



## The advantage of corrugated pipe systems

---

by DROSSBACH GmbH & Co. KG, Germany.

**excerpt**

June 2011



## What makes corrugated pipes the ultimate for modern infrastructure?

As mentioned before the credo for modern plastic pipe infrastructure in sewage and storm water applications is *tight – light – durable*.

First of all, a sewage system which isn't tight for life (within close tolerance values) is a ticking time bomb for peoples health and the environment; beyond that the installation of a fast rotten system means wasting money. The lighter products are, the faster and more cost efficient they are installed. What is more, saving of material means lower cost per piece, enables an attractive price policy and helps reducing resource consumption. And last but not least a sustainable pipe system has to be durable for easy handling as well as maintaining and against increasing and dynamic loads during decades of product life cycle.

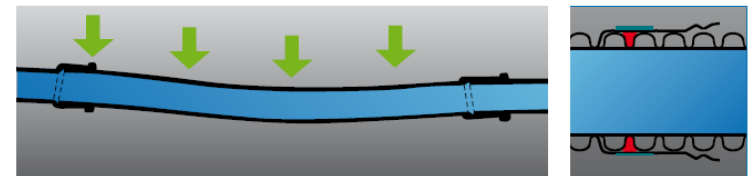
Quality corrugated double-wall pipes fulfill all mentioned requirements as follows:

**1. Plastic pipes made of Polyethylene, Polypropylene or even PVC are flexible in two directions and gain advantage over rigid pipes made of traditional materials like clay stone or concrete in general.**

1.a) The scheme on right-hand side shows the advantage of **flexibility in longitudinal direction**. In case of ground movements, mass relocations or insufficient bedding the pipe body adapts massive antagonistic forces while rigid pipes can't resist all too frequent.

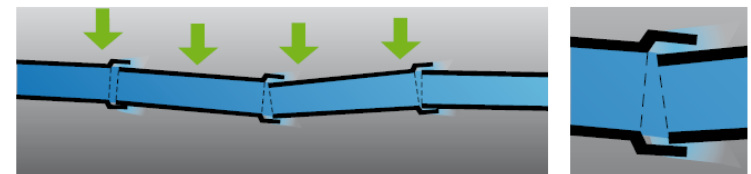
### Flexible pipes

Deformations mainly at the pipe shaft



### Rigid pipes

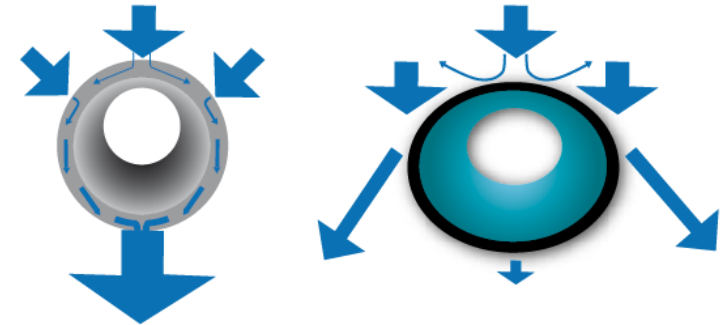
Pipe connections do not deform



## What makes corrugated pipes the ultimate for modern infrastructure?

1.b) The **flexibility in the pipe's cross section** transmits the load stress to the surrounding soil by deformation. The relaxation behavior of the applied polymer guarantees that the tension resulting from long-lasting system deformation is almost fully reversed. Short-term deformations are completely reversible anyhow. According to the standards currently in force a deformation value between 5 – 10% is acceptable.

In contradistinction to this all forces have to be born by the rigid pipe as long as it cracks or breaks (see illustrations above).



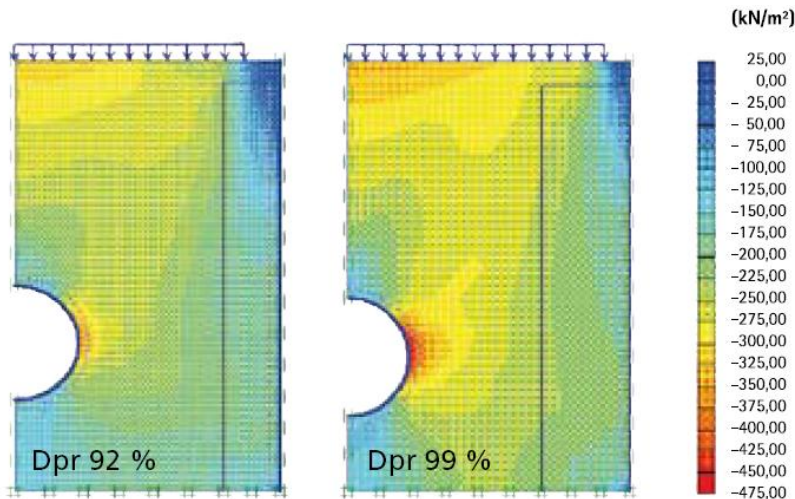
Comparison: load bearing capacity of rigid pipes and load transmission of flexible pipes

### RIGID PIPES

All loads (both static and dynamic loads) are born by the pipe. In case of failure, the material cracks or breaks.

### FLEXIBLE PIPES

All loads are born by the soil surrounding the pipe; the pipe is free of tension.



Results of a corrugated plastic pipe installation with a 92% and 99% soil compression (“Proctor standard”), calculated by means of the finite element method: with increasing soil compression the maximum soil tension is not in the pipe’s soffit area, but at the impost. Here the flexible pipe absorbs the load stress, supported by the highly compressed soil.

## What makes corrugated pipes the ultimate for modern infrastructure?

1.b) Quality management according ring stiffness and longitudinal flexibility by standards currently in force:



Deformation test according EN 13476 with 30% as proof of ring stiffness SN 8 - no buckling, no cracks. DROSSBACH usually tests with 50% deformation.

(double-click for animation)

Long-term tightness test measures with 0.5 bar according DIN EN 1277 and different kind of external deformations for a variety of pipe diameters and fittings (T-piece, post connector) according DIN 4060.

DROSSBACH's inhouse measurements successfully run with 2.5 bar inner pressure if SAFECONNEC® is used for pipe connection.



Bild 2: Abwinklung des T-Stückes in der Muffe bei der Dichtheitsprüfung



Bild 6: Prüfung der Wasserdichtheit mit Scherlasteintragung und Wasserinnendruck von 0,5 bar, die Verbindung mit Verformung war dicht



Bild 5: Ansicht der Rohrverbindung der angeformten Muffe während der Scherlasteintragung zum Ende der dreimonatigen Belastungszeit



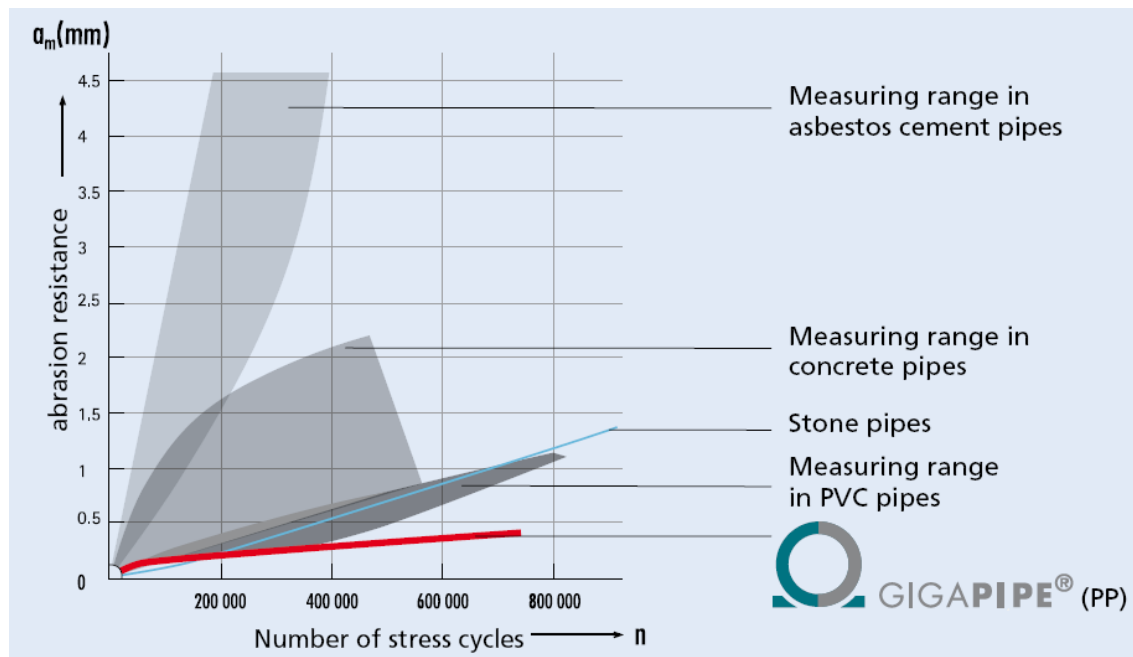
## What makes corrugated pipes the ultimate for modern infrastructure?

1.c) In order to test the **resistance of pipes to mechanical wear**, the so-called “Darmstadt method” is used in accordance with the valid standard (DIN 19565/ EN 295).



Comparative tests show that plastic pipes, in particular pipes made of PP and HD-PE, offer the best abrasion resistance of all.

In this case the measurement results of DROSSBACH’s own brand GIGAPIPE were likened to PVC pipes and traditional materials. The test design with 600,000 load changes simulate a physical life of 100 years - keeping longevity in mind.



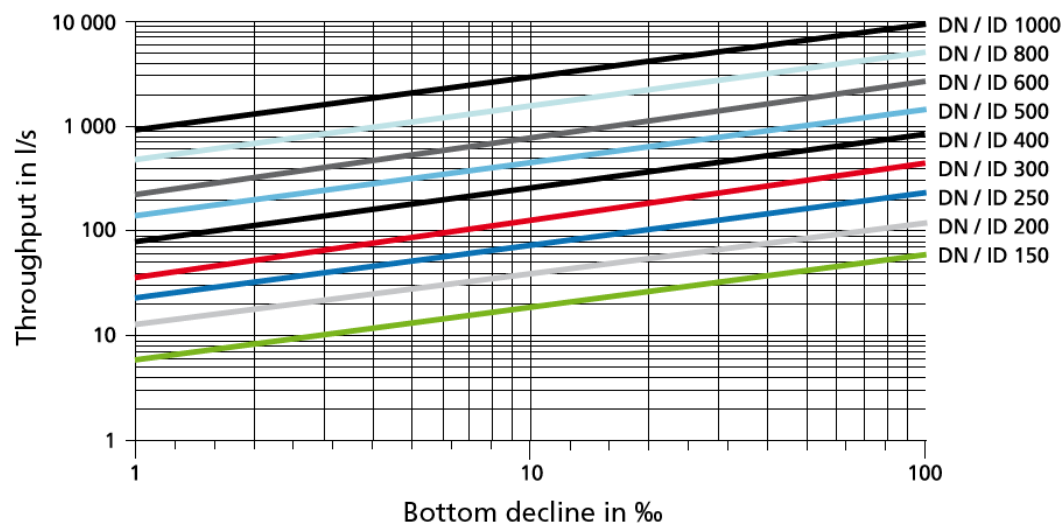
## What makes corrugated pipes the ultimate for modern infrastructure?

1.d) The **drainage behavior in gravity lines** is mainly determined by the pipe's decline and the surface quality of the pipe bottom. Thanks to the optimum processing of PP or HD-PE raw material on DROSSBACH's machinery, our pipes offer a non-porous, very smooth inner layer with an absolute roughness of 0.005 to 0.05mm.

Such a surface prevents the formation of deposits, incrustations and thus the biochemical processes related to them. Additionally it transports the effluent even at a minimal sewer declines.

(For calculation of mathematical service roughness ( $k_b$ ) please find more detailed information in specification sheet ATV-DVWK-A 110 "Hydraulic dimensioning and performance verification of sewers and drains").

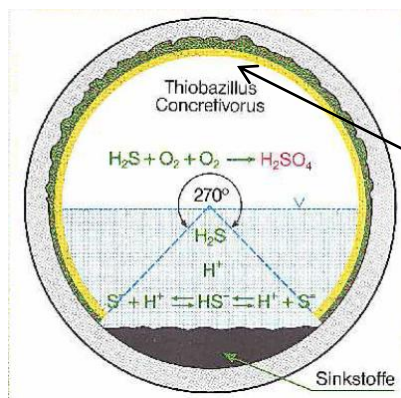
The diagram shows the throughputs of a DROSSBACH product for an above average roughness value of  $k_b = 0.25$  mm relative to the descent. This roughness value corresponds to the technical assumptions for PVC pipes and includes high potential for HD-PE and PP pipe systems.



Flow diagram of GIGAPIPE® pipes for  $k_b = 0.25$  mm

## What makes corrugated pipes the ultimate for modern infrastructure?

1.e) When it comes to **chemical resistance** it is generally recognised that plastic pipes have significant advantages over pipes of traditional organic materials. Depending on chosen resource (clay, concrete, cement) the fluids itself as well as biochemical decompositions within the waste water are mainly threatening the substance and stability of the pipe. Even high-end concretes are massive effected by biogenic acidic corrosion or organic corrosion:



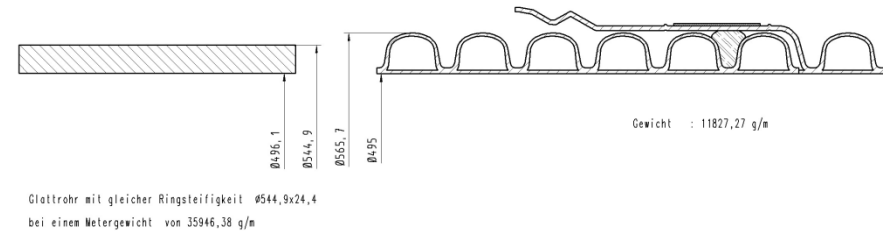
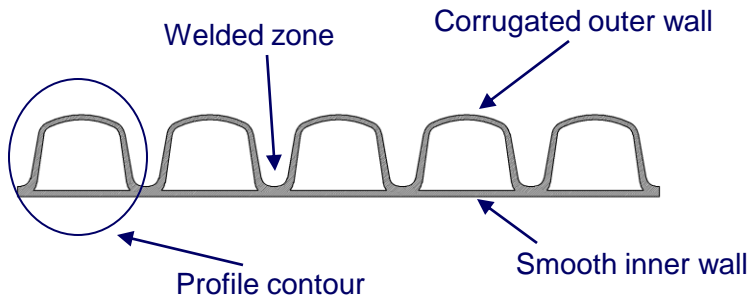
Biogenic sulphuric acid corrosion of concrete – aggressive, fast proceeding decrease .

The chemical resistance of DROSSBACH's plastic pipes made of HD-PE or PP, e.g defined due to DIN 8078 supplementary sheet 1, is guaranteed for pipes, fittings, shaft constructions and sealing systems with pH values ranging between pH 2 (acidic) and pH 12 (alkaline) without any restriction. That fits to all conceivable mixtures of household waste water and more than 98% of industrial waste water. The resistance against waste water as well as soil substances according to DIN 1986 is proven too.

## What makes corrugated pipes the ultimate for modern infrastructure?

2. Beside the general advantages of plastic pipes for modern infrastructure corrugated plastic pipes stand out due to weight/ resource efficiency/ eco-friendliness and usability.

2.a) The cut view illustrates the comparatively low material input. Depending on the chosen diameter and the physical properties corrugated pipes save up to more than 60% of material in relation to smooth pipes of same static, hydraulic, etc properties (cf. ex.).



**Cost reduction:** material input, energy input, installation, maintenance  
**Production efficiency:** production output, ROI, price per piece

DN / ID	200	250	400	500	800	1000
HDPE Corr.- Pipe (kg/m)	2,5	3,7	9,0	14,4	37,5	57,9
HD-PE Smooth Pipe (kg/m)	6,5	10,2	26,3	41,2	105,9	166,5

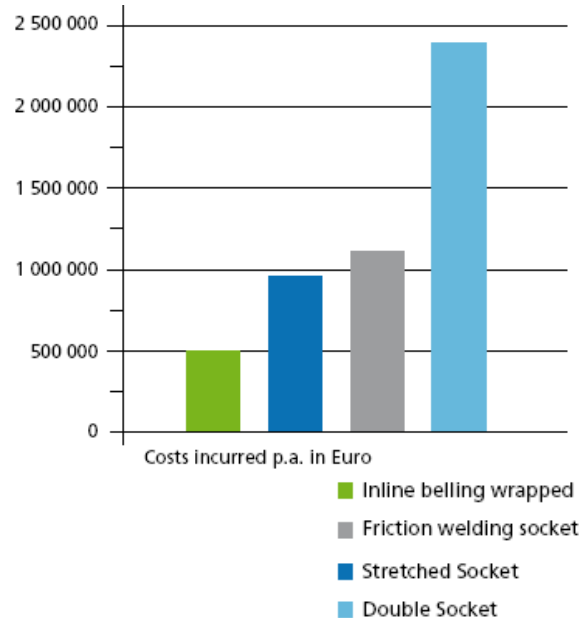
## What makes corrugated pipes the ultimate for modern infrastructure?

2.b) The usability of DROSSBACH-style corrugated pipes is excellent. For the connection of pipe systems there are several concepts available including:

Among these the SAFECONNEC®-system based on an inline produced single-layer socket is the most cost efficient as shown in the practically relevant model calculation. Due to this DROSSBACH chose this technology for our own pipe production as it is described afterwards.

### Main advantage on site:

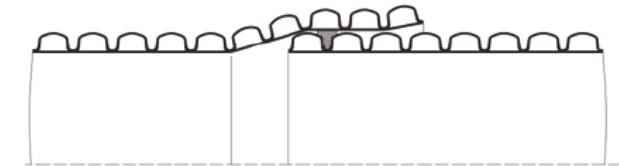
- every pipe has got an integrated socket and could be cut to length individually.
- no welding, no bonding – just connecting manually.
- a single gasket is used per connection



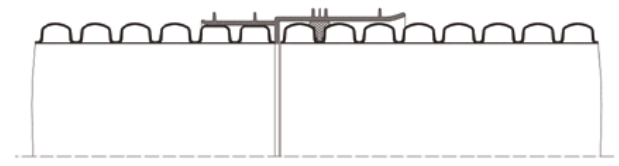
### Socket Systems:



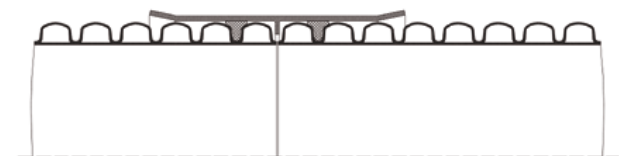
SAFECONNEC®: Inline bellings with reinforcement tape



Socket heat formed on the pipe (stretched)



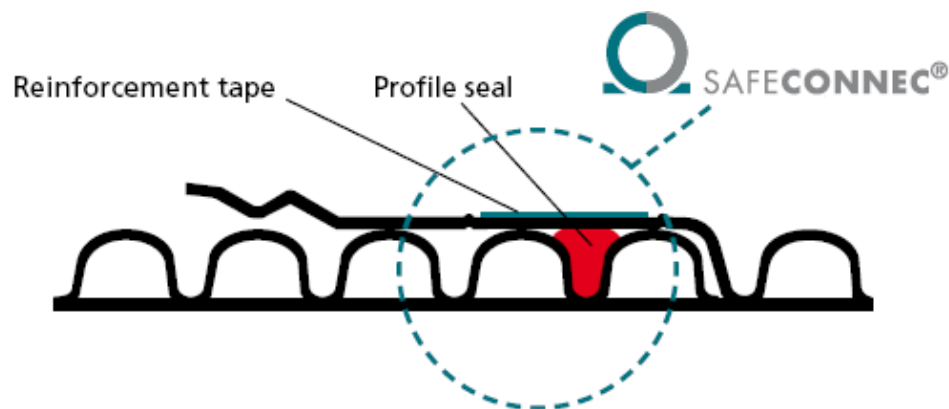
Friction welding socket



Double Socket

## What makes corrugated pipes the ultimate for modern infrastructure?

2.c) The SAFECONNEC® technology is an exclusive innovation by DROSSBACH and is reserved for selected partners and customers with focus on high-end solutions. It was developed in context with the highly efficient single layer in-line socket connecting one of the most advanced double-wall corrugated pipe system for sewage and storm water applications lately. SAFECONNEC® conforms to DIN EN 13476, ensures long term tightness as well as longitudinal force-locked connection for more than 100 years and enables material efficiency plus high productivity at the same time.



SAFECONNEC® is the combination of plastic coated glass fibres welded as a tape on the outside of the single-layer socket and a durable profile seal made of highly-developed caoutchouc (EPDM).



## What makes corrugated pipes the ultimate for modern infrastructure?

2.d) Easy handling of corrugated plastic pipe systems is a circumscription for

- low transport costs
- fast, reliable and cost efficient installation and
- maintenance by low efforts



Telescoping pipes of several diameter is a clever option to lower transport costs.



No need of special or heavy equipment to distribute pipes or system elements on site. Most pipes could be handled manually.

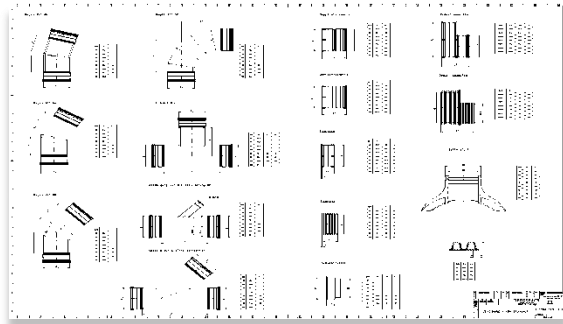


Joining pipes manually with simple tool.



## What makes corrugated pipes the ultimate for modern infrastructure?

2.e) DROSSBACH offers fittings and shafts for each pipe system. Customers are invited to select from an extensive range of products and technologies. Fittings and shaft elements can be produced per high-end injection moulding, blow moulding or even sintering.



Selection from injection moulded fitting range for sewage application.



Beside the fully automated production of system elements DROSSBACH already has the experience to produce them semi-automatically (50% manual welding) which is interesting for clients with small or medium output, a relevant demand on special constructions or diameter range in little demand.

Made to measure of fittings and special constructions for rainwater storage ID 1,000 at manufactory.

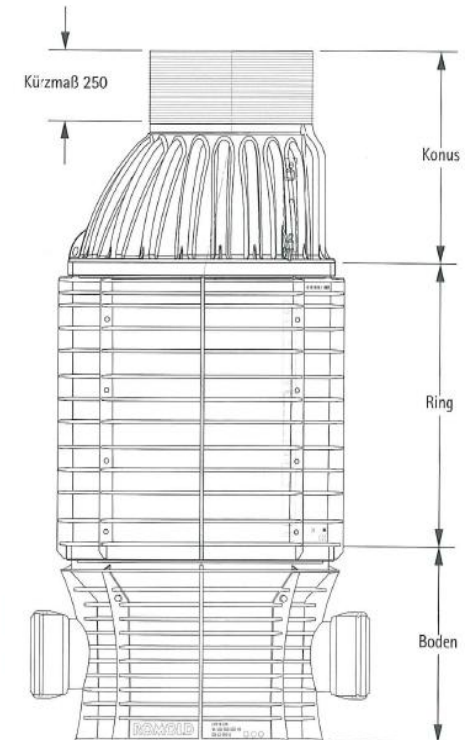


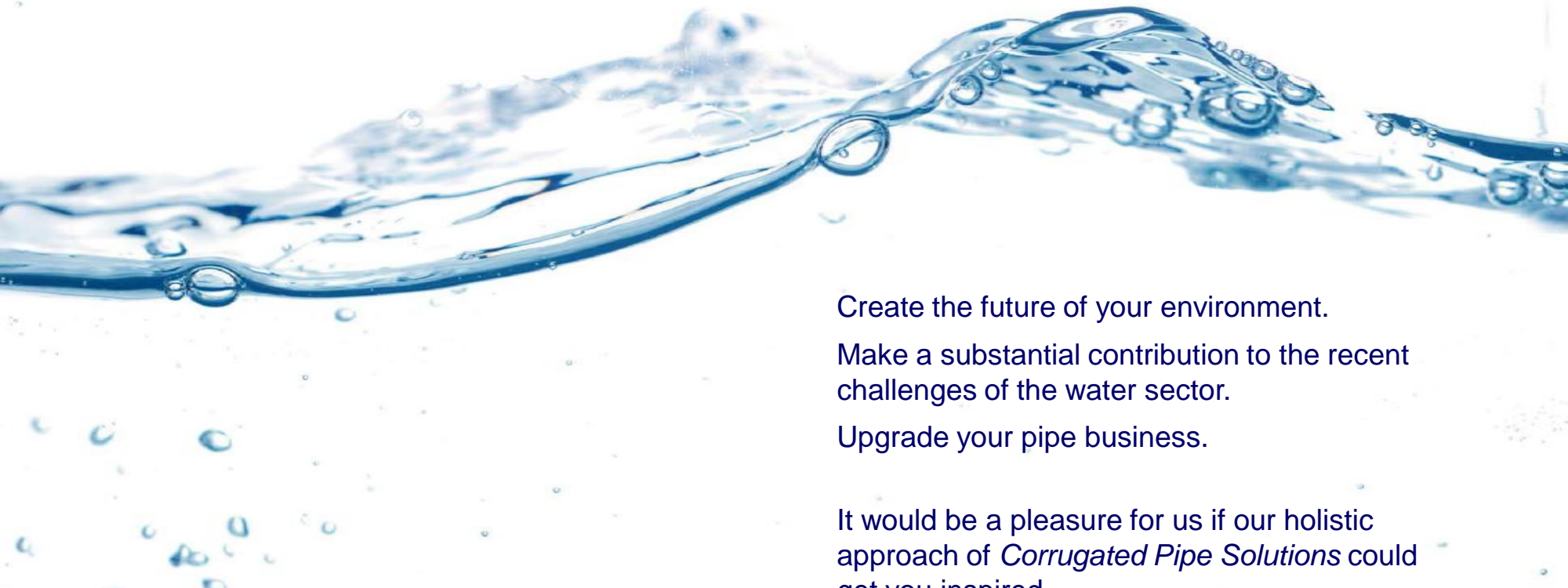
## What makes corrugated pipes the ultimate for modern infrastructure?

2.e) Shafts, manholes and fittings ensure fast and reliable installation and grant convenient access to pipe infrastructure for control, measurements, maintenance and renovation if necessary. Manholes typically are subject of customised case-to-case production due to differing on-site conditions (height). DROSSBACH provides several solutions from individual homemade manufacturing product to fully automated injection moulded modular assembly system.



Modern manholes are usually made out of three precast elements: cone, rings or raisor pipe and base with channel and sockets. They are delivered as monolith version ready to install or in parts to be finished on site.





Create the future of your environment.

Make a substantial contribution to the recent challenges of the water sector.

Upgrade your pipe business.

It would be a pleasure for us if our holistic approach of *Corrugated Pipe Solutions* could get you inspired.





## **DROSSBACH GmbH & Co. KG**

Max-Drossbach-Str. 7  
86641 Rain am Lech  
Tel.: +49(0) 9090/ 702 0  
Fax: +49(0) 9090/ 702 399

[www.drossbach.de](http://www.drossbach.de)

