Some useful web sites and references

- Plastics Pipes for Water Supply and Sewage Disposal Book by Lars-Eric Janson, 2003
- Dreiling, G. “BorECO Polypropylene for sewage pipe systems” Dubai Plast Pro, April 2007
- Barresi, S & Ek, C-G “Large diameter spirally wound PP sewerage pipes installation in Italy”, Plastics Pipes XII, April 2004

Materials for Sewage Applications

### PP Grades

**BorECO BA212E**

- **High stiffness extrusion grade**
- for the production of twin wall sewage and drainage pipes. It will produce high quality products at high output rates.

**BorECO BA415E**

- **Intermediate stiffness for twin wall pipe extrusion**

**BA202E**

- **General purpose PP-B grade**

### PE Grades

**BorSafe HE3490-LS**

- **PE 100 pipe compound providing an excellent balance of production and end use properties**
- It is a high output material which is ideal for producing large pipes for innovating gas, water and sewer systems.

**BorSafe HE3490-LS-H**

- **PE100 pipe compound with exceptional resistance to stress cracking**

**BorSafe HE3490-IM**

- **PE100 compound with improved flow properties**

### Commercial Reference

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About Borouge

Borouge is a leading provider of innovative plastics solutions. Combining the most advanced technology with world-class production facilities, Borouge is a regional company that brings together the very best of Europe and the Middle East.

With a heritage of reliable customer partnership and value creation through innovation, Borouge provides plastics solutions that make a real difference to everyday life.

Established in 1999 as a joint venture between the Abu Dhabi National Oil Company (ADNOC), one of the world’s major oil companies, and Borouge, a leading European plastics provider, Borouge is a genuinely international and innovative leader at the forefront of next generation plastics innovation.

Together, Borouge and Borouge employ unique Borouge technologies to produce innovative plastics solutions in end-use applications throughout the Middle East, Asia Pacific and Africa. Borouge’s role in the petrochemical complex is located at Ruwais, Abu Dhabi in the United Arab Emirates.

Borouge provides a range of differentiated products for high-value infrastructure applications, including pipes, gas and industrial pipe systems, power and communication cables, advanced automotive and packaging components. The advantages of Borouge are well recognized in the industry and are central to Borouge’s success: the technology base has the ability to manufacture high-performance, high volume plastic products that are robust and maintain quality.

Borouge’s presence in key industries throughout the Middle East, Asia Pacific and Africa facilities spread to market, on-time delivery and customer support. Borouge is also the exclusive regional provider of the entire Borouge product line.

To meet ever increasing market demands, Borouge plans a multi-billion dollar expansion at Ruwais. The project, Borouge II, due to commence production in 2015. The world scale project will help existing production capacity to two million tonnes per annum, including, for the first time, polyethylene.

At the heart of one of the world’s most exciting industries, Borouge empowers its customers to create products and solutions that are vital to global development and have a vision of shaping the Future with Plastics.”
Polypropylene materials for non-pressure sewage and drainage systems

Market trends
Over 150 years ago, it was established that a piped sewage system provided a major improvement to public health. Today, however, many of our sewers in the major cities are cracked and leaking into the environment. Most old sewer pipes are made from rigid materials, like concrete or clay, that are brittle and fail due to stone impingement or ground movement (see fig. 1). The generation of sulphuric acid also causes internal corrosion of concrete, which further weakens the structure and is a major problem in hot dry climates. Ground movement and tree root intrusion are also problems for traditional sewage systems.

The benefits of PP for sewage systems:

- **Chemical resistance**: Polypropylene, like polyethylene (PE), is a polyolefin material that is easily processed to form pipes and fittings. It has very low resistance to acids & chemicals.
- **Hydraulic flow characteristics**: Polypropylene (PP), like polyethylene (PE), is a polyolefin material that is easily processed to form pipes and fittings. It has the lowest friction factor of all sewer pipe materials.
- **Weldability**: PP, like PE, is very easy to install (see fig. 2).
- **Specific weight**: PP has the lowest specific weight of all sewer pipe materials, producing a lightweight system that is easy to handle and transport.
- **Resistance to abrasion**: PP is very smooth and has the lowest friction factor of all sewer pipe materials. Therefore, solids can be transported even at low flow rates.

**PP Sewage System Solutions**

The principle design characteristic of a non-pressure pipe is its ring stiffness, which is measured of the pipe’s resistance to applied loads. This ring stiffness of the pipe is a combination of the stiffness of the material and the structural design of the wall. In order to provide the optimum stiffness for minimum weight, different designs are used for different size ranges of pipe.

**Smaller diameter sewer pipes**

Small diameter PP sewage pipes (110 – 315mm) are usually made of solid weldable construction or an extruded or cast wall, for easy connection (see fig. 5). In recent years, high modulus PP-HM materials have been developed, which provide the ideal balance of stiffness, impact strength and long-term properties for non-pressure sewage and drainage pipes. These materials allow the wall thickness of the pipes to be reduced, for a given stiffness class and therefore, are more competitive against other materials.

**Intermediate sized structured wall pipes**

For larger diameters (250 – 600mm), structured wall/PP designs are usually used to improve the stiffness to weight ratio, and thereby reduce the cost per metre. Common designs include ribbed pipes (e.g. Ultrarib) or twin walled pipes, with a corrugated outer and smooth inner wall.

To optimise the design of the pipe corrugation, profile design needs to be matched to the material stiffness. A number of specialised machine manufacturers, such as Unicor, Finkalochka & Co., offer equipment and advice on how to produce these pipe products.

**Large diameter non – pressure pipes**

At very large diameters (900 – 4000mm), it is usual to use a spiral winding process rather than a conventional corrugator. This is constructed from an extruded PP or PE profile that is wound onto a mandrel and welded to the adjacent spiral. In this way, it is possible to build up pipes up to 4,000mm in diameter. European pipe manufacturers, such as Krim and Krah, offer expertise and equipment for the manufacture of such pipes.

Read these case studies where polypropylene materials have provided a durable solution:
- **Corrosion resistant**
- **High abrasion resistance**
- **High stiffness materials**
- **High resistance to acids & other chemicals**