AcvaSurf®

ZLD PC

Treatment and recycling of waste water from **surface treatment workshops**

John Cockerill Water

John Cockerill

Optimized rinsing

Combining economy and ecology

The surface treatment (ST) industry faces two major challenges: reducing its water consumption and its environmental impact, without compromising the quality of its products or slowing down production.

The high salt content and wide range of chemicals used in the baths of ST workshops make their rinsing water difficult to recycle by filtration. It is therefore essential to reduce the volume of the waste water to be treated already at the design stage of the new ST line, without affecting the quality of the end products.

John Cockerill offers a portfolio of proven technologies for depolluting rinse water, reducing water consumption, and recycling waste water (ZLD, Zero Liquid Discharge solutions) needed to comply with current standards.

Surface preparation, protection and coating involve a wide variety of mechanical and chemical processes: sandblasting, pickling, degreasing, passivation, phosphating, chroming, zinc plating, copper plating, painting, etc. The water from the successive rinsing baths is loaded with various pollutants: suspended solids, oils and hydrocarbons, metals in soluble and solid forms. Often highly toxic for the natural ecosystem and the microbial flora of the effluent treatment plants, its decontamination on site is therefore essential.

Why **Acva**Surf®

John Cockerill's Water and Air & Gas business lines, meet the multiple problems faced by surface treatment workshops by providing **integral, tailored turnkey solutions.** With numerous references in the industry, the group is a forerunner in this field and a technology leader in **ZLD processes**. Our expertise covers **process, mechanical, hydraulic, aeraulic and electrical engineering**, as well as **automation**. We support our clients all over the world, from the **preliminary study** through to the **delivery** and **commissioning** of water treatment plants. A thorough understanding of our clients' manufacturing line allows us **to reduce the cost of water treatment and ultimately preserve water resources.**

AcvaSurf® offers numerous benefits

- **Preliminary study, analysis of the effluents** to be treated and **recommendations**
- **Modelling and optimization** of the rinsing baths
- Drawing up of **alternative proposals**, simplification of rinsing lines and minimisation of flow rates, **reduction of the required floor space**
- Establishment of the **volume and mass balance** of the effluents to be treated, determination of the volume of concentrate
- **Treatment of aqueous and gaseous effluents** by chemical, physical or biological means, in function of the requirements
- Implementation of **ZLD (Zero Liquid Discharge) strategies**
- Treatment of **residual sludge**
- Grouping of all activities under a **single supplier**
- Delivery of **complete turnkey plants**
- Tools for **simulation, management, supervision and preventive maintenance**

Water saving and recycling

Design of rinsing lines

Modelling of the structure

The first step in managing the water cycle in a surface treatment workshop is to fully model the rinsing structures in order to optimise them. This allows to establish the volume and mass balance of the effluents to be treated. This balance is then optimised to obtain the lowest possible water flow while guaranteeing the rinsing quality. Simplifying the lines, reducing the number of tanks and looking for alternatives are the key parameters of the design phase. Once the detailed specifications have been drawn up, the various waste water treatment stages can be sized.

John Cockerill has recognised expertise in the treatment and recycling of waste water from surface treatment workshops. Our teams support you from as early as the initial design phase of a new line, as well as during the modernization or upgrading of an existing line.

Waste water treatment

The treatment of waste water from surface treatment workshops is based on physico-chemical processes. Their primary objective is to chemically insolubilize pollutants, including metals, by adding reagents, and then separate the two water-sludge phases by decantation, flotation or filtration

In accordance with the preliminary study, John Cockerill offers all the equipment and instrumentation required for the permanent treatment and recycling of waste water. We consider the reduction of the quantity of reagents used to be a key factor to help control operating costs.

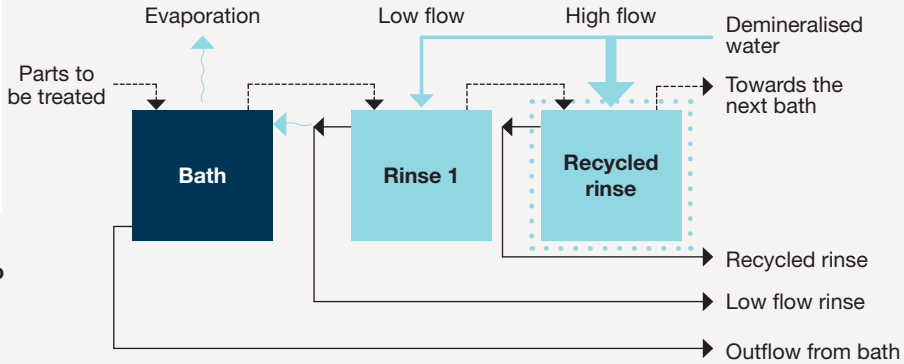
Zero liquid discharge

The ZLD (Zero Liquid Discharge) technique is seen to be the benchmark in the surface treatment industry. It aims to minimise hydraulic flows and concentrate effluents to the point of reducing on-site liquid discharges to zero. Water and dissolved salts are separated by vacuum evapo-concentration and thermal concentration processes. The distillate is demineralised and recycled to the manufacturing line. The concentrates, which are heavily loaded with metals, are treated in a center specialized in their distruction.

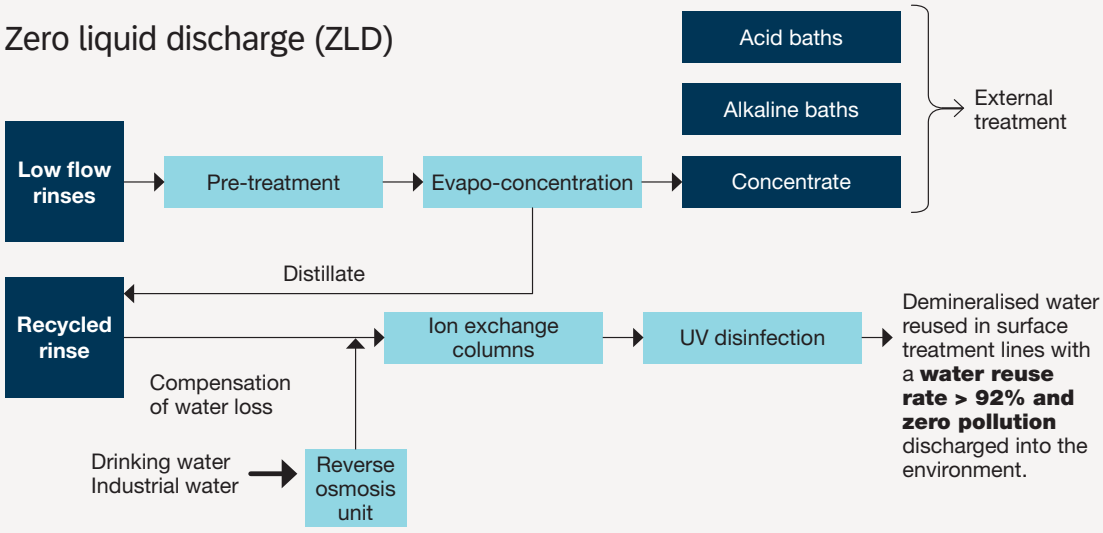
The ZLD technique reduces the environmental impact, minimises the risk of non-compliance and increases the line's reliability.

We have developed modelling tools to calculate the water consumption for different rinsing structures.

Example of optimisation of rinsing structures



Zero liquid discharge (ZLD)



Complete, modular integration

Storage and pre-treatment

Storage of effluents

Effluents awaiting treatment must be safely stored in adapted tanks and secured by retention tanks, in accordance with the prior volumetric study. John Cockerill supplies plastic storage tanks (HDPE or PPH), along with concrete or plastic retention tanks. Piping is made of double-skinned plastic. All material grades are chosen according to the composition and temperature of the effluent.

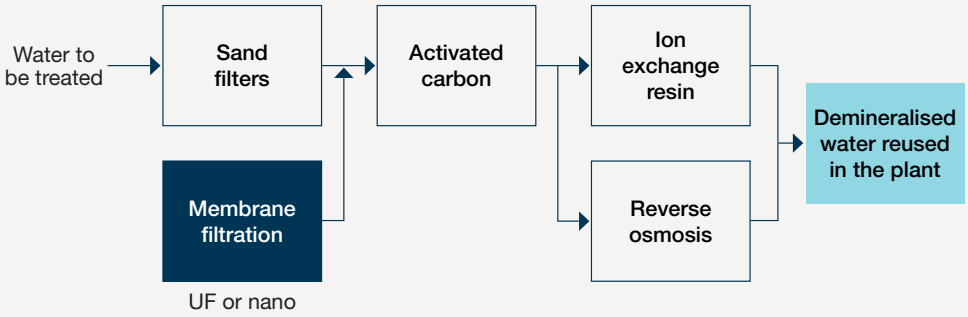
Decyanidation

With cyanides being highly toxic, their full decontaminaton must be ensured by oxidation with sodium hypochlorite. Nitrites, sulphides and sulphites are oxidised at the same time. The residual products can then be removed by coagulation.

Dechromatation

Hexavalent chromium, which is toxic and highly soluble in water, must be reduced to trivalent chromium, which is poorly soluble and can be precipitated. Reduction, in an acid medium, requires the injection of sodium bisulphite.

Storage and pre-treatment



In addition to stationary treatment plants, John Cockerill also offers a range of containerized mobile units with flow rates of: 1 m^3/h, 2 m^3/h, 3 m^3/h, 5 m^3/h, 10 $m^3/$, 20 m^3/h

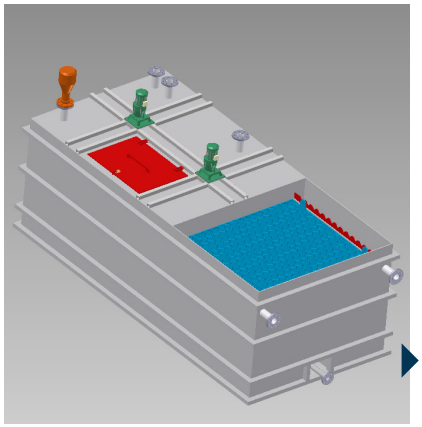
Our extensive expertise in membrane filtration, and reverse osmosis in particular, is key in guaranteeing effective treatment and the production of high-quality demineralized water that can subsequently be reused in the surface treatment plant.

Secondary treatment

Neutralisation

The solubility of a metal depends on its pH. Neutralisation makes it possible to insolubilise and precipitate metals and certain anions (fluorides, phosphates, sulphates). It consists of bringing the pH into the optimum range by injecting bases or acids. The addition of organic insolubilising agents further reduces the residual metal concentration.

Fluorides, phosphates and sulphates are eliminated using lime, by the formation of calcium and/or iron precipitates (for phosphates in the presence of ferric chloride).



Compact physico-chemical station combining a coagulation tank, a flocculation tank and a lamellar decanter.

Décantation

The floc is separated from the water in a decanter, sized according to the particles in question. The clarified effluent overflows at the top of the decanter. The sludge formed at the bottom is pumped out. The decanter can be fitted with lamellae (lamellar decanter), significantly reducing its floor space requirement.

Coagulation

This stage consists of encouraging the agglomeration of colloids by neutralising the electronegative repulsive forces through the injection of iron and aluminium salts. By controlling the pH level, coagulation is optimised and the quantity of reagents minimised.

Flotation

Flotation is an alternative to decantation. It is suitable for light or fragile flocs. The flocs are brought to the surface of the flotation tank by injecting air bubbles. The surface is scraped to recover the floating sludge.

Flocculation

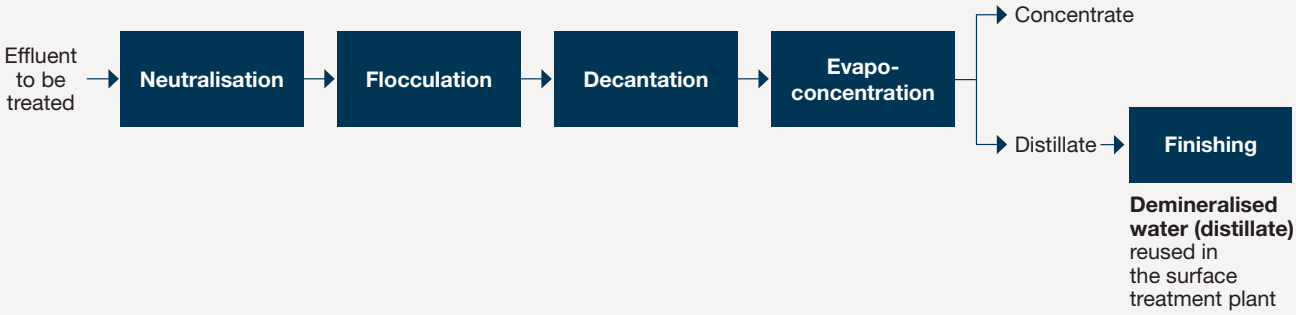
The introduction of high molecular weight polymers captures and agglomerates the particles in the form of flocs. The flocs, which are heavier than water, are then decanted.

Evapo-concentration

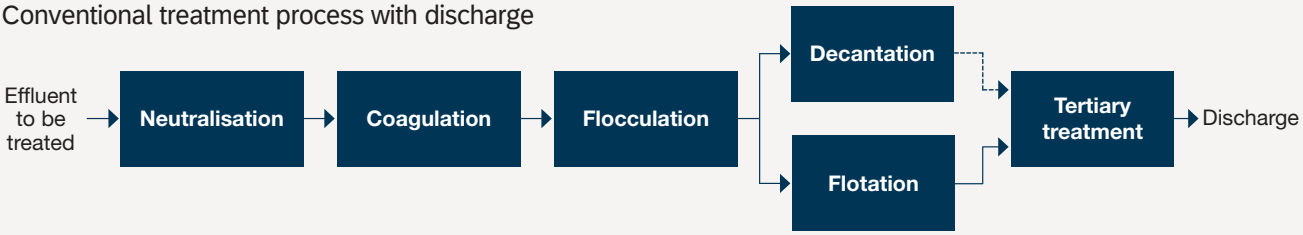
Evapo-concentration under partial vacuum is particularly useful for zero liquid discharge installations, but also for concentrating and evacuating effluent that is difficult to treat by physical-chemical means (complex effluent, high COD content, etc.). This involves separating two liquid phases: the distillate, which can be recirculated, and the concentrate, which will be evacuated.

Secondary treatment

Advanced treatment without discharge (REUSE)



Conventional treatment process with discharge



Finishing

Sand filtration

Sand filtration ensures good water clarification. The effluent is passed under pressure or by gravity through a filter medium (sand, gravel, etc.). Several layers of sand of different particle sizes can be superimposed to improve the filter's efficiency.

Ion exchange

Ion exchangers are used for the demineralization of eluates prior to recycling, or for finishing treatment prior to discharge (elimination of heavy metals).

They are polymerized structures made up of active sites capable of exchanging anions or cations with the external environment.

The ion exchangers are placed behind a sand filter to prevent premature clogging of the resins. They are regenerated periodically and the regeneration residues are returned to the plant inlet.

With **Acva**Mod™, John Cockerill offers a versatile range of membrane systems, of modular and compact design, with automated control and management systems.

For more information, visit our website and download the Brochure:

Activated carbon filtration

Finishing treatment by adsorption on a bed of granular activated carbon is used to remove organic compounds and reduce the residuel COD (Chemical Oxygen Demand).

Membrane filtration

This is physical solid/liquid separation by filtering the effluent through a highly permeable membrane. There are 4 types of filtration (microfiltration, ultrafiltration, nanofiltration, reverse osmosis), which can retain particles from 0.1 µm (microfiltration) to under 0.001 µm (reverse osmosis). The membrane separates the effluent into two streams: the filtrate (filtered effluent) and the retentate (concentrated effluent). The filtration phases are alternated with backwashing and regeneration by chemical cleaning.

Electro-deionisation

Water can be demineralized by applying an electric current between an anode and a cathode through a series of compartments filled with ion exchange resin. The mineral ions bind to the exchange resins and, under the influence of the electric field, migrate to a separate chamber. They are discharged into the waste stream.

A guarantee of quality: the skids and containers of the AcvaMod™ range are manufactured, assembled and tested in our workshops in Europe and North America.

Our solutions

"Drinking water" certified, John Cockerill's **AcvaMod**® range retains most of the undesirable mineral salts (nitrate, sulphates, etc.) naturally present in water, as well as micropollutants such as pesticide metabolites, drug residues and certain PFAS. Of modular, compact design and equipped with automated control and management systems, these skids can be used to produce high-quality water to specification.

As well as providing mobile containerized or fixed units, John Cockerill offers complete systems for the continuous production of drinking or demineralized water, incorporating pre- and post-treatment as required.

AcvaSurf ZLD : zero liquid discharge treatment
AcvaSurf PC : physico-chemical treatment (with liquid discharge)

AcvaSurf PC *	Plant inlet [mg/l]	Plant outlet* [mg/l]
pH (20°C)	0-14	7.5-8.5
COD	900-1500	100-200
SPM	50-500	20
Turbidity (in NTU)	> 500	15-25
Zn	100-300	0.5-2
Cu	100-300	0.05-0.2
Pb	5-50	0.005-0.01
Ni	50-100	0.1-0.8
Fe	100-300	0.3-1
Cr(III)	50-100	0.2-1
Cr(VI)	100-500	< 0.01
Cd	0,01-0,05	< 0.01
Fluorides	10-100	< 0.5
Nitrites	5-50	10
Hydrocarbons	1-10	0.1-0.3

* PC process. The ZLD process does not generate any liquid discharge on site.

A global solution

Air treatment

The use of solvents in surface treatment (particularly degreasing) results in the emission of volatile organic compounds (VOCs), which are harmful to health. The surface treatment activity can also produce fumes and dust.

With its **Ayra solutions** John Cockerill offers a complete range of air treatment systems based on physico-chemical and biological scrubbers.

Supervision and maintenance

John Cockerill offers tools for supervising and managing production, locally or remotely, and for predictive maintenance.

All measuring instruments and electromechanical equipment are easily accessible for servicing and maintenance operations.

Scan the QR code to find out more about our Ayra range:
Our high-performance solutions for air pollution control, odour treatment and solvent recovery for industry and municipalities.

John Cockerill Water

environment.water@johncockerill.com

Belgium:
balteau@johncockerill.com
Tel.: +32 (0)4 253 22 24

France:

- **Industries**
  proserpol@johncockerill.com
  Tel.: +33 (0)1 30 45 90 20
- **Municipalities**
  francois.foulon@johncockerill.com
  Tel.: +33 (0)6 07 72 10 70

North America:
environment.canada@johncockerill.com
Tel.: +1 450-696-4000

John Cockerill Environment

Rue Jean Potier, 1 ▪ 4100 Seraing, Belgium
Tel.: +32 (0)4 330 21 91

John Cockerill's solutions cater to the ecological transition and circular economy

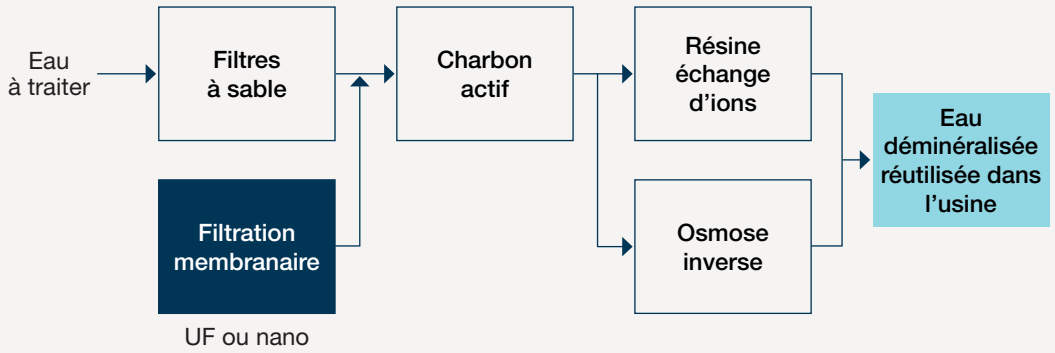
Firmly anchored in our experience, our solid technological know-how and our bold innovation in the treatment of water, air and waste, our **Water Business Line** offers highly performant and modular solutions for the efficient treatment of industrial and municipal wastewater, the production of process water and REUSE, as well as optimized renewable methane production.

Follow us on LinkedIn

johncockerill.com/environment

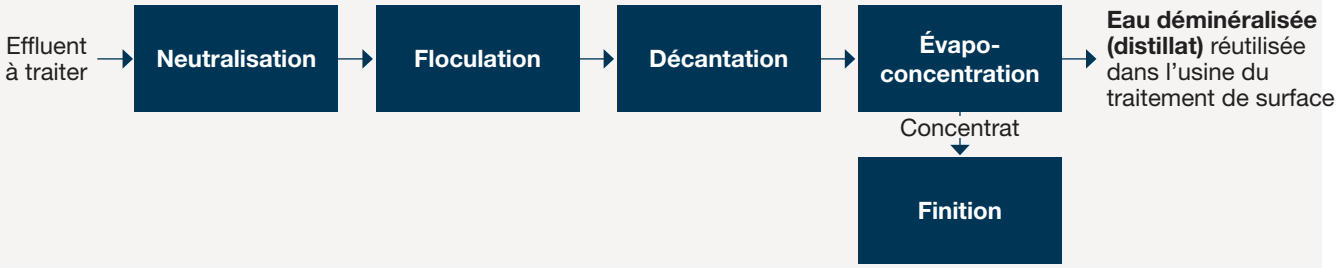
John Cockerill

Stockage et prétraitement



Traitement secondaire

Filière de traitement avancé sans rejet (REUSE/REUT)



Filière de traitement classique avec rejet