

STAINLESS STEEL & WATER

Initial state of the network

Maintenance and replacement of network.

Fragility

50% of the water supply is from the water source (buried aqueducts) and 50% from water plants. Recent surface water is a problem of old pipes break when frozen. Recent surface water is a problem because old pipes break when it freezes. Low temperatures cause breakage: the expansion of water as a result of freezing causes pipes to crack. The cold winters of recent years have exacerbated this problem. The faulty pipes are changed and replaced with pipes with the same characteristics (size and materials).

Work

For the replacement and renewal of the network, the city of Paris makes two to three visits per year and handles sewerage works in two ways:

Internally;

Externally (subcontracting).

For the work done by private companies, the city issues calls for tender for competition. However, it imposes the constraint of renewing the network with identical characteristics.



For each rehabilitation program, the city has a budget based on the precise nature of the work (applying a coefficient of coercion if necessary). This work requires some organization to the extent that the affected roads are closed during all operations.

There is a system for coordinating the work of all the subcontractors managed by the services of the City of Paris.

Constraint: Once a road has been asphalted, it is not possible to change it for 30 years, except in exceptional cases.

Pipes must sometimes be moved, especially since the development of the burial of power cables and the construction of the tram network.

Material

Parisian water systems are primarily made of cast iron. Some are "Marquise" cast iron (weaker), others ductile iron (mixture of gray iron and "féodal": close to steel). The largest diameters (greater than 2500 mm) are reinforced concrete.

Maintenance and replacement of network.

Each year, 70 million euros are allocated for maintenance of the water supply network. Revenues totaled 300 million euros.

Only a small part of the network is replaced. Maintenance work favors renovation. This consists in setting up a "Gibault" joint between two pipes to stop leakage (perfect seal).

Network of undrinkable water

Undrinkable water (UW) is treated minimally. This is the filtration of sediment and suspended solids.

The network has three treatment plants:

- La Villette;
- Auteuil;
- Austerlitz (new plant).

Use

The UW is used primarily by:

- The gardens, including that of the Tuileries;
- The woods (Boulogne and Vincennes);
- Street-cleaning Services.

Squares mostly use the (drinkable water) DW supply network.

The main problem with the UW network is that it is poorly understood. There is little data on its operation. In addition, the low maintenance budget cannot keep it in good operating condition. There is no maintenance policy for the UW network; it is funded by the sale of DW. Eau de Paris (the water utility of the city of Paris) does only emergency work on the UW network (maintaining continuity of service by repairing broken parts without any change of characteristics). For budgetary reasons and water saving over, half of sewage flushing tanks have been destroyed, the latter supplied by the undrinkable water mains. Today, this strategic choice is problematic

since some sewers are drained and the water is stagnant. The decrease in cisterns has increased the difficulties of monitoring and regulating, particularly during water stress, or conversely, following heavy rains.

Diameters

The UW network has pressure problems due to breakage or obstruction

The average diameter of the network is unsuited to the needs (250 mm diameter in the majority) which leads to problems of water circulation. There is no filter, which results in a deposit of sludge in the pipes. In the state of its current use, the network would be optimized with pipes of 200 mm in diameter.

Budget and Future

Until 2012, the budget for UW has been 0 euro. This network is not subject to the system of water service. It depends on the general budget of the city. The future of the UW network was set on March 20, 2012. It will be maintained.

The equipment (plants, tanks...) of this network is bulky. Due the increase of the cost of real estate, changes must be considered. In addition, new technologies allow a significant gain of space; networks and equipment can be buried.

What to remember...

Compared to the maintenance of water pipes of Paris, tracking is managed either by the city of Paris, or by subcontractors.

For rehabilitation programs, once a road has been coated, it is impossible to change it for 30 years, apart from exceptional cases.

For the water supply network, maintenance work is done by favoring renovation at a cost of 70 million euros

For the undrinkable water network, the situation is more critical. Maintenance is minimal and leakage occurs due to a limited budget. The question of keeping it arose recently in the city council of Paris and its new development opportunities are not yet revealed.

The use of stainless steel

Benefits

Flexibility

The main advantage of stainless steel is its flexibility. It is very easy to work and can take any form desired. It is already used for parts of the DW supply network, including at crossroads.

Durability

Besides the advantage of its flexibility, stainless steel is completely recyclable, which compensates for its relatively high purchase price. It appears to be a durable material. Moreover, it is highly resistant to corrosion and therefore requires less maintenance. Its sustainability over time, however, depends its chromium content.

Disadvantages

Stray currents

Eau de Paris uses very little stainless steel. In addition, the underground in Paris is subject to a great amount of stray currents. The problem of stray currents has been extended since the introduction of the Tram (potential difference). Stainless steel captures these currents unlike cast iron or reinforced concrete. The electricity captured has the potential effect of prematurely corroding pipes. The use of stainless steel material would require isolating it from currents. The sealing is done using dielectric seals (electrically insulated) with a current terminal on each side to check the input and output currents (anodes and cathodes). These seals require a periodic dielectric.

A stray current (or eddy current) is a low-value electric current flowing in a uncontrolled fashion in media and conductive materials (earth, metal pipes, steel in reinforced concrete of buildings, etc.), other than appropriately-designed equipment (wire, cable, ect.).

Material compatibility

Most networks (DW supply and UW) are cast. Two materials of different characteristics in contact corrode. The use of stainless steel pipes seems compromised, including replacement of the pipes:

Contact with the adjacent piping (cast iron) would result in premature corrosion;

The use of two different materials requires the establishment of specific seals;

The use of stainless steel implies strong constraints for the network operator (Staff training, welding work in a gallery...)

In addition, the proliferation of materials ultimately causes the growth of specialized agents for each material, and therefore higher costs.

Costs

As seen above, the use of stainless steel would result in costs incurred:

Multiplication of competencies and thus specialized agents;

Establishment of monitoring and controls of stray currents;

Establishment of protection against abnormal ducts wears (steel/cast iron junction)

In addition, stainless steel has a higher purchase cost than other materials currently used like cast iron, which has a life span of over 100 years. Therefore the advantages of stainless steels are limited.

Uses

DW supply Network

The use of stainless steel pipes seems to be difficult and unwise in terms of its constraints. However, there are potential markets for this material:

The new small-scale networks operating without interconnection with other networks such as: concerted activity areas, new cities, districts...

On a larger scale in the private network of individuals.

The public corporation "Eau de Paris" encourages the use of cast iron for maintenance purposes. "Eau de Paris" masters cast iron much better than stainless steel. However, the choice of materials is the responsibility of the developer and the builder (including for concerted activity areas). The urbanization of the Paris region has grown significantly and will expand even more as part of the "Greater Paris" programm. The suburbs seem to be an interesting market for stainless steel.

Regarding private networks, pipes in buildings formerly made of lead, have been replaced with PVC pipes (around 2006). This material is permeable and now the question of their replacement is raised. Stainless steel could be used. Stray currents, as well as compatibility with other materials are not an issue to the extent that network is located beyond the water meter.

The choice of stainless steel will largely depend on its cost, including the percentage difference between the price of "normal" steel and that of "stainless" steel.

UW Network

The future of UW network is under discussion. The removal of this network would cost between 360 and 480 million euros. Given the state of the network, the cost of destruction is almost equal to the cost of rehabilitation. Furthermore, the existence of a UW network, in a city such as Paris, seems an opportunity at this time of climate change. The development of this network would abound in the direction of more sustainable management of water resources.

Other countries, including England and Belgium, have greatly expanded the use of UW, including the recovery and use of rainwater.

The rehabilitation of the UW, would require significant work, which could be favorable to stainless steel. Several potential markets can be targeted:

- Plants;
- Woods and gardens;
- Private networks and use.

Regarding plants, "La Villette" would be enlarged. For reasons of hygiene and durability, stainless steel could be used for equipment.

The "Austerlitz" plant is new.

The "Auteuil" plant would be destroyed or restructured. This factory is located in an area where land is very expensive. Thanks to new technology, the plant could be buried. This could benefit the restructuring of the steel market.

The air-conditioning company Clim space is located near the "Auteuil" plant. It uses the water of the Seine for cooling. This company may use the UW (guaranteed water all year round even during low flow periods). In addition, its water consumption would be largely equivalent to the production of Auteuil. Facilities in this plant could be stainless steel.

The use of stainless steel should also be extended to consumers, including business consumers of UW (or DW supply). In addition to the firms, the UW can be used by individual consumers. The desire to reduce water consumption should encourage the use of UW and particularly of rainwater. The idea is the same for public consumption (woods and gardens). However, for public uses, special attention must be given to regulations.

What to remember...

Stainless steel has the advantage of being both flexible and durable, which makes installation really easy.

Compared to the potential market for stainless steel in Paris, it is small for the network of drinking water supply, but it can be profitable for the new networks in places such as concerted activity areas and private networks of individuals.

As for the undrinkable water system, there is equipment to be installed even if the prospects remain unclear. The potential market would be in plants, in woods and gardens and private networks.

Conclusion

Historically, the water network is made of cast iron (for small networks) and concrete (for large networks). The Mayor of Paris (water network owner and manager) has the will to fix and improve the network with initial materials.

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<ul style="list-style-type: none"> -Little maintenance -Recyclability 	<ul style="list-style-type: none"> -Cost -Current material: reliable, resistant -Stray currents -Requirement for stainless-steel specialists.

POTENTIAL MARKET

- Reconstruction of non-drinking water network
- Flush tanks
- Home network
- Concerted activity areas
- New cities: Greater Paris project ("Grand Paris")

There is a potential market for stainless steel in the Paris drinking and non-drinking water network. Nevertheless, existing networks are not concerned. Stainless steel could be used in futures developments. It would be used principally for closed networks and/or home networks.

Sources

Mairie de Paris:

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