Long Length Large Diameter (LLLD) PE pipes for marine applications

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The Pipelife Group – at a glance

Net Sales
853 mEUR
(2015: 879 mEUR | -3,0%)

Employees
2,714
(2015: 2,680 | +1,3%)

Countries
26
Subsidiaries in Europe and USA

Production Sites
26
Production sites in 18 countries

12/19/2017
Long Length Large Diameter (LLLD) PE pipes for marine applications
1989
Founding of Pipelife by Wienerberger and Solvay

Late 1990’s
Start of operations in PL and RO; further expansion into HR and Northern Europe (SE, EE, FI, LV, LT, NO)

Early 1990’s
Entry into new markets (HU) and expansion into GR, TR, CZ, SK, SI, BE, ES, NL, PT

2000 to 2004
First step into the US market; opening of sales offices in RU, UA, BG; purchase of Propipe (FI) and drainage business of Drossbach (DE)

2005 to 2010
Further acquisitions (100% of the JVs in HU and RO, Quality Plastics (IE), Twebotube (NL), Instaplast (CZ), Westpipe (SE)) Investments in plants in RU and BG

2010-2013
Acquisition of Westpipe (SE); Acquisition of Alphacan’s pipe business (FR), EKO-RPM (SL), Finnflex (FI), Elektrobig (LT)

2010
Closure of Iberian subsidiaries in the course of a restructuring program

2012
Wienerberger acquires 100% of Pipelife

02-2016
Acquisition of Talokaivo Oy (FI)

Net sales in mEUR

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Long Length Large Diameter (LLLĐ) PE pipes for marine applications
The Pipelife Group – present worldwide

630,000 km pipes installed worldwide in 2016
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### Long Length Large Diameter (LLLD) PE pipes for marine applications

- 12/19/2017
PE pipe production started in 1960

Due to lack of proper welding methods at that time, the pipes had to be made as long as possible.

From there the long length pipe concept has been developed.
Pipelife Norway today

Surnadal plant

Stathelle plant
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Long Length Large Diameter (LLLD) Concept

Protected location in a narrow fjord

Continuous extrusion into the fjord

Transport by tugboat to the marine destination
Important characteristics of PE pipes that enabled the concept:

- **Buoyancy** in sea water
- **Flexibility**
- **Non-corrosive**
- **Non-toxic**, potable water approved
- High **fatigue resistance**
- High abrasion resistance
- High chemical resistance
- High resilience to shocks
- Permanent low head loss
- **Weldable**
- Almost unlimited lifetime underwater
- Light in weight, density 950 kg/m³
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HDPE Pipe and fittings range

- HDPE pressure pipes in the range from OD 20 mm to OD 2500 (3000) mm
- SDR classes from 41 to 7.4 (dependent on size)
- Continuously extruded into sea
- HDPE pipes cut in lengths up to 550 - 600 m
The range of products include all accessories needed for a complete pipe system:

► HDPE segment welded bends
► HDPE welded T-branches
The range of products include all accessories needed for a complete pipe system:

- HDPE segment welded bends
- HDPE welded T-branches
HDPE Pipe and fittings range

The range of products include all accessories needed for a complete pipe system:

► HDPE spool pieces
► HDPE wall connection pieces (puddle flange fittings)
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- HDPE spool pieces
- HDPE wall connection pieces (puddle flange fittings)
The range of products include all accessories needed for a complete pipe system:

► HDPE Diffusers
► HDPE Manholes
The range of products include all accessories needed for a complete pipe system:

- HDPE Diffusers
- HDPE Manholes
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Quality control on PE pipes and fittings

- Certification according to ISO 9001 and ISO 14001
- Pipes are produced according to ISO 4427:E and EN 12201
Quality control on PE pipes and fittings

Control of the raw material

- Density
- ISO 1183
- Melt Flow Rate (MFR)
- ISO 1183
- Oxidation Induction Time (OIT)
- ISO 728
Quality control on PE pipes and fittings

Control of the pipe

- Measuring of pipe diameter
- Appearance
  - Diameter
  - Ovality
- Gravimetric control
Quality control on PE pipes and fittings

► Hydrostatic Test

- Hydrostatic strength ISO4427:E / EN12201
- PE80: +80°C / 4.5 MPa / 165 h and +80°C / 4.0 MPa / 1000 h
- PE100: +80°C / 5.4 MPa / 165 h and +80°C / 5.0 MPa / 1000 h
Quality control on PE pipes and fittings

- **Tensile strength test on weld, ISO 13953 – 2001**
  - Conditioning: test piece in air for a min. 6 h at 23°C ± 2°C, testing not be carried out less than 24 h after the butt fusion of the joint.
  - Procedure: Record the maximum force applied and the type of failure as ductile or brittle, as characterized by the ductile and brittle failure modes.

- **Machining of test sample**
- **Tensile strength test**
Quality control on PE pipes and fittings

- Certification Requirements on Welding Machines and Welders
  
  - All our machines are regularly calibrated and maintained
  - Our welders and partners are continuously educated and certified
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Long Length Large Diameter (LLLD) PE pipes for marine applications
Tow preparation

- Tow with Flange Connections Ready Assembled at the Factory
The design of the towing gears is controlled by internationally recognized certifying bodies.

- Departure of OD2500 mm pipe tow
- 9 pipes 280-452 m
- Ras Djinet Power Plant, Algeria, 2014

- Departure of OD2500 mm pipe tow
- 9 pipes 280-560m
- Takoradi Power Plant, Ghana, 2013
Towing in open ocean

- Long length deliveries include towing and transport insurance
- Longest tow record:
  - Departure of OD2000 mm pipe tow, 9 pipes 365-497 m
  - Punta del Tigre Power Plant, Uruguay, (7477 Nm, 91 days), 2015
Installation

► Surface preparation with concrete weights
► Surface assembly of long sections
► Surface positioning along lay route
► Installation with S-bend method
► Surface to seabed transfer utilizing the PE pipe’s flexible properties
► The operation can be reversed if required
► Fast, practical sinking speed 500-1000 m/hour
► No sophisticated equipment required
Installation

S-bend installation method

**STEP 1.**
- 60 m pe pipe
- Lift to stop water to flow until S-bend is formed

**STEP 2.**
- Lift to stop water to flow until S-bend is formed

**STEP 3.**
- Lift to stop water to flow until S-bend is formed

**STEP 4.**
- Pull 30 t

**STEP 5.**
- Pull 30 t

**STEP 6.**
- Add two weights
Concrete ballast blocks (weights, collars)

► Various concrete weight designs

- OD1400mm
- Reykjavik, Island
- 2001

- OD2100mm
- Ashdod, Israel
- 2012

- OD1600mm
- Montpellier, France
- 2003

- OD2500mm
- Ras Djinet, Algeria
- 2014

Long Length Large Diameter (LLLD) PE pipes for marine applications
Installation

Installation in progress

OD2100mm; Ashdod, Israel, 2012

Long Length Large Diameter (LLLD) PE pipes for marine applications
Installation

Installation in progress

OD2500mm; Ras Djinet, Algeria, 2014

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► ANTALYA SEWER OUTFALL, TURKEY, 1997
► Contractor STFA Marine Construction, Turkey
► Delivery of LLLD PE pipes and fittings OD1600, SDR26, 2600 m
Selected references

- SIBENIK SEWER OUTFALL, CROATIA, 2003
- Contractor Montmontaza Hidroinzenjering, Croatia
- Delivery of LLLD PE pipes and fittings OD1200, SDR26, 5134 m
- Installed at 65 m depth
Selected references

- ASHKELON DESALINATION PLANT, ISRAEL, 2003
- Consortium Oceana, Israel – Geocean, France
- Delivery of LLLD PE pipes and fittings OD1600, SDR26, 3000 m
Selected references

- MONTPELLIER SEWER OUTFALL, FRANCE, 2003
- Consortium EMCC, France – Van Oord ACZ, Netherlands – Draflumar, France – Sogea Sud, France
- Delivery of LLLD PE pipes and fittings OD1600, SDR26, 10827 m
Selected references

- TERGA, 1200 MW COMBINED CYCLE POWERPLANT, ALGERIA, 2009
- Contractor Geocean SAS, France
- Delivery of LLLD PE pipes and fittings OD2000, SDR26, 3790 m
Selected references

► CARTAGENA DE INDIAS SEWER OUTFALL, COLOMBIA, 2009
► Contractor EDT Marine Construction, Cyprus
► Delivery of LLLD PE pipes and fittings OD2000, SDR26, 4321 m
Selected references

- ODESSA SEWER OUTFALL, UKRAINE, 2011
- Delivery of LLLD PE pipes and fittings OD2000, SDR30, 4300+ m
- Passage through the Bosphorus channel
Selected references

- ASHDOD DESALINATION PLANT, ISRAEL, 2012
- Contractor I.V.M. Minrev Sadyt, Spain
- Delivery of LLLD PE pipes and fittings OD2100, SDR26, 4984 m
Selected references

- JORF LASFAR PHOSPHATE HUB (JPH), MOROCCO, 2012-2015
- EPC project by SGTM, Morocco and Archirodon, Greece
- Project worth: multibillion $ in multiple stages
- Delivery of LLLD PE pipes and fittings OD1200-OD2100, SDR26&30, 24000+ m in 5 tows. Marine and on land application.
Selected references

- RAS DJINET, 1131 MW COMBINED CYCLE POWERPLANT, ALGERIA, 2014
- EPC project by Daewoo E&C, Korea
- Project worth: 1.1 billion $
- Delivery of LLLD PE pipes and fittings OD2500, SDR26&30, 4500+ m and engineering assistance
Selected references

- TAKORADI, 340 MW COMBINED CYCLE POWERPLANT, GHANA, 2014
- EPC project by MITSUI, Japan and KEPCO, Korea
- Project worth: 260 million $
- Delivery of LLLD PE pipes and fittings OD2500, SDR30, 8800+ m in 4 tows
Selected references

- PUNTA DEL TIGRE, 530 MW COMBINED-CYCLE POWER PLANT, URUGUAY, 2015
- EPC project by Hyundai E&C, Korea
- Project worth: 741 million $
- Delivery of LLLD PE pipes and fittings OD2000, SDR30, 4000+ m and engineering assistance
Selected references

- MOSTAGANEM, 1450 MW COMBINED CYCLE POWERPLANT, ALGERIA, 2015-16
- EPC project by Samsung E&C, Korea
- Project worth: 1.37 billion $
- Delivery of LLLD PE pipes and fittings OD2500, SDR26&30, 10000+ m in three tows
In period 1995-2017, Pipelife has successfully delivered over 140 major projects.

Delivered to over 40 countries around the world.

Installed up to 900 m depths.

Marine and on land installations.

Applications range from sewer outfalls, potable water pipelines, cooling water intakes and discharges, industrial outfalls, fish farms, relining, cable protection.

Full reference list available online.
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Unique advantages of LLLD concept

- Very little to no welding work on site - No risk of bad welds on site
- No risks of ovalisation
- No need for on-land storage place
- No need for local transport and manipulation with stored pipes
- No chance for negative environmental impacts
- Much lower risks for scratches and other damages on the pipes
- Short installation time, which means low installation cost
- Increased overall quality of the installed pipe system
Unique advantages of Pipelife

- Highly experienced supplier
- Long reference list
- Possible to produce pipe with different SDR class without stopping production
- Engineering support
Long Length Large Diameter (LLLD) PE pipes for marine applications

Thank you for your attention!