

Method for transporting water comprising soil particles through a pipeline and flexible peripheral body evidently intended for the method

The invention relates to a method for transporting water comprising soil particles
5 through a pipeline. The invention likewise relates to a method for laying a pipeline for transporting water comprising soil particles, and a flexible peripheral body evidently intended for the methods.

A regularly employed technique for building and strengthening dikes, for the purpose of
10 widening beaches (sand suppletion), raising land areas or constructing artificial islands, comprises of reclaiming sand. During reclamation water with sand and dredged slurry is pumped by a dredging vessel via steel conduits onto a reclamation site.

During reclamation of water comprising soil particles the process water flowing away
15 from the reclamation site may not be discharged directly into a natural water basin, such as for instance the sea. This is because the water still comprises a suspension of relatively fine soil particles which could cloud the seawater and damage the environment. In order to remove the relatively fine soil particles from the water, the water can for instance be carried through a settling basin. The settling basin will
20 however not generally connect directly to the reclamation site and the water comprising soil particles has to be pumped to the settling basin.

A known method for transporting the water comprising soil particles comprises transport thereof through a pipeline. According to the prior art pipelines are constructed
25 from steel pipeline parts (usually of 12 m in length and with diameters of 500 mm and more) which are provided for coupling purposes with end flanges having bolt holes. A pipeline is obtained by laying a large number of such pipeline parts mutually in line, wherein the end surfaces of the end flanges make mutual contact. The pipeline parts are then coupled one by one by arranging bolts through the bolt holes and tightening them.
30 The water is carried through the pipeline by applying a pressure difference between an inlet and an outlet of the pipeline. Since large distances often have to be covered, the inlet pressure in a pipeline, in relation to the large diameters, can be relatively high, for instance in the order of magnitude of 2 bar and more. These pressures are necessary to be able to reach the required high flow rates in the order of magnitude of 10,000

m³/hour and more. Steel conduits are found to be well able to withstand possible wear by the soil particles still present in the process water.

The known method is costly and extremely labour-intensive, but is applied a great deal
5 because only coupled steel conduit parts are deemed able to meet the above stated requirements.

The present invention has for its object to provide an improved method for transporting water comprising soil particles through a pipeline.

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Provided according to the invention is a method for transporting water comprising soil particles through a pipeline, wherein a pressure difference is applied between an inlet and an outlet for the water, wherein the pipeline comprises a flexible peripheral body with a length of at least 300 m manufactured from plastic foil, wherein the peripheral
15 body can be brought from a substantially flat state, in which peripheral parts lie on one another, to an inflated state in which the peripheral body has a throughflow area of at least 0.15 m².

It has been found that a relatively low pressure in the order of magnitude of 0.2 bar is
20 sufficient to bring the peripheral body into the inflated state. In the inflated state the peripheral body has a throughflow area of at least 0.15 m². For a substantially circular cross-section this corresponds to a minimum diameter of 400 mm. The use of the flexible peripheral body makes it possible to lay a pipeline for a fraction of the cost price of a pipeline consisting of coupled steel pipeline parts. Surprisingly, it is found
25 that a peripheral body according to the invention can cope with the pressures and flow rates required for transporting water comprising soil particles through a pipeline, and is moreover found to be sufficiently wear-resistant.

It is noted that from US 2006/0000515 A1 the use is known of a floating flexible
30 pipeline for emptying a manure lagoon. The floating pipeline comprises flexible hoses coupled to each other. The pipeline is inflated with air. According to [0015] suitable flexible hoses have a relatively limited diameter of for instance 30 cm (12 inches) and a working pressure lying between about 3.5 bar (50 psi) and 21 bar (300 psi). The pipeline according to figure 4 has an estimated overall length of about 100 m (340 feet).

In the context of the present description of the invention the term “substantially” is understood to mean more than 90% of the indicated value or property.

5 The fixed costs include among others the purchase of the pipes, transport to the site and installation of the pipeline. It will be apparent that for a pipeline manufactured according to the invention from plastic foil each of these costs will be lower than for a steel pipeline. In addition to the fixed costs, the most important variable costs are associated with the pumping of the water through the conduit. These costs include the consumption of fuel and oils, possible hire costs, maintenance of the pump means and
10 the like.

Depending on the total volume of water comprising soil particles to be pumped in a desired period of time, an optimum distribution is possible between the fixed and variable costs. The number of pump means required and the consumption thereof
15 depends on, among other factors, the selected flow velocity in the pipeline. For the same pump flow rate (volume of water comprising soil particles per unit time) it is generally possible to choose between on the one hand placing a relatively large number of parallel conduits, thereby creating a relatively large overall throughflow area, whereby the conduit flow velocity and so also the pump consumption will be low, or on the other
20 hand placing a relatively low number of parallel conduits, thereby creating a relatively small overall throughflow area, whereby the conduit flow velocity, and so also the pump consumption, will be high.

It is advantageous to opt for a conduit flow velocity higher than a critical velocity at
25 which the fine soil particles settle and the pipeline can eventually silt up. A bottom can comprise particles of different particle size. Gravel for instance thus comprises particles with an average particle size of more than 2 mm, sand comprises particles with an average particle size of between 0.063 mm and 2 mm, slurry comprises particles with an average particle size between 0.063 mm and 0.002 mm, and finally clay comprises
30 particles with an average particle size of less than 0.002 mm. The method for transporting water comprising soil particles through a pipeline is aimed particularly at water comprising fine soil particles, this being understood to mean a suspension of soil particles with an average particle size of 0.1 mm in water.

An embodiment of the invention comprises a method wherein the peripheral body is manufactured from plastic foil reinforced with reinforcing fibres. This embodiment allows the inlet pressures to be increased so as to obtain a higher flow rate. Another embodiment relates to a method wherein the peripheral body is manufactured from a
5 fabric of reinforcing fibres coated with plastic foil.

The plastic used in the plastic foil can comprise any known thermoplastic polymer. The plastic is preferably chosen from the group comprising polyurethanes, vinyl polymers such as for instance polyvinyl chloride, and polyolefins such as for instance
10 polyethylene. A polyurethane foil and/or polyvinyl chloride foil are particularly suitable.

In yet another embodiment of the invention a method is provided wherein the reinforcing fibres comprise organic fibres, preferably polyester fibres, and/or inorganic
15 fibres, preferably glass fibres. It is also possible to apply carbon fibres and/or UHMWPE fibres. These latter have the advantage that they have an exceptionally low density and will therefore display a certain buoyancy in floating pipelines.

The thickness of the plastic foil can likewise be chosen within broad limits, wherein this
20 will depend on the requirements set in respect of pressure and flow rate. The greater the diameter chosen for the peripheral body, the thicker the wall of the peripheral body generally has to be. The wall thickness of the peripheral body preferably amounts to at least 0.8 mm, more preferably at least one millimetre and most preferably at least 1.2 mm.

25 In order that the advantages of the invention become still more manifest, an embodiment of the inventive method provides a plastic foil with a tensile strength amounting to at least 70 kN/m, more preferably at least 140 kN/m. Such strengths are for instance imparted by plastic foils reinforced (particularly) with polyester fibres, in
30 particular polyvinyl chloride foils.

According to the invention continuous lengths of 300 m and more are readily possible. In an embodiment in which the peripheral body is manufactured from a fabric of reinforcing fibres coated with plastic foil the length of the fabric on the roll is generally

at least 2 km. Using a per se known loom fabric lengths of up to 10 km can be produced in one operation with full 'bobbins' of polyester thread. The continuous length of the peripheral body preferably amounts in one embodiment to at least 500 m, more preferably at least 1 km and most preferably at least 2 km. Such continuous lengths
5 provide for a uniform strength over the trajectory of the pipeline and can be transported in standard ship containers.

In a further embodiment of the method according to the invention the pipeline comprises a number of the peripheral bodies, wherein the peripheral bodies run parallel
10 to each other between the inlet and the outlet. Providing a pipeline in the form of a number of peripheral bodies with a throughflow area of at least 0.15 m² running between the inlet and the outlet and connected in parallel enables a relatively high flow rate to be achieved with a relatively low energy consumption, wherein a throughflow velocity is moreover achieved which exceeds the critical velocity. A typical critical
15 velocity can for instance amount to 1 m/sec.

The number of peripheral bodies can be chosen within broad limits, depending on the conditions on site. A suitable embodiment of the method has the feature that the number of peripheral bodies lies between 1 and 15, more preferably between 2 and 10 and most
20 preferably between 4 and 8.

The advantages of the invention become further manifest in an embodiment in which the pressure difference between the inlet and the outlet amounts to a maximum of 2 bar. By applying one or more peripheral bodies according to the invention only a small
25 pressure difference is required to achieve the set objectives. In another embodiment the method according to the invention is characterized in that the pressure difference is applied by pump means with an (overall) capacity of a maximum of 1500 kW. The method according to the invention does indeed allow such a low energy consumption (relative to the pumped flow rate), this having great advantages in respect of CO₂
30 emission and other environmental requirements.

The peripheral body can be formed from flat plastic foil. In such an embodiment a side edge of a flat foil is folded over in the transverse direction thereof onto the opposite side edge, and the side edges are attached to each other, preferably by an adhesive and/or

welded connection. The welding or adhesion of the connecting seams can take place in the factory as well as at the site itself. A sufficient size of the overlap of the side edges to be connected (which corresponds to the width of the connecting seams) is preferably chosen so that the weld has a tensile strength greater than the intrinsic tensile strength of the plastic foil.

A peripheral body manufactured according to the above stated method has a substantially circular cross-section in the inflated state. In such an embodiment the connecting seams can run in the peripheral direction as well as in radial direction of the peripheral body. In the latter embodiment the connecting seams can run inward as well as outward, wherein the latter variant is recommended.

Yet another embodiment of the invention provides a method in which the cross-section of the peripheral body is divided in the inflated state into a number of compartments. Such an embodiment makes it possible to increase the average throughflow velocity at the same pressure difference without the flow rate being reduced appreciably.

In an embodiment the compartments can be formed by fixing to each other mutually opposite peripheral parts running in the longitudinal direction of the peripheral body, for instance by glueing and/or welding.

In an embodiment the pipeline can be constructed substantially from peripheral bodies coupled by means of coupling means. This is for instance the case when a pipeline of relatively great length is necessary, for instance more than 5 or 10 km long.

In an embodiment of the method the coupling means comprise steel and/or plastic pipes or pipe bends to which one or more peripheral bodies are connected. In an embodiment of the method peripheral bodies can likewise be coupled to each other, for instance by coupling means in the form of adhesive and/or welded connections. Welding can for instance take place by local heating with a resistance element or hot air or a high-frequency sound source, after which the two peripheral parts to be connected are pressed into each other with pressure rollers.

- A pipeline constructed with the flexible peripheral body can extend over great distances of more than 10 km if this is necessary. It is advantageous here to provide an embodiment of the method in which the pressure difference between inlet and outlet and the throughflow area is chosen such that the soil particles in the pipeline remain
- 5 substantially in suspension in the water. Settlement of the fine soil particles in the pipeline is hereby substantially avoided. Coupling means in the form of steel or plastic pipes and/or pipe bends avoid the peripheral body collapsing locally, this likewise helping to avoid the danger of settlement.
- 10 In another embodiment of the method for transporting water comprising soil particles through a pipeline, the pipeline constructed from the peripheral body runs substantially horizontally between inlet and outlet. This has the advantage that no additional static pressure is exerted on the pipeline.
- 15 It is further advantageous to characterize the method according to the invention in that the water comprising soil particles is collected in a feed water basin to which the inlet of the pipeline connects. The water comprising soil particles present in the feed basin provides for a static inlet pressure in the pipeline when the height of the water column is greater than the height position of the inlet. Because the feed basin has a certain height,
- 20 the water column cannot exceed this basin height - the water will then overflow - whereby the inlet pressure remains limited. The feed water basin therefore acts as a pressure safeguard for the flexible pipeline.

In order to enable treatment of the water and make it dischargeable into a natural water

25 basin an embodiment of the method has the feature that the water comprising soil particles is collected in a discharge water basin to which the outlet of the pipeline connects, in which discharge water basin the soil particles settle.

It is advantageous here for the outlet of the pipeline to connect to pump means which

30 pump the water into the discharge basin. If desired, the part of the pipeline situated between the pump means and the discharge basin can be embodied as a steel conduit part, preferably with a height difference. In this embodiment the discharge basin can protrude partially above ground level, for instance by building a ring dike.

In an embodiment of the method the water present in the discharge water basin is subsequently carried to a natural basin once a substantial part of the soil particles has settled. A natural basin can comprise an (inland) sea, a river, a lake and the like.

- 5 The invention also relates to a method for laying a pipeline for transporting water comprising soil particles. The method comprises of providing a flexible peripheral body with a length of at least 300 m manufactured from a plastic foil, wherein the peripheral body can be brought from a substantially flat state, in which peripheral parts lie on one another, to an inflated state in which the peripheral body has a throughflow area of at
10 least 0.15 m², transporting the peripheral body in folded state to a site with a transport means and unrolling the peripheral body from the transport means along a desired trajectory for the pipeline. Depending on the thickness (strength) of the chosen plastic foil, 7 km of pipeline can for instance be transported in a single 40-foot standard ship container. Such transport is much simpler than transporting steel conduit parts pipe by
15 pipe for the purpose of laying a steel pipeline kilometres in length. It will be apparent that, when laying the pipeline according to the above stated method, any embodiment of the peripheral body can be provided if desired.

Another embodiment of the method according to the invention has the feature that the
20 transport means advances along the trajectory during unrolling.

The invention likewise relates to a flexible peripheral body with a length of at least 300 m manufactured from plastic foil, wherein the peripheral body wherein the peripheral body can be brought from a substantially flat state, in which peripheral parts lie on one
25 another, to an inflated state in which the peripheral body has a throughflow area of at least 0.15 m², the peripheral body evidently being intended for an embodiment of the invented method.

The method according to the invention will now be further elucidated on the basis of the
30 following description of preferred embodiments and figures, without the invention being limited thereto. In the figures:

figure 1 is a schematic side view of a pipeline according to an embodiment of the invention;

figure 2 is a schematic side view of a pipeline according to another embodiment of the invention;

figure 3A is a schematic cross section of an embodiment of the peripheral body according to invention in inflated state;

5 figure 3B is a schematic cross section of another embodiment of the peripheral body according to the invention in inflated state;

figure 3C is a schematic cross-section of yet another embodiment of the peripheral body according to the invention in inflated state;

figure 4 is a schematic perspective view of a transport means with peripheral body in pressureless state according to an embodiment of the invention; and finally

10 figure 5 is a schematic side view of a device for manufacturing the peripheral body according to an embodiment of the invention.

Referring to figure 1, a method for transporting water 2 comprising soil particles through a pipeline 1 is illustrated. The water 2 comprising soil particles is pumped from a reclamation site 3 by means of a pump 4 through pipeline 1 to a discharge water basin in the form of settling basin 6 bounded by means of a ring dike 5. Pump 4 applies a pressure difference between an inlet 7 and an outlet 8 for water 2, wherein the pressure difference between inlet 7 and outlet 8 and the throughflow area is chosen such that the soil particles in pipeline 1 remain substantially in suspension in the water. The water remains standing in settling basin 6 for a determined period of time until the soil particles have substantially settled. The water present in settling basin 6 is carried for instance to a natural basin (not shown) such as the sea once a substantial part of the soil particles has settled.

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According to the invention at least a part of pipeline 1 comprises a flexible peripheral body 10 with a length 9 of at least 300 m manufactured from plastic foil. Peripheral body 10 can be brought from a substantially flat state (shown in figure 4), in which peripheral parts (10a, 10b) lie on one another, to an inflated state (shown in figures 3A, 3B and 3C) in which the peripheral body has a throughflow area of at least 0.15 m². In a preferred embodiment peripheral body 10 is manufactured from a fabric of polyester fibres coated with polyurethane or polyvinyl chloride foil. Such a plastic foil has a tensile strength of about 150 kN/m.

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In the embodiment of the method shown in figure 2 the water 2 comprising soil particles is collected in a feed water basin 9 to which an inlet 17 of the flexible pipeline in the form of peripheral body 10 connects. Feed basin 9 is bounded by dike bodies 11 and 12. The water column 19 comprising soil particles present in feed basin 9 provides for a static inlet pressure in pipeline 10. Because dike bodies (11, 12) have a certain height, the water column 19 cannot exceed this basin height because the water then overflows. The maximum inlet pressure thus remains limited by the water column 19 which corresponds to the height of dike bodies (11, 12), and feed water basin 9 therefore acts as a pressure safeguard for the flexible pipeline 10. In the embodiment shown in figure 2 pipeline 1 comprises three parts (1a, 10, 1b). Part 1a of pipeline 1 is situated between pump 4 and feed basin 9 and is embodied as a steel conduit part. This part 1a spans the height difference between reclamation site 3 and the top of dike body 11. Water 2 comprising soil particles is carried by pump 4 from reclamation site 3 via this conduit part 1a into feed basin 9. The part extending from feed basin 9 to discharge basin 6 comprises the flexible peripheral body 10. The pipeline part between inlet 17 and outlet 18 constructed from peripheral body 10 runs substantially horizontally. This has the advantage that no additional static pressure is exerted on pipeline part 10. Outlet 18 of the flexible pipeline part 10 connects to a second pump 14 which pumps the water 2 to discharge basin 6 via a third part 1b of pipeline 1 situated between second pump 14 and discharge basin 6. The third part 1b is likewise embodied as a steel conduit part and spans the height difference between outlet 18 and the top of ring dike 5. The steel parts (1a, 1b) of pipeline 1 can function as coupling means for pipeline parts comprising the peripheral body 10. The flexible pipeline part can consist of a continuous length of peripheral body 10, but can also be constructed from peripheral bodies 10 mutually coupled by means of adhesive or welded connections.

Referring to figures 3A and 3B, embodiments of a peripheral body 10 are shown wherein the cross-section of peripheral body 10 in the shown inflated state is substantially circular. Such a peripheral body 10 can be obtained by folding over a flat foil in the transverse direction thereof, wherein side edges of the foil are laid a determined distance over each other and form an overlap 101. Welded connecting seams 102 are formed by locally heating the overlapping portions 101. In the embodiment shown in figure 3A the connecting seam 102 runs in the longitudinal direction of peripheral body 10 and the overlapping portions 101 in the peripheral

direction 103 of peripheral body 10. In the embodiment shown in figure 3B the connecting seams 102 run in the longitudinal direction of peripheral body 10 and the overlapping portions 101 in a radial direction 104 of peripheral body 10. Connecting seams 102 run outward here.

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In the embodiment shown in figure 3C the cross-section of peripheral body 10 is divided in the shown inflated state into a number of compartments (10a, 10b, 10c,...). Such an embodiment makes it possible to increase the average throughflow velocity at the same pressure difference without the flow rate of the water 2 through compartments (10a, 10b, 10c,...) being reduced appreciably. The compartments (10a, 10b, 10c,...) are formed by fixing to each other, for instance by glueing and/or welding, mutually opposite peripheral parts 105 running in the longitudinal direction of peripheral body 10.

- 15 The invention likewise relates to a method for laying a pipeline 1 for transporting water 2 comprising soil particles. As shown in figure 4, the method comprises of providing a flexible peripheral body 10 with a length of at least 500 m manufactured from a plastic foil, wherein the peripheral body 10 (or a plurality of peripheral bodies 10) is transported in folded state to a site with a transport means 20 and subsequently unrolled from transport means 20 along a desired trajectory for pipeline 1. By applying an inlet pressure the peripheral body is subsequently brought from the substantially flat state shown in figure 4, in which peripheral parts lie on one another, to the inflated state shown in figures 3A-3C in which peripheral body 10 has to have a throughflow area of at least 0.15 m². Transport means 4 moves along the desired trajectory of pipeline 1 during unrolling of peripheral body 10 onto a ground surface.
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A pipeline manufactured according to the invention provides great advantages compared to the known pipelines. This is illustrated below, wherein the comparison is made with a known steel pipe conduit (Known Example A), a flexible conduit known from US 2006/0000515 A1 (Known Example B) and a pipeline according to the invention (Example I).

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	Known A	Known B	Example 1
Pipe material	Steel	Fire hose	Foil pipe
Thickness (mm)	12	1	1
Yield stress [N/mm ²]	250		
Yield strength [N/m _{pipe}]	3,000,000	119,700	144,000
Max. diameter [mm]	900	76	760
Bursting pressure at max. diam. [Pa]	6,666,667	3,150,000	378,947
Bursting pressure at max. diam. [bar]	66.7	31.5	3.8
Safety factor [-]	2.0	2.0	2.0
Max. working pressure [bar]	33.3	15.8	1.9
Min. Flow rate [m ³ /s]	4.0	4.0	4.0
Critical velocity [m/s]	1.0	1.0	1.0
Min. Throughflow area [m ²]	4.0	4.0	4.0
Max. Pressure single pump [bar]	15	15	15
<i>Pressure loss</i>			
Slurry density [kg/m ³]	1,050	1,050	1,050
Friction factor λ [-]	0.015	0.015	0.015
Pressure loss at critical velocity [bar/km]	0.1	1.0	0.1
Distance [km]	7	7	7
<u>Pumping at maximum pressure:</u>			
<i>This means minimum pipeline to purchase, but more pump power and fuel input</i>			
Maximun frictional pressure loss [bar/km]	4.8	2.3	0.3
Corresponding velocity [m/s]	7.4	1.5	1.6
Number of pipes required [-]	1	599	6
Effective corresponding velocity [m/s]	6.3	1.5	1.5
Effective frictional pressure loss [bar/km]	3.5	2.2	0.2
Net pump power required [kW]	9,769	6,291	631

Table 1: comparison of pipeline according to the invention to a known pipeline

Table 1 shows that for the same requirements in respect of minimum flow rate, minimum critical velocity and distance over which transport is necessary, a pipeline according to the invention needs only 10% of the power required for a pipeline as according to US 2006/0000515 A1, and only 6.5% of the power required for a steel
5 pipeline.

Finally, figure 5 illustrates a per se known possible method for welding plastic foils (10a, 10b) to each other to form a peripheral body 10. Plastic foils (10a, 10b) are guided by means of guide rollers 30 over a heated wedge 31, wherein the plastic melts at least
10 partially and forms melted layers 34, and are guided between pressure rollers 32 in the direction indicated with arrow 33, wherein plastic foils (10a, 10b) are welded onto each other under pressure 35. After cooling to below the melting point of the plastic a connecting seam is formed.

15 The invention is not limited to the above described exemplary embodiments and modifications can be made hereto to the extent they fall within the scope of the appended claims.

Claims

1. Method for transporting water comprising soil particles through a pipeline, wherein the pipeline is provided between a reclamation site for the soil particles
5 containing water and another location wherein a pressure difference is applied between an inlet and an outlet for the water, wherein the pipeline comprises a flexible peripheral body with a length of at least 1000 m manufactured from plastic foil, wherein the peripheral body is transported in folded state to a site with a transport means and unrolled from the transport means along a desired trajectory for the pipeline, and
10 wherein the peripheral body is brought from a substantially flat state, in which peripheral parts lie on one another, to an inflated state in which the peripheral body has a throughflow area of at least 0.15 m².
2. Method according to claim 1, wherein the location comprises a settling basin,
15 adapted to remove relatively fine soil particles from the water by settling of the particles.
3. Method as claimed in claim 1 or 2, characterized in that the peripheral body is manufactured from plastic foil reinforced with reinforcing fibres.
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4. Method as claimed in claim 3, characterized in that the peripheral body is manufactured from a fabric of reinforcing fibres coated with plastic foil.
5. Method as claimed in any of the foregoing claims, characterized in that the
25 plastic comprises a thermoplastic polymer chosen from the group comprising polyurethanes, vinyl polymers such as for instance polyvinyl chloride, and polyolefins such as for instance polyethylene.
6. Method as claimed in any of the foregoing claims, characterized in that the
30 reinforcing fibres comprise organic fibres, preferably polyester fibres, and/or inorganic fibres, preferably glass fibres.

7. Method as claimed in any of the foregoing claims, characterized in that the tensile strength of the plastic foil amounts to at least 70 kN/m, more preferably at least 140 kN/m.
- 5 8. Method as claimed in any of the foregoing claims, characterized in that the length of the peripheral body amounts to at least 2 km.
9. Method as claimed in any of the foregoing claims, characterized in that the pipeline comprises a number of the peripheral bodies, wherein the peripheral bodies run
10 parallel to each other between the inlet and the outlet.
10. Method as claimed in claim 9, characterized in that the number lies between 1 and 15, more preferably between 2 and 10 and most preferably between 4 and 8.
- 15 11. Method as claimed in any of the foregoing claims, characterized in that the pipeline comprises peripheral bodies coupled by means of coupling means.
12. Method as claimed in claim 11, characterized in that the coupling means comprise steel and/or plastic pipes and/or welded or adhesive connections.
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13. Method as claimed in any of the foregoing claims, characterized in that the water comprising soil particles is collected in a feed water basin to which the inlet of the pipeline connects.
- 25 14. Method as claimed in any of the foregoing claims, characterized in that the pressure difference between inlet and outlet and the throughflow area is chosen such that the soil particles in the pipeline remain substantially in suspension in the water.
15. Method as claimed in any of the foregoing claims, characterized in that the
30 pressure difference amounts to a maximum of 2 bar.

16. Method as claimed in any of the foregoing claims, characterized in that the pressure difference is applied by pump means with a capacity of a maximum of 1500 kW.
- 5 17. Method as claimed in any of the foregoing claims, characterized in that the water comprising soil particles is collected in a discharge water basin to which the outlet of the pipeline connects, in which discharge water basin the soil particles settle.
18. Method as claimed in claim 17, characterized in that the outlet of the pipeline
10 connects to pump means which pump the water into the discharge basin.
19. Method as claimed in any one of the foregoing claims, characterized in that the transport means advances along the trajectory during unrolling.