Re-agent dosing

Sodimate installs standardised equipment to meet the specifications of each plant

Water quality refining is the most essential step in water treatment processes. When done properly, it guarantees palatable taste characteristics suitable for drinking water. The reliability and accuracy of the processes for storing, metering, and dissolving the required re-agents are indispensible for successfully completing this final treatment. Outlined below is a case story about Viry-Châtillon, a water treatment plant, where Sodimate installed a new powder activated carbon (PAC) dosing unit for Eau et Force, a subsidiary of Suez – Lyonnaise des Eaux.

Thanks to a 4500 km interconnected piping network, three towns in the South of Paris region, Morsang-sur-Seine, Vigneux-sur-Seine, and Viry-Châtillon, provide and supply up to 440 000 m^3 of drinking water per day to approximately one million inhabitants

Here is a close-up of the discharge from the concrete silos. The dosing unit is able to process from 0 to 50 grams/m^3 regardless of flow conditions (from 800 to 5000 m^3/hour). It is automatically controlled, easy to maintain, and complies with the ATEX regulation.

Built in 1931 and gradually expanded over several years, the plant in Viry-Châtillon can produces 120,000 m3 of drinking water each day from raw water taken from the River Seine and, to a lesser extent, underground water drawn from aquifers of the Albien and Sparnacien rivers. To produce a perfect water quality, the plant uses the most modern process. After fine-screening, the water goes through ozone pre-oxidation before entering the settlement tanks. The water is then filtered through granular activated carbon to absorb the organic residue. An ozone treatment precedes a second filtration with PAC to process and neutralize micro-pollutants, thus improving the water quality. Finally, before proceeding to the final chlorination, the water's calcium carbon ratio is adjusted to an adequate ratio.

Jean-Louis Le Hir is the Assistant Plant Manager at Viry-Châtillon, a privately owned facility. On the discussion of the management of the water treatment plant, he comments: "*Lyonnaise des Eaux is the owner, via their subsidiary Eau et Force, of all of the facilities at the three main South Ile-de-France plants; which is unusual in France. Eau du sud Parisien, another subsidiary, operates the works*". Eau du Sud Parisien is in charge of servicing and maintaining all equipment and treatment processes. Additionally, they ensure that the workers implement processes and organize the water treatment plant to ensure the proper sanitation of the water produced. However important sanitation monitoring may be, ensuring taste consistency receives the most attention, as Jean-Louis Le Hir points out, "*It is essential that the consumer should have water with the proper amount of nutrients and taste quality*". For this reason, the water treatment division of the plant in Viry- Châtillon includes a refining step on granular activated carbon located between the ozone pre-oxidation and the final disinfection. Injecting powdered PAC in the settling tanks improves water quality by eliminating the odor-causing compounds, pesticides and their by-products, algal toxins, chlorinated hydrocarbons, and trihalomethanes and other by-products from the disinfection process. At Viry-Châtillon, the powdered activated carbon process is used periodically, "*Between seasons, the spring or autumn rains cause deterioration of the raw water quality. The addition of activated carbon and its porous structure allows the absorption of a wide range of compounds",* specified Jean-Louis Le Hir.

Since the middle of the 1960s, the plant in Viry-Châtillon used an activated carbon feeding system to deal with occasional deterioration of the raw water quality; however, the unit was outdated and no longer met current regulations. To upgrade this equipment, Eau du Sud Parisien contacted Sodimate to design and install a new activated carbon preparation and distribution unit. The objective was clear: design and install a new system taking into account the technical, safety, and environmental dimensions of the project. To do this, Sodimate chose to use the proper equipment to design a customised installation to meet the needs of their client.

Integrating Sodimate's standard equipment to design a customised installation

Founded in 1980, Sodimate specialises in the design and installation of equipment for storing, dosing, dissolving, and mixing powdered re-agents. Over the last thirty years, whether it is drinking water, processed water or waste water, the company has acquired genuine expertise in handling dry re-agents specifically for water and sludge treatment such as: hydrated lime, activated carbon, quicklime, microsand, etc. Their services range from providing reliable and efficient equipment,

integrating designs, automation,

In order to use only one type of activated carbon, slurry tank process was designed using load cells to, among other things, control accurately the percentage concentration of the solution. All the Each piece of equipment is automatically controlled and monitored.

and technical assistance. Although the goal is often the same in designing plants, the characteristics vary from one project to another; hence, Sodimate offers custom designs and turnkey solutions to meet the customer's needs.

For their client Eau du Sud Parisien, Sodimate was commissioned to replace the old 1960s PAC dosing and preparation plant in Viry-Châtillon. Three factors were considered while designing the new system, including: compatibility with the existing equipment, completion with the new ATEX regulations, and met the very precise specifications of Eau du Sud Parisien. "*The first difficulty consisted of removing all the old equipment*," explained Stéphane Zuddas, Project Manager for Eau du Sud Parisien. After much consideration, the choice was made to keep the old plant layout despite

their particular configuration: two 70 m3 flat base concrete silos each with three levels: the highest, for storing carbon. The second and lower levels, about 20m² each, house the silo dischargers and feeding system and slurry mixing into the three settling tanks respectively.

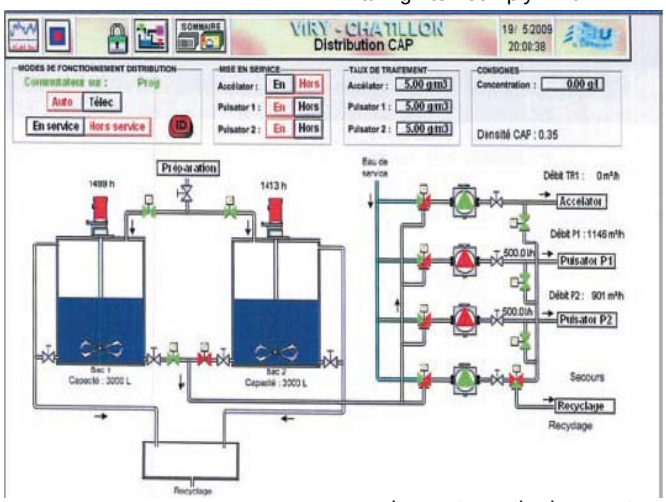
"*Submitting the entire plant to ATEX specifications created considerable installation constraints, generating significant increases in costs"*, explains Zuddas. Dividing the facility into 3 working areas (PAC storage, ATEX discharge and feeding system, and slurry mixing and injection) was the best compromise to meet ATEX norms and reduce costs.

Selecting and installing the equipment

The two concrete silos overlooking the station were upgraded by installing anti-explosion valves. The lower room had to meet ATEX regulations. "This lone room," explained Zuddas, "had to match different requirements: the existing equipment, ATEX regulations, and food sanitation norms, and size constraints". To allow the plant to function 24 hours a day, 365 days a year, the two silos alternate in discharging carbon; the first silo discharge the carbon until it reach the intermediate level and switch to the other one. To remedy the problem created by their flat bottoms, two discharge systems are installed in each silo and split into two different feeders. "Thus," continued Zuddas, *if a breakdown occurs on a line, the process is capable of automatically switching to the second"*. At this level, each piece of equipment, each motor, and each seal is strictly compliant with ATEX requirements, as well as the food quality requirements.

"*We follow a standard that is very close to the agro-food industries,"* Zuddas emphasized, "*each piece of equipment installed must have a certificate and be validated by the owner. For example, each valve casing is both ACS certified and compliant with ATEX requirements"*.

To remove the constraints commonly associated with the use of different quality PAC, a new, innovative preparation device was installed with weighing cells to, among other things, control exactly the concentration of the solution. "*The advantage,"* explained Zuddas, "*is two-fold: it avoids the problems linked to use of different quality carbons and lets an aqueous solution leave the ATEX area at the lower room"*. The normal preparation cycle, that lasts 15 minutes (if necessary, an emergency procedure reduces this to less than 3 minutes), has several distinct phases to refine the dosing. Depending on the concentration needed by the operator, the quantity of carbon required is automatically set "to the gram". The amount of carbon calculated is then introduced in a small amount of water before being dissolved in a previously weighed volume of water, in general 300 litres, to produce the slurry. This preparation is then automatically distributed in two tanks that are used alternately. "*The main difficulty consisted in finding a weight indicator capable of weighing the carbon to the gram, then defining the times and speeds adapted so the powder would soak properly"* stated François Jacob, Sales Director with Sodimate. Regardless of the carbon used, this technique of preparing the activated carbon ensured accuracy, safety, and autonomy without having to comply with ATEX requirements on the lower retention tanks.



Designing an easy to operate and reliable distribution unit

When the slurry preparation is finished, the desired quantity must be distributed in each of the three settling tanks at a specific dosing rate. To do this, four distribution lines (progressive cavity pumps) were installed, three remain on duty and one standby for maintenance purposes. Sodimate chose four booster pumps with offset rotors from PCM to adapt their solution to the process. In the first layout of the customer specifications, the skid pumps were positioned horizontally, "*For safety reasons,*" stated Pierrick Labat, Head of Works Agency, Eau du Sud Parisien. *"We wanted a station that was easy to maintain and did not endanger operating or maintenance personnel"*. As a result, Sodimate considered installing the skid pumps vertically to free up floor space and ensure easy access for maintenance. After several attempts, the solution was validated and implemented. Now, the pumps operate by suction rather than "under pressure". "*The only constraint was that the pump had to be completely water-tight to be operational*," stated Jacob. One by one, the equipment was mounted, installed and tested. Because the access doors were too narrow, the preparation tanks and cisterns were assembled and welded inside the facility. The installation was then configured to the technical, safety and environmental requirements, in accordance with the specifications of the operator. Among these were: a station capable of processing from 0 to 50 grams/m^3 of PAC to treat from 800 to 5000 m^3/hour of water, compliant with ATEX norms,
easy to maintain, fully automated with weekly cleaning cycles, and with zero waste. In case of PAC slurry overflow, the processed

Completely monitored on-site, the installation is also connected to the control room, which displays the levels, preparation, and slurry concentration statuses in real time.

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easy to maintain, fully automated with weekly cleaning cycles, and with zero waste. In case of PAC slurry overflow, the processed water can be re-introduced at the head of the plant.

The completed unit can be monitored locally or within the control room on control screens that display the levels, the preparation, and the concentration statuses. All production/consumption process reports are archived in Lyonnaise des Eaux database, for review and statistics.

Commissioned and installed at the end of 2007 and later completed at the beginning of 2008, the PAC treatment system has proven its reliability and efficiency. For Jean-Louis Le Hir, it reflects the policy of ongoing improvement and optimisation of the processes implemented by Lyonnaise des Eaux to improve safety and working conditions while reducing maintenance time. "*This dosing unit, which corresponds to all regulatory requirements, is safer, easier to manage, more cost efficient, and reduces the use of reagents and energy costs. It perfectly illustrates our logic of progressive improvement and our commitment to offering the customer a product of higher quality.»*