Local villagers in Pakistan celebrate the construction of the cable pipe bridge by HEED engineers.

Borouge share the ADNOC stand at the World Petroleum Congress in Qatar.

Relining water injection lines for the Daleel Petroleum company in Oman.

Borouge Board supporting the plastics industry in India visiting PlastIndia in New Delhi.
Editor's Note

As Borouge prepares for its second major expansion in four years in the plant in Abu Dhabi the Sales and Marketing organisation has also restructured to accommodate this growth. A number of Regional Sales Centres have been created around the world and a new Marketing Centre and leading the pipe team within this new group as Vice President will be Khalfan Al Muhairi.

In this issue of BorPipe Khalfan provides an insight into the plastic pipe market in the Middle East. He describes how the investment in the plastics industry will make it a centre for plastics conversion as many more local and international businesses set up manufacture in the region. He also describes some of the new products already launched by Borouge and his expectations for the future with the opening of the Borouge Innovation Centre in Abu Dhabi later this year.

We also cover some major projects in the Middle East such as the replacement of the 5km steel water injection pipeline linking Zircu Island with the ZADCO oil production platform. Although the original replacement was to be in steel, Halcrow’s engineers calculated that a welded PE100 pipeline could cope with the 25 bar pressure at the average operating temperature of 32ºC for the minimum design life of 10 years. In Oman a 30km long 8 inch diameter high pressure steel water injection pipe was relined with PE100 pipe by United Pipeline Middle East using their “Tite Liner” technology which will protect it from corrosion for many years to come.

A number of articles highlight some of the activities of Borouge and our partners under the “Water for the World” initiative.

One of our partners, Water and Sanitation for the Urban Poor (WSUP) describes some of the advances they have made in poor communities in three African cities. Working with and supporting the local service providers they have improved the water and sanitation facilities for over 300,000 people in these cities and kick started a process that will benefit many more in the future.

In early February PlastIndia took place in New Delhi and Borouge supported the Indian plastics industry and made it a memorable event. This included visits by a number of Borouge and Borealis Board Members and sponsorship of some of the major events. Supporting the theme of the environmental benefits of plastics, Robin Bresser gave a presentation in one of the technical sessions in which he described some of the new pipe products that Borouge had introduced over the last couple of years that provided a higher durability in tough environments.

Two important events later in the year are highlighted. In July, Borouge will have a stand at Singapore International Water Week, which will bring together experts to discuss solutions to some of the world’s major water problems. In September the International Plastic Pipes Conference in Barcelona will feature over 100 papers on the many product and market developments in the plastic pipes business. Both are important events for your calendar and not to be missed.

David Walton
Marketing Manager
Business Unit Pipe

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Borouge supports India’s growing plastics market

The Indian Plastics Industry has been growing at an annual rate of around 12% over the last few years and will soon reach 12.5 million tons of consumption, which will make it the third largest consumer of plastics in the world. The Indian automobile industry is growing even faster at more than 18% each year and is hungry for more plastics to reduce body weight and improve fuel efficiency. In the agricultural sector the need for more food to feed its growing population will require the development of a further 17 million hectares under micro irrigation systems which will further boost demand of plastics in the coming years. Against this very positive but challenging background PlastIndia took place in Pragati Maidan, New Delhi in early February.

Borouge supported the show with a large exhibition stand displaying many of the products designed to provide high performance and durability at low weight and low cost under the theme: “Plastics Solutions for a Greener Society”. This included lightweight car body panels, Tupperware bottles made out of high transparency PP materials, large diameter PP twin walled corrugated pipes, thick sheets for industrial construction in PP and PE materials and many others. The stand was extremely busy and most of our major pipe customers managed to visit the stand at some time during the six days of the show.

Borouge was one of the main sponsors for the “PlastIndia Theme Pavilion” which was entitled “Say Yes to Plastics”. The Pavilion was comprised of a series of rooms which showed different applications for plastics and demonstrated how they play such a very important role in our daily lives. Exhibits also showed that whilst plastics are tremendously useful across a broad range of industrial and domestic activities responsible waste management is an equally important factor. As the population rises, so will the amount of waste and proper disposal procedures will become more critical.

Borouge was also a “Gold Sponsor” of the parallel conference which took place in the Hilton Eros Hotel and many of the Borouge Board Members attended the inaugural session. Pipe Marketing Manager, Robin Bresser gave a presentation in one of the technical sessions entitled: “Stewardship in Plastic Pipes through Innovation”. In his presentation he described some of the new pipe products that Borouge had introduced over the last couple of years that provided a high durability in tough environments. This included high stress crack resistance PE100 material which had already been used in a number of utility projects and for lining steel pipes in the oil and gas industry. In this latter application the lifetime of the host pipe can be considerably extended thanks to the corrosion protection provided by the PE liner. Spiral wound PP-B pipes also provided a corrosion resistant and cost effective solution to large diameter sea water intake and outflow pipes used in many industrial situations – another example of plastics providing increased durability and enhancing performance at little or no increase in cost. Many of the audience were surprised by the wide range of plastic pipe solutions that were now available for industrial applications and Robin challenged the Indian plastics industry to use more plastic pipes in their own production plants.

A customer event was also organised at the Leela Palace Hotel for about 150 key customers from the Indian plastics industry. During the evening Borouge CEO, Wim Roels, addressed the gathering and updated everyone about the current and future plans of Borouge in India and other parts of the world. Everyone enjoyed their evening and left convinced of an exciting future supported by all the investments and innovative ideas from Borouge in the international polyolefin business.
Let me also welcome you to this first regional review in BorPipe which focuses on the Middle East at this extremely dynamic and exciting time for the plastics industry in the region. A recent survey commissioned by the Sharjah Expo Centre estimated that the Middle East plastics industry will grow by an amazing 9% per annum over the next few years due to the investments that are taking place and the preferential situation for feedstock materials. As well as materials this will also lead to a large increase in plastics processing in the region taking it from its current 2% of the global plastics conversion market to around 9-11% as many more local and international businesses invest in plants in the Middle East. Borouge intend to be very much part of this growth and are currently extending their production facilities at Ruwais in Abu Dhabi from 2 million to 4.5 million tons of polyolefin materials per year. This programme will be completed by mid 2014 and in so doing it will create the World’s largest integrated polyolefin plant.

All this additional plant capacity will allow us to develop and launch even more exciting new products over the next few years. A number of customers and end users in the Middle East have already benefited from using our high stress crack resistant PE100 pipe grade BorSafe HE3490-LS-H which is ideal for tough laying conditions such as renovating old water pipes or for lining corroded steel pipelines for the oil and gas industry. This is the first material of its type produced in the region and is taking plastics into some exciting new areas as you will see in some of the articles in this and future issues of BorPipe. Also for the oil and gas industry a new steel pipe coating material, Borcoat HE3450-H is being introduced, which offers greater protection against corrosion and handling damage at the higher ambient temperatures in the region. These products will play a crucial role in extending the working life of our important pipeline assets and by reducing the losses in the region’s water network and protecting the environment against accidental spillages will help us sustainably manage these important networks.
New specially designed polypropylene pipe materials have also been introduced over the last two years for the production of non pressure pipelines for utility and industrial applications. One outcome has been the production of the largest PP pipe in the region produced by Union Pipes industry using spiral winding technology. These pipes which are 2 and 3 metres in diameter are being manufactured from BorECO BA212E high modulus PP-B material produced at the Borouge plant at Ruwais. They will be used for the intake and outfall lines for large quantities of seawater which will cool the process water in a new refinery in Abu Dhabi. The large heat exchanger will enable the process water to be continuously recycled thereby greatly reducing the “water footprint” of the plant. This material is ideal for this application in that it is resistant to corrosion, easy to process and fabricate whilst being lightweight and easy to handle on site.

Other new products are already in the development pipeline and in the next few months you will see new PE drip irrigation materials and PP-R plumbing materials launched by our team in the Middle East. We are also excited about the opening of the Borouge Innovation Centre in Abu Dhabi later this year which will increase our development capacity and our ability to provide many more products to satisfy the specific needs of our regional pipe markets. We believe that a strong local plastic pipe industry is essential to support the growth taking place in the region and are determined to play an important role in this development.

Our “Water for the World” programme has always been close to my heart as it addresses one of the great challenges of our time – that of adequate water and sanitation for everyone. As population increases one of the major challenges will be to produce enough food for everyone given the limited fresh water resources available and here piped plastic irrigation systems are a vital part of the solution. Also in bringing new water and sanitation systems to poor communities or those in hardship following natural disasters plastic pipe systems play an important role. In this region water scarcity is a major issue for whilst the Middle East and North Africa is home to 6.3% of the world’s population it only holds 1.4% of the world’s renewable water supply and the shortfall is made up by expensive desalinated water. This situation has been recognised by the UAE government and only a few weeks ago it was announced that an annual International Water Summit will run alongside the World Future Energy Summit from January 2013 onwards. This recognises the strong links between water and energy and will help to focus international expertise on this issue in order to develop sustainable solutions and I am sure that as with other activities in our region plastic pipe systems will have a strong role to play.

Last but not least, I would like to share a good practice which had been developed in MEA region which is the Gulf Plastics Pipe Academy (GPPA). This initiative from Borouge will enhance the awareness of quality and the sustainability of plastics piping systems in the Middle East. I encourage the industry to support and to be part of this independent and unique platform for exchanging best practices, supporting training and initiating a quality mark.

Please feel free to contact me or one of my team at any time if you want to discuss some of these exciting new opportunities – we are here to help you grow a successful and sustainable plastic pipes industry that benefits everyone.
Choosing the right colour masterbatch for your PP-R system

1. General information on the colour masterbatch

In hot and cold water pressure pipe applications it is necessary to pigment the natural resin to provide colour identification and meet the optical requirements for the product. The colouring process consists of the addition of colour masterbatch to the natural based polymer at a certain pre-defined ratio during the pipe extrusion process. The colour masterbatch will also contain all the necessary additional antioxidants and uv stabilizers to meet the end-use requirements of the system.

But the addition of colour masterbatch into natural resin during extrusion can affect the rheological, mechanical, optical and pressure performance of the PP-R pipes. Therefore it is extremely important to select the right colour masterbatch and also to employ purpose designed extrusion equipment which will provide accurate dosing and good additive dispersion without damaging the pipe properties. Over the years Borouge and Borealis have conducted many detailed studies to be able to advise and recommend the best materials and equipment for this operation to their customers.

2. Physical blending of natural PP-R resin with the colour masterbatch

Before introducing the PP-R resin and colour masterbatch into the pipe extruder, the resin and colour masterbatch need to be mixed in some form of mixer for a couple of minutes. There are different types of mixers available in the market some of which are attached directly to the extruder (automatic mixers) and others that are stand alone units. We would recommend the use of an automatic mixer attached to the extruder as this usually gives the greatest control and accuracy over the dosing levels.

3. Type of colour masterbatch base resin

The type of resin carrier for the colour masterbatch will strongly influence both the short and long term properties of the final pipes. The best resin carrier for the colour masterbatch is PP-R material itself as this will not reduce the performance of the pipes and thus ensure that they have a long operational life. Polypropylene Homopolymers (PP-H) and Block Copolymers (PP-B) are sometimes used as a base resin for the colour masterbatch but are not recommended by Borouge because these materials are not usually pressure pipe materials and have therefore not been fully characterised at long times and high temperatures.

Using a Polyethylene or other material as a base resin will lead to a poor high temperature pressure resistance and also a deterioration in the taste and odour properties. LDPE is an attractive option due to its high flow and good dispersion characteristics but the pressure resistance at high temperature is much inferior to PP-R. Also since the extrusion temperature for PP is higher than for PE, degradation may take place which would have a negative influence on pressure resistance and the taste and odour properties of the pipe.

4. Melt Flow Rate (MFR) of colour masterbatch base resin

The higher the melt flow rate (MFR) of the base resin in the colour masterbatch the better the dispersion...
of the additives in the pipe and the lower the level of carrier resin required. Therefore it is important to select a PP-R material with a higher MFR, ideally between 8 and 15 g/10min. At low dosage levels this material will provide excellent dispersion without detrimentally affecting the properties of the pipe systems.

5. Choice of pigments

In general inorganic pigments are preferred to organic pigments because they have less adverse effects on the properties of the pipe. However organic pigments are seen as an attractive option because of their high colour strength and high brightness.

It is important that the pigment addition level is high enough to reduce opacity to an acceptable level (maximum light transmission of 0.2% when tested in accordance with EN 578). This ensures that the pipes and fittings are opaque enough to suppress the growth of algae in the drinking water. However too much pigment should be avoided as pigment agglomeration can lead to significant reductions in impact strength.

6. Use of fillers or recycled materials

The long term performance of the system will be dramatically reduced if fillers or recycled waste materials are incorporated into the process. Even small quantities of talc or calcium carbonate will reduce the life at elevated temperature and lead to bursts and leaks in a relatively short period (see photograph). Waste materials will affect the mechanical performance of the system and the quality of the water carried in the pipes and could lead to complaints with regard to taste and odour and even seriously damage people’s health.

7. Evaluating your masterbatch by testing the PP-R pipes

To investigate the effects of changes to the colour masterbatch or process conditions the following short term tests can be used:

- **Compare the granule MFR with the pipe MFR.** If degradation has taken place due to the colour masterbatch or due to unsuitable processing conditions than the MFR of the final product will be higher.

- **Dispersion.** If the colour masterbatch base resin is not suitable (e.g. MFR too low) then the dispersion of pigments in the pipe will be very poor and inhomogeneity in the colour can be observed (see photograph).

- **Impact resistance:** Based on ISO 9854 no failures are allowed at 0°C.

- **Longitudinal reversion:** Using EN 743 (oven test) method B the measured reversion should be ≤3% and the pipes shall exhibit no bubbles or cracks.

8. Further information or support

If you have problems in selecting a colour masterbatch please contact your local Borouge representative. We have evaluated a number of masterbatch suppliers and maintain a list from which we can recommend a reliable quality supplier in your region.
Plastic pipes outperform others in Japanese Earthquake and Tsunami

Most of us remember vividly the pictures on television showing the earthquake in Japan early in 2011 and the tsunami that it triggered. The earthquake had an epicentre in the Pacific Ocean approximately 70 km off the eastern coast of Japan and was the fifth-largest in the world since 1900 when measurements began. The damage to the Fukushima nuclear power plant meant thousands of people living near the plant were ordered to evacuate their homes. The tsunami generated huge waves that swept inland for 10 kilometres killing thousands of people and destroying almost everything in its path. It is estimated that the impact of the tragedy on the Japanese economy will be US$ 235 billion.

After the earthquake, local plastic pipe producer Dainippon Plastics, was keen to find out how their pipelines had performed in these devastating events. Many were large diameter spiral wound polyolefin pipes produced using Krah technology and installed as culverts and drainage systems in some of the worst affected areas of eastern Japan. With the approval of the Japanese government technicians from Dainippon visited a number of sites where their pipes had been installed and inspected the pipeline and measured the resulting maximum vertical deformation of the pipes.

Dainippon Plastics have been manufacturing large diameter polyolefin pipes for drainage and culverts, using the spiral winding technology from Bauku and Krah AG since the early 1980’s and have recently opened a second plant to make the products. More recently they have focussed on the Krah technology and used PE or PP materials to produce pipes up to 3.5 metres in diameter. The resulting pipes are stiff and can resist high vertical forces but remain tough and able to relieve high stresses by limited deformation. The successive lengths of pipes can also be welded together using electrofusion, butt fusion or extrusion welding which enables them to resist axial and bending loads that can arise due to earth movement.

Naturally they had many of their products in the ground in areas affected by the earthquake and their technicians visited a total of 21 separate sites between the cities of Fukushima and Miyako, which were cities where the worst of the damage occurred. Despite the magnitude of the earthquake and the damage to buildings and roads all the polyolefin pipes they examined were undamaged and still functioning well. All the pipes were also checked for vertical deformation and all values were below 5% and therefore still met the Japanese standards for the products.

Rigid pipes and structures made from concrete did not fare as well and many were cracked and broken. In many areas the force of the earthquake and the liquefaction of the soil were sufficient to lift concrete manholes a metre or more above the road surface and break the connections between the concrete sewage and drainage pipes below ground.

Axial movement also led to the failure of many GRP pipes as the forces were...
The seventh and latest Disneyland site is currently being developed in Shanghai, China and it is planned to open in 2015. For such a prestigious project high quality infrastructure is important and in particular a reliable water supply system is essential.

After some intense discussions the designers were convinced that PE pipe systems would be the best option and after their good work for the World Expo – Shanghai in 2010 the high quality local pipe producer Shanghai Chinaust were asked to supply the pipelines and provide technical support for the project.

The design of the water system was quite complex as it would have to pass under a number of roads and rivers including the major G15 Shenyang to Haikou expressway. To ensure that there was no damage to the carriageway the 560mm diameter pipe would be installed by directional drilling to a depth of 20 metres. Since the main construction company, Shanghai Special Water Engineering Company, had no experience of installing pipes at these depths Shanghai Chinaust organized a technical seminar for them where they were able to discuss all aspects of pipe supply, welding and installation. At the seminar Shanghai Chinaust presented some of their experience in similar projects and promised to monitor and record all the quality elements of the project to ensure that everything would go smoothly.

In practice the 400 metre section of 560mm SDR 13.6 pipe under the G15 expressway was installed well within the scheduled time with no major operational problems. Construction of other parts of the water supply network are still continuing in many different areas around the site but so far no major problems have been encountered and it is anticipated that Shanghai Disneyland will open up on time to the delight of many children in China.
“Low Ovality Technology” can cut the costs of PE pipe installation

The costs of installing PE pipes on a large project is very dependent upon the length of the pipes delivered to site and the number of butt fusion or electrofusion joints that need to be carried out. Smaller diameter PE pipes can be coiled in long lengths significantly reducing the number of joints but coiling larger diameter PE pipes using standard equipment causes the pipe to collapse or suffer from severe ovality that is difficult to accommodate on site. A company in the UK has addressed this problem and in this article Iain Wallace of Pipe Coil Technology (PCT) describes some of the large diameter coiling equipment they supply to pipe producers around the world.

Low Ovality Technology (LV) from Pipe Coil Technology allows large diameter PE pipe, up to 315mm diameter, to be coiled as free standing coils or reeled onto drums. This innovative technology has been used in Europe for many years now and is rapidly increasing in popularity worldwide due to the many advantages it offers. It offers 60% reduction in the “out of roundness” of the pipe compared to standard coiling technology and up to 40% reduction in coil volume or up to 80% increase in coil length compared to a standard coil pack volume. By keeping the pipe round the system prevents any possibility of localised permanent deformation or kinking in the wall of the pipe.

Many pipe manufacturers continue to manufacture large diameter PE pipes in the traditional 12 or 20 metre ‘stick’ lengths regardless of its final use. Straight lengths are highly inefficient to handle and susceptible to manhandling damage during transportation. Joining these short straight lengths greatly increases the time and the cost of installation and each joint introduces a potential source of weakness in the system.

In many situations, especially in rural environments, it is beneficial to use pipe in longer coils both for cost saving and for environmental reasons. For example, in rural Queensland in Australia it is estimated that 50,000km of pipe will be installed for coal seam gas extraction. With joints every 20m that equates to 2.5 million joints, using coiled pipe from LV coiling equipment this can be reduced to around 67,000 joints in total. Laying 3km of pipe per day using 12 sticks will require around 10 welding teams each with its own set of expensive welding apparatus. By comparison, 3km per day can be joined by just one welding crew when using coils produced on LV coiling equipment which clearly brings benefits to the installer and the end user as well as the pipe manufacturer and the environment.

Pipe Coil Technology Ltd. Is a privately owned company based in Newcastle in the UK with subsidiaries in the USA and in China. The company designs and supplies coiling and packaging solutions for flexible products such as plastic pipe, sub-sea umbilical and power cables, flow-lines and steel wire rope. To find out more visit www.pipecoil.co.uk
The Gulf Plastics Pipe Academy enters a pivotal year in 2012 with a new Chairman in place and a new building in Abu Dhabi that is expected to open at the end of the summer. In this article Rob Lawrence, the Managing Director of the GPPA, explains how he expects the year to unfold.

As some of you may already know the chairmanship of the GPPA Board rotates every three years and as we are now entering our fourth year of operation a change is in order. Up until now SABIC has held the chair and I have to thank AbdulNasser Al Babtain and Sami Al Osaimi for guiding us through our initial period.

In February, Borouge took over the chairmanship for the next three years and our new chairman will be Hussain Sultan Ahmad Lootah, who is Senior Vice President, Middle East and Africa for Borouge. He has been an enthusiastic supporter of the GPPA from the very earliest days and he told me that he is now looking forward to making a more direct contribution to the future of the GPPA.

As in previous years knowledge dissemination through the GPPA programme of workshops is central to our activities. We already have requests from FEWA (the Federal Electricity and Water Authority) in Dubai, Karama in Doha, Aramco in KSA and Maraqif in eastern KSA to follow up on preliminary seminars carried out in 2011. We have also been asked to return to Cairo to present the next instalment of the training course we did last year for the local engineers but this time focusing on more specific engineering topics. The engineers there will help to set the agenda to ensure that they get maximum benefit from the course. We will also set up visits to old friends in Al Ain and Kuwait to re-establish contacts after a two year gap in our visits and we will also continue to respond to requests from consultants and end users for specific technical advice as we see this as an essential part of the GPPA service. Mott MacDonald has already requested an introductory talk on the design of PE pressure pipe and there will no doubt be other similar requests.

Perhaps of even greater importance is to follow up on the establishment of a GPPA Quality Mark. It is timely that one of the GPPA Board Members has become the senior advisor to the Director General of the newly established Quality and Conformity Council in Abu Dhabi. As our interests in promoting the case for quality coincide we have high hopes of making real progress in this direction during 2012.

We plan to stick to our established pattern of having our main conference in November in Dubai at the same time as the Big 5 Exhibition. However our Spring Conference will be for the first time held outside of the UAE, in Riyadh at the end of April. During the course of the year we will also be contributing papers to the Plastic Pipes XVI Conference in Barcelona and some of the other regional conferences.

If as expected the new GPPA building is ready for occupation at the end of the summer period we will organize an event to celebrate the occasion and use it to discuss with members how we make the best use of the facility. The availability of meeting and seminar rooms and laboratories dedicated to the Middle East Plastic Pipes Industry is an exciting prospect and will enable us to demonstrate the benefits of plastic pipe systems to designers and operational engineers so much more effectively. We will also build up courses to help educate and train young engineers to get the best out of plastic pipe systems in the future.

We are certainly all looking forward to 2012, which I am sure will have its challenges, but will undoubtedly be very exciting and rewarding for us and all of our members.
Throughout Africa millions of slum dwellers lack a clean water supply and basic sanitation services which has a massive negative impact on child health and other aspects of human wellbeing. The rapid growth in population and the continued rural-to-urban migration compound the problems but in many cities highly skilled professionals are making substantial progress towards the provision of water and sanitation services for the poor. This article looks at three cities in which Water and Sanitation for the Urban Poor (WSUP) is currently working, namely Antananarivo, Maputo and Lusaka, and describes some of the approaches being successfully applied by utilities and municipal authorities in these cities to improve the water and sanitation services for low-income consumers. WSUP works with the local water and sanitation service providers and helps them build their capacity to serve low-income citizens. In each city WSUP strives to establish three key outcomes: demonstration of improved service models on a representative scale; strengthened service provider capacity and a policy framework that includes provision for poor communities and obtaining the necessary finance to develop the models to a larger scale.

One of the most important strategies that WSUP has adopted in these cities has been to incentivise service delivery to poor consumers. Water utilities and other service providers are often reluctant to work in low-income and informal settlements, because of perceived constraints relating to land tenure, access, and poor consumers’ ability to pay. However, the poor consumers can pay and are often already paying more for their water from local vendors than is paid by wealthier consumers for piped water systems. WSUP therefore works with the local utility companies and other local officials to demonstrate to them
the business case for extending their network to serve additional customers in the poorer communities.

Another important strategy employed by WSUP is helping service providers reduce the level of non-revenue water (NRW), because reducing NRW can have a positive impact on the water supply available for the poorer communities. In addition increasing the utility’s income provides additional funds for the utility to expand their system to reach these consumers. In Antananarivo this involved training the water authority (JIMIRA) engineers in the installation and use of monitoring and control equipment. Subsequently JIMIRA were able to set up their own dedicated NRW reduction team who are currently working in one area of the city with the intention of eventually covering the whole city. The reduced water losses from this ongoing programme have enabled JIRAMA to increase allocation of water resources to poor districts. Furthermore, improved continuity of supply means that poor consumers are increasingly less likely to resort to unhygienic alternative water sources such as the local wells.

It has also been necessary in each of the three cities for WSUP to encourage the authorities to develop policies that are more favourable to the poor communities. For example in Maputo high water connection charges were proving to be a major constraint to coverage and therefore WSUP have promoted more affordable three part payment systems in low-income districts of the city.

Supporting the development of small to medium sized independent operators is another important strategy that WSUP has promoted in improving water and sanitation services to the poor communities. These can be independent private operators or community based organisations operating on business principles. In general, there is a lack of regulatory models that encourage the growth of these organisations but WSUP has argued for their integration into regulatory frameworks in a number of cities. One example is EMA in Maputo who are the local network management and billing company in some of the poor areas of the city. Maputo has seen rapid growth in the urban population served by small private operators in recent years and under guidance from the regulator they have been invited to register with the aim of bringing them into the framework of drinking water provision.

Using the above strategies WSUP has so far helped over 300,000 people in these three African cities improve their access to a clean water supply. WSUP’s approach and methodology has been recognised by many working in the urban communities in the water, sanitation and hygiene sector and by many donor agencies which has helped them reach this large number of people, but the challenge continues to grow and additional support and funding is still required.

At the beginning of 2012, WSUP estimate that they have brought improved water services to a total of 700,000 people and improved sanitation services to nearly 100,000 in all the cities where they have had activities. Working with the local water suppliers they have also reduced the cost of water for the poor by two-thirds and helped the suppliers develop new skills to reduce water losses.

This article is based on a paper presented by Sam Parker CEO of Water and Sanitation for the Urban Poor (WSUP) at World Water Week in Stockholm. More details can be found on the WSUP website www.wsup.com
Borouge and Borealis became members of WSUP in 2007 as part of their “Water for the World” initiative.

WSUP leads the way in improving health issues caused by high fluoride levels

There are two types of fluorosis - dental fluorosis which manifests itself first and then, over time, the bones yield to the debilitating disease of skeletal fluorosis. Njeri represents the many girls and boys, who suffer from dental fluorosis and who without intervention are on their way to skeletal fluorosis. A study, conducted in Mirera Primary School in Karagita, confirmed that 90% of the school children are suffering from dental fluorosis.

For Njeri, fluorosis is not just a health issue but a social issue too. She cannot even laugh freely – she feels the need to cover her mouth while laughing to conceal her brown teeth. As a young girl, the social effects of the disease can be even more intense as girls are often conscious of the way they look. Njeri’s appearance may mean she has trouble being accepted in some professions. Njeri recently had to travel to an area unaffected by high levels of fluoride. Her teeth made her stand out and she was stared at by others who condemned her for not looking after her teeth, unaware that it was beyond her control.

The main source of water in Naivasha is boreholes and most of the underground water contains high levels of fluoride. Njeri has been drinking water with fluoride levels as high as 9mg/litre (the World Health Organisation (WHO) recommended a maximum level of 1.5mg/l). With no other water source available to her, it was difficult for her to escape the disease.

For Njeri, fluorosis is not just a health issue but a social issue too. She cannot even laugh freely – she feels the need to cover her mouth while laughing to conceal her brown teeth. As a young girl, the social effects of the disease can be even more intense as girls are often conscious of the way they look. Njeri’s appearance may mean she has trouble being accepted in some professions. Njeri recently had to travel to an area unaffected by high levels of fluoride. Her teeth made her stand out and she was stared at by others who condemned her for not looking after her teeth, unaware that it was beyond her control.

Njeri says she has been given a new lease of life as further damage to her teeth has now been prevented and the possibility of the disease progressing to skeletal fluorosis has been minimised. With the improvement in the levels of fluoride in the drinking water, the percentage of children with dental fluorosis will be reduced. In future, children will not be denied opportunities as a result of fluorosis.

Water and Sanitation for the Urban Poor (WSUP) is a partnership between the private sector, civil society and academia focussed on addressing the increasing global problem of inadequate access to water and sanitation for the urban poor and the attainment of the Millennium Development Goal targets, particularly those relating to water and sanitation. Borouge and Borealis became members of WSUP in 2007 as part of their “Water for the World” initiative.
The Wengfu Group operates a large phosphorous mine in the south-west of China producing over 1.2 million tons per year making it the largest of its type in Asia. In addition many other valuable materials are produced on the site including 800 kilo tons of sulphuric acid, 600 kilo tons of phosphate containing fertilizer and 450 kilo tons of phosphoric acid. During the processing waste material is collected and transported in the form of a slurry to a large settlement reservoir alongside the Zhou River.

To transport this corrosive slurry the 6.4km from the processing unit to the settlement reservoir large diameter PE100 pipelines were constructed. The SDR11 pipes from 100 to 800mm diameter were produced by Sichuan Chinaust from BorSafe HE3490-LS PE100 material from Borouge. The low sag properties of the material made it ideal for the production of this relatively thick walled pipe reducing both the production time and the level of scrap material generated.

The construction work, which was carried out by the ShenZhen Shengi Environment Company, was completed in July this year at a total cost of US$95 million. To protect the Zhou River from contamination from the slurry a HDPE geo-membrane was used to line the reservoir. This together with the welded PE100 transportation pipelines reduced the possibility of any leakage of the slurry into the ground water or the nearby river. As the solids in the slurry settled to the bottom of the reservoir the water is to be drawn off, treated and recycled to the processing unit thereby reducing the “water footprint” of the operation. It was estimated that the storage capacity of the reservoir would be sufficient to support a 16 year operational lifetime.

This is another example where the corrosion and abrasion resistant properties of polyethylene make it ideal for industrial pipelines. The selection of high quality BorSafe PE100 material for the slurry transportation pipelines ensures the lowest manufacturing costs and provides the maximum protection to the environment.
Lining Water Injection Pipelines in the Oman Oil Fields

The Daleel Petroleum Company produces oil in the Sultanate of Oman approximately 300 km west of the city of Muscat. Like most oil companies they recycle process water and inject it back into the well to increase oil production. As the well increases in age the level of hydrogen sulphide and other contaminants in the process water also increases, which in turn leads to rapid corrosion of the bore of the steel pipes. Failure of these pipes is a major concern as the environmental costs of contaminated water spillage are high and to avoid this many of the pipelines are regularly replaced. One alternative is to use “close-fit” internal lining using polyethylene which will significantly extend the life of the pipeline. This is equally true for new water injection lines, which can be internally protected immediately after installation to increase their service life.

In a recent project 30km of 8 inch diameter steel water injection pipes were lined by United Pipeline Middle East using the “Tite Liner” technology. To ensure that the optimum lifetime was achieved the PE100 pipes were produced from BorSafeHE3490-LS-H high stress crack resistant material. This specially designed polymer will resist the growth of cracks from any scores or damage on the outside of the pipe introduced during installation and extend the operational life of the liner.

The PE100 liner pipes were produced by the local pipe manufacturer Muna Noor Manufacturing and Trading LLC in their Muscat plant and delivered to site in 19 metre lengths. The individual pipe lengths were then welded into strings which were then drawn through United’s hydraulically powered roller reduction box which temporarily reduced the diameter of the pipe. This PE pipe can then easily be pulled through the steel pipe and once in position the load is released so the pipe can recover and form a tight compression fit with the bore of the host pipe protecting it from any future corrosion.

After the completion of the project for Daleel Petroleum the editor talked to the General Manager of United Pipeline Middle East, Jeff Schell about the company and some of their experiences in pipe lining:

Can you tell me a little bit about your company in Oman?

This project was executed by United Pipeline Middle East Inc., which is the legal entity under which United Pipeline Systems operates in the Middle East. United developed the Tite Liner technology in the early 1980's in Canada. Since that time, United has installed more than 15,000 kms of PE Tite Liner in diameters ranging from 2 inch to 52 inch and pressures exceeding 300 bar.

Lining water injection and flow lines significantly increases their service life – can you give us some idea of the payback period?

It is difficult to identify the payback period as it varies from project to project. However it is assured that once installed, the HDPE Tite Liner system will eliminate any future internal corrosion. With Tite Liner, there is no need for chemical inhibition or maintenance associated with internal corrosion issues. Tite Liner is designed to be a “fit and forget” system for the lifetime of the design. In one study conducted in 2007 of a 10" x 8km pipeline it was found that the payback period was less than 3 years compared to unlined carbon steel plus inhibitors. In terms of Life Cycle Cost, HDPE Tite Liner is certainly one of the most cost effective options available.

Can HDPE liners be used for hydrocarbon service like oil or gas? What about at elevated temperatures?
Yes, United has been utilizing the HDPE Tite Liner system for more than 20 years for hydrocarbon service. The basic idea is the same as with water pipelines, the carbon steel host pipe contains the pressure and the HDPE liner acts as a corrosion barrier. The design of the liner is a little different for hydrocarbon service and sometimes United would specify an externally grooved liner like our exclusive Safetyliner product. Temperature is certainly a primary consideration when designing the liner system. United has Tite Liner systems in trouble free service for more than 15 years at operating temperatures exceeding 90°C.

**In the Middle East there must be many opportunities for further projects of this type – can you give us an idea of the opportunities you see?**

We are seeing opportunities in every country in the Middle East. Some clients are utilizing HDPE Tite Liner as a rehabilitation method for existing pipelines that are suffering from internal corrosion while others are specifying it on their newly constructed pipelines to ensure that there will never be an internal corrosion issue.

**Tite Lining is obviously not just for the oil and gas industry – can you give us some examples where it has been used in other market sectors?**

United has used the Tite Liner technology in more than 25 countries around the world to protect a variety of pipeline applications. It has been used in chemical plants, industrial plants, drinking water applications, and pressurized sewerage pipelines just to name a few. HDPE Tite Liner is also used extensively for abrasive mining applications to protect pipelines from erosion.

**For a successful Tite Lining operation it must be important for you to ensure that the pipe quality is the best – can you tell us how you accomplish this in practice?**

It is important for us to specify a high grade of polyethylene material which we can rely on to provide the right level of performance during installation and protection in subsequent operation. We start by specifying the best polyethylene polymer grade for the application and then follow through the processes of liner manufacturing, fusion welding and liner installation. In fact United provides the complete Quality Assurance for the process. Good quality HDPE is the mainstay of the Tite Liner system and therefore we take great care with polymer selection and in this case we have selected BorSafe HE3490-LS-H PE100 from Borouge.
Fitting manufacturers in China see benefits of BorSafe HE3490-IM

Many fitting manufacturers experienced difficulties in achieving good quality fittings using standard PE100 materials that had been developed primarily for pipe extrusion. The fittings had a very poor surface finish with high shrinkage stresses and even voids in thick sections due to the poor flow characteristics of the PE100 material in the relatively narrow mould cavities. Increasing the melt temperature improved the appearance but meant that cooling times in the mould were considerably longer which slowed down production and increased costs.

BorSafe™ HE3490-IM was the first tailor-made injection moulding material to overcome the production challenges and produce high quality low cost PE100 fittings. Using advanced polymerization technology and a hexene comonomer the material combines the strength of a PE100 material with dramatically improved flow characteristics. The result is the production of good looking fittings with a reduced scrap rate and with increased productivity.

BorSafe HE3490-IM material was first introduced into Boraouge regions in 2007, initially produced by Borealis in Europe but more recently produced in the Boraouge plant in Ruwais, Abu Dhabi. During the initial period fitting manufacturers were conducting trials to ensure that they could achieve the expected benefits but once these tests were completed and the benefits confirmed there was a considerable increase in sales as shown in the graph.

A typical reaction is the one from Zhang Yong the Procurement and Marketing Manager from Cangzhou Mingzhu who stated: “Since we used BorSafe HE3490-IM to make fittings, it has been found that HE3490-IM exhibited significant advantages compared to existing fittings produced from PE100 pipe resin, in terms of fitting appearance and ease of processing. By adjusting the processing conditions the production output could be increased by 10-20%, injection moulding pressure reduced by 10-15% with less shrinkage (size variation), i.e. it is easier to control fitting dimensions giving a much lower scrap rate.”

The benefits of lower moulding pressures and temperatures were also highlighted by W S Wan the Deputy General Manager of the GH Fusion Corporation, which were the first fittings company to regularly use the material in China. He recently stated: “We have been using BorSafe HE3490-IM for a number of years now and it has certainly enhanced our production operations.”

During their initial trials the team at Shanghai Georg Fisher Chinaust also carried out a thorough investigation lead by Lu Peifeng, of their Technology Assurance Department. The ovality of thin walled fittings was excessive using normal PE100 materials but with BorSafe HE3490-IM it was much improved. Also on relatively thick walled spigot fittings they measured reductions in ovality of 40% and where other materials had produced voids in very thick sections with BorSafe HE3490-IM the sections were void free. From his work he concluded: “Using BorSafe HE3490-IM provides a large improvement regarding injection moulding processing, compared to normal PE100. The material produces fittings with a much improved surface finish, no voiding and lower internal stresses.” These benefits have been transferred to regular production as confirmed by Quality Manager Zou Lijun who recently stated: “We find BorSafe HE3490-IM is much easier to process than other PE100 materials, which is why we prefer to use it in production.”

These are just three examples of satisfied customers in China who now use BorSafe HE3490-IM material because they have proved to themselves that the benefits claimed for the material can be achieved in regular production and provide them with higher quality fittings, often at a higher output rate, which gives them a clear advantage in the market.
Higher stiffness PP-B HM pipes to cope with demanding geological conditions

China has already invested considerable amounts of money in new infrastructure but the rapid increase in living standards will demand even more expenditure over the next few years. In their latest 5 year plan, which was announced in 2011, the Chinese Government plan an additional 150,000km of sewage and wastewater pipelines to be constructed at a cost of more than US$35 billion. Many of these pipelines will be plastic as they are already well established in the sewage and drainage pipe sector and many will be laid in areas with difficult geological conditions which will require new innovative solutions.

The city of Dongfang on Hainan Island in the extreme south west of China is one such place where the soil is very poor and subject to slippage. In these situations it is essential that the sewage and wastewater pipelines are buried deep and that they are extra stiff and tough to combat the higher ground forces. In a recent project nearly 5 km of drainage pipes were to be installed under the highway crossing the city of Dongfang. It was recognised that the standard SN8 300mm and 400mm diameter twin wall HDPE corrugated pipes would not be up to the job, so Shanghai ERA Material Development Co. produced higher ring stiffness pipes using BorECO BA212E material on their standard production equipment. Using this material the stiffness of the product was increased to SN14, well above the requirement of SN12, whilst the weight of the pipe was actually reduced by 11% compared to the HDPE pipes. This would ensure that the pipes would be far better at resisting any deformation due to the deep burial or any subsequent soil movement.

Because these BorECO PP-B HM materials are considerably stiffer than HDPE they are usually used to produce lighter weight standard products but when additional stiffness is required to meet special circumstances they can be used with standard PE production tooling to produce a far stiffer pipe. Although the pipes are far more rugged they are still lightweight and easy to install requiring none of the heavy lifting equipment that is needed to install concrete pipes.

Investigations in Europe have also shown that flexible plastic sewage and drainage systems are far more able to resist the long term stresses and strains on the system without failure than rigid systems like concrete or asbestos cement. PP materials are also extremely corrosion resistant, often being used to line concrete sewers or industrial tanks, which means that once installed these pipes will go on to solve Dongfang’s drainage problems for many years to come despite the difficult soil conditions.
Borouge exhibit at the 20th World Petroleum Congress in Qatar

The World Petroleum Congress and Exhibition is the largest and most prestigious oil and gas industry gathering in the world and the 2011 event in December was hosted by Qatar Petroleum in the Qatar National Convention Centre in Doha. Holding the event in Qatar for the first time recognised the development that has taken place in the country over the past few years, establishing it as the largest producer and exporter of LNG in the world.

All the major players in the industry were represented in the exhibition halls and being a major oil and gas producer ADNOC had a large and impressive stand. Borouge were invited to share part of the stand to display some of our innovative plastics solutions in

Borcoat HE7405 the new, easier flowing PE “Rough Coat”

The effective protection of high pressure oil and gas transmission pipelines from handling and installation damage and long term corrosion is critical to the working lifetime of these expensive assets. Today in all but a few countries three layer PE coatings are chosen for all onshore pipelines and Borouge and Borealis have established a leading position in supplying the specialist materials for this market. This top position is maintained because we provide complete systems and technical knowhow and we continuously improve the products within the Borcoat range.

In most applications steel pipe coatings need to be even with a smooth surface with a low level of friction. However there are exceptions, such as when the pipe is to be covered in concrete to keep it submerged when it is beneficial for the surface of the PE coating to be rougher to generate a greater level of friction. In these circumstances an additional “Rough Coat” will provide that higher level of friction increasing the grip of the concrete on the PE coating. Similarly when pipes are installed on a steep incline or offshore pipes are installed using caterpillar clamps a “Rough Coat” can be beneficial.

Borouge and Borealis recently launched Borcoat HE7405 which is a “Rough Coat” that can be applied directly onto the PE top coat and has been developed specifically for these applications. It replaces RM7405 and having a higher melt flow rate it is an easier melting and flowing compound
The original steel water injection line linking Zircu Island with the ZADCO production platform was heavily corroded and likely to fail in the near future. The owners therefore considered replacing it with a new steel line until they approached Borouge and Union Pipe Industry who recommended that a PE100 pipeline would provide a more durable solution. Halcrow were appointed as the Engineering Consultants and they calculated that a welded PE100 pipeline could cope with the 25 bar pressure at the average operating temperature of 32ºC for a minimum design life of 10 years.

The resulting pipeline design was 560mm diameter and 80mm thick and this was manufactured by Union Pipe Industry in Abu Dhabi making it the first polyethylene pipeline of these dimensions produced in the Middle East. The excellent low sag characteristics of the BorSafe HE3490-LS-H material used to manufacture the pipe enabled a pipe of these dimensions to be produced using standard extrusion equipment and conditions.

The pipes were then delivered to Zircu Island where they were welded together to form 600m long pipe strings which were then individually pressure tested. The PE pipe strings were subsequently joined to form the 5km water injection line linking the island to the oil production platform – another first in the Middle East. Concrete weights were used to sink the pipeline to the sea bed.

which further simplifies application. Borcoat HE7405 is a black compound supplied in powder form containing all the necessary thermal and UV stabilizers. As well as being the perfect “Rough Coat “ it can also be used to repair small areas of damage in a 3LPE coated steel pipe.

Borcoat HE7405 is applied directly on top of the still molten PE top coat in the coating process before quenching in the cooling unit. There are a number of methods used to apply the powder such as electrostatic spray, using a shaker plate mechanism or a belt dosing unit with a funnel-shaped outlet. The application rate and consistency is dependent on the type of application equipment, coating unit design, dimensions of the steel pipe, temperature of the coated pipe and the line speed. For side extrusion (wrapping), an additional lightweight roller reduces the amount of free particles on the surface. For any further details please contact your local Borouge representative.
Nagpur lies precisely at the centre of India in the province of Maharashtra and even has a Zero Mile Marker indicating the geographical centre of India. With a population of 2.5 million it is the largest city in central India but is only the third largest city in Maharashtra province after Mumbai and Pune. Like many cities in India the water supply to many areas of Nagpur is intermittent due to high leakage levels but the Nagpur Municipal Council has an ambitious plan to renovate the system and have chosen to use welded polyethylene systems for the task.

They made the choice for PE based on the very successful demonstration project designed and managed by Veolia Water India in the Dharampeth district of the city. This convinced the council to go ahead and subsequently they released a number of tenders covering different parts of the city. The systems are designed for 8 bar pressure using PE100 pipes for the mains and MDPE PE80 pipes for the house connections. The main sizes are relatively small in the range 90mm to 160mm and most of the jointing carried out using electrofusion fittings with butt fusion in the larger sizes.

Early in January Prashant Nikhade of Borouge India visited the city and was delighted to see the progress that had been made and to receive some very favourable comments on the use of PE systems from the installers and from members of the local community. Prashant said: “Most of the pipes being used on the site were from Jain Irrigation Systems Ltd and the electrofusion and compression fittings were supplied by Glynwed Piping Systems and Kimplas Piping Systems Ltd., all good customers of Borouge. The installation work was being carried out by Unique Plasto Sales & Services, a local company with over 15 years experience in installing PE systems. The installation teams were well equipped with automatic butt and electrofusion machines and the manpower was well trained in the correct installation procedures.”

Commenting on the general atmosphere on site and the attitude of the workforce Prashant said: “It was nice to hear the positive comments from the installers on using PE systems and to see the satisfaction that was reflected in their faces. If the rest of the installations are completed to the same quality standard I am sure that Nagpur Municipal Council will have significantly reduced its water losses and be heading to the top of the national league tables thanks to high quality PE systems and good installation workmanship.”
It is clear that the economy and the population of India are both growing at a very fast pace but this is not being matched by the development of the infrastructure. Even in many of the megacities where water distribution systems exist they are in poor condition and the need for pipeline renovation has never been greater. Trenchless Technology offers the ideal solution to many of these problems but even if a fraction of these needs were addressed the capacity of the Indian Trenchless industry would be challenged. The Indian Society of Trenchless Technology believes that the failure to address these issues will seriously affect the nation’s health and the pace of future economic development. Hence the theme of the No-Dig Show 2011 - “Underground is the future - let's protect it jointly”.

The event which was held from 13th to 15th December, 2011 at the Habitat Centre, Lodhi Road in New Delhi attracted nearly 900 delegates, clearly demonstrating the interest in the topic in India. The sponsors of the show were Michigan Engineers and Blue Whale Construction Technologies and there were a total of 67 exhibition stands split between two areas, one at Sliver Oak Lawns and the other at the Charminar Area.

At the conference there were several presentations covering many of the important aspects of trenchless technology and related applications. Mohana Murali of Borouge presented a paper entitled “Innovative, high stress crack resistant BorSafe PE100 for lining oil flow and water injection lines”.

This paper featured high stress crack resistant BorSafe HE3490-LS-H which is the ideal material for pipes used in trenchless technology or installed in difficult laying conditions.

Under these circumstances it is even more important to use pipes produced from the highest quality PE100 materials, which can resist cracks which can be caused by the high stresses due to external damage or point loads. He presented a number of examples where pipes produced from this material had been used to internally line flow lines and water injection lines using close fit insertion techniques in the Middle East oil and gas industry. The PE layer on the inside of the pipe protects the steel from any further corrosion thereby extending the lifetime of these valuable assets and protecting the environment. The session was very well attended and provoked a number of interesting questions and enquires.

The Borouge exhibition stand supported Mohana Murali’s paper showing some of the projects where the high stress crack resistant materials had been successfully employed. Attendance at the conference and exhibition was a further example of Borouge’s collaboration with the Indian Society of Trenchless Technology in spreading awareness on the important quality parameters for PE pipes for trenchless applications, which has included a number of earlier training programmes for value chain members.
Their target was to deliver water to the villages of Rayan Seri and Jandar Seri in Jagran Nullah in the mountains of Northern Pakistan, who had lost their existing supply systems in the floods of 2010. However at one point a deep gully stood in their way which would have taken a considerable amount of time and additional pipework to navigate around so the HEED engineers developed an innovative solution – a “cable pipe bridge” to span the gully.

Tying 230 metres of small diameter PE100 pipe to a cable was no problem but they knew that with the winter approaching very fast that the water it carried would soon freeze in the snow and the icy winds of this mountainous region. The other part of the system was well protected as it was deeply buried in the rocky ground and the pipes were produced from BorSafe HE3490-LS-H high stress crack resistant PE100 material, which would resist any point loading from the rocks, but this airborne section would be exposed to all the elements.

The solution was to develop a good insulation system that would protect the water in the pipe from freezing.

In consultation with Andy Wedgner of Boreouge the local HEED engineers tested several different solutions including the use of an outer casing of uPVC pipe with expanding foam to fill in the gap between the PE100 pipeline and the casing. They introduced spacers to try and ensure that the expanding foam surrounded the pipe evenly but they encountered numerous problems in ensuring that the 3 metre sections of uPVC casing pipe were completely full of foam and eventually this solution had to be abandoned.

The final solution was to use 6mm thick foam sheet which was cut into longitudinal strips with a width equivalent to the circumference of the PE100 pipe so that each foam strip could be wrapped around the pipe exactly and temporarily fixed with tape. Then the outer casing of uPVC pipe could be slipped over the insulation holding it firmly in position. In this way they covered the complete 230 meters of the water supply pipe sealing the joints of the uPVC pipe lengths as they progressed to make it waterproof.

As we publish this edition of BorPipe, the water is flowing in the cable pipe bridge and the overall project is now over 90% complete but has come to a temporary halt due to the onset of some severe winter weather. Once the weather improves the remaining minor works will be completed such as surrounds for the water tap stands, additional water storage tanks and the final testing of all the new water supply schemes. This project was funded by Borouge under the “Water for the World” programme and locally supported by the Borouge agent, Arfeen International and the local pipe producer Sun International.
Working with the Gas Industry to improve pipe quality in China

Founded in 1862, The Hong Kong and China Gas Company Ltd. was the first public utility in Hong Kong. Today it is one of Hong Kong’s largest energy suppliers, with a world-class management team that is committed to leading-edge business practices. Hong Kong and China Gas’ core business in Hong Kong consists of the production and distribution of gas, the marketing of gas, the sale of gas appliances, as well as comprehensive after-sales services. With a pipeline network of more than 3,400km, the company supplies gas to over 1.7 million customers in the territory. Hong Kong and China Gas extended its gas business into mainland China in 1994 and currently operates 120 projects across 20 provinces, municipalities and autonomous regions in the country. These include piped city-gas projects, upstream and midstream projects, water supply and wastewater treatment, natural gas filling stations, as well as a number of new eco-energy projects.

Quality has always been one of the key elements within Hong Kong & China Gas’ expansion programme and is rigorously applied whether the operation is in Hong Kong or in China. Borouge has worked closely with them to help them to identify the suppliers of good quality PE pipes in China. Samples provided by Hong Kong and China Gas and other end users in China have been returned to the laboratory in Ruwais, Abu Dhabi, for analysis to identify whether it is indeed produced from a Borouge material as claimed by the supplier. In the early days the number of poor quality pipes was large but over the years this has reduced dramatically as Hong Kong & China Gas have refined their list of approved pipe suppliers and introduced their quality assurance system. The results for 2011 were reviewed at a meeting in January and both teams were pleased to see that the number of poor quality pipes from all sources in China was below 10% for the first time.

Cindy Wang also showed a number of the other activities that Borouge had initiated in China to spread knowledge on PE pipe systems and encourage the continued improvement in pipe quality. This included the very popular International Pipe Conference in Beijing organised through the Plastic Pipes Conference Association (PPCA) and the China Plastic Pipes Industry Association. This event attracted over 350 delegates to listen to a total of 23 papers from technical and marketing experts on plastics pipe systems from around the world. Other important events during 2011 were the meetings with the Gas Research Institute in Beijing and the Sino-French Water Group.

During the remainder of the meeting in Hong Kong many other topics of mutual interest were discussed including quality issues related to butt fusion jointing at extremes of temperature and humidity. Regular exchanges of this type enable the two teams to share information and experiences and generally improve the knowledge of both parties.
On 2nd December the UAE Embassy in China organised an event for around 300 people in Beijing to mark the 40th anniversary of the foundation of the United Arab Emirates. The UAE Ambassador made a welcoming speech and showed some of the history and amazing recent developments in the Middle East.

The local Borouge office organised a table and invited some of their colleagues and guests at the UAE National Day event in Beijing.

Three of the speakers at the 2011 GPPA Spring Conference in Abu Dhabi

Ms Li Changying the Editor of the City Gas Journal being presented with her prize

Borouge China celebrates UAE National Day

The 2012 GPPA Plastic Pipelines Spring Seminar will take place in Riyadh, Saudi Arabia, on 24th and 25th April. This will be an excellent opportunity for delegates to gain knowledge and understand the latest methodologies and solutions for plastic pipelines in the oil and gas and utility sectors. The individual presentations will cover all aspects of the market from pipeline design and construction to pipeline operation and maintenance.

This dedicated seminar and networking event, outlines the challenges currently facing the pipe industry and takes place over two days. The first day will cover the application area “Plastic Pipes for the Oil & Gas sector”, whilst the second day will focus on “Pipeline Construction and Maintenance”.

Register now!
The Abu Dhabi Sewerage Services Company (ADSSC) was established in 2005 as a public organisation wholly owned by the Abu Dhabi government and it took over the responsibilities of the Municipalities of Abu Dhabi and Al Ain for the collection, treatment and disposal of waste water in the emirate.

In the past ADSSC have used GRP and uPVC pipes for sewage and wastewater collection but they have recently completed updating their standard specification to include a new section covering gravity pipes produced using polypropylene materials, their installation and testing. This specification covers both solid wall pipes and fittings to EN 1852 and structured wall pipes complying with EN 13476 produced from PP material having an Elastic (Young’s) Modulus of between 1250 and 2500 MPa.

The new specification will enable ADSSC to benefit from the excellent corrosion resistance and durability of PP-B sewage and wastewater systems which are already well established in Europe and other parts of the world. In addition, because the material is lightweight and yet extremely tough, it is easy to handle on site and quick to install, requiring no special jointing tools or equipment.

A comparison on a recent large diameter highway drainage scheme in Italy showed that whilst the 1000mm concrete pipe sections could be laid at 70 metres per day the equivalent twin walled PP pipe could be laid at almost three times that rate, at 204 metres per day. The number of joints was also reduced by a factor of three as most PP pipes are produced in 6 metre lengths and the installer needs far less lifting equipment on site.

Overall the installation cost savings can be very significant as well as causing far less disruption to the local environment.

**ADSSC embraces PP-B specification for sewage pipes**

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Borouge focus on large industrial projects at WaterWorld Middle East in Doha

Power-Gen Middle East and WaterWorld Middle East 2012 in Doha, Qatar attracted an impressive line up of more than 120 eminent international speakers and nearly 140 exhibitors from 23 different countries. During the conference sessions opportunities for future growth and development were presented along with new and innovative solutions using pioneering technology to overcome the financial, resource and environmental challenges facing today’s power and water industry.

During his opening address H.E. Dr. Mohammed Bin Saleh Al-Sada, Minister of Energy and Industry said, “We will continue to invest in the coming decade, in power generation and water desalination in addition to expanding transmission and distribution of electricity and water networks. We are humbled by the endowment of natural resources available to us for the development of energy industries, including power generation. This will help us achieve sustainable development while not compromising on the protection of our environment and preserving it for future generations. In the context of the GCC’s consumption of water, this aspect is of paramount importance. With no fresh natural water supplies, this region is dependent on the energy-intensive desalination process,” he added.

Also in the opening session H.E. Eng. Essa Bin Hilal Al-Kuwari, President of Qatar General Electricity and Water Corporation “Kahramaa” said, “In the last five years, Kahramaa has spent more than QR60bn (US$16.5 billion) on its capital projects for the upgrade and expansion of existing electricity and water networks. Kahramaa will continue this trend by investing in transmission and distribution infrastructure capital projects in the coming five years.”

Andy Wedgner, Application Marketing Manager from Borouge in Abu Dhabi spoke at the conference about the use of polyolefin pipes in large industrial projects in the Middle East and other parts of the world. He showed that whilst welded steel pipe systems have a very good balance of mechanical properties they suffer from a major “Achilles Heel” in their poor corrosion resistance. Other potential industrial pipeline materials such as GRP cannot be welded and have a higher risk of failure due to installation damage and their lack of flexibility. He argued that the ideal materials for industrial pipelines are therefore PE and PP which do not suffer from corrosion and can be welded to resist axial loads and bending forces. For high pressure applications, steel pipes can be internally and externally protected with polyolefin materials to prevent corrosion and extend their productive life.

To illustrate his talk he described a number of large industrial projects using polyolefin pipes. At the new Borouge polymer plant in Ruwais, Abu Dhabi, 1600mm diameter PE100 pipes produced from Borouge BorSafe HE3490-LS were used to transport sea water the 2.5km from the coast to the heat exchanger where process water was cooled before being recycled through the plant, drastically reducing its “water footprint”. Polyolefin pipes were chosen for this project because the GRP sea water pipe used in the first plant failed in operation causing long and costly plant shutdowns. He also described the Takeer Refinery project where 2m and 3m PP-B spiral wound pipes are being installed for the sea water intake and outlet pipelines. These pipes, which were the first of their kind in the Middle East, were
Sea water cooling system using welded large diameter PE100 pipes

produced in Abu Dhabi by Union Pipes Industry using Borouge BorECO BA122E material. In the process the extruded PP profile is wound onto a mandrel, with additional stiffness being provided by an externally wrapped and welded hollow pipe profile. The resulting pipes are stiff and yet lightweight and the exterior hollow pipe section can be filled with high flow grout to provide negative buoyancy, so reducing the need for external concrete anchor blocks.

At the Borouge exhibition stand Andy met with a number of engineers who had not been aware that polyolefin pipes in these large diameters were available in the region. Through this and similar opportunities Borouge is working hard at increasing the awareness of these potential solutions amongst industrial end users and designers, hence expanding the market for plastic pipes.

Pushp Raj Singhvi of Borouge India with Vincent H Pala, Minister of Water Resources of India at Singapore Water Week in 2010

This conference and exhibition is a global platform for water solutions and last year attracted the record number of 13,500 participants from 99 different countries. Over 600 companies took part in last year’s Water Expo, which included a total of 15 international pavilions.

This year Borouge will once again be present at Singapore International Water Week – come and see us at stand U12 in the main exhibition hall.

Plastics Pipes XVI Conference
24-26th September, Hotel Arts, Barcelona, Spain

Pushp Raj Singhvi of Borouge India with Vincent H Pala, Minister of Water Resources of India at Singapore Water Week in 2010

Robin Bresser speaking at Plastic Pipes XV in Vancouver, Canada in September 2010

This biennial International Plastic Pipes Conference will present over 100 papers on all topics associated with plastic pipes and will attract more than 500 participants from over 80 countries to Barcelona in Spain. It will feature many new products and market developments from around the world to improve your knowledge and stimulate further your interest in the plastic pipes market. Borouge will present a number of papers at the conference – why not come and meet us there?
Graça Muendane is 34 years old and is a member of the Management Committee of Sanitation Block 3, in the Xipamanine Bairro in Maputo, Mozambique. This committee was formed as part of a programme developed by Water and Sanitation for the Urban Poor (WSUP), as a way of ensuring the maintenance and sustainability of the new communal facilities that they are creating in the poor areas of the city.

Graça has always been ready to take on new challenges and when she moved into the area with her family in 1994 she started a business of selling firewood. In 2000, they moved onto selling coal. Initially, her husband sourced the coal from outside Maputo and could only bring back 5 bags at a time, which only lasted 15 days. After a few months, thanks to Graça’s management skills the business improved and the distributor now delivers coal to their house and they sell around 100 bags a week.

Alongside the coal business, Graça also sells soup to construction workers in the area. She found that the workers had nothing to eat for breakfast or lunch, so she saw selling soup as a good business opportunity. To begin with, she sold 12 bowls of soup a day, but now she sells twice that amount, and the number of customers is increasing.

Despite her enterprise the family’s current living space is small and they do not have access to water or sanitation. Each day, Graça and her children had to travel 5km to buy water. The community held regular meetings and the subject of water and sanitation was always raised in an attempt to find ways to improve their lives, but solutions were hard to find. However with WSUP’s intervention the situation is set to change.

Here Graça tells her story: “When Mr. Abdul Gafur visited, introducing himself as a representative of an organisation called ‘WSUP’ to discuss the possibility of constructing new sanitation facilities here, I just cried with joy. The good news soon spread through the neighbourhood.

He explained about the project and asked me to invite all members of the neighbourhood to a meeting. This was not a difficult task because, as I said, the lack of sanitation facilities and water affects us all, so people soon joined the meeting. The main objective of the meeting was to identify where to construct the sanitation facilities. There was a space available right next to my home and the residents agreed with this location.

With the guidance of WSUP, we elected a committee to manage the proposed sanitation centre. I was elected as one of the Members. Throughout the process our hopes remained high, encouraged by the constant visits of Mr. Gafur. Finally, he brought confirmation that the construction work is starting. Everyone is ecstatic and we look forward to improving our quality of life. Having access to water and sanitation means that everyone’s health, particularly our children’s health, is assured. Privacy and dignity is possible. We will live longer and
I will assume my responsibility as a member of the committee with great vigour. I do not want this development to be short term. My grandchildren will benefit from it. This is the message that I pass on in our meetings: You must know how to use this facility! You must know that our suffering is over! Let’s collaborate. We are currently considering proposals on how to make a collective management. I cannot work alone. We women have to take the lead in this endeavour.”

Calender of Pipe Events

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-14 April</td>
<td>Indoplas, Jakarta</td>
<td><a href="http://www.indoplas.com">www.indoplas.com</a></td>
</tr>
<tr>
<td>18-21 April</td>
<td>Chinaplas 2012, Shanghai</td>
<td><a href="http://www.chinaplasonline.com">www.chinaplasonline.com</a></td>
</tr>
<tr>
<td>20-22 April</td>
<td>Int. Trenchless Tech. Conf. &amp; Ex., Zhengzhou, China</td>
<td><a href="http://www.cstt.org">www.cstt.org</a></td>
</tr>
<tr>
<td>24-25 April</td>
<td>GPPA Spring Conference, Al Jabail, Saudi Arabia</td>
<td><a href="http://www.gulfplasticpipes.org">www.gulfplasticpipes.org</a></td>
</tr>
<tr>
<td>27-29 April</td>
<td>India Water Expo, Chennai, India</td>
<td><a href="http://www.indiawaterexpo.com">www.indiawaterexpo.com</a></td>
</tr>
<tr>
<td>7-9 May</td>
<td>Pipeline Integrity Management, Doha, Qatar</td>
<td><a href="http://www.fleminggulf.com">www.fleminggulf.com</a></td>
</tr>
<tr>
<td>14-17 May</td>
<td>Plastivision Arabia, Sharjah, UAE</td>
<td><a href="http://www.plastivision.ae">www.plastivision.ae</a></td>
</tr>
<tr>
<td>15-16 May</td>
<td>AMI Middle East Plastic Pipes, Dubai</td>
<td><a href="http://www.amiplastics.com">www.amiplastics.com</a></td>
</tr>
<tr>
<td>20-23 May</td>
<td>MEPIPES 2012, Abu Dhabi</td>
<td><a href="http://www.theenergyexchange.co.uk">www.theenergyexchange.co.uk</a></td>
</tr>
<tr>
<td>21-23 May</td>
<td>The Global Water, Oil and Gas Summit, Dubai</td>
<td><a href="http://www.cwoilgasandwater.com">www.cwoilgasandwater.com</a></td>
</tr>
<tr>
<td>4-8 June</td>
<td>25th World Gas Conference, Kuala Lumpur</td>
<td><a href="http://www.wgc2012.com">www.wgc2012.com</a></td>
</tr>
<tr>
<td>6-8 June</td>
<td>AquaTech China, Shanghai</td>
<td><a href="http://www.aquatechtrade.com">www.aquatechtrade.com</a></td>
</tr>
<tr>
<td>6-9 June</td>
<td>Thai Water – Entec Pollutec Asia 2012, Bangkok</td>
<td><a href="http://www.aquatechtrade.com">www.aquatechtrade.com</a></td>
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<tr>
<td>18-19 June</td>
<td>PE100+ Advisory Committee Meeting, Prague</td>
<td><a href="http://www.pe100plus.com">www.pe100plus.com</a></td>
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<tr>
<td>26-29 June</td>
<td>Iranplast 2012, Tehran, Iran</td>
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<tr>
<td>28-30 June</td>
<td>The 3rd China (Beijing) International Coal Chemical Industry Expo 2012</td>
<td><a href="http://www.ciec-expo.com">www.ciec-expo.com</a></td>
</tr>
<tr>
<td>2-6 July</td>
<td>Singapore International Water Week/Trenchless Asia</td>
<td><a href="http://www.indowater.com">www.indowater.com</a></td>
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<tr>
<td>11-13 July</td>
<td>Indowater Surabaya, Surabaya</td>
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<tr>
<td>26-31 August</td>
<td>Stockholm Water Week, Stockholm, Sweden</td>
<td><a href="http://www.waterweek.org">www.waterweek.org</a></td>
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<tr>
<td>6-7 September</td>
<td>Oil &amp; Gas Review Summit, Mumbai</td>
<td><a href="http://www.oilasia.com">www.oilasia.com</a></td>
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<tr>
<td>September</td>
<td>SAPPMA 2012</td>
<td><a href="http://www.sappma.co.za">www.sappma.co.za</a></td>
</tr>
<tr>
<td>24-26 September</td>
<td>Plastics Pipes XVI, Barcelona, Spain</td>
<td><a href="http://www.ppxi.com">www.ppxi.com</a></td>
</tr>
<tr>
<td>13-16 October</td>
<td>APIA Convention, Brisbane, Australia</td>
<td><a href="http://www.apia.net.au">www.apia.net.au</a></td>
</tr>
<tr>
<td>19-22 October</td>
<td>Int. Conference on Pipelines &amp; Trenchless Technology (ICPTT 2012), Wuhan</td>
<td><a href="http://www.icptt.org">www.icptt.org</a></td>
</tr>
<tr>
<td>29 – 30 October</td>
<td>Water Expo China/Water &amp; Membrane China, Beijing</td>
<td><a href="http://www.waterexpochina.com">www.waterexpochina.com</a></td>
</tr>
<tr>
<td>5-8 November</td>
<td>The Big 5 Exhibition, Dubai</td>
<td><a href="http://www.thebig5.ae">www.thebig5.ae</a></td>
</tr>
<tr>
<td>November</td>
<td>GPPA Conference, Dubai</td>
<td><a href="http://www.yourppa.org">www.yourppa.org</a></td>
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</tbody>
</table>
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