



OVIVO[™]
Bringing water to lifeSM

Water Specialists for the Pulp & Paper Sector
creating value in water through innovation, creativity and expertise

ovivowater.com

A New Global Force in Water

As society and the global economy demand more and more from water, there is a growing requirement for ever more specialist applications to manage clean water, to create specialist process waters, to treat wastewater, to extract energy from wastewater and to champion the reuse of water.

The 2010 merger of Eimco Water Technologies, Enviroquip, Aqua Engineering and Christ Water Technology plus many smaller specialist firms allows Ovivo to offer a unique combination of advanced solutions, probably the most significant application knowledge base in the world and some of the best brains in the business.

Ovivo aims to become the water partner of choice for clients in the public and private sectors and the leading source of water expertise for engineers and consultants across the globe.

For further information, visit
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Ovivo - creating value in water through innovation, creativity and expertise in clean water, process water, wastewater treatment, waste-to-energy and water reuse markets across 5 continents.



Ovivo - bringing water to life



Our Role in your Industry

The world needs paper products. It also needs means for producing paper using sustainable and environmentally safe methods. A thorough knowledge and understanding of industrial processing techniques is critical to ensuring the successful design of water and wastewater treatment plants. Ovivo supplies products and implements processes that have been developed to meet the more stringent requirements of pulp and paper production in today's world.

Effective water treatment processes help clients to increase productivity, enhance machine life and improve product quality while optimizing water treatment costs. Ovivo supplies entire systems for the production and management of fresh and process waters as well as for the efficient treatment of wastewaters and effluents. An extensive range of research and technology development equipment is available, as are facilities for laboratory testing, pilot and full-scale trials.

Ovivo's process design knowledge can reduce operational and maintenance costs across a plant. Using high-specification components and equipment in our products provides increased reliability and will dramatically reduce a plant's whole-life costs by extending its design life.

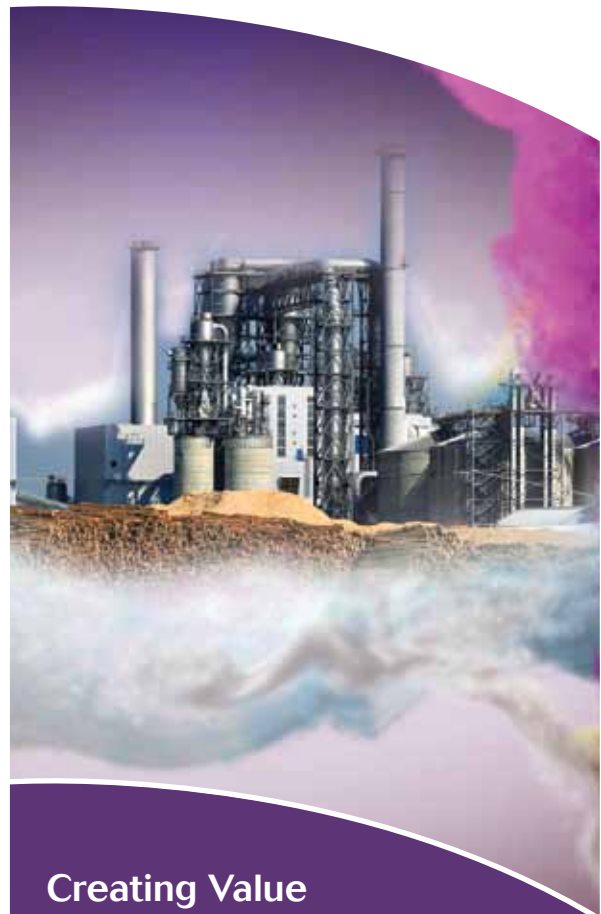
Managing environmental risks better

Manufacturing throughput can be increased by using water of consistently high quality, thus increasing profit potential and reducing costs. Ovivo supplies entire systems for the production and management of fresh and process waters as well as for the efficient treatment of wastewaters and effluents. Water is a shared resource and Ovivo truly believes that every small improvement in the way we use it will have a significant impact on the environment. Ovivo's technological advances and the increasing sophistication of its systems are major elements in the drive to reduce the costs of water and wastewater treatment.

Improving product quality and process reliability

Water treatment processes can enhance clients' productivity and product quality, and optimize their water treatment costs. Ovivo has well-established, cutting-edge technologies and recognized trademarks, an equipment base installed worldwide

and an extended global presence. Our portfolio of products includes screening, sedimentation, filtration, flotation, biological treatment and membrane technologies that are recognized for both performance and efficiency. Experienced, highly skilled engineering personnel across the globe assure complete technical and operational support for our clients.



Creating Value



With hundreds of installations worldwide and a high level of competence in the pulp and paper industry, Ovivo adds value to clients' processes by improving productivity and ensuring that environmental regulatory requirements are fulfilled.



Ovivo Solutions



Raw Water Treatment

As environmental awareness has increased and regulatory requirements have proliferated, Ovivo has become a leader in the development of equipment and technologies to meet the new demands.

Our Reactor Clarifier™ Solids-Contact units are designed to provide the most economic solution for precipitation and clarification. The basic Reactor-Clarifier design provides for coagulation, flocculation, solids recirculation, clarification and positive sludge removal in a single basin, eliminating the need for multiple tanks and associated piping. Ovivo's range of clarifier units, refined by years of application experience in the engineering and manufacturing industries, assure that a best fit solution can be found for any unique plant requirements.

Ovivo's clarification process softens water, removes turbidity, algae, color, iron and metals. Ideal for removing suspended solids from raw water, if clarified water requires further polishing by filtering, residual solids are efficiently removed via granular media filtration systems, which use sand and anthracite. Solid particles are trapped in the media and, when exhausted, are flushed by backwashing with air and water.



Boiler Feedwater

Our key processes for boiler feedwater production are Conesep®, FlooX™ Ion Exchanger, FlooRO™ Reverse Osmosis and different types of filtration. Reverse osmosis is the finest filtration known. FlooRO Reverse Osmosis is used to produce water that meets the high water quality standards demanded by our clients.

The FlooMB Mixed Bed Ion Exchanger is a polishing unit used wherever the quality of the water produced from the main deionization section - both ion-exchange or reverse osmosis type - is insufficient to meet the required standard. It is typically for use in a high-pressure boiler with a steam turbine, or in condensate polishing.



Condensate Polishing

Boiler feedwater treatment is not adequate when small amounts of impurities can get into the condensate, causing corrosion problems. Polishing of the condensate is required in order to meet the quality needs of the high-pressure thermal cycles, and also to minimize consumption of make-up water. Ovivo's advanced solution for condensate polishing comprises cartridge, or pre-coat, filtration and a FlooMB Mixed Bed Ion Exchanger.



Process Water Recycling

Today's requirements for decreased water consumption call for improved water management at mills. Ovivo's solutions born of significant pulp and paper industry experience respond solidly to that challenge.

Microflotation is a well-known method of particle separation; also called Dissolved Air Flotation (DAF), it has long been used in the pulp and paper industry for different applications, such as separation of ash fines, resin and other detrimental substances from processes.

During microflotation, micro-sized bubbles are created by dissolving air into water under pressure. When the air-saturated, pressurized water is released, microbubbles are formed. Suspended solids and colloids attach to air bubbles and to one another due to chemical, physical and electrical forces. These particle flocs then float to the water surface and are scraped off. Coagulation and/or flocculation chemicals can be used to improve the separation.

Ovivo focuses on cleaning and recycling process water in order to find economical, efficient and environmentally friendly solutions. Starting with an evaluation of the best technical solution for installation and start-up, we take full responsibility for supplying the complete process. Additionally, we continually seek to assure excellent levels of plant performance.



Flotation Systems

Ovivo's advanced microflotation technology is called FlooDaf[®] Microflotation. Its main features are its rectangular shape, automatic dispersion water and basin level control. As a result of this, FlooDaf Microflotation can have high hydraulic loading and a small footprint, while still maintaining good separation efficiency.

General Features of the FlooDaf[®] Microflotation:

- Low space requirement.
- Excellent separation efficiency over large particle range.
- Excellent tolerance for hydraulic and solid variations.
- High solid concentration in the sludge.



Wastewater Treatment

Today, industrial plants are taking full responsibility for the way their process waters affect production and the environment. Fresh water taken from nature is cleaned, utilized and recycled carefully within the processes and, when returned to nature, that water must meet stringent standards. These targets can be achieved using FlooBed-based biological treatment solutions.

Ovivo's FlooBed bioreactor is a biological treatment process based on the moving bed bioreactor (MBBR) principle, where microorganisms are attached on carriers to break down organic compounds. The core component of the FlooBed process is the carrier element. Combined with optimized aeration and mixing, the microorganisms form a biofilm on the surface of the carriers and remove organic compounds. The carriers are suspended inside the reactor and are mixed efficiently through aeration.

The FlooBed process can be built to have one or several stages in series or in parallel. Excess sludge is removed from the carriers continuously by intensive mixing and abrasion. Microflotation is typically used for subsequent separation, or sedimentation, if applicable. Part of the sludge is recycled back to the FlooBed system, and the rest is further dewatered.

Advantages of the FlooBed Bioreactor:

- A FlooBed carrier is easy to operate because it is very tolerant to peaks of organic load and variations in flow rate. It tolerates temperature variations and toxins in the feed water.
- The reactor volume needed for a FlooBed system is considerably smaller compared to activated sludge plants. Space requirement is typically 10-40% of conventional solutions.

The FlooBed carrier has an open structure, which facilitates a high amount of biomass and improves mass transfer efficiency. The durable structure of the carriers makes them tolerant to mechanical abrasion, resulting in low maintenance costs.

The filling ratio of carriers can be adjusted on a case-by-case basis. In practice, this means the process is designed to be very flexible. Filling can be changed according to flow and load, and the FlooBed carrier can be also built into an existing basin.

In fixed-film reactors, clogging caused by excess sludge can be a problem. The FlooBed system minimizes this by creating turbulence that churns the water through the carriers, thus no backwashing is needed.

Design Parameters:

- Retention time typically from 1 to 4 hours.
- Organic load range 2–20 kg BOD/m³d.
- Biomass concentration in the reactor 6-12 kg/m³.
- On average 70–80% of microbes attach on the carriers.
- Low sludge circulation, 0–15% of the in-feed flow.
- Efficient aeration.
- Wide range of operating temperatures.
- Carrier filling ratio 20–60% of biomass and improves mass transfer efficiency.

The FlooBed solution has been selected for several applications, such as effluents from process industries, landfill leachate and municipal wastewaters. In the pulp and paper industry, FlooBed has been built into the mill area for pretreatment of existing activated sludge plants and for new mills with high requirements.

The Future

Pulp and paper mills face increased demands for higher quality process water due to increasing machine speeds and improved product quality. At the same time, mills are under pressure to decrease water consumption and treat effluent more efficiently to reduce environmental loading to even lower levels. For most mills, a conventional biological effluent treatment is inadequate to reach the tight effluent concentrations increasingly demanded.

Ovivo's pulp and paper system clarifiers are designed and built with over 50 years of engineering and manufacturing experience and, most importantly, by using information obtained from hundreds of references in pulp and paper wastewater treatment processes.

One of our key technologies, the FlooBed MBBR carrier, is a high loaded system designed for pulp and paper effluent treatment. It can be used for whole mill effluent treatment as single or multiple stages, or it can be combined with activated sludge process (FlooBed BAS). The FlooBed process can also be constructed into existing basins and used to upgrade the old activated sludge process. Because of the good sludge quality produced and low free sludge concentration in the produced water, the following clarification step can be achieved with compact conventional, lamella clarifiers or with microflotation. Because of its compact size, the clarification unit can be built close to the production site, and can later be integrated into the mill's water circuits.

At some production sites, the regulatory requirements for treated wastewater are so stringent that these cannot be met despite thorough biological treatment. In such cases, Ovivo is able to provide an efficient tertiary treatment system. Each of the stages of the pulp and paper manufacturing process requires the continuous provision of water at appropriate levels of quality, and Ovivo is able to assure reliability of supply at consistent quality across each of these.



Creating Value



We define Key Performance Indicators so that you can better manage your processes.

Our goal is the achievement of continuous improvement in environmental management while matching ever-increasing regulatory compliance requirements.



Case Study

Boiler Feedwater Treatment (Stora Enso, Poland)

Brief

Stora Enso's biggest mill in Poland at Ostrołęka serves an integrated paper and paper packaging business. As it has invested in a new power plant, high quality boiler makeup water is essential for steam generation.

Conditioning water properly can increase boiler efficiency and extend boiler life by preventing deposits, which cause corrosion. Treating boiler feedwater also ensures safe and reliable operation.

Solution

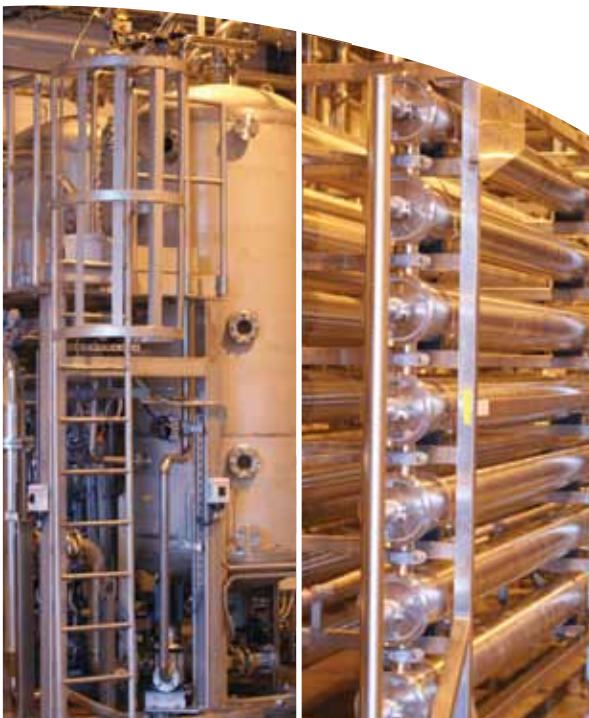
Upstream water intake from the River Narew is 216 m³ per hour. This volume is passed through continuously operating sand filters.

The primary treated water is fed to two membrane-based reverse osmosis and mixed bed ion exchanger lines each with a capacity of 62 m³ per hour. Ovivo's advanced membrane-based demineralization processes reduce carbon footprint by significantly decreasing chemical and transportation costs when compared with conventional ion exchanger processes.

Process condensates are polished with cartridge filters and mixed bed ion exchanger polishers.

Outcome

The treated condensate for Stora Enso's 125 m³ per hour installation at Ostrołęka meets critical water quality parameters. These specifications include measurements of silica, suspended solid and ionic constituents such as sodium and chloride.

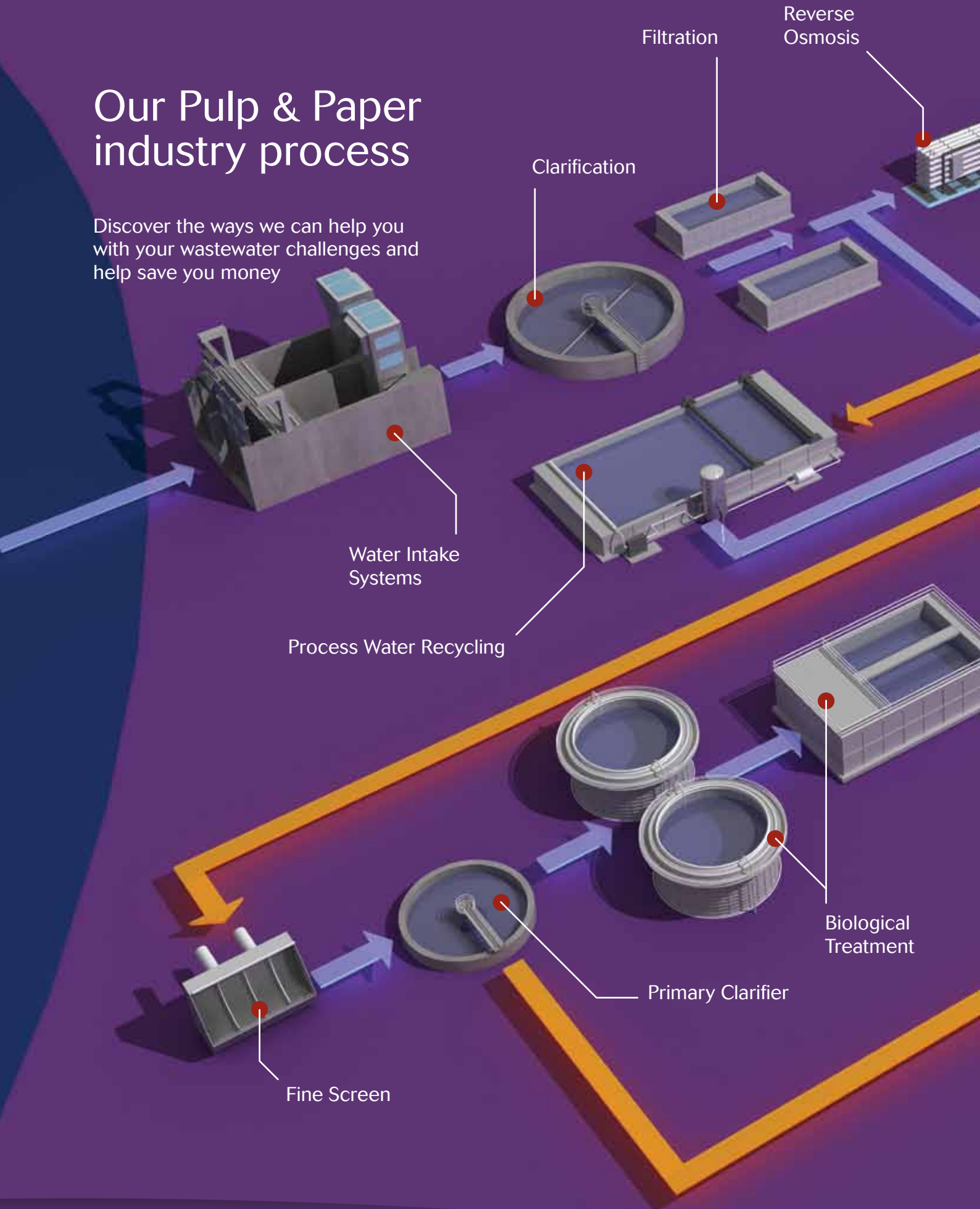


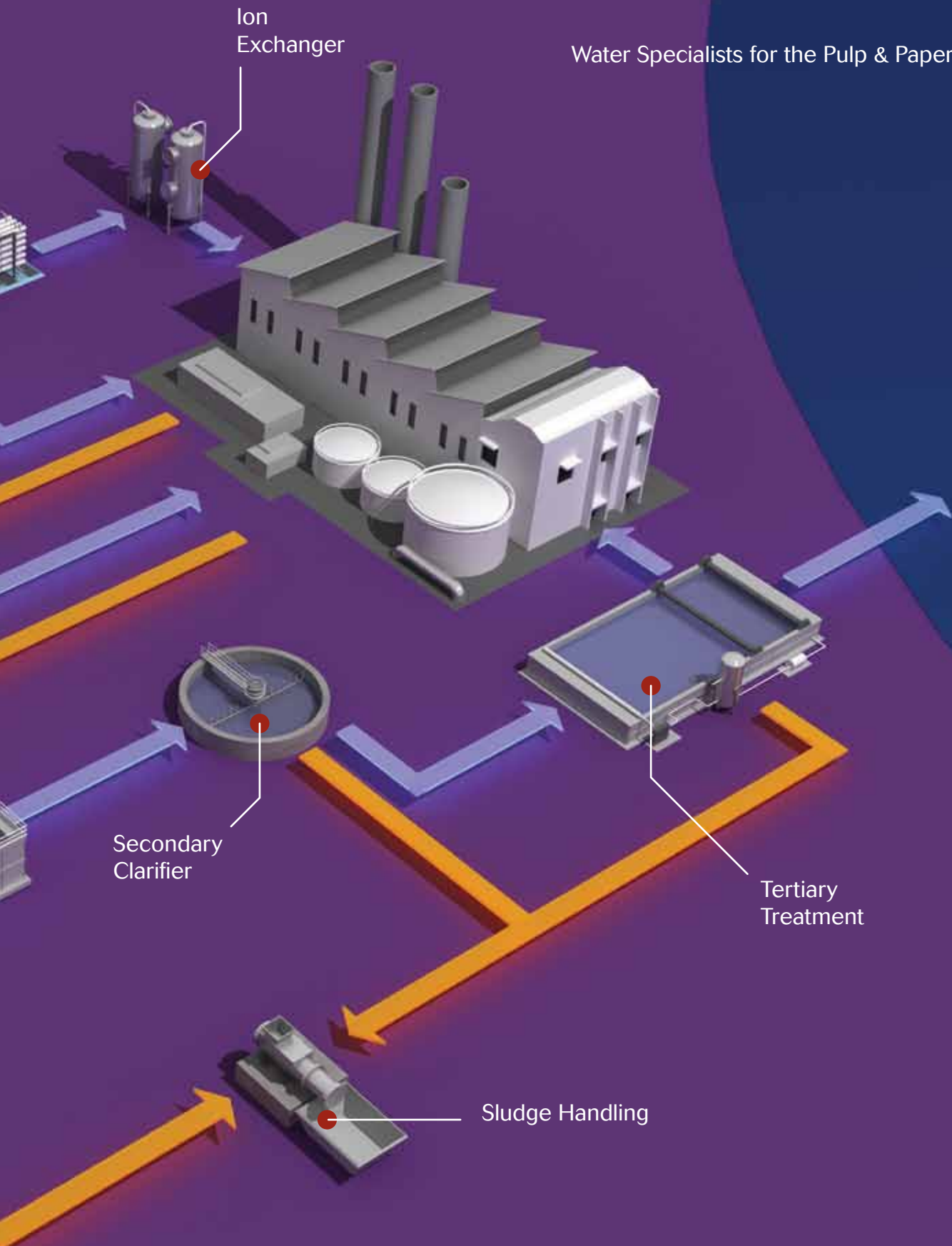
How we created value

- 125 m³ river water treated onsite per hour.
- Treatment reduces condensate impurities to critical water quality parameters protecting plant.
- Ovivo's demineralization processes reduce Stora Enso's carbon footprint by decreasing chemical and transportation costs.

Our Pulp & Paper industry process

Discover the ways we can help you with your wastewater challenges and help save you money





Case Study

Phoenix Pulp and Paper, Khon Kaen Mill, Thailand

Founded in 1975, Phoenix Pulp & Paper is a leading integrated producer of paper products with the capacity to produce 230,000 tonnes of pulp per year from locally harvested eucalyptus and bamboo; the process can generate over 13.5 million cubic meters of wastewater per year.

Brief

Previously responsible for discharging toxic effluents into riverways and surrounding land, the mill recognized that the tightening of environmental requirements necessitated innovative engineering and state-of-the-art technologies to meet the new standards.

Solution

Phoenix selected Ovivo's process combination of the FlocBed MBBR and activated sludge process as its wastewater solution. This FlocBed BAS wastewater treatment process was a turnkey delivery, and included screening up to wastewater tertiary treatment and sludge handling, as well as process instrumentation and automation.

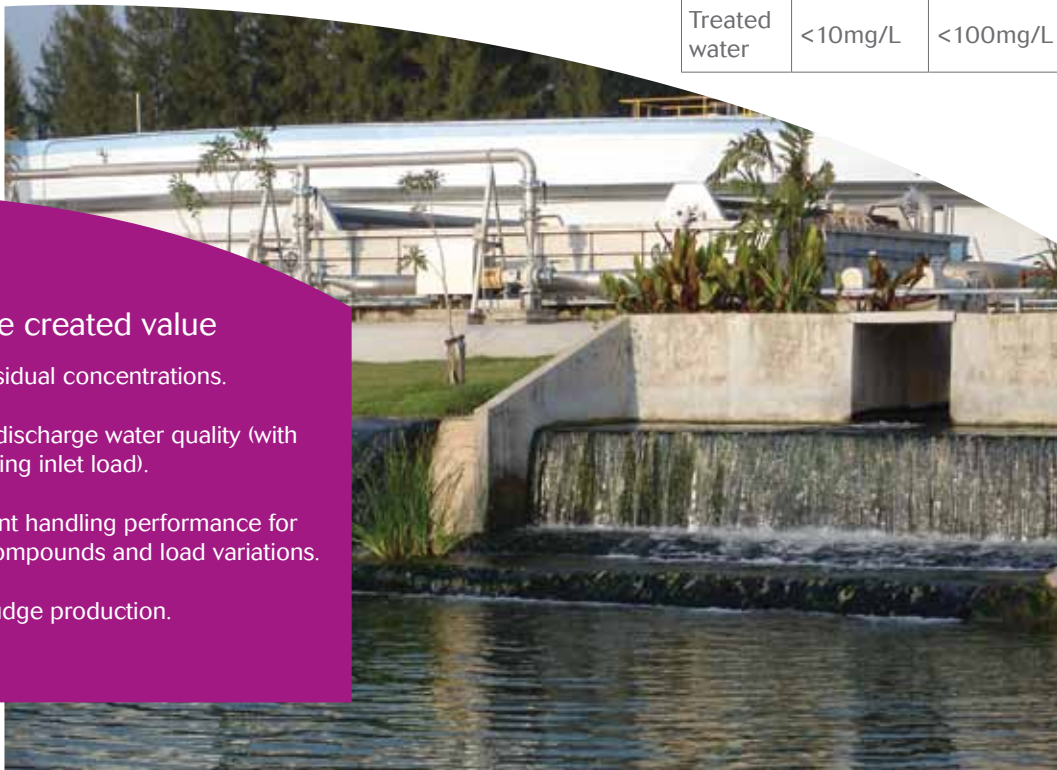
The main unit processes comprised our robust primary and secondary clarifiers, known for their enhanced efficiency in solids removal and capability to produce highly concentrated sludge suitable for dewatering without separate thickening. The FlocBed MBBR ensures low and stable loading into the activated sludge

process; because of requirements for extremely high quality treated wastewater, tertiary polishing via FlocDaf Microflotation was also incorporated.

Outcome

Wastewater flow to the plant was designed to be 15,000 m³/d with inlet COD and BOD concentrations of 2200 and 1200 mg/l, respectively. Right from start-up, treated wastewater quality has been excellent, and during the first months of operation the average treated water BOD was below 10 mg/l, SS < 15 mg/l and the outlet COD was as low as >40 mg/l. Since switch-on of the new plant, it has continued to operate trouble-free and within its operational parameters.

	BOD	COD
Raw water	1000-1500mg/L	15 m ³ /h
Treated water	<10mg/L	<100mg/L



How we created value

- Low residual concentrations.
- Stable discharge water quality (with fluctuating inlet load).
- Excellent handling performance for toxic compounds and load variations.
- Low sludge production.

Prolonging the efficient life of your assets

Ovivo takes a business-orientated view of total operating costs in water and wastewater. Each office can draw upon global best practice and in-depth application knowledge to ensure the efficient and effective running of water solutions within clients' businesses.

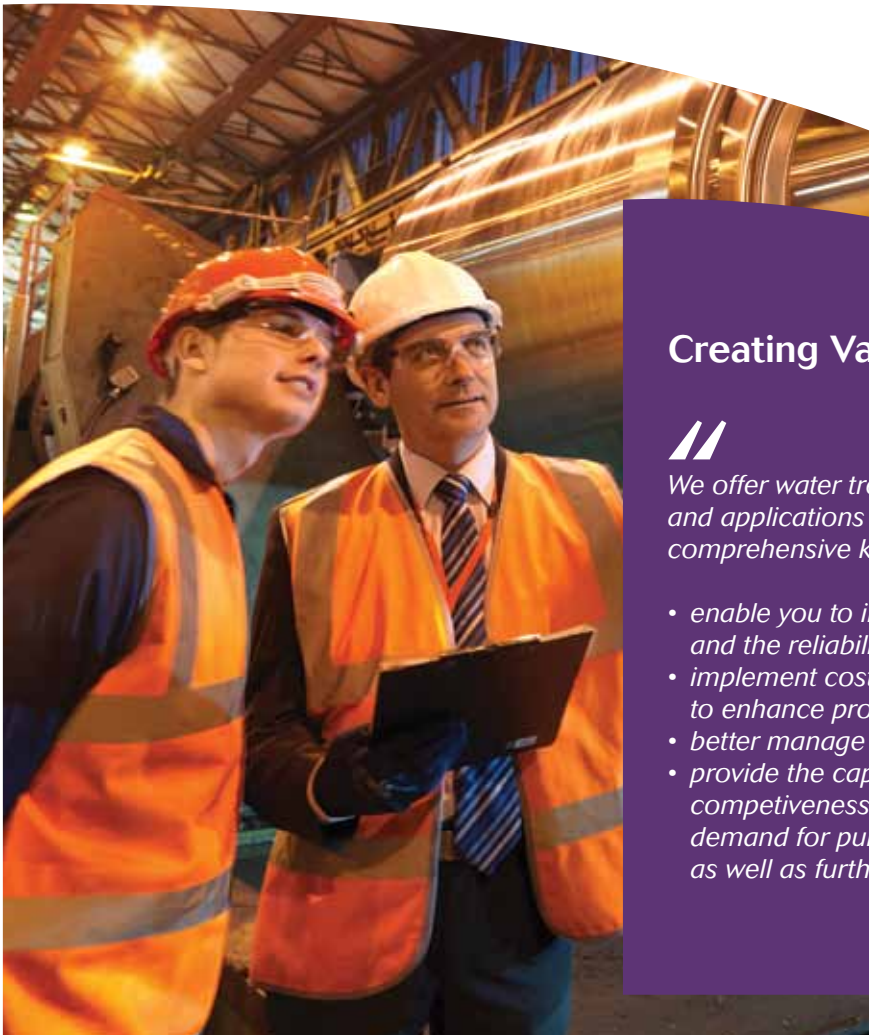
Ovivo's commitment to clients is total, with experts dedicated to the provision of high quality operational support, maintenance, refurbishment and specialty chemical supply.

Ovivo teams worldwide can test and confirm the operating capabilities of systems via regular inspections, either onsite or remotely. They will calibrate water treatment equipment periodically, as specific client service contracts require it.

Your local Ovivo team operates a quality system that conforms to ISO 9001 ensuring that:

- Communicating is as easy as possible.
- Local resources are used wherever possible.
- Costs are kept to a minimum.

Backed by a comprehensive telephone and remote control support service and spare part supply agreements, Ovivo's commitment is to develop productive, long-term customer service relationships with every client. Its teams ensure that plants are kept in optimum condition, minimizing downtime for your business and enabling you to operate at optimal efficiency.



Creating Value

We offer water treatment solutions and applications - together with our comprehensive knowledge base to:

- *enable you to improve product quality and the reliability of your process;*
- *implement cost-efficiencies designed to enhance productivity;*
- *better manage environmental risk;*
- *provide the capabilities to enhance competitiveness when facing increased demand for pulp and paper products as well as further regulatory pressures.*

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