

A Borouge newsletter for the pipe industry

BorPipe

www.borouge.com □ Issue 3, December 2006



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*Borcoat™ coating systems
for oil & gas exploration
and transportation*

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SHAPING the FUTURE with PLASTICS



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Editor's Note

During late summer and early fall, water scarcity issues have become front page news all over the world.

In August at Stockholm's Water Week, the World Business Council for Sustainable Development (WBCSD) launched a series of scenarios entitled "Business in the World of Water". These scenarios highlighted the complex interrelationship between water, energy and food security and the need for a holistic approach to water management. As headlined in the document:

"Unlike energy, there is no alternative source of water"

Also in August, the World Wildlife Fund (WWF) issued a report that future water shortages can also impact relatively rich countries, such as Australia, Spain, Japan, UK and the US, and consequently, water and water leakages have to be of utmost concern to everyone.

In October, a number of presentations at Plastics Pipes XIII Conference in Washington DC, also highlighted a number of water issues. The keynote speaker at the conference was Jean-Michel Cousteau, President of Ocean Futures Society and son of the legendary film maker Jacques Cousteau. In his presentation, he encouraged everyone to change the way they think about water and to help address the ever worsening situation. He said we should ask ourselves:

"What is it I can do that I haven't already done"

In another presentation, some facts and figures emerged on the US water distribution system, which is still largely constructed of iron pipes. In the US on average, there are 700 water main failures each day, mostly due to corrosion of iron mains. The cost to US taxpayers, as a result of corrosion in the water and sewerage systems, is estimated at \$36 billion per year!

In this issue, we also focus on the problems of the deteriorating asbestos cement water pipes in the UK water network. Pipes which were installed in the 1940's and 1950's are already approaching the end of their useful life, by a similar mechanism to corrosion in iron pipes, posing a major problem for the UK water industry, due to the health hazards in handling and replacing these pipes.

In the 21st Century, we must take a more responsible attitude to our water supply and ensure that the pipes we use today are long lasting and pose no problems for future generations. Non-corrodible, high quality polyethylene pipe systems are the right choice to transport this ever more valuable fluid.

If you want to read more on the water reports outlined above, you can click on the following website links:

A full copy of the WBCSD Water Scenarios to 2025 can also be downloaded from <http://www.wbcd.org>

The World Wildlife Fund document can be read on <http://www.panda.org>

Andre van Uffelt
Business Manager Pipe

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Asbestos Cement Pipes – burying problems for tomorrow?

At first sight, asbestos cement (AC) pipe seems a cheap and simple solution for water distribution systems. But is this really the material for the 21st Century when it was abandoned in the 20th Century in Europe in favour of polyethylene (PE) pipes? Whilst it is true that both PE and AC materials are corrosion resistant and therefore preferred to metallic systems, that is where the similarity ends.

In the UK, asbestos cement pipe was installed for water distribution from the 1920's to the 1980's. As the full implications of the health hazards of asbestos fibres became known, usage of AC pipes ceased but today there is still some 42,000km of AC pipe in the ground, equivalent to some 12% of the UK water pipe network. There is growing concern in the water industry about how to deal with these AC pipes, which are deteriorating rapidly and approaching the end of their life.

Hayden Parry, the Operations Manager of Bodycote PDL in the UK, says: "We are one of the few laboratories in the world that are equipped to handle and test these pipes and we have set up special facilities to assess the condition of these pipes for the water industry. Because of the known health dangers of airborne asbestos fibres, we have to comply with many official regulations and work to the code of practice defined by the UK Health and Safety Executive."

The AC pipes used in the UK were made using all types of asbestos fibres distributed in a cement matrix. Externally they were coated with bitumen, which sometimes makes them difficult to distinguish from iron pipes. Over time, the cement matrix is leached out which may release fibres into the drinking water, dramatically reducing the strength of the pipes and causing them to fail due to earth movement and traffic loads.

Indeed the UK Water Industry statistics show that AC pipes have the second

highest failure rate (12 failures per 100km per year) after cast iron pipes and we estimate that the average life time of the pipes is around 80 years (much lower than cast iron pipes) and therefore failure rates are expected to rise sharply in the near future. Some water companies are starting to develop their replacement strategy for these pipes, with Bodycote PDL involved in assessing which of their mains should be replaced first.

Assessing the condition of these pipes is not easy as the deterioration varies considerably both along the length and around the circumference. One technique is to paint the cross-section of the pipe with phenolphthalein, which detects "free lime" in the structure. The areas of free lime are where the structure has started to break down, becoming areas of weakness. The remaining strength can then be estimated by carrying out a ring crush test at the weak points. Barcol hardness testing can also be used but this only gives a very local value at the surface of the pipe.

Using these techniques, the condition of the pipe can then be assessed and recommendations provided to the water company, so that they can develop their replacement strategy.

Thus in a matter of time these pipes will be replaced and they will undoubtedly be replaced by PE pipes. Indeed in the UK, PE currently accounts for 86% of all new water distribution pipes and it is chosen for its installation and durability benefits.

A welded PE system provides full end load resistance and is therefore capable of resisting earth movement and the traffic loading of modern day cities. No expensive concrete anchor blocks are required at changes of direction and the pipe can be flexed around obstacles without the need for additional fittings.

In addition, PE pipe systems may be



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Hayden Parry, Operations Manager,
Bodycote PDL, UK

installed by a number of "trenchless" techniques, such as directional drilling or pipe bursting, which can avoid digging up busy streets and save installation costs (remember the pipe cost is only 10-15% of the total installation cost). No doubt, a number of these "trenchless" techniques will be used to replace the AC pipes in the UK over the next few years.

The durability of PE is demonstrated in the UK Water Industry failure statistics where PE has clearly the lowest failure rate of all the materials used. Modern PE compounds have a very high resistance to cracking from external loading, which directly translates into a high durability and a low "whole life cost" for the system.

Plastics Pipes XIII Review

The Plastics Pipes XIII Conference was held from 2 to 5 October 2006 in Washington, DC. This was the first time that the conference had been held outside of Europe. This conference is organised and funded by the PPCA, which is made up of a number of industry associations (including the PE100+ Association from Europe).

In total, 433 delegates from over 30 different countries attended the conference, to learn about the latest news and developments in their industry. Just over half the delegates were from N. America (52%), 32% were from Europe and 13% were from Asia including Australia. Over 90 papers were presented in 18 sessions, some concurrent, covering technical and application issues for plastic pipes.

Environmental and water issues figured high on the agenda for the first time and many alarming facts and figures emerged about the use or misuse of water in some of the rich developed countries in the world. In the USA, a staggering 2.45 billion gallons of treated water is lost every day from corroded iron pipes. Similar high losses in the Italian water system (average 42%) confirmed that we do not value water highly enough nor invest sufficiently in our underground infrastructure.

In his keynote address, Jean-Michel Cousteau, President of the Ocean Futures Society and son of the famous oceanographer said:

“Everything is connected but how come we are running out of water? Because of mismanagement and not understanding how water works. The ocean has now become a universal sewer - out of place and out of mind! And yet water is our life support system. One way to change this situation is through education, education, education.”

Mike Shepherd of Thames Water described how after years of



Mats Backman of Borealis presenting his paper "Innovative PE100 Material Improves the Quality and Productivity of Injection Moulded Fittings"

debate, a major investment plan has been approved to replace London's Victorian water mains:

“In common with most other major cities around the world, London has grown outwards and its population has increased. This has resulted in the present situation where over half the water mains in metropolitan London are over 100 years old and a third over 150 years.”

The program involves the expenditure of almost EUR 900 million (from 2005 to 2010) on the replacement of 1600 kilometres of old cast iron pipes in central London. The chosen material for this Asset Management Plan is polyethylene (PE):

“PE is a flexible material able to cope

with the soil conditions, traffic and vibration loadings. Furthermore, it lends itself to the use of trenchless methods of installation, an important consideration when working in heavily trafficked streets containing many buried utilities,”

A further demonstration of the true benefits of PE pipe for water distribution was found in a “whole life costing” model presented by David Walton of Borealis. This model includes all the costs of installation and costs of ownership, with comparisons made between PE, Glass Reinforced Plastic (GRP) and Ductile Iron pipes within diameter ranges of 400-900 mm. In nearly all cases due to the reduced installation costs and lower failure rates, PE was the most economic solution even though the basic pipe cost was higher.

Many more valuable papers were presented, adding to the knowledge and understanding about the benefits of plastics pipes. The complete programme can be viewed on www.plasticpipes.com and requests for specific papers should be addressed to your local Borouge Technical Service representative.

Plastics Pipes XVI will take place at the Budapest Intercontinental Hotel in September 2008, with Dr. Jeremy Bowman of Uponor chairing the event. Try not to miss this important event!

Calendar of Pipe Events

Date	Event	More information
26-30 November	WEPTEX 2006 - The 2nd Saudi Int'l Water, Environment, Pumps & Pipes Technology Exhibition, Dhahran, Saudi Arabia	www.dhahran-expo.com/exhibition/2006/epowerwepetex
5-8 December	OSEA - 16th International Oil & Gas Exhibition & Conference, Singapore	www.osea-asia.com
13-16 January 2007	Arabplast 2007 - The 8th Arab International Plastic & Rubber Industry Trade Show, Dubai International Exhibition Centre	www.alfajer.net/Arabplast
28-31 January 2007	ENVIRONMENT 2007 - Abu Dhabi International Exhibition Centre, UAE	www.ee-uae.com
13-15 March 2007	WETEX 2007 - Water, Energy, Technology and Environment Exhibition, Dubai World Trade Centre, UAE	www.wetex.ae/index1.htm
14-16 May 2007	Water Malaysia 2007 - Kuala Lumpur Convention Centre, Malaysia	www.watermalaysia.com/
21-24 May 2007	Chinaplas 2007 - The 21st International Exhibition on Plastics and Rubber Industries, Guangzhou International Convention & Exhibition Centre, China	www.2456.com/chinaplas

Borouge and Borealis enhances its presence at global water event

For the very first time, Borouge and Borealis jointly participated in the IWA World Water Congress and Exhibition in Beijing, China. Held from 10 to 14 September 2006 at the Beijing International Convention Centre (BICC), our participation at the biennial event was a resounding success!

During the event, which saw a turnout of about 5,000 water professionals and experts from around the world, Borouge and Borealis highlighted the important role that plastics, such as Polyethylene (PE), can play, in preserving and distributing drinking water.

Our eye-catching booth attracted many visitors, both local and international (from outside China). A clear favourite with visitors was our display containing the pipe samples and black resins, which allowed onlookers to have a real "touch-and-feel" experience with the actual pipe and resins.

To reinforce the important role that PE pipes play in water distribution, we organised a press conference and two customer seminars "PE



Pipe Solutions for Urban Water Distribution". These were a huge success, with the first seminar filled to full capacity! Mike Shepherd, Senior Consultant from Thames Water Utilities, gave an insightful presentation on his water mains replacement project in London, and explained to the audience why Thames Water had chosen PE pipe systems for new pipes and its advantages over older-generation materials, such as steel and ductile iron.



Mike Shepherd said, "We chose PE pipes because they would not be affected by the corrosive London clay soil. PE pipes are flexible so they can be bent round underground obstacles and as they are welded together, the fittings are not prone to leak over time. PE pipe networks are resistant to ground movement and most importantly they can be installed using a variety of trenchless techniques.

"Trenchless techniques enable faster, cheaper and ultimately less disruptive installation - this benefits Thames Water and our customers."

Exhibitors and visitors to the IWA Congress and Exhibition included the world's leading water companies, manufacturers, utilities, consultants, research institutes, NGOs and government bodies.

Overall, throughout the exhibition, we made many useful contacts, met old friends and promoted our presence to key players in the water industry. We look forward to participating in the next IWA event - to be held in Vienna, Austria in 2008. See you there!

Pipe websites to visit

Being well informed about PE and PP plastic pipe systems is a must to develop our industry. We have selected several informative and useful web sites for you.

Description	Address
Borouge	www.borouge.com
Borealis	www.borealisgroup.com/pipe
PE 100+ Association	www.PE100plus.net
Plastic Pipe (Plastic Europe & Teppfa)	www.plastic-pipes.com
Plastics Pipe Conference PP XIII, Washington	www.plasticspipes.com
PIPA, Australian Plastics Pipe Association	www.pipa.com.au
IWA, International Water Association	www.iwahq.org
Water industry in China	www.h2o-china.com
Gas industry in China	http://newsgasshow.com

Traccoding – an excellent solution to track PE materials during the service life of pipe systems

New PE water and gas distribution networks are installed, lasting 100 years or more. A good informative marking on each PE pipe will provide additional value to the network. Borouge has recently registered its range of PE compound materials for pressure pipe applications under Traccoding. Thanks to a common marking, PE pipe produced out of Borouge materials will be easier to track after 10, 30 or 150 years of service life.

Marking is a key element among all the advantages of PE pipe systems over other pipe materials. A bit of history: when European gas companies decided 30 years ago to develop PE gas distribution networks, marking of PE pipes and fittings was enforced to ensure an excellent tracking system. 30 years later, all domestic Quality Marks have maintained this concept which guarantees a long term traceability of pipes and fittings long after being grounded. Today, all European gas and water PE pipes manufactured in Austria, Germany, France, and UK are perfectly identified. Typically, each PE pipe is marked with the name of the pipe manufacturer, a monogram of the local Quality Mark e.g. DIN, the type of PE e.g. PE100, the type of application e.g. Gas, the nominal pressure, the pipe dimensions, the production date, the batch number and the PE supplier name (see a typical marking at end of article).

Marking of pipe is nowadays very well defined in all EN and ISO pipe standards. A global identification system for PE pipe materials, PE pipe and fittings called Traccoding is integrated in ISO 12176-4 (2003): "Plastics pipes and fittings - Equipment for fusion

joining polyethylene systems - Part 4: Traceability coding". Each component and/or PE compound manufacturer/supplier is invited to register his product(s) on the "Traccoding" website to obtain the coding(s). The website www.traccoding.com handles the list of codes for component manufacturers/suppliers, for the component types and for the PE compounds.

The system is already used in several countries in Europe. For example, France uses the coding for the NF quality mark. The short-list consists of PE compounds from 10 raw materials suppliers, including two located outside Europe. The code is a fixed number of characters and is assigned by the Traccoding office for each compound and each component manufacturer/supplier. While Borealis has 11 compounds registered (with N as first letter code), Borouge has

registered three PE compounds:

- R01 for Borstar® HE3490-LS
- R02 for Borstar HE3470-LS
- R03 for Borstar ME3440

Borouge is committed to implementing the Traccoding system in the Middle East and Asia Pacific region. This system permits all the members of the value chain to aim for best practices. At its level, the pipe manufacturer will be keen to use common identification codes for the PE100 and PE80 materials used. The contractor or the water company will be able to recognize precisely the type of materials used. Last but not least, the responsibility of the pipe and fitting manufacturer will be reinforced with a stricter focus on the use of ready-made compound materials only.

Our general Pipe brochures, data sheets and shipping documents will be amended soon, and will contain corresponding identification codes. We will invite our customers to stamp their pipes and fittings with Borouge attributed codes. Don't be surprised if you notice PE pipes properly marked according to ISO 12176-4 with either R01, R02 or R03 wherever you are, either in Beirut, Abu Dhabi, Mumbai, Auckland or Kuala Lumpur. By promoting the usage of Traccoding, we are indeed shaping the future with plastics.

DNO 731 NF PE100 GAS8 160X14.6 SDR11 W0306 881 R01

New Borouge brochure - Borcoat™ coating systems for oil and gas exploration and transportation

Borouge and Borealis have just released their first joint Borcoat brochure. As leading providers of coating materials for Pipelines, we are pleased to produce this brochure, to educate and offer innovative solutions to companies and professionals in the Steel Pipe Coating (SPC) industry.

If you wish to receive a copy, please drop us a note at: infopipe@borouge.com



Borouge to participate in two leading shows in the Middle East

Borouge and co-owner Borealis will jointly participate in two major shows come January 2007. They are **Arabplast 2007**, the 8th Arab International Plastic & Rubber Industry Trade Show, and **ENVIRONMENT 2007**.

Held at Dubai International Exhibition Centre, **Arabplast** is the most prestigious event for the plastics industry in the Middle East. With a gross exhibition space of 17,500sqm, the event promises to be a key focal point for leading companies from industries, such as petrochemicals, additives and polymers. 326 exhibiting companies from 38 countries and about 10,000 visitors attended its previous showing in 2005. Borouge and Borealis will be showcasing its latest offerings, including pipe applications, at **Arabplast 2007**, with an impressive 200sqm booth.

ENVIRONMENT 2007, held from 28-31 January 2007 at the Abu Dhabi International Exhibition Centre, also promises to be an exciting event.

ENVIRONMENT 2007 has emerged as the largest and most important event in the region, focusing on the environmental field. The last event was a huge success, attracting 338 exhibitors from 41 countries and over 10,000 visitors. Borouge and Borealis will enhance its presence at Environment 2007 with a 50sqm booth, highlighting their joint vision of **"SHAPING the FUTURE with PLASTICS"**.

Come see us at these two major events!



Quick facts:

ARABPLAST 2007

Date: 13-16 January 2007

Venue: Dubai International Exhibition Centre

Borouge Booth at: 1B 200, Hall 1

ENVIRONMENT 2007

Date: 28-31 January 2007

Venue: Abu Dhabi International Exhibition Centre

Borouge Booth at: 2212

Borcoat™ PE and PP systems – Solutions for rough coated surfaces

About three to four years ago, we have observed a growing demand of so-called "rough-coating" of polyolefin coated steel pipelines. Rough coating is used either for

- **Anti-slip properties** for specific projects (de-coiling under certain circumstances, safety rules for personnel e.g. handling or walking on (slippery) pipes during installation in humid or extremely cold weather conditions)
- **Concrete coating and additional weight assembling.** Necessity to create a rough surface for strong mechanical bonds between the PE or PP top coat and the concrete layer. There is a trend to specify Three Layer PE Borcoat systems for offshore pipeline projects, in lieu of coal-tar enamel or FBE coatings for typical water depth of 30 to 400 meters.

Borouge recommendations

- Different solutions, like patterned press-rolls, spray and sinter coating, have been evaluated by Borouge and Borealis experts. However, the best solution is to use a technology based on PE or PP powder to match with the top coat. When applied properly, this gives a weld-bond between the top coat and this extra layer without any negative impact on the final coating properties.

Borealis has used its pipe coating line located in Finland to evaluate the different options. Best experiences are based on spray application (like epoxy spray) where the pipe goes through a spray chamber followed by slight pressing and vacuum-cleaning. This reduces the amount of loose granules to a minimum and the operation is safe.



For rough coat application, Borouge recommends Borealis RM8406, RM8345 and RM7405, black PE compounds in powder form. All grades can be applied on pipes either by spray gun or by gravity with a vibrating feeder, just before cooling when the top coat is still hot. For 3LPP, Borouge recommends BB108E-1199 (powder) to be sprayed on top of BB108E-1199 surface. Typically, a consumption of 100-150 gm/m² will provide a rough surface on 3LPO top coat, with a sufficient good grip.

Success in the large diameter pipe market, with increasing usage of PE material



Battenfeld Extrusionstechnik supplies complete extrusion lines for large-diameter pipes with all components from one source.



Large-diameter plastic pipes for waste water disposal are on the increase worldwide.



Cooling unit for 1.6 meter PE pipe.

The large polyethylene pipe market is growing fast in the Middle East and Asia Pacific, supported by investments in water infrastructures and the growing acceptance of PE as the material of choice for the water industry. Borouge' sales of PE100 Borstar HE3490-LS (the material used for PE pressure pipe segments for diameters above 200mm) have exceeded expectations, rising above our sales forecasts. This trend is confirmed by Battenfeld Extrusionstechnik GmbH, a leading supplier of extrusion equipment.

With a market share of 70 %, Battenfeld Extrusionstechnik GmbH (BEX), Bad Oeynhausen, Germany is the market leader in manufacturing extrusion equipment for the production of large-diameter pipes from PVC and Polyolefin (Polyethylene and Polypropylene). Only within the last two years, the company has shipped 15 large-diameter pipe extrusion lines to produce smooth pipes with diameters ranging from 800 to 1,600 mm.

About 120 large-diameter pipe extrusion lines are currently operating around the world, of which 85 originate from Bad Oeynhausen. The main markets for the lines shipped within the last two years have shifted from Europe to North and Latin America, the Middle East and Asia. In addition to the turnkey extrusion lines producing smooth pipes, Battenfeld Extrusionstechnik has also delivered

several extruders that are being used to manufacture large-diameter corrugated pipes and wrapped tubes.

As a supplier of turn-key lines, in which all machine components are perfectly matched with each other and with the manufacturing process for which they are designed, Battenfeld Extrusionstechnik also offers suitable machinery and equipment to manufacture large-diameter pipes. Apart from the extruder, which must ensure high output with optimized product homogeneity, the die and the entire downstream equipment must also be laid out for large-dimensioned diameters from 800 to 1,600 mm with wall thicknesses of up to 118 mm. The machine manufacturer has succeeded in building large-diameter pipe extrusion lines including suitable automation systems that ensure high production safety, minimum machine downtimes and extremely low reject rates.

"PE100 Low Sag materials – like Borstar HE3490-LS manufactured by Borouge in the UAE – have facilitated the development of the large PE pipe segment in the Middle East and Asia Pacific regions. Customers are eager to invest in new extrusion facilities when the access to best-in-class materials is secured", said Udo Spilker, who oversees Battenfeld Extrusionstechnik activities for Asia Pacific

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For more information contact: infopipe@borouge.com or visit www.borouge.com or call: +65 6275 4100

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