Industrial Water Recycling & Reuse
Creating Water Solutions

VEOLIA WATER
Solutions & Technologies
Risks of scarcity, needs of constant quality, stringent regulations, high costs: water recycling & reuse is the answer and shows many benefits.

**Cost effective**

- **Reduce costs** by limiting water intake and consumption
- **Improve performance** and productivity by optimizing the industrial water cycle
- **Limit fees** due to effluent discharge

**Safe and secure**

- **Continuous water supply**, avoiding risks of plant shutdown
- **Consistent quality**: no risk of fluctuation caused by environmental disturbances (floods, seasonal variations, droughts)
- **Achieve zero liquid discharge** when no water outlet is possible

**Sustainable**

- **Expand your production** without increasing water intake
- **Comply with more stringent regulations** by limiting discharge in the environment
- **Improve the image** of industrial sites through better environmental responsibility
- **Choose best available technologies** and innovative solutions
A New Water Resource

Veolia Water Solutions & Technologies (VWS) offers its extensive knowledge and expertise to provide you with the best solutions and services, guaranteeing reliability, autonomy, efficiency, performance, return on investment. VWS is your key partner for identifying water recycling & reuse opportunities:

- A Complete portfolio of 200+ technologies from effluent treatment to highly-purified water production
- Innovative combinations of proven technologies responding to all industrial applications: ultra-pure water (UPW), process water, cooling tower make-up, boiler feed water, utility water (washing, cleaning, fire network, irrigation...)
- A large choice of standard equipment & modular solutions
- Complete package for easy integration & turnkey plants
- A strong experience in upgrading and boosting existing treatment plants
- Advanced solutions for compact, reliable, low energy consumption installations
- More than 100 references in water recycling and reuse in various industrial sectors: automotive, biofuels, chemicals, food & beverage, metals, micro-electronics, petrochemicals, power, pulp & paper, surface treatment...

A broad expertise

- Water cycle analysis and preliminary studies
- Characterization of water needs
- Pilot plants, testing (Anjou-Recherche R&D center)
- Engineering, Design & Build, start-up, commissioning and training
- Full project management and construction supervision
- Technologies integration, covering the full industrial water cycle

A full range of services

After-sales services
- Spare parts and consumables
- Service deionization: AQUADEM®
- Water Treatment Chemicals: HYDREX®
- Emergency or temporary needs: AQUAMOVE®

Operational technical support

- Audits, diagnosis
- Control, monitoring of installations
- Maintenance 24/7

Complete package with financing solutions:
- ALL-IN-PACK®, including equipment and maintenance

Industrial outsourcing for complete water cycle management
From Technologies to Innovative Solutions

The best combinations of technologies

- BIOSEP® MBR + Reverse Osmosis (RO)
- Secondary treatment + ACTIFLO® + Filtration + Membranes (UF, MF, NF, RO)
- ANOXXALDNES™ MBBR + Clarification + Membranes (UF, MF, NF, RO)
- Reverse Osmosis + Evaporation + Crystallization
  Achieve Zero Liquid Discharge when regulations are very stringent or no outlet possible.

The most efficient and reliable technologies from effluent treatment

- ACTIFLO® Pack
  High-efficiency tertiary clarification
  - 50 times less footprint
  - Standard design up to 640 m³/h.

- BIOSEP® Pack
  Membrane bioreactor (MBR):
  - High quality treated effluents
  - Directly before RO for recycling
  - Standard from 2 to 60 m³/h.

- ANOXXALDNES™ MBBR
  Moving Bed Bio-Reactor allowing
  - Boosting of the treatment plant
  - Easy refurbishment of existing installations

- RECYCLO™:
  A new All-In-Pack® solution for water recycling & reuse
  - Compact, Plug & Play
  - Easy to run and maintain
  - 90% of water recycling
  - Standard units from 2 to 20 m³/h, integrating the 3FM technology (Flexible Fiber Filter)
From Cost Effective Solutions to Performance

Proven solutions:

FRANCE: meat processing plant
Reuse of treated effluent for cooling water
- BIOSEP® + reverse osmosis

AUSTRALIA: chemical plant
Reuse of treated effluent for high quality water needs
- ACTIFLO®

SINGAPORE: microelectronic industry
Reclamation of treated municipal effluent for ultra-pure water production
- Microfiltration, reverse osmosis, U.V.

to purified water:

- Purification and disinfection
  - Membranes (from ultra-filtration to reverse osmosis)
  - Ion exchange
  - U.V.

- Closed loop recycling and element recovery
  - Electrolysis
  - Crystallization
  - High-pH RO

- Evaporation
  High quality distillate recycling from high-loaded effluent
  - Standard units (EVALED™) or custom-designed systems
Surface treatment & metal finishing

Water recycling creates value!

Your Benefits
- Lower water consumption
  ➞ Lower costs per unit of production
- Short recycling loops for materials recovery
  ➞ Easier water recycling
- Reduction of final waste
- Compliance with environmental regulation and IPPC recommendations, especially in terms of metal, COD, toxics levels
- Respect Best Available Technologies (BAT) recommendations

Our Solutions
Metal finishing and surface treatment industries present various and complex production processes with specific chemicals and materials.

Veolia Water Solutions & Technologies (VWS) provides solutions for waste streams recycling and valuable materials recovery based on a global approach:

- From pre-treatment to final purification:
  - Physico-chemical treatment, neutralization
  - Clarification: MULTIFLO®
  - Flotation for oil/water separation and removal of particles: Titled Plate Separation Systems (TiPSS™)
  - Evaporation for distillate recycling: EVALED™
  - Compact membranes and ion exchange units for final purification
  - Activated Carbon Systems (PICA™)
  - RECYCLO™: a new plug&play compact unit for water recycling integrating the advanced zFM filtration technology
  - Crystallization, ion exchange for loop recycling of rinse water

- Metal recovery: Retrom™, Retec™, Auroclaim™, Barrel plating

- Solutions regeneration through:
  - Ion exchange: Recal™
  - Electrolysis units (simple or compartmented)
  - Membranes: Kompalox™, Kompasep™
  - Evaporation: EVALED™

- Oil / water separation and recovery: ultra-filtration and micro-filtration units: Kompalox™, Kompasep™
Applications

Effluent from surface treatment industries generally needs a specific approach and treatments covering metals, toxic chemicals, hydrocarbons, color, extreme pH, salinity, oils, detergents, high COD with low BOD, etc. These elements need to be carefully treated to avoid any risk of pollution.

YWS' know-how helps you with identifying all opportunities for recycling:

- Use for utility water, scrubbing, washing, process water...

- Short loop recycling:
  - electro-galvanization,
  - chemical milling
  - coating baths
  - tribo-finishing
  - metal spraying

> Concepts of water uses and recycling in the surface treatment industry
Your Benefits

- Ensure water system quality and reliability for efficient water management
- Drought proof solution to shortages of fresh water by reducing overall plant consumption
- Reduce water and waste costs
- Avoid lack of surface water dilution and increase of pollutants concentration (TDS, TOC, BOD, algae, NaCl spikes...)
- Expand production without increasing water usage
- Create value by converting waste streams that are currently discarded or disposed of
- Environmental compliance and sustainable growth

Our Solutions

Veolia Water Solutions & Technologies (VWS) provides optimal solutions and integrated processes to guarantee savings and ensure safety of water reuse:

- **ACTIFLO®** and **MULTIFLO®** tertiary treatment to improve TSS removal
- GAC filtration, ozone, or biofiltration for color, organic and micro-pollutants removal
- Softening (including **MULTIFLO®**)
- Membranes, ion exchange for polishing
- Chlorine, ozone, UV for disinfection
- Evaporation / crystallization for Zero Liquid Discharge
- Low-pH, High-pH RO for treating acidic or alkaline streams

**Segregation of waste streams** is essential to:

- **In-house** reuse
- **More efficient** wastewater treatment
- **Control** of the treated wastewater quality to be reused
- **Organic and inorganic by-products recovery** (metals, acids, alcohols, halogenated compounds, salts, ...) through electrolysis, ion exchange, adsorption, solvent extraction, distillation (evaporation, rectification).

Simple and economical water recycling & reuse can be implemented through:

- Site and waste streams inventory
- Compounds identification from effluent
- Study of possible interactions
Applications

Water is an essential resource for the chemical process industries:

- Steam production
- Cooling water
- Process water
- Selective decentralized recycling loops
- Service water for fire protection, cleaning, flushing, irrigation

Water supply can be reliably managed from a program that encourages recycling and reuse of in-house streams including:

- Treating or reusing "reclaimed" water from the plant site or local municipality
- Reducing and recovering of blowdown streams from boilers and cooling towers
- Stormwater run-off
- Recovery of condensate
- Remediated groundwater

Implementing water reuse should focus on identifying plant operating practices and treating key parameters. Contaminants such as colloidal materials, trace metals, iron and manganese, soluble and insoluble organic constituents, inorganics (including dissolved salts, highly acidic or alkaline streams) must be removed to reduce scaling, fouling or corrosion risks.

Example of water cycle in a chemical plant

[Diagram of water cycle in a chemical plant]
Your Benefits

- Reduce water consumption
- Avoid shutdown in case of drought
- Boost production capacity
- Diversify the source of water supply
- Compensate a seasonal or temporary need (peak of production)
- Optimize water flows

Our Solutions

When continuous water supply is threatened in case of production increase or discharge limitation, water recycling (for non-food applications) can be a cost effective, technical and environmental solution for the Food & Beverage industry.

VWS provides a broad range of solutions from standard equipment to customized plants, with innovative combinations of technologies:

- Activated sludge + multimedia filtration + UV.
- ANOXKaldnes™ MBBR + multimedia filtration + U.V.
- BIOSEP® + Reverse Osmosis + U.V.
- Evaporation units: EVALED™
- Water consumption analysis
- Advanced secondary treatments:
  - Anaerobic technologies (UASB, EGSB)
  - ANOXKaldnes™ MBBR: Moving Bed Bio-Reactor for refurbishment and higher performance of existing installations
  - BIOSEP® Pack for high quality effluents before reverse osmosis
- Tertiary clarification: ACTIFLO®
- Filtration: sand, multimedia, pressure leaf
- Membranes (UF, MF, NF, Reverse Osmosis)
- Ion exchange units
- Disinfection: U.V., chlorine, ozone, legionella prevention
Applications

Recycling treated effluents can cover many applications:

- Boiler feed water
- Cooling water make-up
- Washing and clearing water
- Conveying raw materials

Example of water recycling treatment lines at a slaughterhouse (Cooperl, France)
Minimize effluent discharge and water consumption

Your Benefits

- Cost savings of wastewater treatment and waste disposal
- Compliance with very strict discharge limits for highly polluting effluents
- Implement zero discharge systems
- Produce high quality recycled water
- Choose compact systems avoiding conventional processes with large footprints
- Recycle and regenerate by-products, solutions/baths

Our Solutions

The glass industry requires large amounts of water and must consider water reuse as a key solution for cost savings and regulatory compliance.

Veolia Water Solutions & Technologies (VWS) provides complete solutions to implement water reuse on-site and optimize the water cycle, based on key technologies and innovative treatment lines:

- ACTIFLO® / ACTIFLO® Pack clarification
- Oil removal: API separators, coalescers, flotation (TIPSS™)
- Multimedia filtration
- Reverse osmosis: MiniRO™, MidiRO™, MaxiRO™, MegaRO™
- Evaporation / crystallization: EVALED™
- HYDREX® water treatment chemicals
- RECYCLO™: a new plug&play compact unit for water recycling integrating the advanced 3FM filtration technology: 90% of water recycling.

VWS offers a comprehensive approach to analyze, improve water flows, and install short loop recycling. To implement water recovery, we focus on key parameters:

- Glass particules and clay, potentially recoverable for added value
- COD, TSS, turbidity, conductivity, TDS, silicium...
- Oils and grease
- Magnesium, aluminium, metallic oxides, heavy metals
- Spent solvent wastes
Applications

For all types of glass industries:
- Glass containers manufacturing
- Industrial glass manufacturing (vehicle, buildings, domestic glassware, glass products, pressed and blown glass)
- Isolation products: glass wool, fiber glass, coating
- Optical glass (production, laboratory)
- Glass obscuring
- Silk screen printing

From wastewater streams...
- Acid polishing
- Rinsing, washing, cleaning effluents
- Scrubbing
- Tin baths waste streams
- Grinding process (production of CRT glass)
- Baths and solutions

...to water needs:
- Scrubbing and polishing
- Cleaning, washing, rinsing
- Cooling systems
- Preparation of solutions
- Laboratory applications

Example of water cycle in the glass industry:
Micro-electronics

Ultra-pure water at better costs!

Your Benefits

• Significant cost savings
• From less discharge to zero liquid discharge (ZLD)
• Less downtime for systems cleaning
• Recovery of valuable materials
• No environmental impact

Our Solutions

Veolia Water Solutions & Technologies (VWS) provides complete treatment lines to ensure high purity of process water:

• Physico-chemical treatment, compact clarifier
• Settling cyclone
• Neutralization, decarbonatation, stripping...
• Ion exchange for polishing, baths recycling or solutions regeneration: KOMPaion™
• Disinfection
• Vacuum evaporation and crystallization: EVALED™
• Metal recovery through electrolysis technologies (plate, barrel, membrane): Retec™, Auroclaim™, Reton™, Retrom™, ReEMR™
• Polymer or ceramic membrane systems:
  - Ultra-filtration (KOMPaion™), Micro-filtration (KOMPalox™), reverse osmosis

Recycling configurations:
- closed loop at the point-of-use
- cascading
- long loop

Whatever the wastewater characteristics (including reverse osmosis concentrates), cost effective recycling can be implemented for 60 to 70% of ultra-pure water needs.
Applications

Opportunities for water recycling & reuse in computer chips, electronic devices, flat screen manufacturing:

- Reverse osmosis concentrates
- Spent rinse water (from wafer cleaning, first or mixed acid rinses)
- Boilers and cooling towers blowdown
- Scrubber wastewater
- CMP and AWN rejects

Examples of treatment for ultra-pure water production:

Long loop recycling for UPW production line involves pollutants separation at the finishing step of the effluents (metal recovery, solutions regeneration,...).
Mining

Robust and reliable solutions to improve productivity, comply with legislation and treat contaminated water

Your Benefits

- Improve production efficiency by treating all sources of available water
- Manage environmental risks and ensure water meets requirements for reuse
- Optimize water balance
- Recover valuable minerals and constituents from effluent or sludge
- Secure high quality water, even on remote sites
- Setup reliable equipment for easy maintenance and operation
- Suitable to peaks of production while complying with stringent regulations

Our Solutions

Veolia Water Solutions & Technologies (VWS) offers long-term cost-effective solutions for water recycling and reuse. We focus on technical performance and compliance with process and environmental requirements.

From effluent treatment to water production, VWS solutions are based on combinations of proven technologies to fulfill your requirements:

- Aerobic and anaerobic processes
- ACTIFLO® clarification for effluent polishing
- Filtration technologies
- Membranes (UF, MF, NF, RO)
- Ion exchange for high purity water production, recovery of solutions
- Evaporation and crystallization for Zero Liquid Discharge, waste reduction, recovery of condensate from spent liquors...
- DENSE SLUDGE™ process to minimize sludge production and maximize valuable element recovery
- Mobile services for temporary or emergency water needs: AQUAMOVE™
- Services and maintenance on-site, through our technicians network to guarantee a short response time.
- Pilot testing
Applications

For all applications, VWS offers solutions which treat and efficiently remove all contaminants (heavy metals, arsenic, suspended solids, organics, iron, manganese, specific ions):

- Recycling and reuse for industrial and utility water production, boilers and cooling towers make-up
- Condensate recovery
- Metals recovery
- Groundwater reclamation
- Treatment of contaminated pond and underground mine water
- Brackish and sea water desalination
- Stormwater collection and treatment
- Reuse of mine water for irrigation
- Zero Liquid Discharge (ZLD)

For all configurations and characteristics:
- Gold, uranium, nickel, copper, coal mines...all mining sites have specific water needs
- Existing or abandoned mine sites

Example of a treatment line for contaminated mine water treatment and reclamation
Your Benefits

From gas and crude oil extraction to petrochemical industries, water use optimization can be essential to a site’s operation and viability, especially in areas with low water availability.

- Lower discharge of effluents, meaning lower costs
- Lower operational costs from water consumption
- Increased water availability
- No risk of production breakdown
- Regulatory compliance
- Environmental responsibility
- Expand production without increasing water intake

Our Solutions

From extraction fields to refineries...

Veolia Water Solutions & Technologies (VWS) responds to:
- Simple and complex recycling water cycles
- The highest water quality needs

Produced water reuse
- Titled Plate Separator Systems (TiPSS™)
- CPI separators
- Ceramic membranes: CERAMEM™
- Reverse Osmosis, including high-pH RO process: OPUS™
- MPPE systems (Macro Porous Polymer Extraction)
- POWER CLEAN SYSTEMS™ nutshell filters
- Coalescers
- Induced Gas Flotation: AUTOFLOT™
- Evaporators: EVALED™, HPD™
- Evaporation of reverse osmosis brines for Zero Liquid Discharge (ZLD)

Wastewater reuse and waste streams recycling in refineries
- Oil / water separation: TiPSS™
- Cartridge oil adsorption and oil removal filters or membranes
- MPPE systems for MTBE, BTEX and PAH removal
- Clarification: ACTIFLO®, MULTIFLO®
- Membrane Bio-Reactor (MBR): BIOSEP®
- Activated Carbon Systems (PICA™)
- Reverse osmosis
- Ion exchange for demineralization
- Elements removal: oils and hydrocarbons, BTEX, hydrogen sulfide, ammonia, phenols, hardness, metals, silica, cyanides, MTBE, PAH, dissolved solids, organics and inorganics, ...
- Evaporation of reverse osmosis brines for Zero Liquid Discharge (ZLD)
- Innovative combinations: MPPE + BIOSEP™ MBR
Applications

- Cooling tower make-up and boiler feed water
- Water injection in wells for extraction
- Industrial process water
- Washing water for specific processes such as desalter
- Storage for fire safety networks

From many sources of wastewater:

- Water from stripping
- Desalter waste streams
- Boilers and cooling towers blowdown
- Rain water run-off
- Condensate recovery
- Produced water recycling (onshore/offshore/SAGD applications)
- Boilers blowdown (including OTSG applications)

Example of potential recycled flows
From reliable and sustainable water management to complete recycling and Zero Liquid Discharge!

**Your Benefits**

- Meet stringent water quality requirements
- Comply with all regulatory discharge constraints
- Avoid reduction of production or shutdown due to source water availability or out of specification conditions (droughts, seasonal variations, etc...)
- Consistent and reliable water management program
- Optimize the use of chemicals
- Zero Liquid Discharge (ZLD) program:
  - water discharge is not possible
  - fresh water availability is limited
- Utilize and treat reclaim water from the local municipality

**Our Solutions**

Veolia Water Solutions & Technologies (VWS) offers process *technological expertise* and experience, combined with engineering and project execution capabilities:

- **ACTIFLO® and MULTIFLO®** tertiary treatment to improve TSS removal
- Membranes filtration (UF, MF, NF, Reverse Osmosis) for producing lower TDS water
- Ion exchange for demineralized water production, condensate polishing and reuse
- Disinfection: U.V., ozone, chlorine
- Water Treatment Chemicals: HYDREX®
- **OPUS™** for recovering cooling tower blowdown significantly reducing the volume of water discharged
- Sea water desalination as alternative resource:
  - Thermal: MED (Multi-Effect Distillation)
  - Membranes: DESALATOR™
- Scrubber wastewater / flue gas desulfurization (FGD):
  - Crystallization: DENSE SLUDGE PROCESS™
  - Desaturation, precipitation, coagulation, clarification (ACTIFLO®/MULTIFLO®), degasifying

- **Segregation of waste streams** is an important step:
  - Improved plant water management
  - Reuse of streams with low contamination levels (blowdowns, storm water, coal pile run-off, ash pond overflow, ion exchange regeneration streams)
  - Designs utilizing existing installations for economical upgrade
  - Package plants requiring minimal installation time and labor
Applications

Conventional, fossil fuel or nuclear power stations utilize large volumes of fresh water requiring several different levels of treatment from low turbidity to low levels of TDS. Various applications and requirements include:

- Supply make-up for the plant cooling tower, gas scrubber, service water and fire protection needs
- Demineralized water with low levels of TDS, TOC, silica and alkalinity, for boiler feed water make-up

There are many opportunities to reduce fresh water consumption by recycling certain streams, by reviewing and integrating the design and water management:

- Treatment of internal plant streams
- Boiler and cooling tower blowdown recycling to maintain top operating power production efficiency
- FGD purge water
- Site stormwater management, including coal pile run-off or ash pond overflow streams
- Utilization of municipal reclaim or "gray water"

> Overview of water cycle and recycling opportunities
Improve productivity, optimize resources and secure water supply!

Your Benefits
- Reduce water costs related to high volumes consumption
- Safe water supply to:
  - secure process operation
  - avoid shutdown of activity in case of water shortage
- Comply with strict environmental legislation
- Improve environmental image
- Zero Liquid Discharge (ZLD)
- Groundwater clean-up

Our Solutions
From mining to processing, water reuse is a key solution to ensure continuous operation, provide large volumes of water, and manage highly polluted effluents.

Veolia Water Solutions & Technologies (VWS) offers adapted solutions for short loop recycling, materials recovery and optimization of water reuse:
- Process water production (metal processing, hot rolling, cold rolling, direct product cooling, demineralized water, softened water...), or flue gas treatment:
  - Clarification: MULTIFLO®, ACTIFLO®
  - Carbon removal
  - Filtration, ion exchange, membranes
  - Flotation: TIPSS™ (Tilted Plate Separation Systems)
- Recycling in cooling water circuit:
  - Side-stream filtration in the cooling loop
  - Disinfection: UV, legionella prevention
  - HYDREX® Water Treatment Chemicals: biocides, sequestering agents...
- Oil / water separation for oil recovery and water reuse:
  - Induced Gas Flotation (IGF): AUTOFLOT™
  - Flotation: TIPSS™
  - Ultra-filtration / Micro-filtration, evaporation
  - Effluent from pickling: physico-chemical treatment (flow treatment, settling cyclone)
  - Scrubber bleedwater: physico-chemical treatment
- Materials and solutions recovery:
  - Electrolysis, ion exchange, ultra-filtration units, evaporation
- Groundwater reclamation:
  - Heavy metals removal: METCLEAN®, membranes
- Temporary needs: AQUAMOVE™ mobile units
Applications

Due to the complexity of the process there are many opportunities for optimizing recycling within the water cycle:
- Reuse of treated municipal wastewater can provide large volumes of water
- Cooling water loop
- Wastewater from flue gas treatment in the blast furnace
- Spent baths from chemical pickling in cold rolling process
- Effluent from coking plant
- Spent rinsing circuits
- Reuse from continuous casting in hot steel processing
- Treatment of stable emulsion in cold rolling process
- Metal recovery
- Oil recovery from stable emulsion from QWERL (cold rolling process)
- Groundwater remediation

For all applications, VWS offers solutions which efficiently treat the elements to be removed:
- Inorganics from flue gas effluent / TSS and oil in the cooling loop / oil, VOC, heavy metals for groundwater remediation

> Overview of water uses and recycling opportunities in the steel industry

![Diagram of water uses and recycling opportunities in the steel industry]

Veolia Water

Solutions & Technologies
Optimize effluent treatment and management for better recycling and better energy use

Your Benefits

- Separating specific waste streams for better treatment and water cycle optimization
- Cost reduction of water consumption
- Consistent high-quality water
- Energy costs optimization through recycling of warm effluents, with no additional heating required for process water, especially for plants in colder regions
- Reduction of the water consumption ratio per kg of product
- Better quality of the final product
- Continuous operation
- Improvement of image thanks to better environmental practices

Our Solutions

The Pulp & Paper processes require large quantities of water, which represent a significant cost.

Veolia Water Solutions & Technologies (VWS) proposes compact treatment lines for optimal effluent treatment and process water production:

- **ACTIFLO**® clarification, accelerated by means of microsand
- Anaerobic digestion with granulated sludge blanket (UASB, EGSB)
- **ANOXKALDNES™ MBBR**: Moving Bed Bio-Reactors, boosting existing installations
- **MULTI-BIO™** biological treatment
- **BIOSEP®**: Membrane Bio- reactor (MBR)
- Evaporators and crystallizers, including black liquor treatment: **EVALED™ / HPD™**
- Membranes: UF, MF, NF, Reverse Osmosis
- Ion exchange

Due to the technical and regulatory demands of the Pulp & Paper industry, mills require suppliers with experience and understanding of their process.

VWS offers opportunities for **production efficiency, reduced energy consumption** and recovery of valuable water and by-products for process and utility needs.
Applications

For specific concerns...
fibers, volatile compounds, high COD loads, color, dissolved salts and reagents...

...Specific solutions:
Waste streams recycling at the point-of-use:

- Washing effluent after bleaching or oxygen delignification
- Condensates from black liquor evaporation
- White and gray waters
- Fibers recovery from exceeding volumes of white waters
- Vacuum pump sealing water

Example of recycling opportunities in a kraft pulp mill
Biofuels

Alternative resources for sustainable production!

Your Benefits

- Reduce and optimize water consumption and costs
- Avoid production shutdown due to water scarcity
- Increase autonomy regarding water supply
- Improve performance and productivity
- Respond to strict regulations
- Minimize environmental footprint by limiting effluent discharge
- Contribute to the image of the biofuel industry

Our Solutions

To meet the biofuel industry’s needs for sustainable solutions, Veolia Water Solutions & Technologies (VWS) offers full engineering and project execution capabilities, responding to your needs:

- Low energy consumption plants
- High efficiency for high-loaded effluents
- Small footprint for space saving
- Quick delivery and installation
- Easy to operate

With the most reliable technologies from standard to customized plants, we offer key combinations:
- BIOSEP® + reverse osmosis (RO)
- Secondary treatment + ACTIFLO® + RO
- Secondary treatment + flotation + evaporation
- Zero Liquid Discharge: membranes, evaporation, crystallization

Compact advanced treatments for greenfield sites or refurbishment:
- Anaerobic technologies (UASB, EGSB), with biogas production for energy optimization
- ANOXKALDNES™ MBBR: Moving Bed Bio-Reactor for refurbishment and boosting of existing installations
- BIOSEP® Pack Membrane Bio-Reactor (MBR) for high quality results in one treatment step
- ACTIFLO® tertiary clarification
- A full range of purification technologies from multimedia to membrane filtration
- Distillate recycling from stillage concentration: HESC™ (High Efficiency Stillage Concentration)
Biofuels

Applications

A safe and continuous supply for constant quality and full safety:

- Raw material separation, extraction or hydrolysis
- Liquefaction, saccharification
- Fermentation and distillation
- Oil refining and ester purification
- Boiler and cooling systems make-up
- Gas scrubbing

Example of water needs in various biofuels processes

- On-site rainwater collecting
- Surface water groundwater remediation
- Use of external sources: treated municipal or industrial effluents
- Boiler blowdown recycling
- Cooling circuit blowdown recycling
- To process water or cooling tower make-up
- To process water or boiler feed water

Global reuse on-site
Zero liquid discharge

Internal or cascading recycling

Biodiesel
(extraction, purification, transesterification, phase separation, alkyl-ester washing...)

Bioethanol
(mashing, cooking, liquefaction, saccharification, fermentation, distillation...)

Wastewater treatment plant

Discharge

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