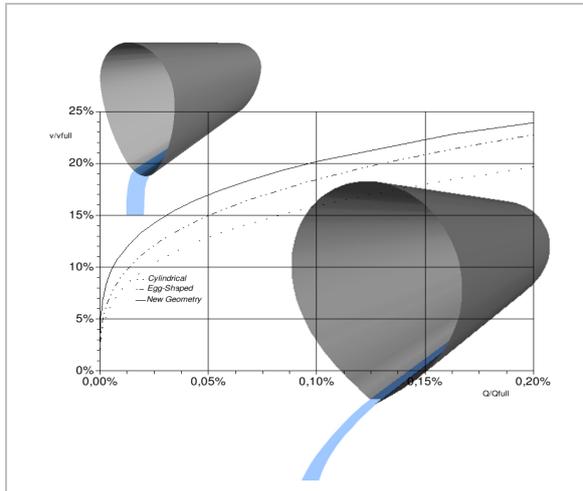


ULL TECHNOLOGY OFFER

TITLE: Tubular element of nonconventional section that increases the speed of the flow in sewage and storm drainage

TYPE: PRODUCT PROCESS USE



FEATURES:

Tubular element made of concrete, fiberglass reinforced plastic, PVC, polymer concrete, etc. with a nonconventional geometry that increases the relative speed with minimum discharge in open flow.

The geometry of the solid cross section also counteracts the effect of stress concentration and adds new functionality.

PROBLEM SOLVED:

Sewage and storm drainage systems often suffer from very low speed of the flow when the discharge is minimum, say 0.1% of the full pipe discharge or lower. Low speed of the flow produces sedimentation and partial or eventually total blockage, anaerobic conditions in waste waters and, consequently, generation of hydrogen sulphide, a foul-smelling and very toxic gas.

To avoid these problems, instead of the cylindrical pipes egg-shaped ones have been used, but the improvement sometimes is not enough.

ADVANTAGES:

- The speed of the flow is more than 20% of the full pipe speed when the relative discharge is 0.1% of the full pipe discharge (relative speed is 15.9% in cylindrical, and 18.5% in egg-shaped pipes for a relative discharge of 0.1%).
- The relative speed of the flow is over 17% when the relative discharge is 0.05% (relative speed is 12.8% in cylindrical and 14.9% in egg-shaped pipes for a relative discharge of 0.05%).
- Solid cross section improved to avoid stress concentration side effect.
- Do not need special manufacturing or installation facilities: just those as for egg-shaped pipes.

APPLICATIONS:

Manufacture of pipes to be used in sewage and storm drainage systems

READINESS FOR PRODUCTION:

IMMEDIATELY (Proof of Concept done) SHORT TIME (Prototype is needed) LONG TIME (R&D is needed)

GOAL: LICENSE AGREEMENT COLLABORATION R&D/TEST INVESTMENT IN SPIN-OFF

IPR STATUS: PATENT APPLICATION FILED BY ULL September, 2009 KNOW-HOW PROTECTION

REFERENCE (OTRI CODE): P200901922

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Tubular element of unconventional section that speeds up the flow in sewage and storm drainage

Problem Description

Sanitation networks sometimes have problems of low flow rate, especially in joint sewage and storm drainage networks which must be sized to operate with a very wide range of flows.

Joint network collectors usually have a great size to carry stormwater. Since too high flow rates with full pipe could break the collector, the slopes of the inverts should be moderate. This and other reasons, such as geometric constraints the terrain (for example, collectors parallel to the sea-shore), sometimes causes very low speed when the flow rate is very small relative to the design flow rate (for example, in early morning hours of dry weather). The low velocities in the flow of sewage produce on the one hand, problems of settling of solids and, secondly, the growth of organisms under anaerobic conditions and the generation of hydrogen sulphide.

Prior Art

To increase the speed of the flow with low flow rates, egg-shaped section tubes have been used as an alternative to the circular cross section.

The egg-shaped collectors, also known as ovoids, are constructed either in situ or using precast concrete pipes, fiberglass, PVC, etc. The manufacturing techniques to produce ovoid pipes are essentially the same as those to produce pipes of circular cross section, excluding of course spinning techniques.

Proposed Innovation

We propose the use of pipes with some inner cross sections alternative to the circular and ovoid. These inner sections provide greater relative velocities where the flow rates are very small. Its use solves the problems of sedimentation and sulfide generation resulting from low flow rates.

Some of the sections for which the patent is sought reach relative speeds $v/v_{full} = 20,1\%$ with relative flow of 1% over the full section flow rate, and relative speeds of $17,0\%$ with relative flow of 0.5% (Fig. 2).

This allows to get good flow speeds with minimum flows rates, and at the same time not exceeding maximum speed when the collector is full or almost full.

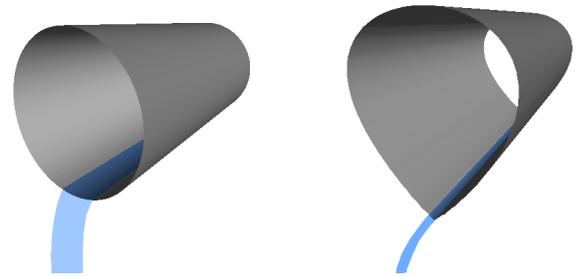


Figure 1: Stream flow of $Q/Q_{full} = 0.5\%$ in a circular collector and one for which the patent is sought.

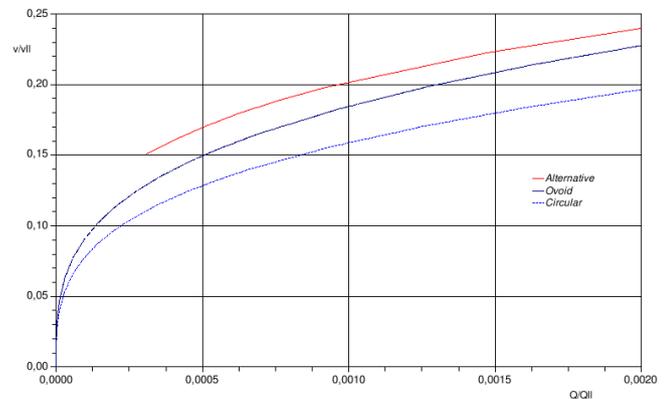


Figure 2: Relative speed versus relative flow in circular, egg-shaped and one of the proposed sections

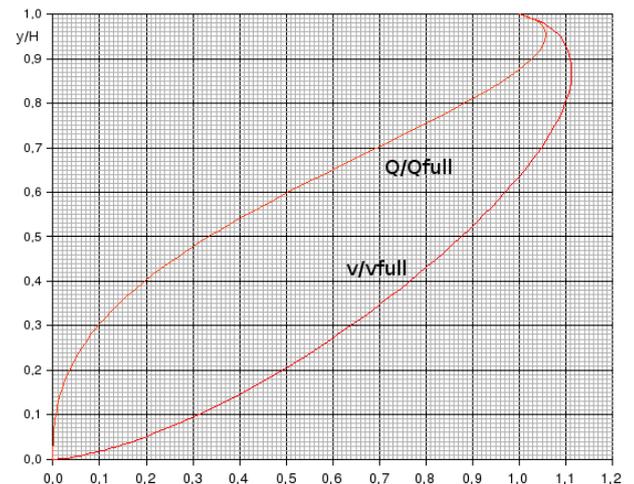


Figure 3: Relative speed and flow rate versus relative depth y/H of one of the proposed new sections

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