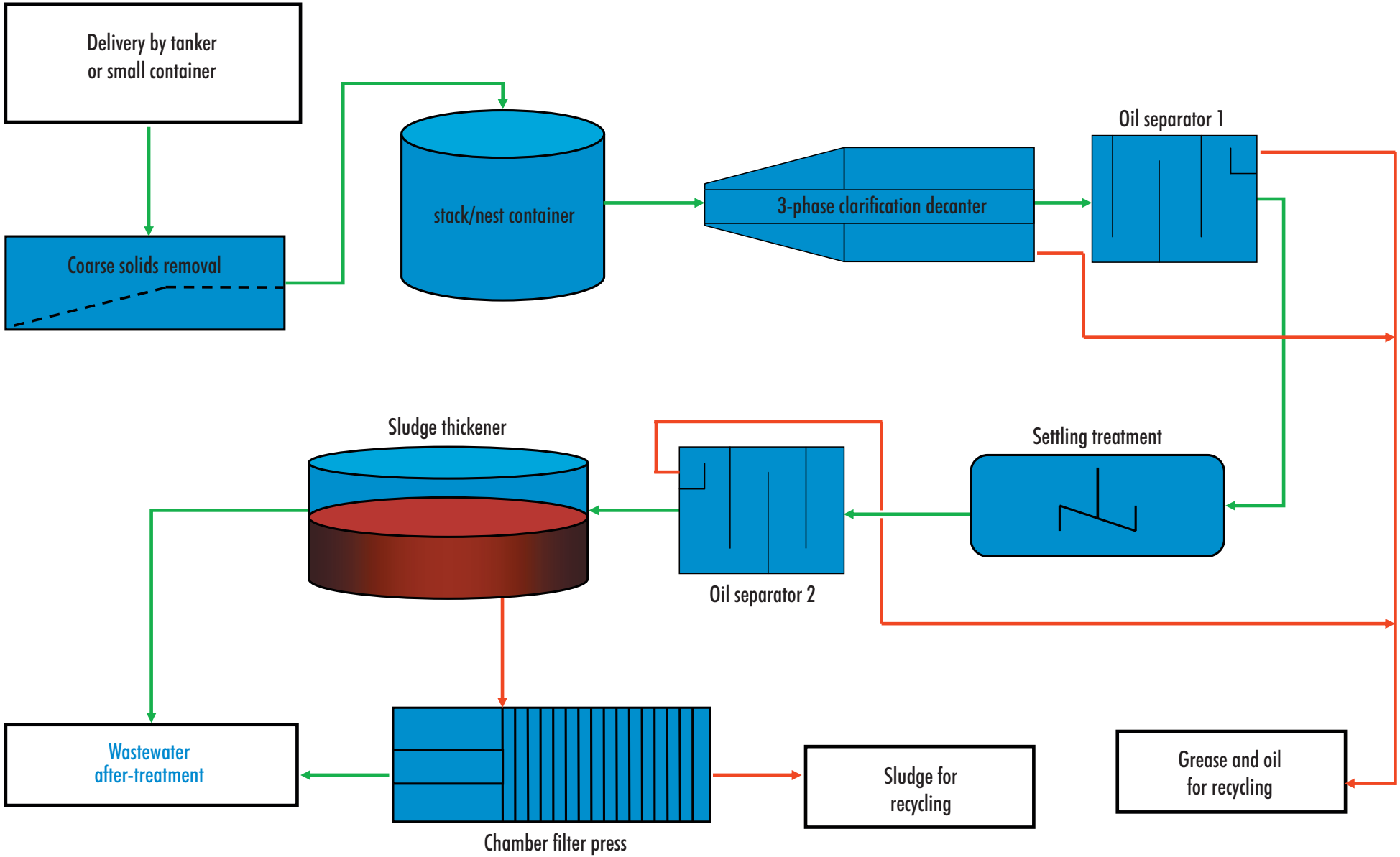
Chamber filter press



Reactor for the production ozone



Recycling Module 2:
Emulsions, cooling lubricants, oil/water mixtures, alkaline degreasing agents



2.3 Recycling Module 3

Cyanide-containing solutions are today still widely detoxified with wet-chemical methods using chlorine bleach and hydrogen peroxide. The drying or incineration of cyanide-containing solutions is also widely used.

At ZEA, these solutions are recycled with an electrochemical method. Cyanide is detoxified – without use of chemicals – by an anodic oxidation. The previously dissolved metals are simultaneously collected by the cathodes. This allows the recovery of precious metals (e.g. gold, silver, copper).

2. 4 Recycling Module 4

Chemical nickel and alloy baths, e.g. zinc/nickel and zinc/iron, are often not treatable be-cause of high concentrations of non-precipitable phosphorus compounds and complexing agents.

ZEA took up the challenge of recycling these waste products. Complexing agents (EDTA, NTA and other amine complexing agents) are destroyed by using an ozone plant. This makes the previously complex bonded metals accessible for a subsequent precipitation method. After the metal precipitation and sub-sequent dewatering, the module produces a metal-rich filter cake sludge that is suitable for a metal recovery.

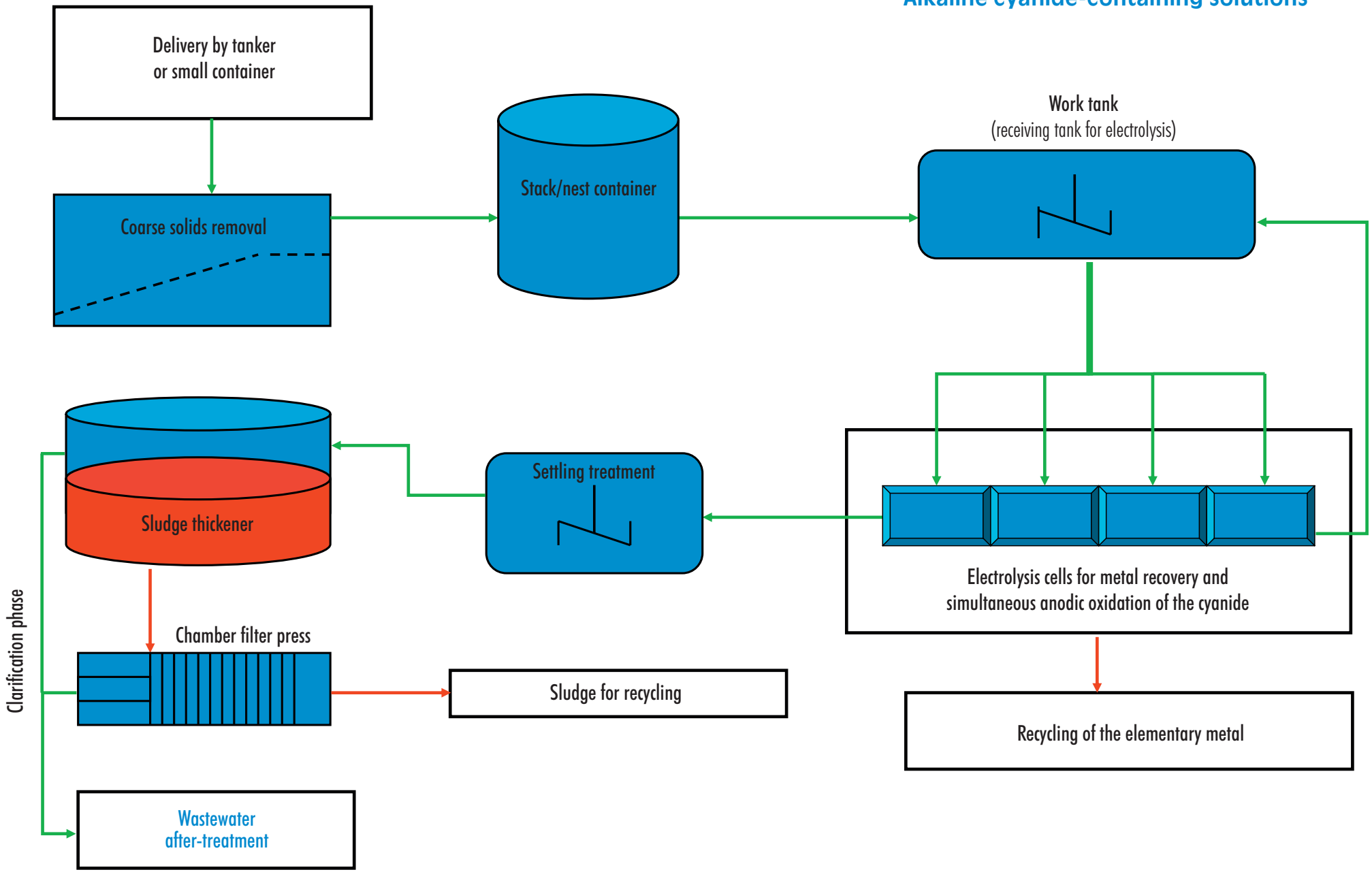
2.5 Recycling Module 5

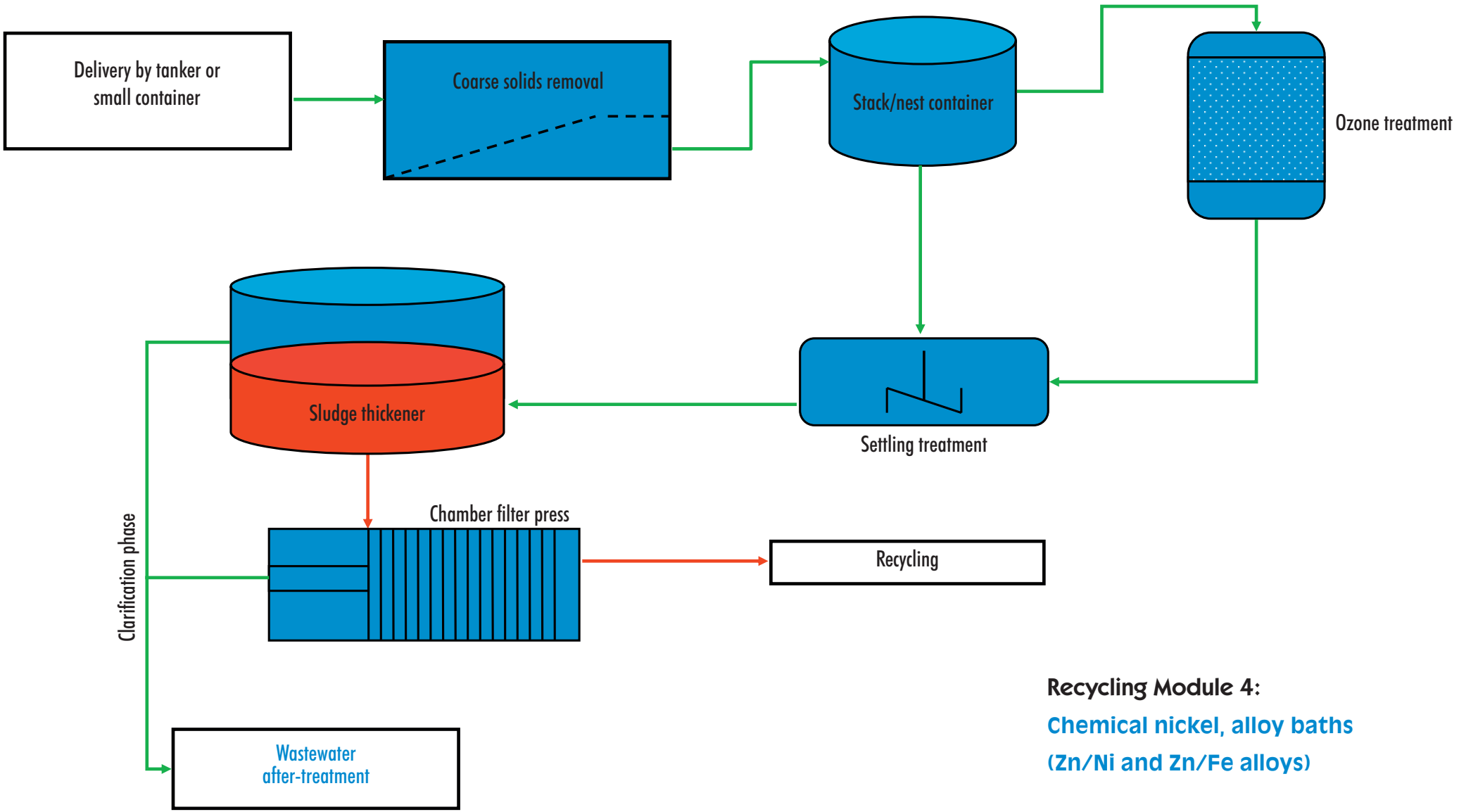
The industrial processing of stainless steel involves the use of nitric acid and nitric/hydrofluoric acid pickling liquor. This use gradually contaminates the acids with foreign metals to a point where they are no longer usable and have to be disposed of.

The method used at ZEA recycles this acid to produce a metal-rich filter cake sludge that is suitable for metal recovery.

Recycling Module 3:

Alkaline cyanide-containing solutions



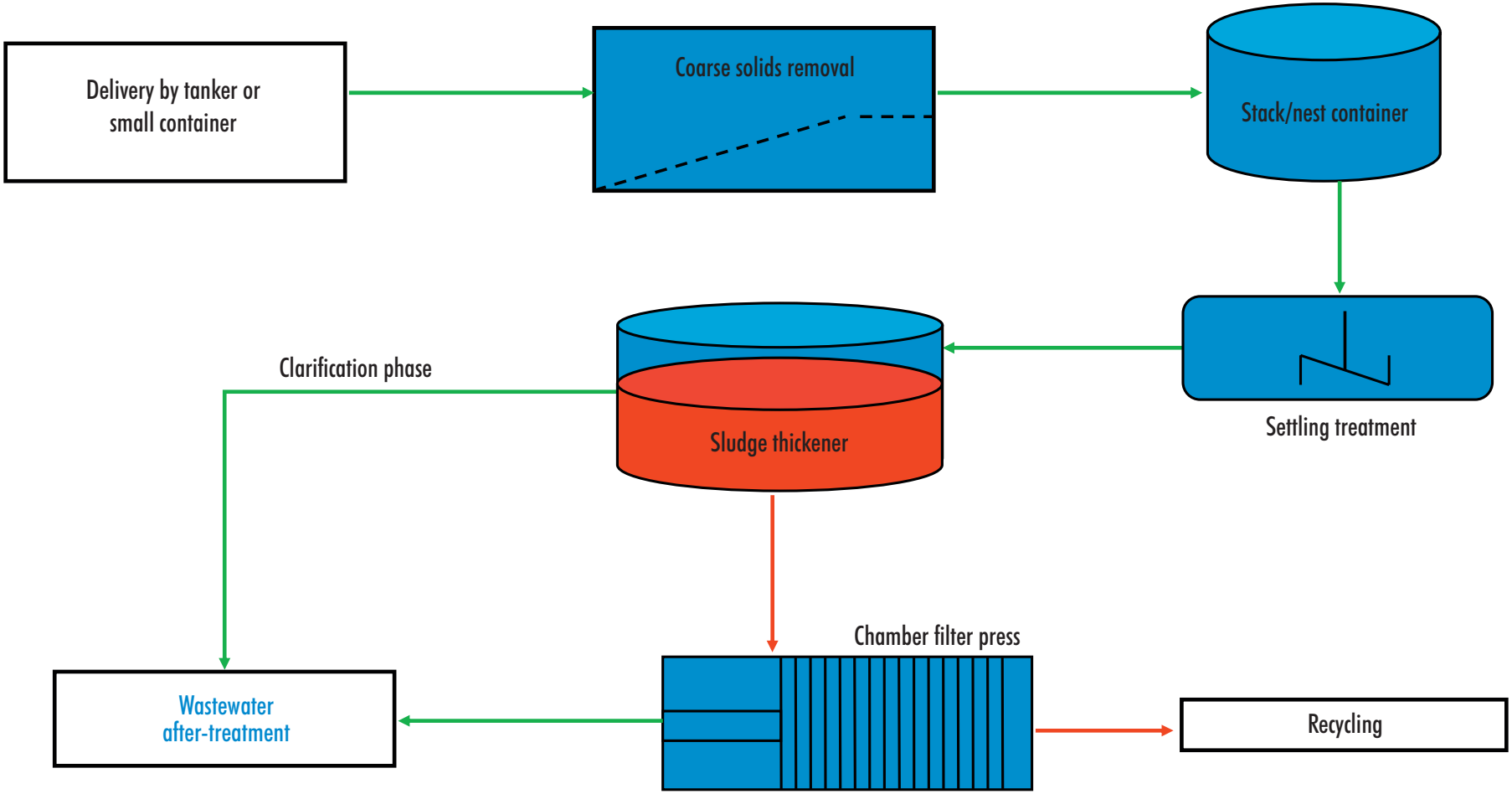


Recycling Module 4:

Chemical nickel, alloy baths (Zn/Ni and Zn/Fe alloys)

Recycling Module 5:

Sulphuric acid, nitric acid, nitric/hydrofluoric acid, phosphoric acid



2.6 Recycling Module 6

Hydrochloric acid pickle liquor containing iron can be recycled diversely at ZEA. Depending on the quality, these acids can be used as precipitant in the biological wastewater treatment plant. The material properties of the iron are then used in order to, for example remove the phosphorus from the wastewater.

Another possibility is the use as proton donator for emulsion splitting in recycling module 2.

2.7 Recycling Module 7

Enterprises that have their own wastewater treatment plant but do not have a drainage facility can bring their metal-containing thin sludge to ZEA, where this sludge can be dewatered and used for metal recovery.

3. Wastewater treatment

The waste treatment plant has a sophisticated, multi-stage downstream wastewater treatment plant. The wastewater produced by the waste treatment is first treated with an inorganic process for residual cyanide detoxification, residual chromate reduction and metal precipitation.

This is followed by a biological wastewater treatment. Nitrogen compounds, like nitrite, nitrate and ammonia, are removed from the wastewater by way of an intermittently operating nitrification and de-nitrification.

Non-precipitable phosphorus compounds are first treated with ozone to make them precipi-table. The precipitable phosphorus compounds can then be precipitated in the biological waste-water treatment plant with sodium aluminate or iron-containing hydrochloric acid. After this sophisticated treatment, the wastewater has a good enough quality for it to be used as process water.

The biological wastewater treatment also makes it possible to take over and treat landfill leachate.