

## A pipe-crawling drone helps anticipate and rationalise dredging operations.

*Thanks to its partnership with a Carnot Institute, SARP, a subsidiary of French group Veolia Environment, is able to offer a faster and economical assessment to local communities with its new drone "PREDIRE".*

### Supporting Innovation

The use of video to inspect sewer pipes for maintenance work has been in use for quite a while. But such a solution quickly reaches its limits in the case of a partially clogged drain. With PREDIRE, the exploratory analysis can be carried out whatever the environment. Indeed, the fully autonomous unmanned vehicle can move across a broad variety of terrains (grease, mud, sand) by means of a worm screw propulsion system and climbs up and down obstacles very easily.

The wireless and pilotless explorer can travel distances up to 1.2 km per day. The robot is able to take high-definition photos every 10 seconds, thus providing the teams with the necessary data to estimate what is actually needed in terms of dredging operations or in relation with the sections to be treated.

This most effective preventive economical maintenance process therefore allows to save on very costly operations.



### The client needs

ISARP, a subsidiary of French group Veolia Environment, results from mostly the aggregation of several, sometimes 100-generation old, family-run businesses.

The 150 agencies making the group provide sewer maintenance for the municipalities and local communities. Dredging clean-up operations require heavy equipment fitted with high-pressure pumps. The company has asked to limit this type of maintenance operation to a strict minimum by way of preventive inspections since 2014. To this end, SARP made field requirements to the TN@UPSaclay Carnot Institute (CEA LIST).

Now four years later, PREDIRE is able to move across pipes up to 20-30 cm diameter, ie across 70% of the sewer network. The data thus collected has enabled SARP to significantly improve its knowledge and learn about the sewing pipes by implementing a reliable predictive maintenance strategy. SARP is able to provide its 100 000 customers, as a result, with a very innovative and competitive cost-constrained service offering, including both a drone pre-diagnosis and dredge optimisation.

### Partnership

The CEA LIST is a tech institute dedicated to smart digital systems and is labelled as TN@UPSaclay Carnot Institute. In response to SARP's needs, without any technological a-priori, the teams collaborated iteratively by applying the so-called Archimedes screw or worm screw for the propulsion system. Linked to a dedicated control system the drone scans and refines its approach, as it moves through the detected environment.

Two patents protect this innovation, moved to a state of industrialisation at the end of 2018.

The Carnot researchers have worked from an expression of requirements. They have managed to apprehend all issues and constraints and conceive a built-in system through a collaborative R&D interactive partnership. The robust PREDIRE inspection system is already being operated by SARP and has been introduced on newly gained markets. Used internally for now, the device could well be marketed widely in the near future.