Helical Extruded Pressure Pipes PE100, ID 1700 + ID 1900, SDR 26



UGPM helical extruded Pressure Pipe PE100, ID 1700, PN6 - 6 m length, elongated to 12 m length

General:

Pressure pipes made of Polyethylene have been successfully used since the 50's of the last century. Over more than 60 years the material has developed significantly in mechanical, thermal and physical characteristics. Mostly used in the pressure market is the pipe grade PE100 with a long term strength of 10 MPa (MRS 10). Furthermore you find in the market PE-types with optimized properties, for example with a better resistance against slow crack growth, called PE 100 RC (crack resistance) or fiber reinforced polyethylene pipes (e.g. Krah PE-GF 200) with very high strength and stability (MRS 20).

The most used international standard for polyethylene pressure pipes is the ISO 4427. Even if this standard has some limitations in tolerances and dimensions, it is always a good base for more detailed specifications.

The requirements of ISO 4427 were originally made for external calibrated pipes (direct/axial-extruded) and the standard is limited until pipe diameter OD 2000 only. Nevertheless the physical and mechanical requirements can be adopted for larger dimensions easily.

ISO 4427 does not consider that more and more pressure pipes in large dimensions are produced by the helical extrusion process with internal calibration. For helical extrusion the pipe tolerances must be verified, the wall thickness can be produced much more accurately because no sagging-effect happens during production. Additionally it would make sense for helical extruded pipes to specify the tolerances for the inner diameter. Also the pressure classes should be defined more flexible, because for these pipes there is almost no limitation in wall thickness and every pressure class can be manufactured. Also a low quantity of pipes can be produced very economically with the helical extrusion process.

This kind of helical extruded pressure pipes are already used worldwide. The company UGPM from the Sultanate of Oman for example is using the newest pressure pipe production technology for direct

extrusion and helical extrusion (Krah-pipes). For large dimensions UGPM installed a special isolated test basin with all equipment for testing pressure pipes and fittings until DN 3000 mm.

In the following, the test procedure for a helical extruded Krah pipe in dimension DN/ID 1700 is documented.

These pipes are part of the big pressure pipe project "Ghubra Desalination plant", where the pipe dimensions ID1700 and ID 1900 are required in SDR 26 (PN6). All pipes and necessary bends, T-branches, stub-ends and flanges are produced and manufactured by UGPM Oman and will be tested acc. ISO 4427.

Scope :

For the helical extruded PE100 pipes, the resistance against constant internal water pressure has to be determined at constant temperature bath and at prescribed duration and conditions according ISO 4427.

The Product:

Helical extruded pipe (Krah-pipe), solid pipe wall

- Raw material = PE 100 (Borouge HE3490LS)
- Internal diameter = 1700 mm
- External diameter = 1842 mm
- SDR class = SDR 26
- Design pressure PN class = PN 6
- Date of production = 05. August 2013.

Quality Inspection:

- QA/QC Department UGPM, Oman
- External Consultant Plaspitec, Germany

Date of Testing:

08 until 24. October 2013

Test conditions

According to ISO 4427 and in agreement with the third party, UGPM has tested the pipes under two different load conditions:

a) Temperature = 20°Cb) Temperature = 80°CDuration = 100 hDuration = 165 hTest Pressure = 9 BarTest Pressure = 4,4 BarStress = 12.4 MPaStress = 5.4 MPaSamples = 3Samples = 3

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Specimen preparation:

- The test specimens are taken from running production for the current project, date of production 05/08/2013.
- Each specimen is joined by Butt fusion with two stub ends, made from same raw material and
 - also helical extruded (PE 100 stub ends also manufactured by UGPM, Oman)
- Closing both stub end with Steel blind flanges and GRP backing rings, with help of Bolts & Nuts.
- Pre conditioning = 24 h in test bath



Specimen before, during and after testing

Test results:

- The helical extruded pipes DN/ID 1700, PN6 fulfills the requirements of ISO 4427 regarding hydrostatic pressure load at 20°C and at 80°C.
- The pipe-specimens have not shown any damage during or after testing.

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UGPM Test documents

Conclusion:

The helical extruded pipes are the technical equal to axial extruded pipes. The pressure load capacity of helical extruded pipes is at minimum the same like for axial extruded pipes. The tolerances for wall thickness of helical extruded pipes are less because of the no-sagging-effect and the rotating production procedure. Tolerances for ovality are more or less the same.

The difference in calibration should be considered for joining pipes and fittings.

The project "Ghubra Desalination plant" has finished and all pipes and fittings in ID 1700 and ID 1900 are installed successfully in year 2014!

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