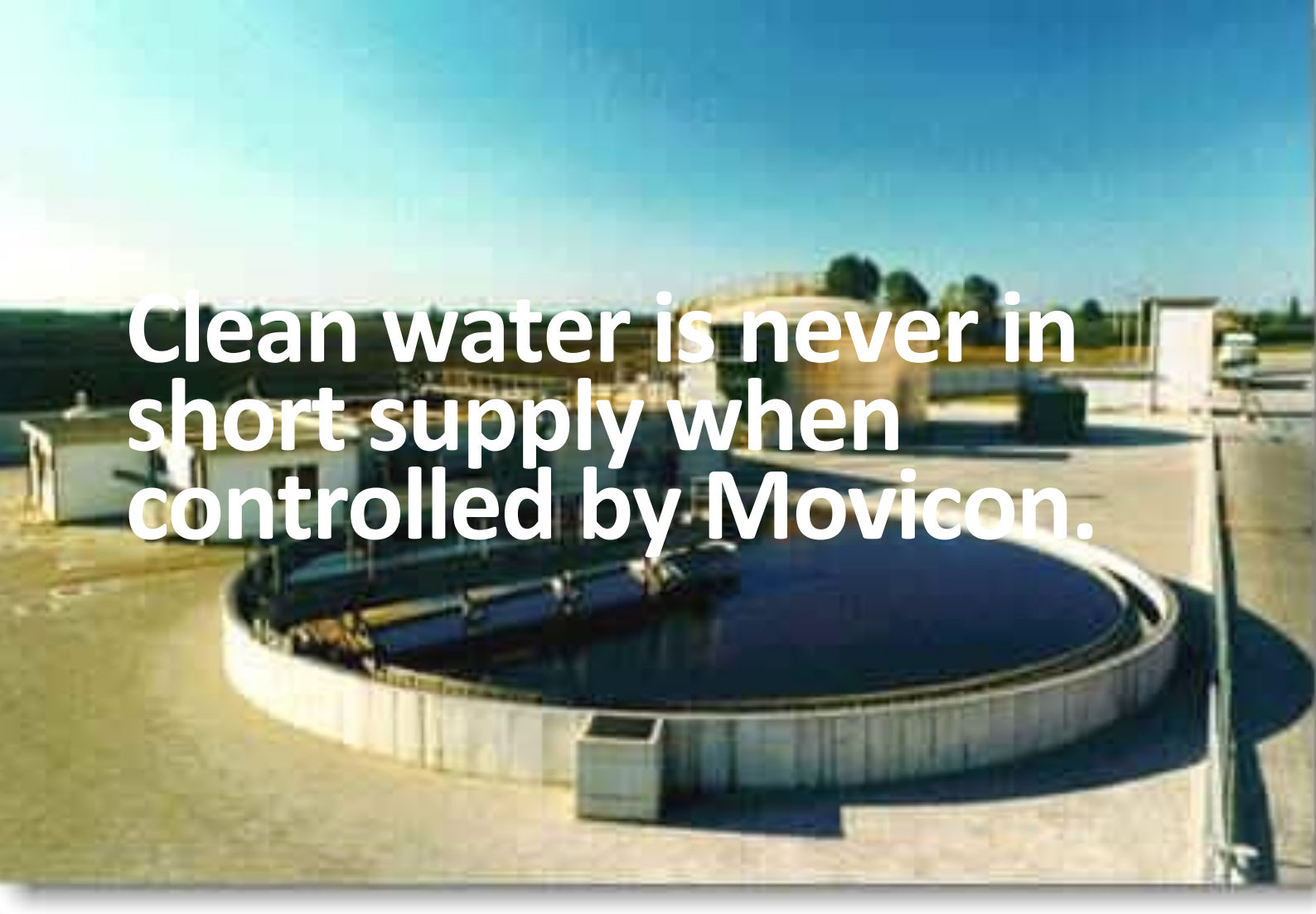


Clean water is never in short supply when controlled by Movicon.

Applying the best technologies to municipal and industrial purification plants is always good news for local inhabitants. Movicon helps keep minds at rest.

It's not an easy task for the public water board authority to perform a balancing act between running the whole water cycle process (collection, distribution, purification, drainage and sewage) and pleasing public administration (the local council) at the same time.
The mission of those companies assigned this task (many ex government-owned) is to incorporate the best and most cost effective technological solutions to ensure that water is clean enough for public use and keep the local environment safe and healthy.
The majority of small municipalities are expected to manage small plants, with treatment potentialities to the equivalent of 1,000 to 10,000 habitants; medium to large size plants, usually collect and treat wastewater from both civil and industrial areas with an expected treatment potentiality of the equivalent to 10,000 habitants and more.
The habitant or population equivalent (p.e.) is the unit of measure used to describe the size of wastewater discharge for evaluating the organic biodegradable load (matter) having a five-day biochemical oxygen demand (BOD) of 60 g of oxygen per day.The population equivalent doesn't necessarily reflect the actual number of community occupants. Practically, daily waste produced by one inhabitant is taken as a unit for measuring the waste produced by one industrial entity. The population equivalent method is used by purification plants to calculate which purification treatment level is to be used to treat wastewater arriving from urban communities and industrial plants.

EX GOVERNMENT-OWNED COMPANIES

Many of the government owned companies of the past have now been privatized and become joint stock companies through shares sold on the stock market. Many now manage and run services for the general public using industrial logic to provide the best services. These companies demand efficiency with cost effectiveness, important commodities which require plants to be automated and controlled to the point where any unexpected inefficiency or malfunctioning should be prevented or detected and dealt with straight away. This requires fully detailed information at all times not only to guarantee efficiency but, even more importantly, quality as well.

The effort to supply clean water, an essential natural resource to mankind, is becoming more strategic and precious each day due to its increasing scarcity worldwide.Here forth two cases of water purifier plants in Concordia and Medolla, in the Modena province, and one in Cesena will be taken into consideration especially for their hi-technological systems controlled and supervised by Movicon, the Progea supervision platform.

WATER POLUTION

Water population has been a major problem since the roman times for causing a variety of diseases and illnesses that have now reached a climax in most undeveloped countries. Overpopulation, urbanization growth into restricted areas, industrial growth, increase in quantities of chemical substances used in technical agriculture are all offenders.

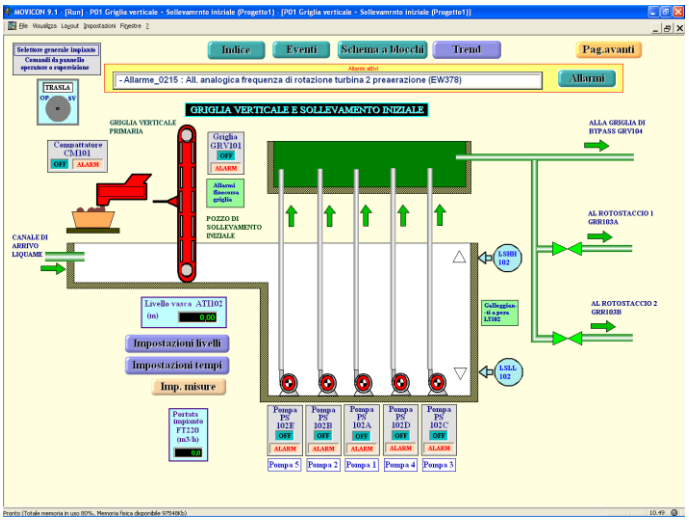
The most harmful polluters are:

- household waste, deriving from organic and bacterial human and animal deletions and from using endless varieties of industrial detergents containing organic synthesis (surface active) involving non biodegradable and harmful substances;
- Agricultural activities that use fertilizer and pesticides (herbicides, insecticides, fungicides).
- Industrial activities that produce organic synthesis substances or use toxic or noxious substances.

High quantities of rubbish and sewage are produced in all three cases, which contain too many harmful substances and impurities making water too contaminated to purify naturally.

Water contains bacteria, and decomposer microorganisms (aerobe bacteria), which breakup and metabolize the organic pollutants with a process in which this organisms absorb oxygen and emit carbon dioxide; the pollutants are then removed from the water and transformed into compounds which are utilized by plant life.

However, in order for this pollutant substance breakdown process to work, the pollutants need to be of a biodegradable nature so that they can be used by the microorganisms but not all the pollutants are biodegradable; in addition to this



Userfriendly screens help operators keep each single part of the plant under control.

water needs to have a certain amount of oxygen to allow the microorganisms to live and be favorable to the oxidation process. As the biological reaction progresses the oxygen content diminishes; this determines a redox state where the water absorbs oxygen from the earth's atmosphere, which is more effective with turbulent running water. This water/air cycle cannot take place if the pollution concentrate is too dense, impeding the absorption of oxygen from the atmosphere leading to complete oxygen deletion from the water; the aerobic metabolism system will then be unable to evolve properly causing marine and land vegetation to die out and the natural purification of water to cease. This is where the purifier plants make their entry with the aim to keep the environment clean and

under total control by intensifying the purification process, giving Mother Nature a hand. Water, once treated, exits from the purification plant and returns to the river. This water however, is not yet portable but can recommence with the cycle described above successfully.

THE PURIFICATION PLANT SYSTEM

The water is treated in various stages: arriving water is first screened through a large filter to remove any large debris, which may interfere with or damage the purification machinery and its process. Then the water is passed up with a rotary screw pump into various basins of different depths for the next treatment phase. Another screening is carried out using a finer filter, which removes particles up to 2 mm in size. This progresses into the sedimentation basin – floc separation phase where air is injected into the basins to keep the water moving quickly in order to separate the sand and grit sediments, which sink to the bottom forming sludge, from the oil, fat and grease sediments, which float and accumulate on the surface with the force of the upward jetted air. Both the sludge at the bottom of the basin and the oil, fat and grease residue on the surface, known as floc, are then removed, collected in containers and disposed of.

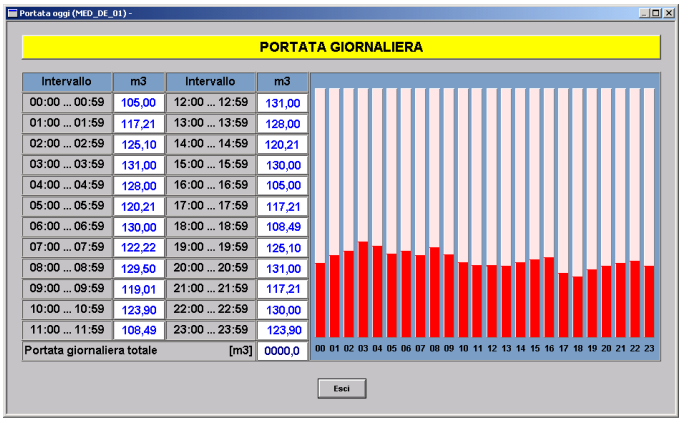
Having completed the primary sedimentation phase, the water then flows slowly through into bigger basins to rest long enough to allow those sediments which escaped the previous screening phases, to sink to the bottom of the basins. This sediment is then separated from the water and sent along to the sludge treatment process.

Next is the biological oxidation phase and the fundamental part of the purifying process: Big aeration tanks lined with sludge are injected with oxygen to activate the sludge to contain large quantities of bacteria that attack and decompose the remaining organic material.

To enable this to work the water and sludge are stirred and oxygenated continuously for the reaction time needed.During this phase the sludge biomass within the tank, increases as the microorganisms feed on the nutrients and reproduce. Therefore some of the sludge is removed to keep it at a certain quantity. Once this purification phase is completed, the water is separated from the sludge during the “final sedimentation phase” which takes place in the large big sedimentation basins where the layer of sludge is deposited at the bottom when the stirring action calms down and pumped out and sent along to the sludge treatment process while the clear water overflows and exits from the final sedimentation basins into the final filtration phase where it is filtered through sand to remove any remaining suspended particles and unsettled floc. From there onwards the purified water exits from the plant into canals that transport it back to the rivers.

REUSABLE WATER

Once industrial wastewater has completed the primary and secondary treatment phases it must undergo further treatment with ozone in order to be used again.



Reports are displayed on both bar and trend

This ozone treatment completely disinfects the water against any impurities that may still be in the water after having been completely purified. This treatment is very significant for industries such as Ceramics factories in Carpi, Italy, whereby totally eliminating residue dye colour from disposed wastewater makes it fully reusable without having to use other water.

This kind of treatment completely and effectively disinfects water to be reused for industrial purposes but however is NOT fit for drinking or domestic use.

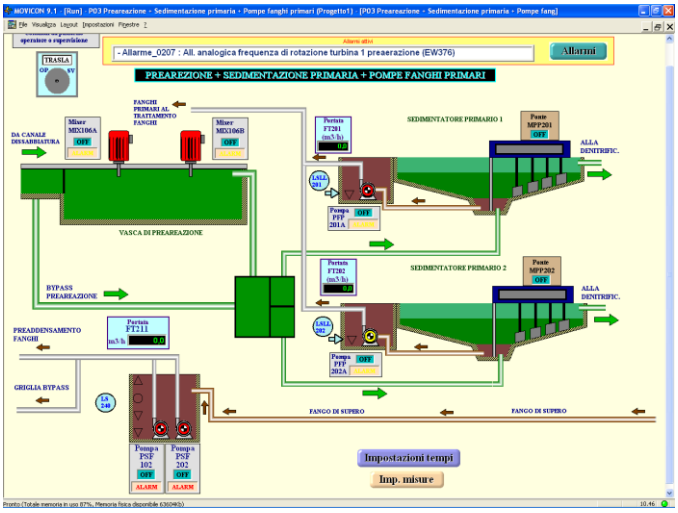
MOVICON AND TELECONTROL

The purifiers are managed by one or more PLC, distributed in the field, to manage all the devices involved. One or more supervision stations, local

and remote, allow process information acquisition and plant monitoring. For instance, the Medolla and Concordia plants are telecontrolled from the Carpi council technical offices where all information is gathers in order to run the plants with optimal conditions at all times. The central pc, with the Movicon application, has the task to retrieve data from the plants and displayed and historically logged on relational database files (ODBC standard), which are SQL Servers. The telecontrol system allows long distance intervention in remote management systems, based on the requirements established by centrally based operators. The configuration functions permit operators to setup each plant device separately with its own functional configuration, manual activations and the necessary working parameters. The remote alarm management is a very important feature in the plant management system through which anomalies can be constantly monitored in the control center. Each activated alarm is retrieved and recorded on the event log, to allow easy analysis for quick solutions by the control center operators who can then intervene and adjust the working parameters at a distance when needed.

The Cesena plant, for its size and importance, has a redundancy system where two supervision and control stations have been setup, one on standby in hot back-up mode while the other is running.The secondary server (slave) completely takes over system control automatically when the primary server (master) crashes. The historicals containing the quality data are kept exactly identical and specular by the Movicon system's automatic re-synchronization.Deploying the Movicon system to control and supervise the purifying process and management has brought many advantages in organization, quality, reliability and running of the plant with substantial save in costs.

The system automatically manages system malfunctions and instantly alerts long distance operators using remote PSTN or GSM telephone line connections or other assigned telephone connections. Movicon also sends



Movicon controls and monitors thephysical largeness and alarm management by sending notifications and alerts to on-call personnel as well

event notifications to on-call personnel (ie. emergencies) using both SMS and vocal calls with Text-to-Speech. The plant is now managed more efficiently and less time is spent on plant intervention procedures and therefore less manual operators are needed on the plant floor. The dosage phase is more reliable in emitting the correct dosage measures at the right times. System data retrieval is much more accurate and by interfacing with the chemical laboratory has made statistical analysis on the plant's performance an easier job when having to acquire and handle less onerous data.

The Data Reporting of different sections of the plant periodically, permits operators to monitor the environmental impact of the water being treated by the purifier system. All the process data and parameters are recorded daily in appropriate industrial databases (SQL Server) in realtime. This enables personnel to immediately retrack data of any anomaly occurrence while the plant is working by using the Movicon built-in report and analytic tools. Regular data printouts can also be obtained in order to run a thorough check on the quality of the water and services carried out.

Giuseppe Bettini