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News Review

PE100+ Association

Plastic Pipes International

Article

PE100+ ASSOCIATION

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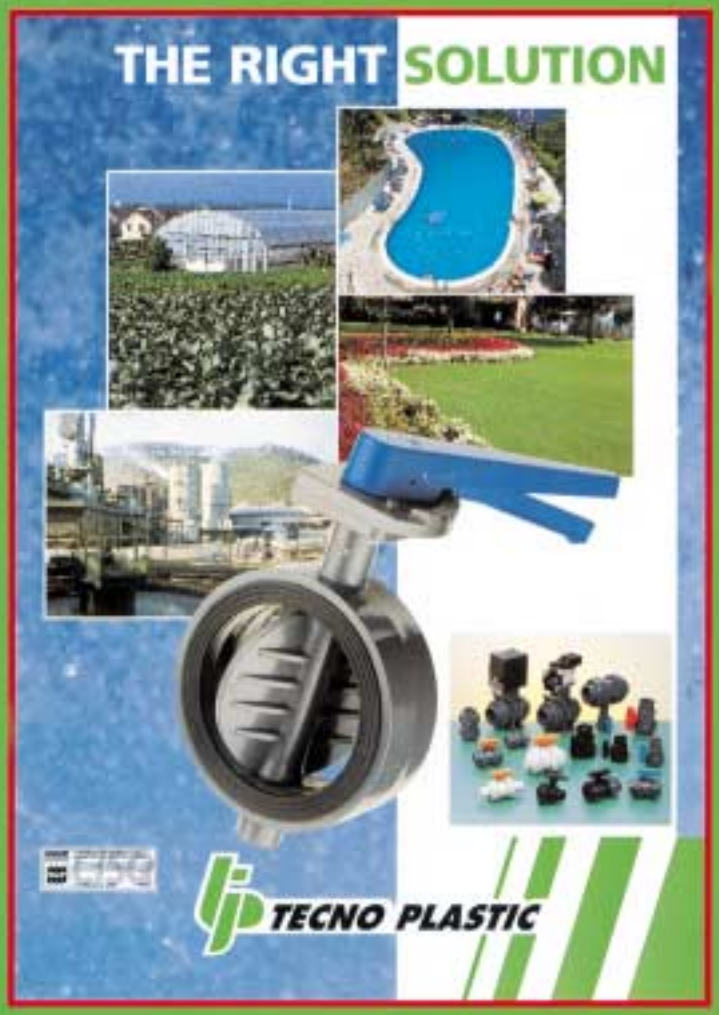
PLASTIC PIPES INTERNATIONAL

marketing technologies and regulations



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PE100 IS SETTING THE STANDARDS

THE PE100 ASSOCIATION

Borealis Elenac and Solvay aim higher

By Dr. A. Scheelen, president of the PE100 Association

THE USE OF PLASTICS IN GAS AND WATER DISTRIBUTION

At the beginning of the gas industry last century, only metals were used for piping. Their use started with grey cast iron going to nodular iron and mild steel up to high performance steel today. Plastics were first used in the US where various studies were carried out, resulting in networks in various types of plastic: ABS, PVC, PA and PE.

In water distribution, which started more than one millennium ago, the range of materials is even more wide, ranging from metals or wood, over all kinds of brick and ceramic materials to, more recently, plastic materials. Today, both plastic and non plastic materials are used, and actual choice is very much depending on the local situation. But it is clear that both polyvinylchloride (PVC) and polyethylene (PE) have taken important parts of this market.

Of all the tested, evaluated and used plastics for gas distribution, not taking into account a few exceptions, only polyethylene has been retained, with very good results thanks to its exceptional resistance against all kinds of failures that might happen in the field, including absence of brittleness and corrosion. Above all that, there are the easy, economical and reliable methods of laying and jointing polyethylene pipes.

At first, the use of polyethylene was limited to low pressures, both in gas and water distribution. At the end of the eighties, PE80 was the standard material for such applications, certainly in the lower diameter range.

THE INTRODUCTION OF PE100 RESINS OFFERED GAS AND WATER ENGINEERS AN EXCELLENT OPPORTUNITY

The introduction of PE100, about one decade ago, enabled end users to extend the advantages of the well known PE80 beyond the technical or economical limits they were faced with.

Indeed, gas engineers were looking for a type of polyethylene being able to withstand to pressures above 4 or 5 bar in all safety, without running into a risk for rapid crack propagation (RCP). PE100 offered this possibility and end users such as British Gas (UK) or Electrabel (B) used this new material almost immediately for their medium pressure gas distribution (5 – 7 bars). Other countries followed later on and PE100 is being used for pressures up to 10 bar in gas distribution today.

Water engineers were constantly looking for large diameter polyethylene pipes withstanding higher pressures or having a greater hydraulic surfaces. They used the 25% higher long term strength offered by PE100 to reduce wall thickness or increase pressure rating, thus enabling more economical solutions to their problems than ever before.

PE 100 is therefore the high density polyethylene resin which today is the reference material for these demanding applications. Several suppliers of this material are available now.

QUALITY INSURANCE FOR PE100 PIPES

PE100 is a well established pipe material, offering reliable operational performance under extreme loading conditions. To guarantee the material's high performance standard, strict quality control tests must be adopted. The requirements that must be met today by PE 100 materials are determined by a whole range of end-user specifications, national and international standards. These will shortly be replaced by new and binding European Standards which will constitute a uniform, pan-European basis of minimum requirements. However, these Standards are, in fact, based upon a series of compromises, the result being minimal performance requirements and, specifically, no systematic material quality control is mandatory. With the aim of offering a "safety plus" by raising the performance require-

Figure 1 - The logo of the PE100+ Association

ments of PE100 resins, above those to be demanded by future European Standards (CEN), three leading PE manufacturers have taken the initiative to join together to form the " PE100+ Association " (see figure 1). The PE 100+ Association was launched at the 24th of February 1999 by polyethylene manufactures Borealis, Elenac and Solvay Polyolefins Europe SA.

TESTS ON 3 FUNDAMENTAL PROPERTIES

The PE100+ Association bases its material acceptance first of all on the ISO and CEN Standards: the relevant materials to be tested must conform to EN 1555-1 or EN 12201-1. To comply with this, fully documented data sets have to be provided demonstrating a long term strength of at least 10 MPa at 20°C over a period of 50 years.
The PE100+ Association also organises regular controls on three critical properties which ensure PE100 pipes can be securely operated. The three properties are:

- a high degree of long-term strength
- excellent resistance to Slow Crack Growth
- good behaviour in Rapid Crack Progression (RCP).

The PE100+ Association aims to set far higher performance targets for these three properties than those which will become the norm in future CEN standards (see figure 2) for the following reasons.

❍ Despite it being a very ductile material, polyethylene can, under adverse conditions, undergo rapid crack propagation, in just the same way as steel. If a gas pipeline is damaged by an outside force (such as, for example, a digging machine or an earth movement caused by an earthquake), the crack which is initiated can, due to the high internal pressure and potential energy in the gas pipeline, spread almost at the speed of sound. The tests realised on materials listed by the PE100+ Association make sure that this risk is minimised.
❍ Durability under pressure is determined by the creep phe-

PE100+ Tests

Property	Test Method	EN Standard	PE100+ Association
Creep Rupture Strength	Pressure test at 20 °C and 12.4 MPa	≥ 100 h	≥ 200 h
Stress Cracking Resistance	Notched pipe pressure test at 80 °C and 9.2 bar	≥ 165 h	≥ 500 h
Rapid Crack			≥ 10 bar

Figure 2: the requirements of CEN standards and the requirements of the PE100+ Association on three critical pipe properties.

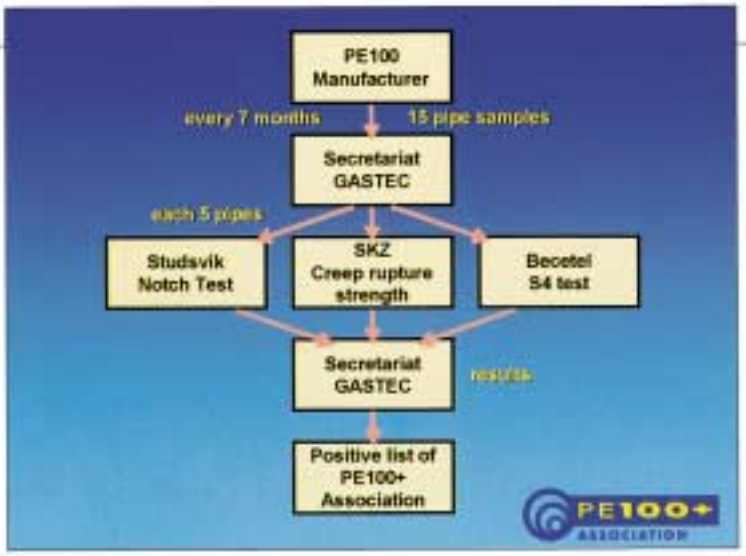

Figure 3 - the organisation of a test run in the PE100+ Association

Figure 4 - The first positive list of the PE100+ Association

nomenon. However, in practice, scratches may occur on the surface of the pipe, resulting in slow crack growth. Both phenomena are accelerated by high temperatures. Therefore, in order to establish the life expectancy of the material, both creep rupture values and notch sensitivity have to be measured.

All tests are performed on 110 mm SDR 11 pipe. Independent laboratories will carry out the tests at seven monthly intervals and under supervision of Gastec, an internationally recognised testing institute according to the scheme below (figure 3).

Based on the test results generated by the above scheme, the PE 100 + Association will publish the list of materials that successfully meet the PE 100+ requirements. In order to keep the "safety plus" objective of the PE100+ Association, only materials that are regularly controlled can be part of that positive list, and materials have to pass two successive test rounds in order to be listed, thus not only insuring quality control but also quality consistency. Figure 4 represents the first positive list.

The PE 100+ Association is open to every supplier passing the above cited requirements. More information can be obtained at the following adress: PE100+ Association, c/o Gastec, Wilmersdorf 50, 7327 AC Apeldoorn, The Netherlands. An internet site will be opened soon under **www.pe100plus.net**.