

# **HOBAS<sup>®</sup>** Deep Trench Pipe Systems

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### **Over 50 Years' Experience**

The unique HOBAS<sup>®</sup> Process had its beginnings in Switzerland during the 1950s when Basle's Stückfärberei, a textile processing company, was trying to find a replacement for the wooden cylinders on which the cloth was wound during the dyeing operation. In the course of time the wood became splintered and discolored causing damage to expensive fabrics.

A solution to the problem was sought in the new – at that time – plastics polymers using glass reinforced polyester resin. The already established filament winding process was investigated, as the material produced exhibited corrosion resistant qualities. However, since it was essential for the outside surface to be smooth to prevent damage to the cloth, this type of product was unsuitable.

The idea of manufacturing the cylinder using a centrifugal molding technique was explored first by using a simple lathe. Following the success of these initial trials, casting machines were made and the manufacturing techniques mastered.

The glass reinforced cylinders proved to be an outstanding success. A request for a lightweight pipe suitable for a steep gradient stimulated the company to venture into the manufacture of pipes using the new process. The process was developed further by automation and patent applications were made. By the early seventies, the process had been improved and sales grown to such an extent that the pipe manufacturing operations became self sufficient. All this led to a joint worldwide sales system for the new manufacturing technology, HOBAS Engineering. Ever since, the process has been developed further and the progressive technological changes of the computer age have been incorporated into the manufacturing systems. Pipe factories and sales organizations are now operated by the HOBAS<sup>®</sup> Group all over the world. As a result, it has gained a worldwide reputation for excellence in quality and workmanship.

HOBAS<sup>®</sup> and partners contribute to the work of various national standardization organizations as well as the European and international standardization committees (CEN, ISO) concerned with the application and use of plastics pipes for water and sewage. These activities, together with the ongoing commitment to research and development both in the company and at several external research establishments, ensure that HOBAS<sup>®</sup> continues to maintain its technical strength



# **Material Composition and Production Process**

HOBAS<sup>®</sup> CC-GRP (Centrifugally Cast Glassfiber Reinforced Plastics) Pipe Systems are a special compound made of unsaturated polyester resins (UP), chopped glass fiber and mineral reinforcing agents. These raw materials are fed into a rotating mold, thus building up the wall structure from its exterior surface. The sophisticated manufacturing process is described in brief below.

Raw materials undergo stringent incoming inspection and laboratory testing before being approved for use. They are then stored in special tanks to ensure that sufficient quantities are available at all times.

Computer-controlled pumps and high-precision metering systems guarantee that the right amounts of raw materials for the relevant product go to the HOBAS<sup>®</sup> Feeder. A 100% control of production process is assured. Roving stored on spools is chopped to the required length and added.

The feeder now deposits the predefined quantities of raw materials layer by layer in the six-meter-long rotating mold.

Centrifugal casting is important for the quality of HOBAS<sup>®</sup> Pipes. The preset mold speed with centrifugal acceleration of up to 70 g causes the layers to be bonded into a compact fiber composite.

Spraying hot water onto the outside of the mold starts the polymerization process. Resin solidification is irreversible as a result of the threedimensional chemical bonding. GRP is thus a thermosetting plastic which retains its dimensional stability in any environment.

After being treated with cold water, the pipe is removed from the mold. Finishing includes trimming and beveling the pipe ends. Finally a coupling is mounted onto one end of each pipe.



Feeder in mold



Ongoing development leads to new feeder generations

# **Benefits of the HOBAS<sup>®</sup> Product**

For the past 50 years the name HOBAS<sup>®</sup> has been synonymous with centrifugally cast GRP Pipe Systems.

The centrifugal casting process produces a product with unique features. Users in the water and sewage industries immediately see the benefits of HOBAS<sup>®</sup> Pipe Systems:

- Manufactured in many countries and supplied in quantities to satisfy most construction requirements.
- Smooth, accurately dimensioned exterior. This provides a positive sealing surface for the elastomeric rings used to join the pipes. Additionally, the smooth surface extends along the whole length enabling the **pipe to be cut at any position** for a joint.
- High-density wall. Produced by high compaction of the solid materials during the centrifugal spinning process, the density is responsible for the product's extreme impermeability. This feature results in a structure that displays no water infiltration.
- Process particularly suitable for the economical production of pipes for buried and trenchless applications. The advantages of using higher stiffness pipes in areas with weaker soils or where it is difficult to guarantee correct installation and good backfill compaction are well known.
- Fully automated HOBAS<sup>®</sup> Production System enables a product to be manufactured with the specific properties for its application, e.g. sewage system, pipe jacking, bore casing, above ground installation or pressure pipe project.





- Resin-rich internal lining layer resulting in a highly corrosion resistant structural wall across a wide pH range. This liner is backed by a resin-rich corrosion barrier layer to give added protection to the structure. Long-term strain corrosion testing has demonstrated that this system significantly exceeds the standards.
- Ability to withstand the high compressive loads occurring during pipe jacking. This enables HOBAS<sup>®</sup>
  CC-GRP Pipe Systems to be used in major trenchless installations in both Europe and the USA.
- No corrosion in conditions which are detrimental to traditional materials. HOBAS<sup>®</sup> Pipes are not subject to electrolytic corrosion and require no cathodic or other type of protection.
- Low coefficient of linear thermal expansion.
- Light weight combined with a standard length of 6 meters offering considerable savings to users through reduced transport, handling and installation costs.
- Smooth bore, giving excellent hydraulic flow characteristics with significantly lower friction losses than other products of similar dimensions.
- Internal surface not prone to tuberculation and encrustation.
- Used and accepted by major water and sewage authorities all over the world.
- Advanced design and safety concept combined with a sophisticated quality control system. No other pipe material undergoes four different types of long-term tests to assure performance for an operational service life of more than 50 years.

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# **Uses and Applications**

HOBAS<sup>®</sup> CC-GRP Pipe Systems' qualities of high strength combined with flexibility and corrosion resistance make them very attractive for use in numerous applications. Amongst others, they have been successfully installed in the following:

- Sewage (HOBAS SewerLine)
- Drainage (HOBAS BridgeLine)
- Potable water (HOBAS WaterLine)
- Raw water and irrigation (HOBAS WaterLine)
- Hydro power (HOBAS HydroLine)
- Cooling (HOBAS ThermaLine)
- Industry (HOBAS ChemLine)
- HOBAS ShaftLine
- HOBAS Retention Systems

Furthermore, HOBAS<sup>®</sup> CC-GRP Pipe Systems have been installed using all the various pipe laying methods:

- Open cut
- Above ground
- Sliplining/relining HOBAS (Relining Pipes, HOBAS NC Line)
- Microtunneling/pipe jacking (HOBAS Jacking Pipes)



For the International HOBAS<sup>®</sup> Reference Database including HOBAS<sup>®</sup> Projects all over the world from 1961 till now, please contact <u>info@hobas.com</u> or see <u>www.hobas.com</u>/en/projects/ref-database.html.



### **Quality Assurance**

During the course of manufacture, the quantities of materials and parameters that are important to process performance are constantly monitored and recorded. Regular product sampling and testing is also conducted to check compliance with the manufacturing standards.

### Pipe Wall Construction – **Deep Trench Pipe Characteristics**

#### **Protective Layers**

**Outer Layer** (Mechanical protection, UV resistance)

#### Structural Layers



HOBAS<sup>®</sup> CC-GRP (centrifugally cast glass fibre reinforced plastics) Pipe Systems can be manufactured cost effectively and with comparatively low wall thickness, in very high stiffness classes. Even in these high stiffness classes HOBAS<sup>®</sup> Pipes are lightweight, making transport efficient and installation on the construction site easy, resulting in greater pipe laying productivity.

Outstanding assembly characteristics, long life, high corrosion and abrasion resistance and high static load capacity are some of the advantages of HOBAS<sup>®</sup> Pipes.

During the HOBAS<sup>®</sup> Centrifugal Casting Process, separate materials required to construct the specific wall layers are placed in a rotary mold by an electronically controlled and measured feed system. The extremely compact wall construction is created from the outside. Once all materials have been fed into the mold, the rotation speed is increased, so that the centrifugal force presses the material against the mold wall with enormous pressure, all air is forced out and the material is thoroughly compressed and suspended into a homogenous resin matrix. In this way a dense, impermeable and uniform wall is produced over the full length of the pipe. When the polymerization process has been completed the finished pipe is pushed out of the mold. The outer surface of the pipe is completely smooth and has a uniform diameter throughout its length.



Glass, resin, additives - the starting point for high quality HOBAS<sup>®</sup> Pipes.

#### Advantages of Deep Trench Pipe Systems

- Outstanding long term characteristics and durability
- High static load capacity
- Dense, homogenous pipe manufactured using centrifugal technology
- High abrasion resistance
- Minimal encrustation and sludge deposition
- Extremely smooth inner pipe surface roughness factor k according to Prandtl-Colebrook: ≤ 0.01 mm
- Greater resistance to deformation
- Extremely high corrosion resistance
- Lightweight

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# Gravity Sewer Pipe PN 1 SN 15000 and SN 20000



DN	Serial	d <sub>e</sub> , mm	SN 15000		SN 20000		
			e <sub>mean,</sub> mm	Mass m <sub>mean,</sub> kg/m**	e <sub>mean,</sub> mm	Mass m <sub>mean,</sub> kg/m**	
150	B2	167	5.4	5.0	5.8	5.5	
200	B2	220	6.7	8.6	7.2	9.4	
250	B2	272	7.9	13.0	8.6	14.2	
300	B3	315	9.0	17.3	9.7	18.8	
300	B2 B4	324	9.2	18.2	10.0	20.0	
350	B2	376	10.5	24.4	11.4	26.6	
400	B3	400	11.0	27.0	11.9	29.5	
400	B2	427	11.6	30.7	12.6	33.6	
450	B2	478	12.8	38.3	14.0	42.0	
500	B3	500	13.3	41.5	14.5	45.6	
500	B2	530	14.0	46.7	15.3	51.1	
550	-	550	14.7	50.5	16.0	55.4	
600	B1	616	16.3	63.2	17.8	69.2	
650	-	650	17.1	70.3	18.6	76.8	
700	B1	718	18.7	85.4	20.4	93.3	
750	-	750	19.5	93.1	21.2	101.5	
800	B1	820	21.1	110.5	23.0	120.7	
860	-	860	22.0	121.4	24.1	132.5	
900	B1	924	23.6	139.7	25.7	152.6	

DN	Serial	d <sub>e</sub> , mm	SN 15000		SN 20000		
			e <sub>mean,</sub> mm	Mass m <sub>mean,</sub> kg/m**	e <sub>mean,</sub> mm	Mass m <sub>mean,</sub> kg/m**	
960	-	960	24.4	150.6	26.7	164.5	
1000	B1	1026	26.0	171.5	28.4	187.5	
1100	-	1100	27.9	197.4	30.4	215.6	
1200	B1	1229	30.9	245.3	33.8	268.1	
1280	-	1280	32.1	265.9	35.1	290.6	
1350	-	1350	34.0	297.4	36.9	322.7	
1400	B1	1434	35.7	332.2	39.1	363.3	
1500	-	1500	37.3	363.3	40.8	397.2	
1535	-	1535	38.3	383.5	41.9	419.7	
1600	B1	1638	41.0	439.3	44.9	480.7	
1720	-	1720	42.7	480.5	46.7	525.7	
1800	B1	1842	45.9	554.4	50.2	606.4	
2000	B1	2046	50.7	682.1	55.6	746.6	
2160	-	2160	53.1	754.1	58.1	825.4	
2200	B1	2250	55.2	817.7	60.9	901.4	
2400	-	2400	59.4	938.0	64.6	1019	
2400	B1	2453	60.7	979.5	66.4	1071	
2555	-	2555	63.0	1061	68.6	1154	
3000	-	3000	72.8	1441	79.8	1576	

\* Standard length is 6m (+ 0/- 60 mm). However, pipes may be supplied in other length (1, 2, 3, 4, 5 m) on request.
\*\* Calculated with a density of 1.7 g/cm<sup>3</sup>.

All figures are generally calculated values and may differ slightly from the finished product due to the manufacturing process.

Wall thicknesses and weights are mean values respectively approximate values plus tolerances according to HOBAS<sup>®</sup> company standard. The information and recommendations correspond to our state of knowledge at the time of publication. An express or silent guarantee cannot be deduced from it. The statements shall be checked and – if necessary – coordinated depending on the object. Liability by HOBAS<sup>®</sup> shall be excluded. This also applies to print errors and writing mistakes as well as additional modifications of technical data.

# As long as the Yangtze

Yiwu is a city of around 1 million people in the greater area of the Yangtze delta. It was founded during the Qin dynasty around 200 B.C. very close to Hangzhou, the capital of the province Zhejiang. As trading area of Shanghai it is today known as one of the most influential economic areas in China.

Due to the region's leapfrog development over the last years, the maximum capacity of the local sewer system was soon reached. Apart from this and despite the city's large scale investments in the network, the line was in such bad condition that the groundwater was threatened to be polluted. It was therefore absolutely essential to establish a new main leading to the local treatment plant. 12.6 km HOBAS SewerLine<sup>®</sup> were installed for this purpose in the Yiwu district Choujiang. The undertaking was quite challenging, since the soil in the coastal area of the South China Sea was weak and therefore difficult for installation.

The project was conducted in three parts. 2.3 km HOBAS CC-GRP Pipes DN 1200 to 2000 were installed for the first part, the second section consisted of 2.9 km DN 800 to 2000 and the third and longest part was established utilizing 7.4 km HOBAS Pipes DN 800 to 2000. The complete line was built with gravity pipes and a stiffness of SN 15000. This enabled a cost efficient installation in great depths and weak soils. A maximal trench depth of no less than 18 m and an average depth of 7 m were required for the project. The extra-strong HOBAS pipe proved to be an intelligent and flexible solution that also ensures long-term stability.



Several reasons let the municipality Yiwu decide for HOBAS centrifugally cast, glass fiber reinforced pipe systems. The mentioned weak soil conditions, for instance, would have made the use of heavy equipment elaborate.



However, CC-GRP pipes weigh a lot less than other materials and are easily installed without special equipment. Also the additional challenge posed by a road nearby the pipe route was overcome due to the easy handling of HOBAS Pipes. The installation had to be quick, space-saving and flexible at this point to avoid any traffic disruptions. No problem with HOBAS. Leak tightness was a further important criterion for the right material choice: the groundwater should not be endangered.



HOBAS Pipes and couplings run through stringent short and long term tests and are provably leak tight. Corrosion resistance was yet another crucial factor in the decision making process. Pipes are often exposed to external influences especially in coastal areas. HOBAS Pipe Systems are highly corrosion resistant and therefore easily withstand environmental influences.

Ground was broken for this demanding project in July 2008. It shall be finalized and commissioned beginning of 2009. HOBAS is the sole provider of centrifugally cast GRP pipe systems in the Chinese market supplying clients with the material as well as planning and installation expertise. This package already proves to yield fruit in this project for all involved parties are highly content with product choice and cooperation.

#### **HOBAS Engineering GmbH**



	Overview
2008 – 2009	Year of Construction
12,612 km	Length of Pipe
PN 1	Pressure Class
DN 800 – DN 2000	Diameter
SN 15000	Stiffness Class
open cu	Installation Method
SewerLine®	Application
City Yiwu	Client
light weight, high stiffness, simple cost effective installation also in large depths, absolutely leak tight, corrosion resistant	Advantages

# **Excerpt from our reference list**

Excerpt from our reference list*							
Project	Land	Year of Construction	DN	SN	PN	Length m	
Korsnas	Sweden	1983	400	20000	1	1758	
Trinity Outfall Lothian R.C.	Great Britain	1984	1500	20000	1	240	
D M Drainage WAWA Joondalup	Australia	1990	300	20000	1	618	
BHP Whyalla	Australia	1992	450	20000	16	250	
Lawson	Australia	1993	1200	20000	1	150	
Castelldefels	Spain	1994	500	15000	10	1300	
Palaborwa Mining Company, mine dump water drain	South Africa	1995	600	15000	6	720	
Tunnel D'Arrissoules	Switzerland	1995	500	20000	1	138	
Oulun Kaupunki	Finnland	1996	700	20000	6	255	
Tay Outfalls	Great Britain	1999	1400	15000	3	180	
Wildon Sammelkanal A9	Austria	2002	700	15000	1	6000	
Warszawa, Magistrala Poludnie	Poland	2002	1400	20000	1	69	
River Ore Sewer Replacement	Great Britain	2004	700	15000	6	134	
Blunsden III	Great Britain	2004	900	15000	8	9660	
Renovatie Zwanenburgbaan Schiphol	Netherlands	2004	1348	15000	1	200	
Hettstedt, Sanierung Hadebornbach	Germany	2006	1500	20000	1	300	
Boxtel, Legbuizen	Netherlands	2006	1000	20000	1	126	
Fresach BA 02	Austria	2007	150-200	15000	1	9800	
Fognatura Predazzo	Italy	2009	200-300	15000	1	6333	

\* For further projects please contact your HOBAS Sales Representative.



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