THE FUTURE OF FLEXIBLE PIPE

Spiral wound PE and PP pipe reach new dimensions in New Zealand

PE100 structured wall pipeline at Jazan IGCC Power Plant completed ahead of schedule
Protecting Pakistan’s longest RLNG network with Borouge PE top coat solutions
Enabling large pipe extrusion with efficient internal cooling systems
The cover of this edition showcases the latest development of spiral wound PE & PP pipes in New Zealand. After more than a decade of development, PKS Frank now have a complete range of sizes from DN300-2500mm. These systems now play a key role in the reconstruction of Christchurch after the 2011 earthquake, once again demonstrating the versatility and adaptability of polyolefin materials.

In Utilities, four interesting projects are featured. The first is a continuation of the huge drive to expand the Chinese gas network and how one local gas company, ENN Group, have installed a 6km long 500mm OD PE100 as part of their network in Zhejiang. We then move to Saadiyat Island in the UAE where a PE100 network is supplying the new Abu Dhabi Cultural District, including the new Lourve Museum that opened on 11 November last year. Next is a mega project by Telangana state government, India named the Mission Bhagiratha which aims to provide safe drinking water to every household at a total estimated cost of US$6.6 billion. The first phase, which was completed in August 2016, involved the laying of almost 9000km of pipelines to connect 340,000 households. Staying in India, we feature a 9km 400mm OD PE100 PN16 pipeline in Auroville, Tamil Nadu state, where 420m was installed using HDD.

With regards to geomembranes, we feature an application example from GSE Egypt of how FB1370 & FB2230 helps them increase production efficiency. The only pipe coating project featured in this edition details the first of its kind LNG transport pipeline – Project X carried out by Sui Northern Gas Company, Pakistan. This massive 1044km project utilised steel pipelines of up to 42 inch diameter, protected by our Borcoat system.

Returning to the Middle East, we showcase two industrial projects – Jazan Refinery and the UTICO water transmission project in which our BorSafe material was used to successfully complete both projects. In this edition, we also discuss the Chinese PE gas pipe standard and compare them to the internationally referenced ISO4437. Rounding up the technical portion, we focus on two technical areas – extrusion technology for thick walled pipes and the latest developments in fusion jointing.

On sustainability, we celebrate the 10th anniversary of our Water for the World programme and are proud to kick off the Bintan household sanitation project.

We hope you enjoy reading this issue and look forward to meeting some of you at our upcoming events and exhibitions!

Your Editors,

Andy Wedgner
KH Lou

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Protecting Pakistan’s longest RLNG network with Borouge PE top coat solutions

by Chanchal Dasgupta

Background
According to leading Pakistani newspaper DAWN, the country’s power sector is currently facing a shortage of 4000 megawatts (MW) due to a disconnect between installed power capacity and actual generation. This has resulted in industrial and commercial entities resorting to higher cost alternatives such as diesel generators and uninterruptible power sources (UPS).

In an effort to resolve the problem, the government has pushed for the development of Liquified Natural Gas (LNG) based power plants and a cross country Regasified LNG (RLNG) network to serve domestic, commercial and industrial sectors along with gas fired power plants.

Project X – Pakistan’s longest cross country RLNG transportation network
The contract to install the new RLNG network was awarded to Sui Northern Gas Pipelines Ltd (SNGPL), one of Pakistan’s leading providers of integrated gas solutions. Termed “Project X”, the new pipeline was the first of its kind and would have an unprecedented maximum diameter of 42 inches and a total length of 1044km – a mammoth challenge for SNGPL.
In addition to working under a very tight timeline, the company had to transport and install the pipes under rocky terrain and poor road conditions, and develop a protection system for the pipes to enable them to withstand tough environmental conditions. In order to cope with the extraordinary demands of the project, SNGPL upgraded their existing project resources, procured new construction equipment and hired additional manpower for their construction teams.

3LPE coating systems – an ideal safeguard against environmental stress
SNGPL decided on a three layer PE (3LPE) coating for the pipeline’s corrosion protection system and selected Borcoat™ PE top coat solutions from Borouge for the system. Borouge’s solutions, which are produced under a patented bimodal technology platform, have a better balance of processing, stress crack resistant and mechanical properties as compared to unimodal PE materials. Ideal for temperatures of between -40°C to 80°C. 3LPE, being a multilayered system, combines the oxygen barrier properties of fusion bonded epoxy (FBE) with the moisture barrier properties of HDPE.
In addition to this, all additives including carbon black are incorporated using specially designed in line compounding units to ensure that they are well dispersed, allowing the coating system to provide a high level of protection from environmental impacts and stress over a long service life.

The sheer size and urgency of the project meant that SNGPL would require close to 7000 tonnes of materials comprising PE top coat, adhesives and fusion bonded epoxy (FBE) to be procured within a short span of time. The laying of the pipeline was carried out over four phases, which involved the laying and welding of stainless steel pipes from 16 to 42 inches in diameter. The bulk of the 3LPE coating was applied by SNGPL at their coating facility, with Borouge supplying all 6500 tonnes of the high quality PE coating materials.
China based ENN Group is a major provider of integrated natural gas solutions. Operating city gas networks in 152 cities across 17 provinces and autonomous regions of the country, the company’s extensive reach enables it to deliver natural gas to over 12 million households and 56,000 industrial and commercial entities.

Located in China’s Zhejiang province, the city of Huzhou has experienced rapid economic growth and urban development in recent years. This, together with the Chinese government’s push for cleaner energy and coal-to-gas conversion, has resulted in an increase in the demand for natural gas and a consequent need to expand the city’s existing networks.

ENN Group subsidiary Huzhou ENN Gas Company operates a 454km network of medium and high pressure pipelines that deliver natural gas to over 100,000 households and close to 700 industrial and commercial customers. The company is also the owner of two natural gas terminals - the Sichuan and West gas terminals.

In order to boost the capacity of their network, the company relocated the West gas terminal which required the installation of a new PE pipeline comprising two 315mm OD SDR 17 PE100 pipes and a 500mm OD SDR 17 PE100 pipe. The use of a 500mm OD for gas is still uncommon for a connector pipe in China, where most gas companies only use pipes of 355mm in diameter, in line with their standard technical requirements. For this project, the pipes were made by leading local pipe convertor Gaofeng, who used BorSafe™ HE3490-LS PE100 material from Borouge, which is used for the production of pipes of up to 630mm in diameter.
The Matrimandir or “Temple of the Mother”, is Auroville’s most famous landmark.

**Auroville Project uses BorSafe HE3490-LS for HDD project**

by Prashant Nikhade, Srinivas Goud and Chanchal Dasgupta

Auroville or the “City of Dawn”, is a universal township in India bordering Viluppuram in Tamil Nadu and the union territory of Puducherry. Founded in 1968 by late spiritual leader Mirra Alfassa (also known as “The Mother), the city is currently home to almost 2,500 residents from 49 countries. The Matrimandir or “Temple of the Mother” is the city’s most famous landmark.

Auroville has three water sources – groundwater, harvested rain water and desalinated water. However, with the gradual depletion of groundwater resources and increasing saltwater encroachment into the ground, desalinated water is set to become the primary source of water in the future. In order to prepare for this potential scenario, the town’s authorities commissioned the development of a 5 MLD capacity mini desalination plant at Varuna Beach to channel desalinated water to Auroville over a distance of 5.5km.

A key part of the project involved the laying of a 9km 400mm OD SDR11 PN16 PE100 twin pipeline, which would have to run under the intersection of the East Coast Road, a two-lane state highway which was soon to be widened to a four-lane divided, open access freeway. In order to overcome the problem, project manager M/S Varuna Energy & Water Private Limited Auroville proposed for the pipe to be installed using horizontal direct drilling (HDD) after months of research, as the method would greatly minimise damages and disruptions to the surrounding areas and its inhabitants. The contract for the production and installation of the pipeline was awarded to M/S UPI Polymers Private Limited.
Utilising a maximum pressure of 1500/1600 psi, the 400mm pipe was successfully pulled through a 700mm diameter bore at a depth of 7m using HDD; the process was conducted in a body of water and bentonite slurry. The 90/120m pre-fabricated HDPE pipe section was butt-welded during the pulling process to form a total length of 420m. Made from BorSafe™ PE100 low sag material from Borouge, which has outstanding resistance to notches and stress crackling, the pipeline was designed for an operating pressure of 12kg/cm² and hydro-tested at 21kg/cm² in compliance with the SFS3115E standard. Two 680m sections of the pipe that were not required to be installed using HDD were laid underground at a depth of 3.4m, with the drill entry point at the Varuna Plant near the coast and the exit point at 420m from Bolyapalem school.
PE100 structured wall pipeline at Jazan IGCC Power Plant completed ahead of schedule

by Mohamed Ali Jaber

Saudi Arabia is embarking on a bold transformation of its economy in line with its goal to further diversify from the current reliance on the export of oil and petroleum related products. One facet of this transformation calls for the creation of up to 6 economic cities across the country, which aims to grow the local economy and raise the standard of living by enhancing competitiveness, creating new jobs, improving skill levels and balancing development across different regions of the country. One example of this is the Jazan (also known as Jizan) Economic City, which is located on the southern coast of the Red Sea.

Build at a cost of USD27 billion, the Jazan Economic City will span 100 square km and have a population of 250,000 upon its completion in 2030. Focusing on heavy industries and agribusinesses, the new city will also be home to the new 3.7GW Jazan Integrated Gasification Combined Cycle (IGCC) Power Plant - the world's largest\(^3\) gasifier based power plant.

The Jazan IGCC Power Plant, which is expected to be completed\(^2\) by end 2017 and started up in 2018, will be connected to a refinery with a capacity of 400,000 bpd of medium and heavy crude, 75,000 bpd of gasoline and
250,000 bpd of ultra-low-sulfur diesel, and its own marine receiving and export terminal. Once completed, the plant will be able to supply up to 2.4 GW of electricity to the surrounding areas, in addition to fulfilling the needs of the refinery complex.

Oman based United Gulf Pipe Manufacturing Co. LLC (UGPM) is a manufacturer of large diameter HDPE pipes, manholes, house connection chambers and other accessories for pressure and gravity applications in sewage and water treatment plants, outfall piping, mining, storage tanks and containers. UGPM along with PPA & Krah (Spain) was appointed by plant developer ARAMCO to supply non-metallic piping for the project, which required a DN 3m PE100 structured wall pipeline with a total of length of 15km to be laid in 6 parallel 2.5km strings. To manufacture pipes of such large diameters at a sufficient stiffness, UGPM utilised world renowned technology from Krah, which is well suited for the production of pipes of up to DN 5m. BorSafe™ HE3490-LS material from Borouge was chosen for the manufacturing of the pipe sections, which were produced in 600m lengths at a time and joined on-site using a patented electrofusion jointing system from Krah.

Work to install the pipeline commenced in April 2016 and was undertaken by main contractor China Harbour Engineering Co. Ltd, who completed the project well ahead of schedule within a 13-month timeframe – the system capacity of the completed outfall pipeline was 501,000m³/h. The quicker than usual installation process was made possible by the flexible and versatile nature of PE100, which makes it an ideal choice for large scale projects over traditional materials like steel and concrete.

Sources:


The Lourve Abu Dhabi on Saadiyat Island under construction.

The new Louvre Museum in Abu Dhabi is supplied through a BorSafe™ network

by Andy Wedgner

The Louvre Abu Dhabi is the first of five international museums and cultural centres including a branch of the Guggenheim and the Zayed National Museum, which will form the heart of the emirate’s new 280 hectare Cultural District on Saadiyat Island. Located north of the city centre, the Cultural District is developed by the Abu Dhabi government owned Tourism Development and Investment Company (TDIC) and will also include both commercial and high end residential development.

As the master developer for the Cultural District, TDIC were responsible for providing the district’s infrastructure including its utility networks. For the water supply, irrigation and gas distribution networks, they followed guidelines issued by the municipality and local utility organisations which called for them to be installed using PE80 and PE100 piping systems complying with ISO standards. The infrastructure networks were designed by engineering consultants Parsons International and constructed by Nael and Bin Harmal Hydroexport.

BorSafe™ HE3490-LS black pipe for water applications.
The table below shows the respective lengths of the three PE100 networks, which totaled nearly 50km.

<table>
<thead>
<tr>
<th>Network</th>
<th>Length (km)</th>
<th>Size Range OD (mm)</th>
<th>SDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potable Water</td>
<td>22.2</td>
<td>110 – 500</td>
<td>17</td>
</tr>
<tr>
<td>Irrigation</td>
<td>13.1</td>
<td>110 – 355</td>
<td>17</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>14.3</td>
<td>32 – 400</td>
<td>11</td>
</tr>
</tbody>
</table>

The PE100 pipes were manufactured by Al Ain based Inter Pipe Factory and Sharjah based Cosmoplast using BorSafe™ HE3490-LS black PE100 with different coloured striping to indicate their application.

Nael and Bin Harmal commenced work on the project in October 2014 and the infrastructure networks were completed in January 2017. As the contractor who installed Abu Dhabi’s first PE100 water utility network back in 2002, the company has a long track record in the detailed design and installation of PE water networks. Project Director, Wissam Abi Nahed, who worked on both projects, has over 20 years’ experience in the water and infrastructure sector. He said, “HDPE is one of the most reliable solutions for piping systems for water, irrigation, gas and district cooling. I have never experienced a failure when testing properly installed PE systems”.

MEIL uses Borouge PE100 in Telengana Water Grid project in Southern India

by Chanchal Dasgupta, Prashant Nikhade and Srinivas Goud

The Telangana State Water Grid or Mission Bhagiratha, is a megascale project initiated by the Telangana state government to provide clean and safe drinking water to every household in India’s newest state. With a 5,000km main network supsplanted by a 50,000km secondary network and a further 75,000km of pipelines to channel the drinking water to households, Mission Bhagiratha was developed at a projected cost of USD6.6 billion, and is India’s first integrated drinking water distribution network.

The success of the project is highly dependent on the optimal utilisation of water from the Godavari and Krishna Rivers that flow through the state; a total of 34 billion cubic metres of water from the Godavari and 21 billion cubic metres from the Krishna are required for the water grid.

Hyderabad based Megha Engineering & Infrastructures Limited (MEIL) was appointed as the main contractor for Mission Bhagiratha. With a proven track record of 25 years in the Indian infrastructure industry, MEIL is one of the
country’s foremost companies for key industry verticals such as irrigation, drinking water, hydrocarbons, power, renewable energy and transportation for large scale civil and industrial projects. The company has also achieved the rare distinction of being the only infrastructure company in India to commission major river-integration projects such as the Narmada- Kshipra Simhastha Link in Madhya Pradesh and the Pattisam project in Andhra Pradesh. Other projects undertaken by MEIL include the Sauni Yojana project in Gujarat and the Upper Ruvu-Kimara Water Transmission/ Kidamba Reservoir drinking water project in collaboration with DAWASA in Tanzania, East Africa.

Mission Bhagiratha commenced with the development of the Gajwel water grid in November 2015, which saw the successful transportation of water to 67,000 households in the towns of Toopran, Gajwel Rural, Gajwel Town, Wargal, Dubbaka and Malkapur. This section of the project was completed ahead of schedule in August 2016 with the laying of a 1,200km pipeline — an event that was graced by Indian Prime Minister Narendra Modi and the Chief Minister of Telangana state Sri K. Chandrashekhar Rao. MEIL was also contracted to provide operational and maintenance services for the pipeline over a period of 10 years.

The next phase of the project, which covered the Mahbubnagar, Karimnagar, Sircilla, Jagityal and Manthini-Bhupalpally sections, required a pipe network with a length of almost 13,000km to supply water to over 340,000 households. Another pipeline with a total length of over 11,000km was also installed for the Paleru-Warangal, Adilabad, Dummugudem, Nalgonda, Nizamabad and Alair-Bhongir sections to deliver drinking water to 172,000 households across 22 mandals (i.e. districts).

HDPE pipes make up two thirds of all the pipes used in the project, with most of them installed as part of the distribution network. The pipes were made from high quality BorSafe™ HE3490-LS pre-compounded black PE100 from Borouge. The material, which is resistant to high impact, abrasion, chemicals and UV rays, is also excellent at withstanding rapid crack propagation and slow crack growth.

In line with its key focus on quality management, MEIL established an in-house quality control and planning department exclusively for Mission Bhagiratha for the implementation of quality execution programmes, construction management models and advanced QAPs (Quality Assurance Plans).
GSE Environmental is a leading global manufacturer and marketer of geosynthetic lining products and services. Its products include PE geomembranes, geonets, geocomposites, geosynthetic clay liners, concrete protection liners, and vertical barriers. Used for the containment and management of solids, liquids, and gases, the company’s products are used mainly in the construction, waste management, mining, water, waste water and aquaculture industries. Headquartered in Houston, Texas, GSE Environmental maintains sales offices throughout the world and manufacturing facilities in the US, Chile, Germany, Thailand and Egypt.

The Middle East accounts for almost 30% of the geomembrane demand for Greater Asia¹, with the number expected to grow by 21% between 2017-2022. The top three segments underpinning this growth are water management, civil engineering and waste management. A booming construction sector in the UAE, Saudi Arabia and more recently, Egypt and Oman, are driving up the demand for geomembrane of all forms for use as liners to minimise water loss and seepage in roads, buildings, tunnels, waste storage ponds and also in other containment solutions.

An industry leading producer of geomembrane products for waste and water management, mining, civil engineering, agriculture and aquaculture, capping system and oil and gas applications, GSE Environmental PE geomembranes are widely used in many projects across the MEA region. Produced using medium density polyethylene (MDPE) and linear low density polyethylene (LLDPE) solutions from Borouge, the company recently supplied geomembranes for two projects in Egypt – the Diamond Plaza hotel in Sharm El-Sheikh and the Geotech Shrimp Farm at Kafr El-Shaikh.

**Diamond Plaza**
The Diamond Plaza is a new hotel located in the famous resort city of Sharm El-Sheikh. Situated at the southern tip of the Sinai Peninsula along the Red Sea, the city is a popular destination with visitors from Europe and the Middle East, and is also one of the world’s top diving sites.

The development was designed with a large artificial lake and accommodation buildings uniquely styled as individual islands surrounded by small water channels. However, the close proximity of the buildings to the water body posed a potential risk to their foundations due to soil settlement from water erosion. The issue was made even more complex by the development’s coastal location, which meant a constant exposure to ground settlements from rising sea levels.
In order to prevent these issues, a durable and reliable containment system was required. GSE Environmental was contracted to produce the multi-layered system, which comprised a black geomembrane layer and a drainage piping network below it to collect excess water. This would serve as a backup for the blue geomembrane, which forms the top layer; any water that escapes the containment of this layer is collected by the network and returned to the main water channel using water pumps, thus preventing the excess water from damaging the building foundations adjacent to the water features.

The lining system was produced using 40,000m² of HD 1.5mm smooth blue geomembrane for the top layer and 16,000m² of 1.0mm smooth black geomembrane for the bottom layer.

**Geotech Shrimp Farm**

The Egyptian government has been promoting marine farming in its coastal regions as a means to improve the livelihood of the communities in these areas. Today, the country’s aquaculture industry is the largest in Africa².

Egypt’s national provider of soil reinforcement and ground stabilisation solutions, Geotech, recently completed the construction of a mega shrimp farm in the governorate of Kafr El-Shaik. One of the largest aquaculture projects in the country, the farm targets both domestic and export markets. The scale of the project meant that a reliable and cost effective system had to be installed for the large aquarium units containing the shrimp – once fully populated, these units would be subjected to continuous operations under the harsh desert environment and accelerating coastal conditions from a combination of climate change and agricultural human settlement³.

The project commenced in May 2016 and is currently undergoing further expansion. As of May 2017, GSE Environmental has supplied over 1.8 million m² of 0.75mm and 1.0mm black geomembranes made from high quality Borstar® FB1370 and FB2230 bimodal PE solutions from Borouge.

References:

Enabling large pipe extrusion with efficient internal cooling systems

by Farraj Tashman

Growing worldwide demand for large diameter, thick-walled PE pipes for different construction and industrial applications has resulted in challenges for material, machine and pipe producers alike.

In order to increase cost-effectiveness for producers, the material must be specifically designed with good sagging properties. In other words, the molten PE, which is shaped in the die head at 200°C to form the required outside diameter and wall thickness, must be viscous enough not to flow (i.e. sag) from the top of the pipe's inner wall to its bottom and sides before solidifying. The machine must also be able to accommodate a sufficiently high throughput extruder that can deliver a homogeneous melt at moderate melt temperatures, equip the die head with individually controlled heating bands and manage the flow of the molten polymer running inside the die head; an efficient cooling system capable of getting the pipe-shaped melt below its crystallisation temperature as fast as possible before the onset of the sagging process is also essential.

For the extrusion of large, thick-walled PE pipes with a final temperature of between 60°C and 80°C, a number of vacuum/cooling baths are required. For instance, the production of a large SDR 11 pipe will require a 1500kg/h throughput rate, with a 'wet' specific cooling length of 95m (i.e. 0.7 x 1,500 / 11) – the equivalent of 10 huge water tanks. In order to reduce the use of resources, a number of leading pipe extrusion line producers such as KraussMaffei Berstorff have devised an innovative way of cooling the extruded pipe via controlled air suction from the inside through the die, as seen in Figure 1.

Due to the a reduction in the number of conventional water tanks utilising chilled water, the internal cooling system requires less initial capital investment in downstream units and space – this in turn, will lead to an increase in productivity and lesser sagging of the pipe during production.

Battenfeld Cincinnati, another top extrusion line producer, has developed the Efficient Air Cooling (EAC) system which cools down both the pipe's interior and the melt inside its die head. It has also collaborated with Labotek to develop a technology that treats the hot air exhaust generated by the EAC system before feeding it into a drying system, where it is converted into energy (Figure 2 and Figure 3). This efficient technology helps to reduce the energy requirements of the drying system by almost 90% as compared to other standard desiccant drying systems.
Frank PKS New Zealand (NZ) began manufacturing large diameter spiral wound pipes in 2005 with the production of a DN1200 pipe for the Timaru District Council Sewer Project. The success of this initial order has been underscored by an ongoing relationship they have had with the TDC. In total there has been 14km of pipe delivered to Timaru since the Frank-PKS inauguration. Today, the company produces polyolefin pipes in diameter sizes ranging from DN300mm to DN2500mm in addition to fittings and welding technology. There has been a sharp uptake in flexible pipe technology since the devastating 7.1 magnitude Canterbury earthquake and subsequent aftershock which struck New Zealand’s South Island in the six months between 2010 and 2011.
Frank PKS NZ has been at the forefront of this, with their position being further enhanced by the addition of a third manufacturing line at their Christchurch plant earlier this year. “All the materials used in the manufacturing of our piping systems conform to AS/NZ 4130 standards. Sourcing for quality materials is a must for us to meet the requirements as set out by these standards, and Borouge, through its local distributor Ravago NZ, meets these requirements. We use BorSafe™ HE3490-LS PE100 and BorECO™ BA212E PP from Borouge for the manufacture of our core tubes”, said Frank PKS NZ Managing Director Nick Browne.

Frank PKS NZ currently supplies pipes, manholes and fittings of up to DN2500mm in diameter for various projects around New Zealand, including culverts for expressways. Many of these culverts require fish baffles specific to the fish species that travel the waterways. Traditionally manufactured from stainless steel, the culverts are very prone to infiltration and degradation when the baffles are bolted through their substrates. This issue can be resolved with the use of PE fittings, which can be extrusion welded to the base of the pipe without perforating and damaging the structure of the pipe. The baffles can also be installed in the production facility prior to delivery, which reduces the duration of the onsite installation process. With the increase in nominal diameter and the lack of suitable testing equipment in New Zealand, Frank PKS NZ has filled the gap by developing a testing rig to ensure that stiffness ratings for projects are met. The finished products are tested in-house, with independent testing companies brought in to verify the results when the need arises. “It just provides the peace of mind to the customer that the product as specified is being delivered, and shows our commitment to quality” said Browne.

Frank PKS NZ is currently engaged in another major project – the Queenstown Eastern Access Road. Funded largely by the Queenstown Lakes District Council and supported by the New Zealand Transport Agency, the new road will provide an alternative route between Frankton and the Shotover River, enabling drivers to avoid the existing SH6 and SH64 junction, which is a long-standing bottleneck for traffic to and from Queenstown. The first stage of this project will see the manufacturing of pipes, manholes and a DN1400mm hydrobrake to slow the downhill velocity on a 1:1 slope. The brake itself has an eccentric reducer and enlarger feature and PE rings welded to the inside to slow the velocity of the water. Other fittings include DN1100 and DN1400 junctions entering...
a DN1800 mainway pipe at narrow angles. Also added on site was a DN1000 riser for man access, which was achieved with the installation of a large manhole that was cast in situ. The parameters were further expanded upon the discovery that the existing concrete pipe and manholes had succumbed to hydrogen sulphide erosion—these were then replaced by a spiral wound PE pipe and manholes.

“Our market exposure is growing with the increasing number of projects that we are taking on”, said Business Development Manager Chris Price. “PE used to be regarded as a niche material for projects but we are now seeing a total life cost approach by councils who are struggling to cap rate rises into the future. PE materials, which have a minimum lifespan of 100 years and allow for quicker installations, are a step in the right direction. We are proud to be leading the way in this respect”.
Improving the lives of rural communities in Bintan through Water for the World™

by KH Lou

Background
Water and sanitation related diseases are highly prevalent in developing countries, resulting in illnesses and deaths, especially among children. Poor sanitation, hygiene practices and drainage result in the contamination of local water sources with pathogens, making them unsafe for drinking and cooking. In order to ensure the sustainable development of these water sources, measures must be undertaken to protect them from pollution and minimise the negative downstream effects of wastewater treatment and disposal.

Challenges
Conventional sewage and wastewater treatment facilities are uneconomical for rural areas with low population densities due to a lack of know-how and financial means to build, run and maintain them. As a result, wastewater from toilets is discharged directly into the surroundings, resulting in groundwater pollution. To mitigate such problems, some villagers spend a large portion of their income on bottled drinking water.

In tropical coastal areas like the Indonesian island of Bintan, water tables can be very high, reaching less than 1m in height after frequent rains, resulting in serious challenges in the areas of construction and water treatment. Communal or centralised systems are not viable solutions, as the flat topography of the region also impedes gravity flow into drainage channels and centralised piping networks. Installing septic tanks or building waterproof concrete tanks on-site have also proven to be extremely difficult, as floods are common in excavation areas due to the high water tables.

The Solution
LooLa Adventure Resort and the Business Council for Sustainable Development Singapore decided to initiate a pilot project for Bintan based on a concept¹ for rural wastewater and sewage treatment originally developed for the reconstruction of Aceh and Nias in Indonesia after the 2004 Indian Ocean tsunami.

The system comprised three major components - a septic tank, a leach field (garden) and a ceramic filter. Household wastewater and sewage is collected in the septic tank, which when filled with water, acts to manage the discharge of the solid and liquid mixture by ensuring that inflows into the tank inlet are balanced with a corresponding amount of outflows through a separate outlet. In addition to this, the tank enables the separation of solid and liquid components, breakdown of organic matter, storage of solids and the discharge of the
clarified liquid for further treatment and disposal into the soil absorption system; accumulated solids are periodically removed from the tank to maintain its efficiency. It is also imperative that the tanks are leak-proof and durable enough to withstand the ground settlement and upward force from swollen groundwater levels during periods of heavy rain.

The primary-treated discharge from the septic tank then flows into a vegetated leach field and is evenly distributed through horizontal perforated pipes laid on a gravel bed. The gravel bed is first covered with sand and then with densely planted fast-growing plants which ‘harvest’ the nutrients (i.e. main pollutants found in the ground and surface waters). The wastewater is distributed over a large area to be treated by the plant roots and microbes in the gravel.

In tropical climates, nutrients cycle more rapidly and continuously because of higher temperatures. A smaller system in the tropics can treat wastewater to the same standard as larger systems in cold climates. Another factor making this system suitable for the tropics is that nutrients are stored in the tropical plant itself, as compared to colder climates, where nutrients are stored in the soil. Fast growing plants like the banana take up large quantities of macro nutrients (especially potassium and nitrogen) and can evapotranspire significant amounts of water. The Vetiver grass with its massive root system is another fast growing plant shown to be effective in liquid waste treatment.

A small pore ceramic filter is also provided to each household to serve as a simple but effective means to remove dirt, debris and any remaining bacteria from the water before usage. This pilot project is supported by research teams from the Eindhoven University of Technology (TU/e), Universitas Gadjah Mada (UGM) and the National University of Singapore (NUS). The septic tanks were sponsored by Borouge and made from BorSafe™ PE100 and BorECO PP-B material.

Supported by funding from the Dutch government, the teams from the universities² will investigate the water quality and efficiency of different variants of this system over a 9-12 month period starting from August 2017 to enable improvements for future installations. The data and results will be made publicly available.
**Benefits**
A major advantage of leach fields is that they stop wastewater from being dumped into public drains. Nutrient-rich wastewater can stagnate in drains on flat terrains and facilitate the breeding of mosquitos and flies, thereby causing vector-borne diseases.

The unique spiral profile of the tanks made from BorSafe™ and BorECO™ material using the Bauku process helps anchor these buried tanks and enable them to withstand the upwards force from swollen water levels. Because the tanks do not move significantly during heavy rains as compared to standard smooth walled tanks, there is lesser risk of damage to the pipe connections that could cause leaks and reduce the efficiency of the system.

Equipped with these waste water gardens, the villagers have started drinking water from the well near their homes and report no issues so far. They also save money from not having to buy bottled water and the area surrounding their homes no longer smells. The gardens are also aesthetically pleasing and help beautify the environment. Other households in the village are now aware of these benefits, and there is now a waiting list of households who are keen to purchase and install these simple and effective systems.

**Sources:**


EVENTS

Reinforcing PE’s track record for gas distribution applications at GIS 2017

Supported by the Directorate General of Oil and Gas (MIGAS), the Gas Indonesia Summit & Exhibition (GIS) 2017 was held at the Jakarta Convention Center from 12-14 July 2017, with over 400 conference delegates and 3,000 international visitors in attendance over its 2 day run.

The event, which provided key updates on regulatory changes and infrastructure developments in the local gas and LNG sector, was in line with the government’s plans to increase natural gas utilisation in Indonesia, with a target for it to account for 30% of the country’s primary energy mix by 2025 through appropriate allocation, utilisation and pricing — a move which supports its national goal of boosting domestic energy resilience and security. Indonesia has 2.9 trillion cubic metres of proven natural gas reserves – the 14th largest in the world. The country produced 75 billion cubic metres of gas and was the 10th largest global producer and the 2nd largest in the APAC region.

Indonesia’s National Gas Infrastructure Roadmap 2016-2020 calls for a total investment of US$48.2 billion out of which US$12 billion is for pipeline and US$2.2 billion for households. There are currently 185,900 households connected to the city gas network nationwide while the target for end 2017 was to get 345,600 households connected, implying significant delays in the implementation of this plan. By end 2019, the original target calls for 509,600 households to be connected. During this event, representatives from the Ministry of Energy and Mineral Resources reiterated their determination to narrow the implementation gap in household connections.

Sources
Since 2015, Borouge, together with the Vietnam Water and Sewerage Association (VWSA) collaborated in raising awareness on the latest plastic piping technologies to the local Vietnamese infrastructure and construction industry.

A half day seminar was jointly organised with VWSA in early 2017, to ensure that the industry is updated with the latest global trends and international practices in large diameter pipe projects. The seminar was targeted mainly at the Vietnamese Ministry of Construction and major design consultants focusing on the Whole Life Cost concept and the advantages of PE100 material.

In Vietnam, steel pipes are preferred by Vietnamese engineers and designers compared to PE100 for large water pipeline projects as a cost effective option. Several tenders for pipes of above 1.2m diameter were floated in the past year.

The seminar was an opportunity to share key benefits of PE100 pipes. Despite its higher costs, PE100 pipes is a cost effective option in the long run. It eliminates frequent maintenance and operational costs that is usually required by a traditional steel pipe.

A review of newer technologies made from the latest polyethylene materials featured in previous Borpipe editions were also shared during the seminar. This includes trenchless installations, pipeline rehabilitation and pipeline protection which gives a wider range of options to project engineers and designers during the selection of pipe materials.
Representing the PE100+ Association at Trenchless Indonesia 2017

For the first time in Indonesia, the PE100+ Association participated at the Trenchless Indonesia 2017 held in Jakarta. This specialised event saw a total of 30 exhibitors and attracted almost 1000 visitors over two days.

Members from PE100+ took the opportunity to promote the benefits of PE100 in alleviating current infrastructure problems and increasing demands in the booming construction industry.

Borouge, on behalf of PE100+, presented the newly developed ‘No-Dig Technical Guide’ – an online guide to assist end-users in identifying the most suitable trenchless methods for installing PE100 pressure pipes.

Participants joined in during the Q&A session with questions on PE100 welding methods, maximum pipe bending radius during field installation and pressure testing after pipeline rehabilitation.

Attracting almost 50 participants consisting of members of the Indonesian Professional Engineers Association, the National Association of Contractor Indonesia as well as local plastic pipe producers and suppliers, the presentation was also used as a platform to raise the profile and awareness of PE100+. Representatives from the Siam Cement Group (SCG), as PE100+ members, were also present to support the outreach.

This South East Asia participation is an excellent opportunity for the PE100+ Association to remind authorities and key decision makers of the benefits of PE100 whilst ensuring the best quality materials are specified to meet the rapidly increasing demand.
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