

CASE STUDY

Using Borstar® very low shrinkage product HE6067 for TKF fiber optic LTMC* cables

Customer

TKF (BV Twentsche Kabelfabriek) was founded in 1930 and started optical fibre cable production in 1986. Since then, it has grown from a local Dutch cable manufacturer to an international leader in a cable technology. TKF serves customers all around the globe particularly in the international broadband market. It provides single mode and multimode fibre cables to various European operators, installers and end users. TKF is a full member of TKH Group, an internationally operating group of companies, focusing on development and delivery of innovative Telecom, Building and Industrial Solutions.



Picture 1. Installation of backbone at Bonaire

Challenge

Cable downsizing in the fast growing fibre optic cable market

One of the more popular ways of installing fibre optic cables is to blow them with compressed air into ducts. Typical installation blow lengths are over 1 km. Over the years there has been a drive for miniaturization of the cables. This improves the installation performance due to the reduced cable weight and the increased free volume inside the ducts.



* Loose Tube Mini Cables



Picture 2: Test circuit for blown cable installation at TKF site

For the cable manufacturer this has a major impact on the product and process designs; principally the redesign of the tubes used to accommodate the fibres. Typically a 2.4 mm tube for 12 fibres has had to be reduced to 1.6 mm resulting in hardly any space for the glass fibres. Used in a loose tube cable, the lay length is calculated in such a way that there is an optimal balance in a temperature range of -30°C - $+70^{\circ}\text{C}$ between fibre excess length and the needed free volume. Any variation in the tube length due to cable shrinkage will immediately lead to an increase of the fibre attenuation. For a cable with these dimensions it is a very delicate balance which can easily be disturbed by the choice of jacketing materials.

Thanks to low coefficient of friction, good hardness and abrasion resistance it is a common practice to use HDPE jacketing materials. However, conventional HDPE jacketed cables have one big disadvantage which is high shrinkage compared to those jacketed with MDPE, LDPE, or LLDPE. Shrinkage of the jacket imposes huge stresses on the cable core leading to high signal attenuation.

Solution

A special bimodal HDPE

TKF has selected Borstar® HE6067 based on the compound's extremely low shrinkage properties.

HE6067 (and its colourable version HE6068) is based on Borealis patented technology Borstar®. It has higher melt index and very low viscosity compared to both conventional unimodal and Borstar HDPE. The product exhibits rapid stress relaxation and a reduced extrusion temperature both contributing to very low cable shrinkage. Alternatively for a given attenuation performance, HE6067 allows cable manufacturers to significantly increase the production speed. The lower melt temperature of HE6067 also allows cable manufacturers to potentially save energy.

The use of a non-warping colour masterbatch with Borstar HE6068 (natural) for coloured jackets is recommended to prevent shrinkage due to excessive crystallization which can be promoted by the nuclei present in some pigment masterbatches.

Benefits

Cable productivity improvement coupled with superb attenuation performance

HE6067 also offers high mechanical strength and excellent environmental stress crack resistance. With improved productivity, HE6067 allows cable makers to respond the fast growing fibre optic cable market without further capital investment.

"HE6067 enables TKF to design fiber optic cables at minimum dimensions. Processing at high linespeed does not negatively influence the post extrusion shrinkage. Installation performance is at world class level with blowing distances of 1800 m in one shot! (96xSM G.652D LTMC cable into 10-14 mm HDPE duct)" says Hans de Boer, TKF Head of Research and Development.

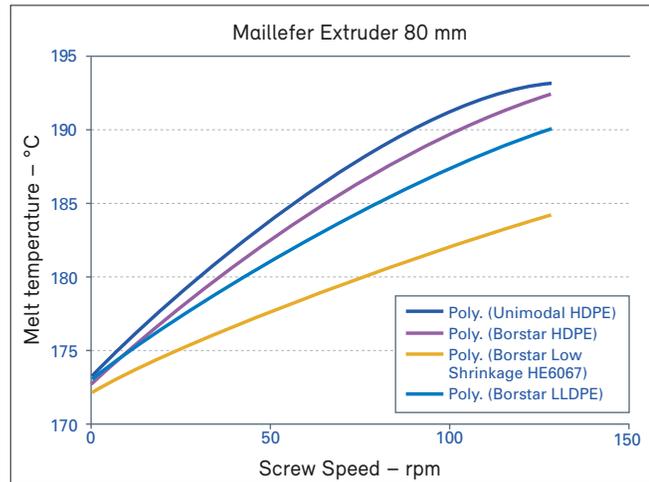


Figure 1. Speed versus melt temperature.

Zones	Borstar® low shrinkage HDPE (°C)	Unimodal HDPE (°C)
Zone 1	140	170
Zone 2	170	180
Zone 3	175	190
Zone 4	175	200
Neck	175	210
Die	190	220

Table 1. Extrusion temperature setting comparison.

Bringing energy all around | Date of issue: March 2010

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For more information:

Borealis AG · IZD Tower
Wagramer Strasse 17-19 · A-1220 Vienna · Austria
Tel +43 1 22 400 000 · Fax +43 1 22 400 333

Borouge Pte Ltd · Sales and Marketing Head Office
1 George Street 18-01 · Singapore 049145