

BorPipe

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Borouge & Borealis present "Water for the World" at IWA World Water Congress in Vienna



Borouge helps to provide safe drinking water to victims of Sichuan earthquake



PE pipes make a breakthrough in Pakistan



Water Stress in Middle East

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Editor's Note

Despite the so called "credit crunch" and the downturn in the market, Borouge has maintained a very strong presence during the last quarter of 2008, attending many conferences and exhibitions, continuing to demonstrate and promote the benefits of polyolefin systems. In this issue, you will find reference to a number of papers that Borouge has presented at these conferences. You are welcome to receive copies of any of these papers and use them in your market to show what can be achieved using PE pipes – for your copies, please contact infopipe@borouge.com

The cost benefits of PE systems were strongly promoted by two important papers at the Plastics Pipes XIV Conference in Budapest in September 2008. The first was a paper by a group of researchers at CISO, Australia who had developed a life cycle analysis model for water networks (LICAN) which confirmed that PE provided the lowest life cycle costs and the lowest leakage rates compared to other pipe materials. A similar conclusion was obtained by Professor Alessandro Marangoni, who analysed the water and sewage networks in Italy, where the estimated water leakage rate is 42%. He calculated that the cost of the current leakage was around \$6 billion dollars per year and the costs to upgrade the networks to match the best levels in Europe are considerably lower, using plastic materials rather than iron or concrete. Borouge and Borealis also played a strong role at the conference, presenting many papers as described later in this edition.

The Gulf Plastics Pipe Academy (GPPA) achieved a couple of landmarks in this quarter, becoming officially established and then holding its first General Assembly at the Big 5 exhibition in Dubai in late November. The GPPA has an important mission for us all in raising and maintaining standards of both plastic pipe products and installation procedures in the Middle East region, and I am sure we all wish them much success. So far over 80 companies have expressed their interest in joining the GPPA, and if you would like to receive a membership form, please go to www.yourppa.org

I am sure that many of you are seeing a downturn in business, due to the financial crisis and we all hope that this will be short lived in our regions, and all our pipe markets will soon be back on track. We believe that the utility sector will not be so severely affected and indeed, a number of governments have declared their intention to use the respite in industrial development to upgrade their infrastructure. In many countries, particularly in Asia and Africa, water, sanitation and environmental pollution problems should be addressed and addressed now using plastic pipe systems.

In their recent report the Living Planet, the World Wildlife Fund (WWF) likened the current environmental situation to the financial crisis in that we are consuming resources 30 per cent faster than the planet can replenish them. It is anticipated that by 2025, water consumption will have increased by 40% and one third of the world's population will be affected by water shortages. As stated by one of the WWF executives, "Once we use these resources, they're gone,

credit markets can be rebuilt, banks can be bailed out but there's no such thing as a post-water economy."

Many governments are investing in reducing water losses and in this issue, you will read how Beijing Waterworks have been using modern PE pipe folding techniques to renovate some of the old iron and concrete pipes in the city network. These old mains, which were installed in the 1950's, are now failing at regular intervals, due to the ever increasing traffic loads, wasting valuable water in a region of major water stress. The use of "no dig" techniques has enabled them to reduce this water loss at a reasonable cost, without bringing the city to a standstill. Their success in these projects will mean that many more "no dig" projects will be carried out in the city to reduce water loss and help reduce future water shortages.

Also regarding China, you will no doubt remember that on May 12 this year, an earthquake measuring 8.0 on the Richter scale hit the Sichuan Province in China. The devastation took the lives of nearly 70,000 people and over 15 million have been displaced from their homes. Many of the displaced people will be living in settlement camps for many years to come and it is important that during this time, the risk of water-related diseases, such as cholera, are minimised. Ensuring uninterrupted provision of safe drinking water is therefore a top priority in the resettlement camps if disease is to be prevented. A collaborative project called "*A Drop of Hope*" aims to alleviate the shortage of safe water supply and in so doing, reduce the incidents of water-borne diseases and safeguard the lives of victims affected by the Sichuan earthquake. This project is a collaborative programme between the Singapore Water Association, Lien Aid (LA) / Lien Foundation of Singapore and Borouge. The objective is to build and operate a Mobile Water Purification System (MWPS) that treats raw water from a nearby lake and produces drinking water for 10,000 people that are living in a resettlement camp, located in one of the areas that was hardest hit by the Sichuan earthquake.

I hope you enjoy reading this last edition of BorPipe for 2008 and as the year end is approaching soon, let me thank you all for your support during the year and for those of you celebrating Christmas, let me offer you my very best wishes for the festive season and for the New Year.

André van Uffelt
Vice President
Business Unit Pipe



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Borouge Innovation Centre – a new development capability for polyolefin pipes



The Borouge Innovation Centre

The Borouge Innovation Centre will be established by the end of 2009 in Abu Dhabi, in order to fully support the launch of Borouge 2. It will further enhance Borouge's capability to serve its customers and to develop grades according to their needs. In 2010, Borouge will triple its production capacity and introduce 800,000 tonnes of Borstar PP grades into the Middle East and Asia. With state of the art equipment, the Borouge Innovation Centre will initially focus on the development of PE and PP products for pipe, film and moulding applications.

The Borouge Innovation Centre includes a pipe application development cluster, which contains

three mono and multilayer pipe extrusion lines, capable of producing pipe diameters from 12 mm up to 250 mm. The material testing laboratory will be furnished with extensive mechanical testing equipment, including rapid crack propagation testing equipment, pipe pressure testing equipment and butt and electrofusion welding machines.

More value will be created through cooperation with customers and universities. The Borouge Innovation Centre will respond to market needs and enhance education and know-how in plastics material development, not least by providing interesting career opportunities in Abu Dhabi for

innovative experts from around the world.

From 2008 to 2010, approximately 50 people, including Borouge and Borealis experts, will be required to plan, commission and start-up the Borouge Innovation Centre. Specifically, there will be requirements for technicians and researchers for the application hall and analytical & physical testing laboratories, in addition to managers and product developers. Borouge intends to recruit experienced and motivated people for this exciting start-up.



Reducing water losses from Beijing's old water mains

Like so many of the major cities around the world, Beijing faces a serious water shortage which has been made worse by successive years of drought. Much of the water for the city comes from dams and underground reservoirs in the neighbouring province of Hebei, but this source is now under pressure and Beijing must reduce its water losses.

Much of the water network in Beijing was installed in the 1950's and the old iron and concrete pipes are now heavily corroded. The ever increasing traffic loads in the city adds to the problems and bursts now occur at regular intervals. The main challenge is to reduce this water loss at a reasonable cost without bringing the whole city to a standstill.

Polyethylene pipes have many advantages over other types of pipes but perhaps the most important property when it comes to lining old mains is that the material has a memory, which means that if it is deformed, it will return to its original shape once the constraints are removed. Therefore, if the PE pipe is folded into a "U" shape and then strapped in position, it can be drawn through an old main. Once in position, the pipe can be pressurised to break the holding straps and then it will recover to form a snug fitting liner to the inside of the old main.

The Beijing Waterworks Group first tried this technique in the summer of 2006, with support from the pipe producer Chinaust. This first project was the lining of a short section of water main between Zhongguancun Avenue and Zhichunli Road, which is a well known commercial and university district in Beijing. A 795 mm diameter PE100 pipe was used to line the 486 m section of pipeline. The pipe was manufactured by



Folded and strapped pipe pulled into main



New PE lining pipe in position

Chinaust, using BorSafe HE3490-LS and the installation and engineering work was carried out by the Beijing Waterworks Group.

The PE pipe was shaped to form a "U", using special equipment so that it could be inserted into the old metal pipeline. Then high pressure water was used to recover the PE pipe, so that a close contact between the metal and plastics pipes was achieved. This project was a milestone in the cooperation between Chinaust and Beijing Waterworks Group, due to its success and the good outcome of the project.

Since this first success, another three "no dig" projects have been completed by the two partners, including the rehabilitation of an old water main between two bridges on the city ring road, which was awarded the "Beijing New Technology Award" and the renovation of 3.6km of water mains in the old downtown area of Beijing, using 500mm diameter PE100 pipe. The success of the projects carried out by the Beijing Waterworks Group will mean that many more "no dig" projects will be carried out in the city to reduce water loss and help reduce future water shortages.



Chinese phosphorous plant reduces its “water footprint”



Butt welding the lengths of PE pipe together



The pipelines lying across the landscape

The Wengfu Group in the south-west of China is the largest phosphorous producing plant of its type in Asia. In the process of producing phosphorus, large quantities of water are consumed and equally large quantities of acid wastewater developed. The shortage of water in many parts of China has led to government pressure to improve water efficiency in the industry.

Wengfu developed a novel method of treating the water from the phosphorous production (the “WFS” waste water processing technique), that would enable the water to be recycled and reused in the process. This would significantly reduce their demand for fresh water and decrease the environmental footprint of the whole operation. This breakthrough technology was subsequently awarded first prize for scientific and technological progress by the China Petrochemical Association.

The remaining problem was how to transport the acid wastewater at pressures up to 80 bars to the treatment plant. This water was extremely corrosive and would quickly destroy a normal steel pipeline and therefore, it was decided to use a steel pipe, but to protect the pipe from corrosion, a polyethylene liner to protect the inside of the steel pipe would be used. The liner would be introduced using a technique first developed for lining leaking water and gas distribution pipelines.

The liner pipe was produced by Sichuan Chinaust from BorSafe HE3490-LS PE100 material from Borouge. In total, 41km of 316mm diameter with an 8mm wall thickness pipe was produced. The PE pipe was butt welded in strings and then reduced in diameter by 10%, by pulling it through a die prior to being pulled through the steel pipe by a winch. Once the liner was in position, the winch

was disconnected and the PE pipe expanded to form a close fit with the inner surface of the pipe. This process relies on the strength and flexibility of polyethylene and the fact that the material has a memory and will return and retain its original circular shape. Material quality is an important consideration and therefore, high quality pipes produced from PE100 compounds were essential.

The project was contracted by China Bluestar Lehigh Engineering Corp and America United Pipeline Systems and went without a hitch. Based on this project, the Wengfu Group benefited by a direct annual saving of \$7 million and their water footprint was reduced by 2.7 million cubic metres of water, and as in so many water conservation schemes, PE pipes played a key role.



Borouge helps to provide safe drinking water to victims of Sichuan earthquake



Beichuan High School, reduced to ruins, as a result of the Sichuan earthquake in May 2008



André van Uffelt of Borouge (left) joins hands with Singapore Water Association President Tang Kin Fei (centre) and Lien Aid Chairman Lee Poh Wah, to bring clean and safe water supply to victims of the Sichuan earthquake

On the afternoon of May 12 this year, an earthquake measuring 8.0 on the Richter scale hit the Sichuan Province in China. The devastation took the lives of nearly 70,000 people and over 15 million have been displaced from their homes.

Residents displaced by the earthquake are at a high risk of water-related diseases, such as cholera. Ensuring uninterrupted provision of safe drinking water is therefore a top priority in the resettlement camps, if disease is to be prevented.

The project, "**A Drop of Hope**", aims to alleviate the shortage of safe water supply and in so doing, reduce the incidents of water-borne diseases and safeguards the lives of victims affected by

the Sichuan earthquake. This project is a collaborative effort between the Singapore Water Association, Lien Aid (LA) / Lien Foundation of Singapore and Borouge. The objective is to build and operate a Mobile Water Purification System (MWPS) that treats raw water from a nearby lake and produces both potable and drinking water for 10,000 people that are living in a resettlement camp, located in one of the areas that were hardest hit by the Sichuan earthquake.

The MOU signing ceremony between the three parties took place on 13 October 2008. Under the agreement, Borouge will provide a PE100 polyethylene pipe, 3 kilometres long to transport water to the community of Leigu Township in Sichuan. The 14 tons of BorSafe HE3490-LS material for this 160mm pipe will be provided

free of charge to a partner pipe manufacturer in Sichuan province. Borouge will also provide the required fittings and technical advice for installation, and also be responsible for the manufacturing, transporting and maintenance costs of this water pipeline.

The Borouge and Borealis joint initiative "Water for the World", attempts to address the global water challenge and provide sustainable solutions for the availability of safe drinking water and sanitation. By contributing towards the "A Drop of Hope" project, Borouge will not just bring water to those in need but more importantly, give hope to the victims, as they embark on the journey to recovery.



Polyethylene – Water Education Day at HCM Technological University

The first Polyethylene Water Education Day at Ho Chi Minh Technological University in Vietnam drew over a hundred civil and environmental engineering students to learn about new technology using polyethylene in water piping, installations and treatment, in a half-day packed with presentations, videos and practical demonstrations.

On 20 October 2008, Dr Nguyen Phuoc Dan, Dean of the Faculty of Environment, opened this unique event with presentations from Borouge, Uniplast, Dewaco and Han Huy Trading. Robin Bresser, Marketing Manager of Borouge, introduced the students to the vast and successful use of polyethylene pipe in Europe, particularly the reduction of non-revenue water loss and low failure rates in the UK, Denmark and Germany, due to its resistance to corrosion and leak-tight jointing. The 50 years of good track record of polyethylene in Europe, combined with attractive whole life cost benefits, has propelled a similar growth of polyethylene systems in Asia over the last decade.

Mr. Truong, Chairman of Dewaco Water Company, described the water situation in Vietnam and the need for water infrastructure investment. Vietnam has only 82% of urban water access and 48% in rural areas, hence polyethylene pipe systems offer a particularly attractive and high quality solution to bring water to the whole country, and help combat the high leakage rates of about 40%. Ho Chi Minh City, once known as Saigon, had inherited an old piping system that requires upgrading and the engineering students took great interest in the opportunities offered by polyethylene to rehabilitate their ageing infrastructure using the new trenchless technologies.

Worries about leakages in the joints were addressed by Mr. Khuong, Technical Manager of Uniplast, a

leading plastics pipe producer in Ho Chi Minh City, by demonstrating the ease of polyethylene jointing using butt welding. The impressive practical demonstration was a crowd-pleaser and sparked exciting discussions between students and the presenters.

Besides quality, polyethylene offers economic benefits over traditional material, with the whole life cost, which consists of material, installation, operations and maintenance over the 50 years design lifetime. Kang Peck Tze, Technical Service and Market Development Manager of Borouge, told the students how to adopt an economic overview on material selections in addition to the technical considerations in design and installation. The students responded with keen questions about the rehabilitation techniques and application of polyethylene.

The water cycle is not complete without sound water treatment, and the seminar ended with a delightful note about a new water treatment plant to be invested in Cau Mai by Dewaco. A 16km polyethylene water pipe system will supply water to the fishing village and will upgrade the town, from class 5 to 4, enabling people access to tap water which they are now getting from rivers and deep wells. Such improvement to quality of life is made possible through the combined efforts by the value chain members, availability of new plastic material and an open mind to adopt them.

The feedback from the engineering students was very positive, especially towards the trenchless technologies using polyethylene piping, which were judged as extremely interesting. In summary, the day was seen as a very useful event by both students and the presenters, preparing future engineers with some knowledge about the modern pipe systems they will undoubtedly be designing and working with in their careers.



Strong student support for PE Water Education Day



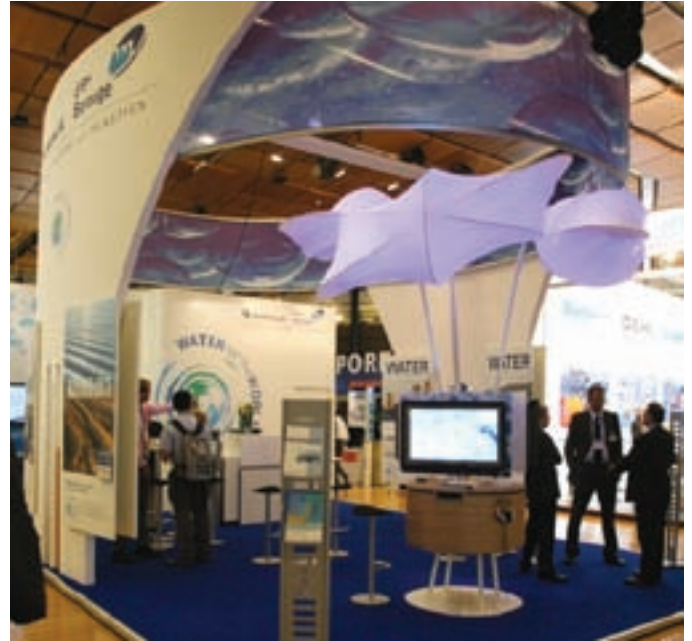
Students learn about welding PE pipes



Borouge & Borealis present “Water for the World” at IWA World Water Congress in Vienna



Steven Sheu of Borouge (left) exchanging a light-hearted moment with Singapore's Minister for the Environment and Water Resources, Dr Yaacob Ibrahim



Borouge & Borealis “Water for the World” stand

The IWA Water Congress is a bi-annual conference that brings together water and sanitation experts from all over the world to discuss technical issues related to these topics. In early September 2008, the venue for this congress was the Austria Centre in Vienna, and over 2500 delegates attended the presentations and workshop sessions.

Accompanying the Congress was an exhibition, which presented many of the companies associated with the water and sanitation business. The exhibition was opened to delegates for the duration of the event but was also opened to the public on the last two days of the congress, which greatly increased the number of visitors.

Borealis and Borouge had an eye-catching exhibition stand,

which featured many of the projects undertaken with partners within the “Water the World” programme. The CNBC video, showing the Thames Water project in London and the “24x7” water scheme in Malkapur, could also be viewed on the stand. Both these projects demonstrate what a significant difference plastics pipes can make to water distribution networks and to people's lives. For example, Thames Water estimated that since their renovation programme started in 2007, they have saved 300 million litres of water. In Malkapur, the biggest change is undoubtedly to people's lives, particularly the many women who no longer have to spend hours standing in queues, wondering whether there will be sufficient water available for their families' needs.

Borealis and Borouge also sponsored the Development Corner, which provided a platform for a number

of NGO's and academics to hold small seminars or workshops on their interests and activities. A full programme of meetings was organised and a number of lively discussions were held in this area during the week.

Borealis also invited many of their local pipe and fitting customers from Austria, Germany, Italy and Croatia to tour the exhibition stand and afterwards, they attended a concert at the world famous Vienna Concert Hall. In addition, a stakeholder dinner was organised, where a number of issues around the “Water for the World” programme were discussed with representatives from a wide range of water and sanitation-based organisations. The stakeholder dinner was held at a high-level restaurant, which overlooked the entire city of Vienna, providing additional inspiration to the discussions.



CNBC documentary demonstrates how PE pipes can reduce water leakage

The CNBC documentary series, “Responsible Business”, shows how companies are working to address some of the severe challenges that the world faces. In their July 2008 programme, they explored the water crises and showed what Borouge and Borealis were doing to help under their “Water for the World” initiative. In particular, they showed how the transfer of modern PE pipe technology from the streets of London to a village in rural India can really improve the quality of life for thousands of people.

The video starts in London, which is usually thought of as having a wet climate but in reality, is quite dry and as the population grows, the aquifers that have fed the city are becoming dangerously low and therefore, it has become essential to save every drop of water. In central London, many of the cast iron pipes, which were installed over 150 years ago, are badly corroded and loosing up to 30% of the water, from up to 200 major leaks per day. In 2007, Thames Water started a major mains renovation programme, using new welded polyethylene pipes, which has dramatically reduced leakage. Thames Water estimated that since the programme started just over a year ago, the PE pipes have **saved over 300 million litres of water.**

Transferring these same materials and technology to the other side of the world has been equally effective at reducing water leakage in Malkapur – a village 400kms to the south of Mumbai, India. In this village, the water supply system installed in 1988 is now woefully inadequate and residents had to queue up to collect what little water was delivered and then store it for use during the rest of the day. The system itself was designed for a population of 14,000 by 2010, but due to the fact that the village is in the middle of the sugar



Pushp Raj Singhvi (extreme right) and Khalfan Al Muhairi (extreme left) from Borouge discuss project details on site at Malkapur

production belt, the population today is already 30,000. This, together with leakage of around 35% from the old ductile iron and PVC system, means that everyone was loosing out.

The solution was to provide a new high quality fusion welded polyethylene feeder main delivering water 24 hours a day to the 2960 individual households in the village. This project was conceived and financed by Maharashtra Jeevan Pradhikaran (MJP) and was undertaken by Kimplas Piping Systems and EPC industries, strongly supported by Borouge. This new system is designed for an eventual village population of 67,000

and water will be billed on a volumetric basis to every home, with the expectation of reducing the unaccounted for water from its current level of 35% to less than 5% - demonstrating that modern PE pipe systems can really make a difference to the water crisis and to people’s lives.

To see the video, go to www.borouge.com and select Corporate Citizenship and Water for the World, then click on the CNBC video icon.

The GPPA comes of age: report from the 1st General Assembly in Dubai



The speakers and supporters from left to right: Rob Lawrence GPPA MD; Dr Hamad Al Olayan KSA Liaison (SABIC); Peter Hayes (Borouge); Mark Jarrett (Georg Fischer); Abdunnasser Ahmed Al Babtain GPPA Chairman (SABIC); Khalfan al Muhairi GPPA board member (Borouge); David Walton (Borouge)

The Gulf Plastics Pipe Academy (GPPA) held its first General Assembly on 24 November 2008, at the Fairmont Hotel in Dubai, in the very same room that the concept was first publicly launched back in April 2007. This meeting followed the signing of the legal documents earlier in the month, that had established the GPPA LLC as a limited liability company, that will be the platform for all the activities of the GPPA.

Abdunnasser Ahmed Al Babtain of Sabic, the first Chairman of the GPPA Board, welcomed the attendees and pledged his energy

and support during his tenure to make the GPPA a major force in the region. Later in the proceedings, Khalid Al Fouzan of TASNEE, expressed his thanks to all those present for their support during the formation of the GPPA and in particular of Borouge, for their foresight in realizing the importance of the concept. He also stated that he and the many others present were now ready to help in taking the GPPA forward in the coming years.

In attendance at the meeting was André van Uffelt of Borouge, who was an early advocate of the GPPA concept. Other stalwart supporters

were also present, such as Georg Fischer and Bodycote, representing the pipe and fittings manufacturers and the professional testing groups. It was also a great pleasure to welcome representatives of the end users; Al Ain Distribution Company, Abu Dhabi Distribution Company and for the first time, City Gas of Abu Dhabi.

Guest speakers from Borouge, David Walton and Khalfan Al Muhairi, presented some aspects of the global water and sanitation crisis, with some stark data from all around the world, including the Middle East region. They then showed some examples of how plastic materials and the technologies vested in the GPPA members were beginning to make a difference in a number of specific cases.

Mark Jarrett of Georg Fischer then showed the development of the training matrix that will form the basis for the strategy of the GPPA education and training programme. Peter Hayes of Borouge then gave a brief overview of the financial situation and outlined some of the decisions that the GPPA Board will have to take in the near future. The satisfaction of the membership and the generation of income would be key factors in the long term success of the GPPA.

Finally, Robert Lawrence, Managing Director of the GPPA, thanked the many people that had assisted during the formation period and was delighted to receive the additional support from the many organizations represented by the attendees. The support of the full membership would be crucial, as the GPPA now enters this second chapter of its life.



Water Stress in the Middle East

Water has always been scarce in the Arab world, but growing populations place ever-increasing demands on the limited resources. In the wealthier Arab countries, their needs are met by desalinating seawater whilst others drill ever-deeper wells, which in time will only make the problem worse. Forecasts have shown that by 2025, Egypt, Morocco and Syria would be among the 9 countries around the world suffering from water scarcity, and many other countries in the region will have encountered serious shortages. In this article, we look at some of the most water-stressed countries in the region.

Jordan

The Hashemite Kingdom of Jordan is one of the most water scarce countries in the world. Currently, water use exceeds the renewable freshwater resources by more than 20%, which means that as the population continues to grow and industry and agriculture continue to develop, demand for water will exceed availability in the near future. An important factor is the geographical distribution of the population and the concentration of population through urbanization has created problems - this is the case in the Amman-Zarqa area, where some 60 percent of the population is concentrated. The Ministry of Water and Irrigation has prepared an action plan to address these problems, which will involve the rehabilitation of many old water networks and the improvement of the efficiency of agricultural irrigation.

Syria

Syria is more fortunate than many other countries in the region in that in the west and north of the country, the rainfall supports cultivation but in the rest of the country, it relies on irrigation from the Euphrates River and its major tributaries. Over the years, the flow of the river has been dramatically reduced by the building



of dams for hydroelectric power, water control, storage, and irrigation. In the mid 1980s, about one-half of the annual Euphrates River flow was used by the three nations.

Yemen

Yemen is a semi-arid country located at the southern tip of Arabian Peninsula, which without any river systems, it is dependent upon sporadic rainfall. Known in ancient times as "Green Yemen", 60% of its population are still involved in family-based farming production. Water resources in Yemen are today overexploited, with annual withdrawals exceeding renewable resources by up to 36%. Most people in Yemen are concentrated in the highlands in the northern part of the country and with further migration areas like the Sanaa Basin, could dry up completely in a few years, leaving the population dependent upon its meagre rainfall.

Egypt

The Greek historian Herodotus called Egypt, "The Gift of the Nile," and along that life-giving river, the ancient Egyptians built their amazing civilization, one they ruled for three millennia. However recently, the Cairo-based Center for Rural Studies says roughly five million Egyptians live without sufficient access to clean drinking water, which is about 6% of the population of 73.4 million. Egypt is an extremely arid country with limited land and water resources. Less than three percent of its area is cultivated, because of water shortage. The Nile is the country's basic life-sustaining system, but the available water is already fully utilized, mainly for agricultural and human use.

The Borouge team based in Abu Dhabi are supporting a number of activities in the region to improve the water supply and environmental situation in the region – come visit us at ENVIRONMENT 2009.

Large diameter PE pipes protect Abu Dhabi's attractive new public beach facilities



PE pipes ready for installation on Abu Dhabi's new beach



Installing the large diameter PE drainage pipe under the sand

As part of Abu Dhabi's Emirate development program, the Directorate of Gardens and Recreational Facilities in Abu Dhabi Municipality planned a new beach at the northern region of Abu Dhabi's Island. The new seashore was designed to incorporate a sandy beach area with green landscapes, to create a unique modern beach, which would be an attractive destination for Abu Dhabi's residents. The new beach, which is 11 hectares in area, has swimming areas, scenic gardens, walking pathways, refreshment outlets, beach volleyball fields and children's play areas and toilets to serve the beach visitors. In the construction of the beach, large diameter PE pipes were used for storm water drainage for the first time in Abu Dhabi.

After a few weeks of intensive marine dredging work, two kilometers of new beach had been made on Abu Dhabi Corniche road. Abu Dhabi Municipality,

owner of this project, had selected Hyder Consulting Middle East to do the engineering consultancy and project monitoring. Gulf Construction Company (GCC) was the chosen contractor of the Municipality, due to their local experience on similar large scale construction projects.

Originally, there were seven outfalls of storm water serving the Al Khalidiyah area. These outfalls were buried underneath the new beach and a new gravity pipeline had to be designed along the new beach to link these seven outfalls together and transport the storm water to a water pumping station on one side of the beach. This station would then pump the collected storm water out to sea. In the original design, reinforced concrete pipes had been specified as was usual practice, in the region for storm water drainage. However, due to the specific conditions of this project, the specification was changed to include PE pipes for the first time in the region.

The first reason was the time frame for the project, which was insufficient for the supply and installation of reinforced concrete pipes. However, with locally produced large diameter PE100 pipes, the time frame could easily be achieved – as stated by Qassim Al Sharafi, Chairman of Gulf Contractors Company: ***"The completion date for this project was a challenge, but with the local availability of HDPE pipes, we managed to complete the project within four and a half months, which is earlier by almost one and a half months as has been planned at the earlier stage."***

PE pipes, up to 1600 mm, can now be produced in Abu Dhabi, greatly reducing the supply time for projects of this type. In addition, PE pipes are easier to handle and joint and faster to install during construction - features that definitely helped the contractor to finish the work well-ahead of schedule. As stated by Osama Taha, Senior Resident Engineer, Hyder

Come and meet us in January at two major shows in the Middle East

Consulting Middle East: ***“Due to HDPE pipes features and advantages, for the first time in the region, PE 100 material was chosen to make the new storm water pipeline at Abu Dhabi Beach.”***

Since the new beach was made of newly dredged material, it is not fully consolidated and contains sea salt. Normally, at least 24 months is allowed for consolidation before any civil work is carried out. However, whilst these two factors are considered risks for traditional concrete pipes, PE pipes are resistant to corrosion and tough enough to handle the ground movement due to the settlement.

The new PE gravity pipeline was from 630 to 1200mm in diameter and stretched 1.96 km along the beach. The PE pipes were produced by Union Pipes Industry (UPI), who used BorSafe HE3490-LS to produce the large diameter sizes, due to the excellent low sag properties of the material.

The actual completion date was 30 June 2008, which was 42 days earlier than the assigned date. Once again, PE pipes had proved their advantages over other materials, including speed of supply and mechanical properties which can overcome the toughest environments. In this project, the excellent collaboration between the value chain members provided another success towards sustainable development in the UAE.



Borouge and Borealis to participate at Arabplast 2009 and ENVIRONMENT 2009

January 2009 will be a very busy month for us, because together with Borealis, we will participate in two of the leading shows in the Middle East. They are Arabplast 2009, the 9th Arab International Plastic & Rubber Industry Trade Show, and ENVIRONMENT 2009.

Held at the Dubai International Convention & Exhibition Centre, Arabplast is the biggest event for the plastics industry in the Middle East. With a gross exhibition space of 25,000sqm, the event serves as a key focal point for leading companies from the petrochemicals and polyolefins industry. Over 300 exhibitors from 38 countries and nearly 10,000 visitors attended the last event in 2007. Borouge and Borealis will present their latest developments and update you on our marketing initiatives, including our Water for the World programme, at our impressive 240sqm booth.

ENVIRONMENT 2009 will take place from 19 to 21 January 2009 at the Abu Dhabi National Exhibition Centre and also promises to be an exciting event. Held under the patronage of His Highness Sheikh Khalifa Bin Zayed Al Nahyan, President of the United Arab Emirates, ENVIRONMENT 2009 will be the fifth successive show since the event was first held in 2001. The previous ENVIRONMENT exhibition had over 330 exhibitors from 28 countries taking part, occupying a gross exhibition area of over 10,000 square metres.

Quick facts:

ARABPLAST 2009

Date
11-14 January 2009

Venue
Dubai International Convention
& Exhibition Centre

Borouge Booth
ZA140, Zabeel Hall

ENVIRONMENT 2009

Date
19-21 January 2009

Venue
Abu Dhabi National Exhibition
Centre

Borouge Booth
L11, Hall 3

New equipment provides superior protection of the “field joint” on Oil and Gas pipelines



Typical oil & gas pipeline installation site, banding shows field joint



The field jointing machine undergoing testing in Finland

Oil and Gas pipelines are protected from corrosion, using various coating techniques but in all cases, the protection of the joints after they are welded in on site is the weakest link. Borouge and Borealis, together with KWH Technology, have now developed a new “field joint” protection system which solves this critical issue in three layer PE & PP coating systems.

Equipment design

The equipment design is in the form of a mini portable coating

line, which rotates around the circumference of the pipe coating area of the field joint. A mini extruder melts the solid polyolefin pellets to form a molten mass at a desired temperature. The molten polyolefin is then either pushed directly through a die or fed into an insulated cylinder, which is attached to the machine.

The die is used to shape the molten polyolefin to the desired thickness and width, prior to application onto the girth weld area. An adjustable die gap

provides optimization of polyolefin width to match the cutback area.

A pressure roller ensures intimate contact between the polyolefin and corrosion protection coating, to maximize adhesion between the two and squeezes out any air between the two layers to prevent entrapment. The transveyor is the platform onto which the insulated cylinder (used to store molten polyolefin), die, pressure roller, and other equipment items is mounted. The transveyor frame is fastened to the pipe with a chain, just behind the cutback area.

Machine Operation

To achieve performance of the coating at the field joint, comparable to the performance of the mainline coating, a similar application methodology must be followed. To ensure optimal adhesion, at both the overlap area of the factory-applied mainline coating and the bare steel in the girth weld area, they must be cleaned. Removal of contaminants from the surface of the steel can be achieved by shot, grit or sand blasting. Surface modification of the polyolefin by gas torch or chemical pre-treatment is not necessary. Pipe pre-heating, prior to application of the anti-corrosion coating and polyolefin topcoat, can be done using any of the traditional methods: infrared (IR) heating elements, induction heaters or direct gas flame. Heating with IR or induction heaters can be done as either a separate application step or with the heating units mounted onto the transveyor.

Once the steel pipe surface has reached the required temperature, the anti-corrosion layer can be applied. To achieve performance comparable to the mainline coating, the same type of anti-corrosion layer should be used. The options are one-part liquid epoxy, two-part liquid epoxy, or fusion bonded epoxy powder. At this point, the transveyor is fastened to the

Borouge Water Pipe Seminar in Riyadh, Saudi Arabia

mainline pipe and positioned over the girth weld area for application of the protective topcoat.

For the topcoat, there are also several options which could be employed. These options are: adhesive (powder or molten) plus polyolefin (polyethylene (PE) or polypropylene (PP)) or reactive topcoat alone (PE or PP). In prototype testing, a reactive topcoat was used to eliminate the need to apply adhesive and polyolefin in two separate steps.

The drive motor starts to move the transveyor around the circumference of the pipe. At the same time, the hydraulic arms mounted on each end of the insulated cylinder begin to push the molten topcoat through the die. Drive motor speed and hydraulic compression are coordinated to ensure that the desired thickness of topcoat is applied. As the topcoat comes into contact with the anti-corrosion coating, a roller applies pressure to squeeze out any entrapped gases and air and ensure intimate contact between the two layers. Once the transveyor has completed one pass around the pipe, it is dismantled for transport to the next girth weld to be coated. During transportation, the cylinder is re-filled with topcoat in preparation for the next field joint.

Concluding Remarks

Since the concept was devised in early 2007, there have been approximately 18 test runs on 500mm and 900 mm pipes at the Borealis technical centre in Porvoo, Finland. These results are extremely encouraging and further coating trials are planned in order to optimise the design and operation of the equipment and the performance of the coating system.

For more information on the equipment, please contact infopipe@borouge.com or your local Borealis, Borouge or KWH representative.



André van Uffelt of Borouge opening the PE pipe seminar in Riyadh

In November 2008, Borouge organised a seminar for customers, water network designers and system operators, in parallel with a major Water Conference in Riyadh, Saudi Arabia. In total, over sixty people attended the seminar, over two-thirds of whom were consultants and end users.

André van Uffelt welcomed the guests and then Ahmed Al Mazrouie presented the key statistics of Borouge's development in the Middle East. He then introduced Khalfan Al Muhairi, who outlined some of the key benefits of using PE pipes for water distribution. In particular, he focussed upon those characteristics that reduced potential leakages and water losses. Following this, Peter Hayes then presented a number of recent projects in the Middle East where PE pipes had been successfully used. The growth in the large diameter PE pipe market was then outlined by Reinhardt Witt, who showed the large number of extruders that Battenfeld had sold around the world that are capable of making 800 mm diameter pipe or larger. In total, they have sold almost 60 machines in 800 to 2000 mm range, which indicates the growing acceptance of larger diameter PE pipes for water and industrial applications. This trend is to a large part driven by the savings that can be achieved using PE pipes, due to reduced installation and maintenance costs. This "Whole Life Cost" argument was presented in the final paper by David Walton, who showed that using 900mm 16 bar PE pipe, the cost-savings in installation and maintenance completely outweighed the initial higher cost of the pipe itself.

At the parallel 3rd International Conference on Water Resources and Arid Environments, David Walton and Khalfan Al Muhairi presented a paper entitled "Reducing water losses using welded polyethylene piping systems". This paper presented some of the problem regions around the world, where water is in crises and how in many of these areas, polyethylene pipe was making a difference. A number of diverse examples were presented, including the supply of water to villages in rural India and the use of large diameter pipe at the new Borouge PE production plant in Ruwais, Abu Dhabi.

Plastics Pipes Conference comes to Budapest, Hungary



David Walton of Borouge presenting at Plastics Pipes XIV Conference in Budapest

Over 400 people gathered for the fourteenth Plastics Pipes Conference in Budapest, the beautiful capital of Hungary, on the banks of the Danube River. In total, around 100 papers were presented on the technical and application aspects of plastics pipes. Borouge and Borealis were well-represented at the conference with an exhibition stand, plus over 20 delegates, and an involvement in many of the papers.

In the opening session, **Jane Toogood** of Borealis described what Borealis and Borouge together with partners were doing within their "Water for the World" programme, to address the global water and sanitation challenge. Among other things, she was able to report that together with one of our customers in India, Kimplas Piping, we were able to bring a new continuous water supply to the 30,000 villages in Malkapur.

Professor **Alessandro Marangoni** from a major Italian financial institution explained the true cost of water leakage and how plastics systems provided the lowest cost means of replacement and renovation. He had calculated that the 42% leakage rate within the

Italian water network was actually costing the tax-payer over \$6 billion per year in extra water costs. Investing in plastic systems to replace these leaking networks was financially justified and beneficial to the environment and the future health and prosperity of the community.

A number of papers presented the market development of plastics pipe systems in different parts of the world. **Miron Gorilovski** of the Poliplastic Group stated that in Russia, Belarus and Ukraine, the growth rate for plastics pipes had been as high as 30% in 2007 and although he expected lower growth in the future, the prospects were still very good. In China, **Zhan Jie Wang** of the China Plastics Piping Association (CPPA) also reported high growth rates, which he expects to continue, given the high government targets for future water conservation and recycling.

There was a number of case studies presented, describing how plastics piping systems had become accepted in a range of application areas, from nuclear power plants to fish farms. **David Walton** of Borouge described how large diameter PE pipes had been accepted for the cooling water supply in the latest phase of development of their new polyolefin plants in Abu

Dhabi. In the earlier phase, GRP piping had been used but major failures of the line had encouraged a change in material selection. **Gaby Abou Chedid** of API - one of Borouge's valued customers from Lebanon, presented a paper on the success he has achieved in selling the higher performance PP-RCT hot and cold water systems in the Middle East. The higher performance material from Borouge enables the designer to reduce pipe and fitting dimensions, which can provide significant cost-savings and installation benefits in many of the high-rise buildings being built in the region.

A number of papers dealt with new material developments, with the new breed of high stress crack resistant polyethylene pipe materials of particular interest. **James McGoldrick** of Borealis described the work he had been doing with AGRU, a major Austrian customer, to develop new ways of assessing the performance of these materials. **Christian Goetzloff**, also of Borealis, described how these new materials when incorporated into a multilayer pipe construction, can provide cost-effective protection to pipes used in very demanding installation conditions.

There were a number of presentations on how the plastics pipe industry were organising themselves to provide good quality products and services in different parts of the world. **Jan Venter** of the South African Plastic Pipe Manufactures Association (SAPPMA) described some of their challenges and how they had responded by setting up their own quality assurance system. This had improved the reputation of plastics pipes in South Africa and improved market conditions for their members. In the same session, **Rob Lawrence** of the Gulf Plastics Pipe Academy (GPPA), described their unique approach to similar challenges in the Middle East.

To obtain copies of any of the papers mentioned above or any other information about the conference, please contact infopipe@borouge.com

Borouge supports 2nd SAPPMA Conference in Johannesburg



Delegates at the SAPPMA Conference in Johannesburg

The second annual conference organized by the South African Plastic Pipe Manufacturers Association (SAPPMA) took place in Johannesburg in September 2008. Following their successful event in 2007, this conference was oversubscribed and more than 140 delegates participated and a total of 14 technical papers were presented. A wide range of topics were covered, including the water challenges, PE, PVC material developments and a number of pipe application projects.

In his opening speech, Jan Venter, CEO of SAPPMA, stressed the need for quality in plastic pipe manufacture, if the industry is to maintain its reputation and growth. SAPPMA members currently produce over 80% of the 140,000 tons of plastics pipes that are being produced in South Africa, which is a good measure of the success of the organisation.

Since its inception, SAPPMA has played an important role in maintaining the quality of pipes being produced in the region, by developing their own quality assurance and auditing system, utilizing the SAPPMA logo,

which assures product quality to the end users. SAPPMA also provides a Technical Manual for the use and installation of plastic systems, which is currently under revision and will be launched at the end of the year.

His presentation was followed by Dr. Roelof Botha and Prof Eugene, who described the important economic and water challenges faced by South Africa in the years ahead. The continued growth of urban populations around the major cities, such as Johannesburg, creates major concerns for the planners but provides growth opportunities for plastics pipes suppliers.

Mohana Murali of Borouge then presented a paper highlighting the key parameters that define the quality and durability of PE raw materials that have been embodied in the latest international specifications. He showed how a new high stress crack resistant PE-100 material from Borouge, can provide extra security in tough installation conditions, such as directional drilling and pipe bursting. This enables the cost benefits of polyethylene pipe to be maximized, without sacrificing system durability,

thus providing peace of mind to the system operator.

In the subsequent presentation, Tim Webb of Anti Corrosion Protection Systems (APS), described some of the projects that they had completed around the world using PE pipes and no dig installation techniques, and the benefits it had provided to the system owners and the local communities. As well as pipeline installation and renovation services, APS also provide the pipeline mapping and leak detection services, which enable water companies to address their unaccounted for water problems, so important in water stressed regions, such as South Africa.

This presentation was followed by Nicolo Gericke of Alprene Plastic Products, who described the importance and benefits of good welding and installation procedures for PE pipes.

An interactive session between SAPPMA members and South African Bureau of Standards (SABS) followed, debating the various quality related issues and establishing the responsibilities of the pipe manufacturers, above the SABS specifications.

Another interesting paper was presented by Ian Kee of Ethekwinini Municipality, who described the work done on the replacement of approximately 2000 km of asbestos cement secondary mains using plastic pipes, which will now serve the city for the next 50 years.

During the conference, there were several other papers describing the application, quality and integrity of plastic pipes, and some of the new developments that had been brought to the market. By the end of the day, everyone agreed that the event had been another resounding success.

PE pipes make a breakthrough in Pakistan



High quality extrusion at the Hi-Tech plant

Hi-Tech, an important Borouge customer in Pakistan, achieved a major milestone when they converted a large diameter water project from steel and GRP to polyethylene pipe.

The "Rawalpindi Environmental Improvement Project" was financed by the Asian Development Bank and undertaken by the Rawalpindi Development Authority (RDA), close to the nation's capital of Islamabad.

The Project Consultant is Osmani, who are also familiar with Borouge. The consultant has visited the Hi-Tech factory to witness the manufacturing and testing facilities along with the higher management of Project Management Unit (PMU) of Rawalpindi Environmental Improvement Project (REIP). After many visits, they concluded and accepted that

Anahita, Mauritius "Finding PE in Paradise"



PE pipes ready for installation in the island paradise

The name Anahita suggests romance, as it rolls off the tongue, and where better to develop such a concept than the beautiful island of Mauritius - The Pearl of the Indian Ocean.

Let the website speak for itself:

"Anahita is the quintessence of Mauritius. A sanctuary set in the stunning natural beauty of the island's east coast. Anahita is described as a privileged hideaway, offering a subtle blend of elegance and recreation; the essence of a refined and refreshing Mauritian lifestyle."

Borouge has played its part in the development of this idyllic resort, being the supplier of PE material to PPP Piping Systems Ltd. PPP first introduced PE pipes to Mauritius in the late 1980's. They soon won the support of the local installers and engineers, due to their ease of installation and proven reliability and performance record. PE pipes were adopted by the Central Water Authority (CWA) for most of their networks, up to size 250 mm, for the following reasons: speed of installation, virtually no ongoing maintenance costs, light-weight compared to the more traditional

materials, and excellent chemical resistance.

STR Marketing Ltée, a division of PPP, began supplying PE100 pipes to REHM GRINAKER Construction Ltd for the most recent infrastructure developments at the end of 2006 and the work was completed during the third quarter of 2007. The project comprised some 20 kilometres of pipe, ranging in diameter from 63mm to 250mm, which was a substantial project for this small island.

A major factor, which enabled STR Marketing Ltée to secure the order, was their unique ability on the island to manufacture and supply fabricated PE fittings. In addition, the STR Marketing Ltée technical team not only assisted the local sub-contractors for the electrofusion jointing, but also carried out the pressure testing of the whole network successfully.

A spokesman for the local water company CWA stated: "**We were delighted with the outcome of this project and I'm sure we will undertake further infrastructure improvements in the years ahead. PE has now become a proven pipeline material for water supply.**"

Hi-Tech have world-class PE pipe manufacturing and testing facilities.

The project focused on the principle of environmental improvement and for the first time in Pakistan, PE100 pipes up to 1000mm diameter were specified.

This project was primarily designed for steel and GRP pipes. During a presentation, given by Hi-Tech, the concerns were resolved regarding the technicalities of this system. The traditional and proven properties of polyethylene; cost effectiveness, flexibility, long-term life, easy handling, easy repairing, effective and reliable jointing, availability of specials, enabled the customer to make the recommendation for PE. In no small part, the concept of 'whole life cost' was understood and greatly appreciated.

RDA was also quick to appreciate the quality of the Borouge PE100 raw material, which was supplied to Hi-Tech. Hi-Tech, for their part, were able to convince the customer of their manufacturing expertise and future investment plans, which would enable them to service the ongoing requirements of the customer.

After-sales service was also an important consideration for RDA. Not only do Hi-Tech have considerable technical expertise, but they can also supply specialist fusion jointing equipment on site.

Pipe diameters for the project ranged from 225mm to 1000mm, totalling almost 8kms.

The formal contract was signed by Mr. Fakhr-e-Alam, President, Hi-Tech Pipes in Islamabad.

To date, Hi-Tech has supplied over 1.8 kms of pipe in diameters 450mm and 630mm.

Executive Director of Hi-Tech, Muhammad Qasim, commented: ***"This project represents a milestone for Pakistan. We have always appreciated the support and commitment from Borouge. It is our intention to invest further in large diameter extrusion equipment, in order to meet the needs of our customers. The environment is going to be a key issue for the future and we, at Hi-Tech, are proud to have played our part in the Rawalpindi Environmental Improvement Project."***

Calendar of Pipe Events

Date	Event	More information
10 - 13 Jan 2009	Arabplast 2009, Dubai International Convention & Exhibition Centre, Dubai	www.alfajer.net/arabplast1
18 - 21 Jan 2009	ENVIRONMENT 2009, Abu Dhabi National Exhibition Centre, Abu Dhabi	www.enviro-uae.com
4 - 9 Feb 2009	PlastIndia 2009, Pragati Maidan, New Delhi	www.plastindia.org
10 - 12 Mar 2009	WETEX 2009, Dubai International Convention & Exhibition Centre, Dubai	www.wetex.ae
4 - 6 May 2009	OG Pipeline Conference, Abu Dhabi	www.theenergyexchange.co.uk/3/13/articles/46.php
18 - 21 May 2009	Chinaplas 2009, China Import and Export Fair Pazhou Complex, Guangzhou	www.chinaplasonline.com
19 - 21 May 2009	Water Malaysia 2009, Putra World Trade Centre, Kuala Lumpur	www.watermalaysia.com
22 - 26 June 2009	Singapore International Water Week, Suntec Singapore International Convention & Exhibition Centre, Singapore	www.siww.com.sg

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