



REUSE OF WASTEWATER FOR IRRIGATION





ABOUT MM



MM Spa

is a leading Italian engineering firm specialized in the design and construction of public transportation infrastructure and urban redevelopment projects promoting the sustainable development of the local area.

Founded in Milan in 1955, MM is responsible for the construction of the city's entire metropolitan rail system - 108 stations and over 100 km of track - and for major traffic and hydrological engineering projects.

MM is now able to export the solid experience it has developed in this sector to other major projects throughout Italy and abroad. It has participated, for example, in the construction of the metropolitan rail systems in Naples, Rome, Brescia, Turin, Copenhagen and Thessaloniki, the light rail systems in Padua and Venice, and the Autostrada 35 (BreBeMi).

MM Spa offers services ranging from project design to technical and financial assessments, from preliminary characterization to work supervision, and from design validation to inspections, testing and quality control.

MM is now a business partner to public agencies on major public works, whose cost and complexity demand consolidated management capabilities and absolutely reliable technical and administrative support.

Since 2003 MM is also in charge of Milan's Water Supply Service, which includes abstracting, purifying and distributing groundwater, collection and treatment of municipal wastewater, and generally, planning maintenance and investments for the water supply and sewer systems.

In 2014, MM also undertook management of the real estate assets of the City of Milan, comprising over 38,000 subsidized housing units, parking garages and other facilities. To accomplish this, MM created the new organizational unit "MM Casa", which works alongside other company structures that are already managing city services.



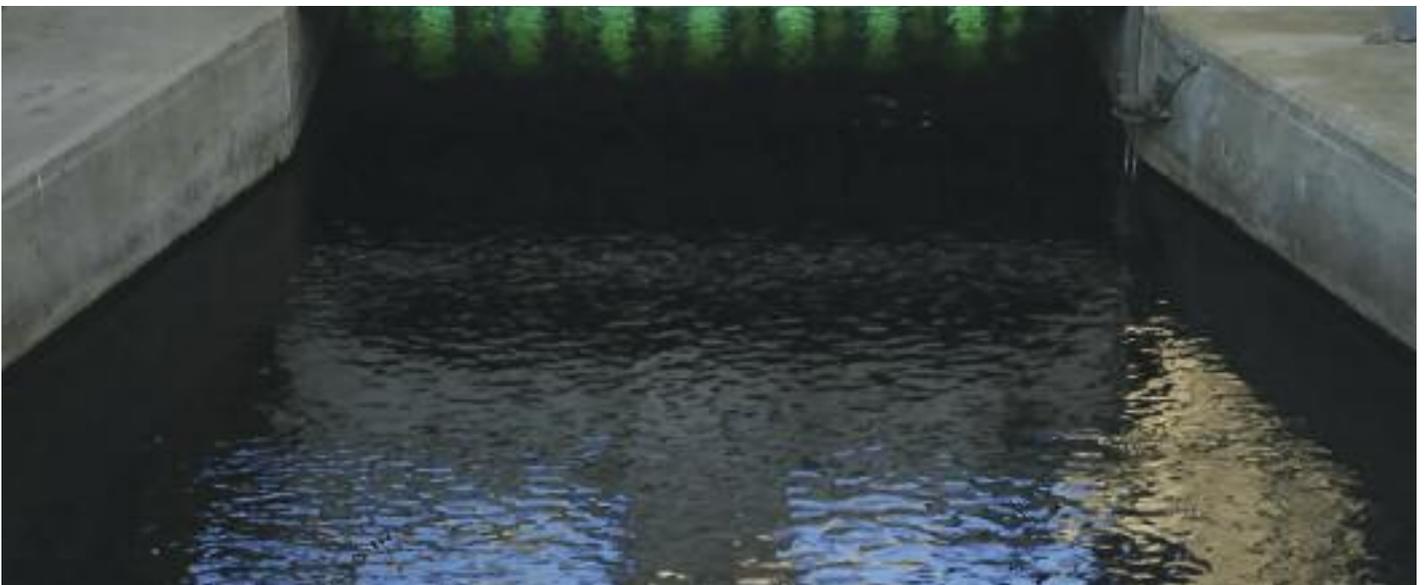
TECHNOLOGICAL INNOVATION WITH ANCIENT ROOTS



The city of Milan boasts centuries of tradition of reusing wastewater produced in the city for irrigation of the surrounding farmlands. As far back as the 1200s the Cistercian monks in the Chiaravalle Abbey used wastewater from Milan in the Vettabbia canal to irrigate their water-meadows, producing very high yields of animal fodder, representing at the time a bona fide technological innovation.

The practice of reusing Milan wastewater for fertilization was used and approved by the municipality since the beginning of the past century thanks to the abundance of fields available for the natural purification of wastewater.

In a City of Milan publication dating to 1960, we find the following description: “The waters of the Vettabbia canal, used since the 12th century by the monks of Chiaravalle to irrigate the fields surrounding the homonymous abbey... as they leave the city are spread over the land to irrigate the water meadows, which are the city’s greatest and most effective natural purification system.”





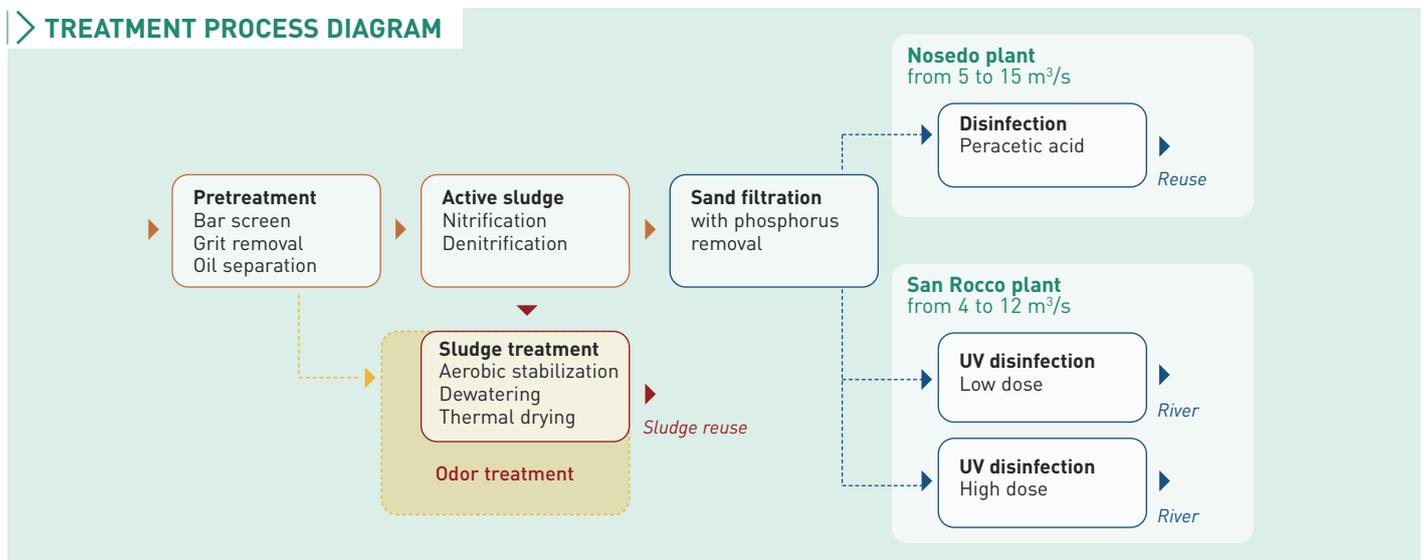
Today the rehabilitation of the city's wastewater takes place principally in the two wastewater treatment plants of Nosedo and San Rocco, which provide the farmlands south of Milan an annual volume of 150 million cubic meters of water meeting the strict standards of Ministerial Decree 185/2003.

Milan's reuse of wastewater for irrigation represents a point of excellence in Europe for quantity and quality: the volumes reused in Milan exceed the total reused by France, Greece and Portugal combined.

To achieve this the Milan WWTPs use state-of-the-art tertiary treatment technologies in order to:

- Remove nutrients (nitrogen and phosphorus) which, although helpful in growing crops, represent a source of eutrophication in sensitive areas like the Po watershed;
- Enhanced disinfection of discharged water to ensure removal of bacteria and viruses that would come into contact with crops during the irrigation phase.

TREATMENT PROCESS DIAGRAM





A NATURAL
TREATMENT
SYSTEM

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The Milan treatment system provides:

- Pretreatment to remove coarse solids (bar screens), grit, and oil/grease arriving through the sewer system;
- Activated sludge bioreactors to remove the organic component of the water and for nitrogen removal in biological nitrification and denitrification sections. Mobile Bed Biological Reactors (MBBR) and Integrated Fixed Film Activated Sludge Systems are used to increase the effectiveness of the removal of nitrogen and nitrogen compounds thanks to the dual biological oxidation effect from suspended activated sludge and sludge adhering to the plastic supports;



Bioreactors

- A chemical-physical section to remove phosphorus via chemical precipitation and gravity sand filtering;
- Enhanced final disinfection using UV radiation or peracetic acid.

> TREATMENT PRODUCTS

The end product of the treatment process is principally the sludge, which is constantly removed from the bioreactors to maintain a constant concentration.

Activated sludge contains colonies of microorganisms that grow and reproduce while metabolizing and breaking down contaminants.

The average age of the sludge microorganisms is managed by evacuating excess sludge. The extracted sludge is dewatered and dried in the sludge line and then goes to specific stabilization and disinfection processes so that it can be reused in agriculture.

The city of Milan's treatment sludge has excellent characteristics for reuse thanks to the particular nature of the sources in a city whose economy is predominantly based on the service sector (finance, fashion and industrial design).

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