Waste water treatment: technology for a sustainable future

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The starting point is **Goal 6 of the UN 2030 Agenda for Sustainable Development,** "Clean Water and Sanitation", which reads: **Ensure access to water and sanitation for all**. One might be held back by the difficulty of fully realising this goal as well as the other 16 that make up the Agenda, all of which are extremely challenging to achieve. However, their strength lies precisely in posing themselves as global challenges, in their radical nature that makes them capable of guiding a programme of action that must be implemented day after day. A necessary condition is the involvement of all countries and stakeholders, who are called upon to work together and propose concrete solutions.

Drinking water: a universal right

Access to clean water is an essential, fundamental and universal human right, indispensable for people's survival. However, 40% of the world's population suffers from water shortages and as many as 2.2 billion people have no access to drinking water. Moreover, climate change and increasing demand pressure are bound to exacerbate the problem. Today we increasingly speak of "**water stress**" to indicate a demand for water that is greater than its natural availability. Hence the urgency to realise Goal 6, working on the eight targets of which it is composed.

6.1 By 2030, **achieve universal and equitable access to safe and affordable drinking water** for all;

6.2 By 2030, achieve access to adequate and **equitable sanitation and hygiene** for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations;

6.3 By 2030, improve **water quality** by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated waste water and substantially increasing recycling and safe reuse globally;

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address **water scarcity** and substantially reduce the number of people suffering from water scarcity;

6.5 By 2030, implement **integrated water resources management** at all levels, including through transboundary cooperation as appropriate;

6.6 By 2030, protect and restore **water-related ecosystems**, including mountains, forests, wetlands, rivers, aquifers and lakes;

6.a By 2030, expand international cooperation and capacity-building support to **developing countries in water- and sanitation-related activities and programmes**, including water harvesting, desalination, water efficiency, waste water treatment, recycling and reuse technologies;

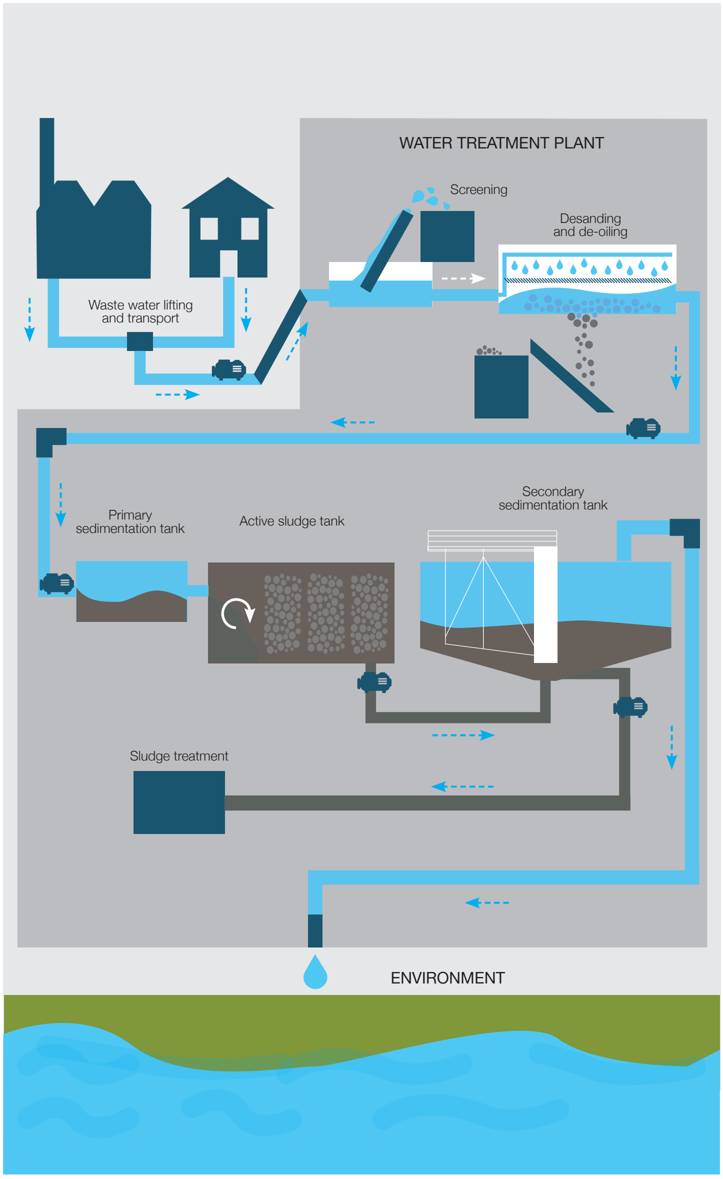
6.b Support and strengthen the **participation of local communities** in improving water and sanitation management.

The subdivision of the main goal into several sub-goals is interesting because it clearly shows how t**he whole water cycle management** needs to be made more **efficient**, through investments in the different activities, from abstraction to distribution, up to **waste water treatment** on which we want to focus here.

The purification closes the integrated water cycle

As always the figures are exceptionally clear. Currently, half of the waste water produced by human activities is discharged into rivers or seas without purification systems. More than half of the global population lacks safe sanitation and every day about 1,000 children die from preventable diarrhoeal diseases related to water and hygiene. Waste water treatment is therefore of paramount importance because it allows the integrated cycle to be closed by reintroducing unpolluted water back into nature.

Let's take a look at one of the most common operating schemes for waste water management. Domestic and industrial waste water through the sewage system is conveyed to treatment plants to undergo a series of treatments before being returned to surface watercourses. In this context, **waste water transport** is very important, which can be carried out by means of different technical solutions, depending on specific needs. In general, waste water is transported through underground sewerage networks, which can be made of different materials, such as concrete, PVC, steel, or other plastic materials. Pumps are essential for lifting and transporting waste water, used to overcome height differences and transported to the treatment plant. These pumping systems are used when the sewerage system is located lower than the treatment plant. Pumps for lifting and transporting waste water must be chosen according to the characteristics of the liquid to be transported, the required flow rate and the required head. Furthermore, it is very important that these pumps are designed and installed in such a way as to ensure safe and efficient operation, with special attention to maintenance and public cleaning.
Arriving at the purification plant, the water is separated from the coarse material through **screening, desanding and de-oiling**, then sent to the **primary sedimentation tanks** where separation from the sludge that accumulates at the bottom of the tank takes place via gravity. The treatment of dissolved substances and suspended solids takes place in the **activated sludge tank**, thanks to the metabolic action of microorganisms that utilise the organic substances dissolved in the slurry and the oxygen insufflated in the tank for their activity and reproduction. Biological oxidation leads to the formation of colonies of bacteria that are easily eliminated in the subsequent **final sedimentation phase**. Waste water discharged after the various primary and secondary sedimentation phases can be defined as clean, of course, if it meets precise measurement parameters set by law. **Sludge**, on the other hand, is sent to the specific treatment line that runs in parallel with the water treatment line. Here the sludge undergoes thickening and dewatering processes to be more easily disposed of.



The electric pump industry and the challenge of sustainability

Electric pumps play a key role in the treatment process. They ensure the **handling of the effluent**, from the first lifting phase to the subsequent transfers. Centrifugal pumps are most commonly used in waste water treatment plants. The number of pumps and their flow rates naturally depend on the **design specifications**, but in general these devices must guarantee maximum reliability - to avoid plant downtime - and ease of maintenance.
However, there is another very important aspect to consider. Waste water treatment is an **energy-intensive** activity, consuming up to 3% of the world's total energy production and contributing more than 1.5% of global greenhouse gas emissions. Therefore, the use of efficient pumps can make a significant contribution to the **containment of energy consumption**, with positive effects on both purification costs and CO2 emissions, thus orienting waste water treatment activities towards increasingly sustainable models.
It is clear, therefore, that technology is a strategic ally in bringing **energy savings into waste water treatment**. It is precisely the task of pump manufacturers to develop innovative products that help make plants more efficient, thus participating in the increase in waste water treatment capacity that international goals indicate is necessary to respond to the protection of water resources and public health.

High-efficiency pumps for sewage treatment

In general, centrifugal pumps account for around 20% of industrial energy consumption, a huge consumption that could not escape the attention of both Italian and international legislators. The European Union, in particular, has in recent years developed specific standards such as the M.E.I. (**Minimum Efficiency Index** - in accordance with Regulation (EU) No. 547/2012 on the ecodesign of water pumps) to keep only the best-performing products with the lowest environmental impact available. To date, the regulations mainly relate to submersible and surface pumps, but for some years now there has been talk of **extending the regulations to cover waste water electric pumps as well**. This is a need strongly felt by water system operators, installers and planners, also due to the rise in energy costs we have been witnessing in recent times.
Caprari has recently launched **a new high-efficiency twin-blade open impeller** that guarantees **efficiencies of more than 80%**, equivalent to **5-10 percentage points more than traditional closed-channel or vortex impellers**.
This new product is the **natural evolution of the K+ ENERGY range**, created to reduce energy consumption and designed as a high-efficiency motor plus pump system. Caprari's R&D team has created **a wet end with excellent performance**. In particular, the impeller is equipped with a grooved profile disc useful for conveying the solids contained in the pumped fluid and channelling them from the impeller disc towards the blades. The latter are heat-treated to give the impeller a high mechanical hardness and to ensure that fibres are cut, avoiding any possible

clogging problems. In addition, the new **FIXING SYSTEM** was designed to maintain the distance between the impeller and suction body, which is necessary to guarantee wet end performance. This extremely simple system, through the use of external screws, allows adjustment between the impeller and disc to be carried out in a matter of seconds during both assembly and maintenance.

In addition to the performance of the wet end, there are the **IE3 efficiency class motors**, which the K+ ENERGY series features. Finally, other advanced solutions contribute to the added value of this product: the **DRYWET SYSTEM (patented by Caprari)** for operation both in the tank and in the dry chamber, and the **Caprari NON-STOP** anti-clogging system, guaranteeing total operating reliability.

With this new product, Caprari has created an ideal solution for any waste water pumping system, from domestic and industrial drains to waste water treatment in sewage plants, dewatering, and the management of first flush tanks. It is a perfect example of how efficient design in response to customer needs can anticipate current regulations, for a truly more sustainable future.

Innovating to be part of the change

Energy saving, environmental impact and sustainability are increasingly becoming key drivers, also important for those involved in i**ntegrated water cycle management**.

It is our goal to be part of the change by being a technology partner to the industry. We want to provide innovative products and solutions that help our customers conserve water resources while reducing the cost and environmental impact of treatment. If treated effectively, waste water can once again become part of the water cycle, a key aspect in addressing the scarcity of this vital resource. Furthermore, reducing the amount of untreated water means protecting the environment and people's well-being from pollution that can manifest its effects immediately but also in the long term. Added to this are the **prospects opened up by the circular economy**, i.e. the possibility of extracting energy, nutrients and value-added by-products from sewage sludge. It is these great challenges that inspire and sustain our efforts every day.

Sources

www.un.org | www.unicef.it | www.agi.it | www.industriaitaliana.it caprari

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