REINNOLC

Wastewater treatment technology using a multistage thermal distillation method

EXERGER

Problem

Conventional wastewater treatment methods damage nature and cause huge economic damage

24
billion m^3

per year of water are consumed by industrial enterprises in Russia

345
million m^3

of wastewater are discharged every year exceeding regulations

100
million m^3

of sludge are produced by wastewater treatment plants

Up to 1 kg

of reagents (salts, acids and alkali) from 1 m^3 of wastewater is discharged into the environment

EXERGER

has a complex impact on economics, environmental safety and ESG-index of an enterprise

Up to

100%

reduction of wastewater discharge

Up to

99%

reduction of water consumption and water returned to the production cycle

Areas of use

Exerger technology is particularly effective in those industries that actively use steam and discharge large volumes of wastewater — for example, in thermal and nuclear power, ferrous and non-ferrous metallurgy, chemical and pulp and paper industries, oil and gas and mining and processing industries.

- Na-cationite wastewater (regeneration solutions and wash water)
- Chemical desalination wastewater (used regeneration solutions and washing water)
- Blowdown of recirculating water system
- Reverse Osmosis brine (concentrate, wash-out solutions)
- Chemical treatment wastewater and equipment preservation water
- Biochemical unit wastewater from coking of coal and coke gas cleaning
- Used etching solutions, electrolytes, washing water at the rolling production site
- Treatment of washing water used for oil desalination
- Desalination of water used for washing out salt caverns for gas storage
- Quarry, dump and mine water
- Mining and processing plants` wastewater
- Woodworking industry wastewater
- Sulfate wastewater of the pulp and paper production
- Chemical production wastewater (mineral fertilizers, polymers)

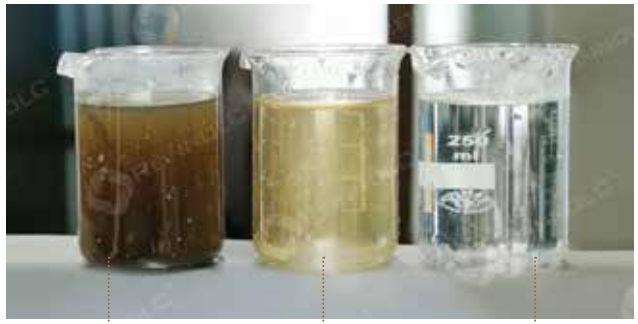
Innovative industrial of wastewater treatment technology with production of secondary resources, such as production

Distilled water **Sludge** **Crystal salt** **Concentrate**

The key technological principle

Multistage flash thermal distillation in a vertical evaporator

Implementation results



Industrial effluents
coke gas condensate cleaning after biochemical treatment

Wastewater
after clarifying

End result
distilled water after evaporation

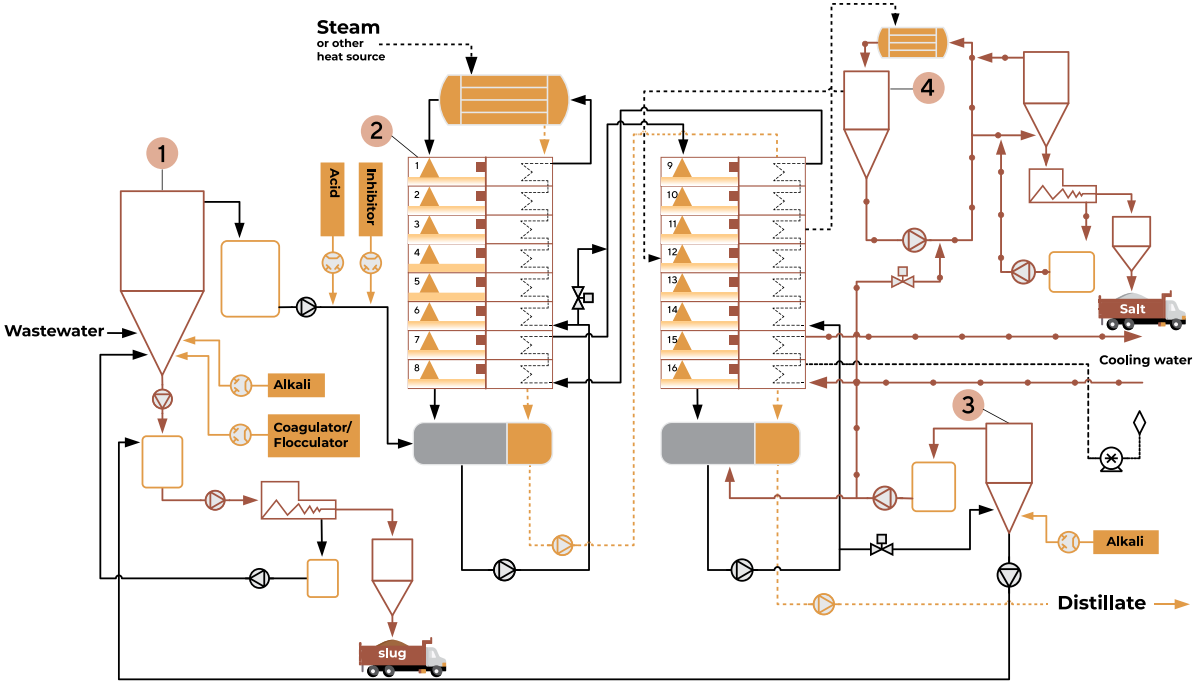
Significant reduction of water consumption

Zero Liquid Discharge

Secondary products for an enterprise`s technical needs

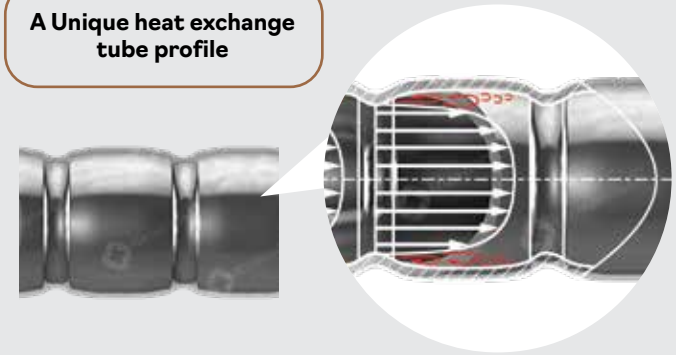
Technical solution

Exerger WTU technological scheme

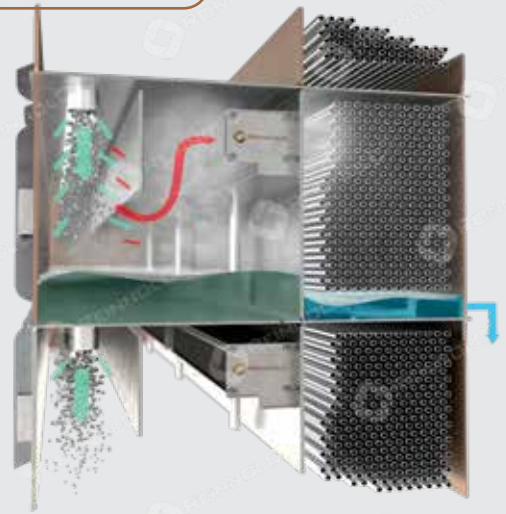


1. Pre-treatment block of the clarifier
2. Concentration block of the flash evaporator
3. Hardness salts extraction block in a sedimentation tank
4. Evaporation and crystallization block

A Unique heat exchange tube profile



Exerger FVE stage



Technologies compared

	Comparison factor	Exerger® WTU evaporator	Conventional evaporator with forced circulation	Reverse osmosis	Electrodialysis
Requirements to feedwater	Reagents use	**minimal**	medium	high	medium
	Suspended matter, organic admixtures, petroleum products	**acceptable**	acceptable	not acceptable	not acceptable
	Dependency on salt content	**weak**	weak	strong	strong
Technology products	Cleaned water deaeration	**yes**	yes	no	no
	Concentration degree, g/l	**max (>250)**	max (>250)	20	60
	Full disposal of liquid discharge	**yes**	yes	no	no
	Production of crystallized salts of required quality or their strong solutions suitable for re-use or sale	**yes**	yes	no	no
	Desalinated water conductivity, μS/cm	**1-10**	20-150	30-200	100-600
Operation conditions	Steam parameters, MPa	**≥0,02**	≥0,4	≥0,02МПа	≥0,02МПа
	Specific steam consumption per 1m^3 of wastewater, t/m^3	0,1-0,18	0,3-1,1	0,02-0,03	0,02-0,03
	Specific energy consumption, kWh/m^3	**4,5-6**	8-30	2-6	10-20
	Reagents-free cleaning/washing	**yes**	yes	no	no
	Equipment service life	**30 years**	30 years	15 years	15 лет
	Maintainability	**high**	high	low large-node replacement	low large-node replacement
	Spare parts, consumables and their replacement intervals required	**no**		yes every 2-4 years	yes every 2-4 years
	Dependency of imported spare parts	**low**	low	high	medium

Exerger WTU advantages

Operates with source water of any quality

High quality of desalinated water (distillate)

Energy efficiency – works on low-potential heat sources and ensures heat recuperation

Heat efficiency at minimal weight and dimensional characteristics

Eco-friendly process and equipment

Minimal scaling

Russian engineering and production

Secondary resources

High quality distillate suitable for technological needs

Low-hazard sludge containing calcium sulfate and calcium carbonate and magnesium hydroxide

Crystal technical salt suitable for chemical production and Na-cationite filter regeneration

TDS:

↑ 0,5-5 ppmmg/l

Industrial trials of the Exerger technology at EVRAZ production site

2020

R&D

2021

Design
and engineering

2022

The unit production
and successful
industrial trial

Industrial trials of the Exerger technology at EVRAZ production site

Task

Coke gas condensate cleaning after biochemical pretreatment

Technological process

- ↓ Pre-treatment using coagulation and flocculation
- ↓ Concentration in the Exerger unit
- ↓ Crystallization in the evaporation block

Sediment dewatering

Pilot unit characteristics specifications

- Capacity 1 м^3/h
- Concentration from 4 to 300 times

Results

Avoiding discharge of polluted effluents

Production of distillate suitable for the customer's technical needs

EXERGER benefits

- The unit capacity from 1 m^3/h to 200 m^3/h
- Specific steam consumption 0,07-0,15 t/m^3 of wastewater
- Treatment of industrial wastewater of various concentration and salt content
- Minimal consumption of chemical reagents
- 2-4 times lower metal consumption compared to equivalents with the same energy consumption due to the highly efficient heat exchange process

Cost of ownership is

1.8 - 2.5

lower than equivalents

Flash evaporator Exerger FVE

ReinnolC offers

Audit of the current circulating water cycles
and wastewater treatment units

Project feasibility study:
cost of ownership and return on investment

Complex engineering and deployment of the Exerger technology:

- Industrial wastewater treatment
- Circular water treatment cycle
- ESG index growth
- Secondary resources production: distillate, sludge, technical salt

Pavel Blokhin,
Founder

> *We believe that efficient production leads to sustainable development, higher quality of life, and rational use of natural resources*

ReinnolC Group of companies is the technological leader in engineering and solutions for industrial wastewater treatment

Expertise

10+ years of experience in water treatment and processing of effluents

40+ engineers – graduates from top universities, PHDs, and inventors

Innovative technologies

Inventions protected by Russian and international patents

Own R&D lab

Own production facility

300+ equipment units produced for customers from various industries

Resident of Skolkovo Innovation Center (Moscow)

Resident of Sverdlovsk region Technopark

learn more about the technology

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