

Schlüsselbauer Technology GmbH & Co KG, 4673 Gaspoltshofen, Austria

Bilcon Industries sets new benchmarks in jacking of corrosion-resistant pipes in Singapore

The island state Singapore has developed rapidly into one of the most modern industrial nations in the world within just a few decades. Right now, more than 5.5 million inhabitants are living in the densely populated Singapore, the large majority in the same-named capital city. Thus, it is not surprising that the strategic drinking water and wastewater management has been given a high priority for a long time. As part of an ambitious infrastructural programme the country already started in the 1950s with the construction and further expansion of a nationwide sewerage system. Nowadays, the South-East Asian city state is also an international leader in the field of reprocessing from sewage to drinking water. 'To use every drop of water more than just once' is not only a declared motto – it is consequently put into practice in Singapore. More than one third of the whole wastewater is already recycled. Naturally there are very high demands on the quality of pipelines and sewerage systems in general. For instance, solely corrosion-resistant pipes may be used for wastewater disposal all over the country. The Singapore-based company Bilcon Industries, a well-established manufacturer of concrete pipes and precast elements, responds to this trend and has recently installed an innovative Perfect Pipe plant to produce lined concrete-HDPE composite pipes.

■ Ralph Mitterbauer, Schlüsselbauer Technology ■

Since last November Bilcon Industries is producing wet cast concrete pipes with different nominal widths in Singapore by using the Perfect Pipe manufacturing system developed by Schlüsselbauer Technology. The pipes with consistent corrosion protection are made for pipe jacking. First projects have already been successfully finished too. As a result, Bilcon sets new standards in microtunneling on the South-East Asian civil engineering market particularly regarding the criteria of economical efficiency and sustainability of pipe systems.

Decisive arguments for Bilcon Industries to choose the Perfect Pipe system were, on the one hand, the manifold product advantages of the wet casted pipes with consistent HDPE-lining, which are characterised by a maximum of robustness and corrosion protection. On the other hand, the decision

was strongly influenced by very positive experiences during a reference project in 2015 when Perfect Pipe was installed in Singapore for the first time. On behalf of the JTC Corporation, pipes with a nominal width of DN300 have been installed in the 'Tuas South Avenue' by the KTC Civil Engineering group using the jacking method. As the result was so much convincing for all involved parties, Bilcon immediately took the decision to start the planning of an own Perfect Pipe production plant in Singapore together with its partner Schlüsselbauer Technology. For the implementation of this ambitious project it was necessary to pass through all locally required product-specific tests in order to get the permission to install this revolutionary concrete-HDPE composite pipe all over the country. After the successful completion of these tough examinations last summer, in which not only the pipes itself but also the whole pipe system was tested, there was

nothing more left that could prevent the start: Within just a few months a modern production plant for Perfect Pipe was established by Bilcon and Schlüsselbauer Technology at the main location in Singapore.

Bilcon Industries – one of the leading technology pioneers in Singapore

The concrete pipe and precast producer Bilcon Industries looks back on a long and successful tradition. The company was founded in 1963 by Mr. Tan Leong Teck and has been manufacturing various products for strategic drinking water and sewerage systems more than 50 years so far. Bilcon has always been a leader in technology and innovation since then. For example, the company already started in the 1980s to line conventional concrete pipes with synthetic materials in order to increase both corrosion-resistance and



Fully automated cutting and welding of the Perfect Liner film according the requested nominal width



Thermoplastic forming of the Perfect Liner ends for the future connector position



Demoulding of a cured jacking pipe



Secure product handling with a hydraulic gripper

longevity of the products. Looking back, frequently ceramic and therefore rather brittle pipes were used in sewerage systems in Singapore. Due to frequent construction activities and increasing ground movements the trend is now clearly towards more robust concrete-HDPE composite pipes which are highly resistant against all kinds of chemical attacks in addition.

Strategic investment in Perfect Pipe manufacturing system

With the decision for the Perfect Pipe manufacturing system Bilcon takes an important step for the further modernisation of its pipe production. In addition to the economical production method of the manufactured Perfect Pipes they are especially highly valued because of their long expected lifetime of more than 100 years. On the one hand, this is secured by the internal corrosion-resistant Perfect Liner which is firmly anchored into a solid concrete shell. On the other hand, the consistent protection is guaranteed by the Perfect Connector made from resistant polypropylene which is also characteristic for the Perfect Pipe system. The pre-installed dual tilting lip gasket of the connector ensures maximum watertightness. Thanks to the Perfect Connector, the connection of pipes can be produced more quickly and therefore more economically than by welding synthetic pipes on the construction site. This leads to a significant increase in the installation rate in the range of no-men-entry nominal widths starting from DN300, while at the same time resulting in a reduction in installation costs.

Increase in capacity due to innovative production technology

At the moment jacking pipes in the dimensions DN300, DN400, DN600 and DN800 with lengths from 1 to 2m are manufactured at the Singapore location by using the proven vertical Perfect Pipe production method. Thanks to the optimised



Storage of ready jacking pipes at Bilcon Industries in Singapore

production technology from Schlüsselbauer, Bilcon is able to fill the moulds several times per day and to multiply its output of ready pipes.

In the beginning of the Perfect Pipe manufacturing process, the HDPE film with a wall thickness of 2.5 mm is cut to size in accordance with the desired nominal pipe width and length and welded to form a watertight cylinder in a fully automated process. Next, the liner cylinder is applied to a supporting core and the ends undergo an automatic thermoplastic transformation. In the subsequent pipe, the Perfect Connector is inserted into the expanded pipe ends that are formed in this way, without a reduction of the pipe cross section.

The final outer contour of the pipes produced at Bilcon is created by filling the vertically aligned steel moulds with self-compacting concrete. In order to secure the dimensional stability of the corrosion protection the liner is fixed on a steel core first. After concreting and a curing procedure of approximately 12 hours the finished products are demoulded and are immediately ready for further use.

Maximale Dichtheit und hohe Maximum tightness and high advance rate along with easy installation

The solid Perfect Pipes made from flowing concrete are ideal for pipe jacking and pro-



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Inserting a pipe into the starting pit



Preparation of the jacking devices



Reliable jacking of the pipe



Temporary storage of Perfect Pipe at the building site

vide a crucial advantage for the trenchless construction: The higher jacking speed due to quick and simple fixing of the tight pipe connection by using the Perfect Connector in the starting pit. Before lifting a pipe into the manhole, the connector is already assembled in the end of the pipe. Upon reaching the target shaft, a durable, corrosion-resistant, operational and watertight pipe system is available in the form of a combination of Perfect Liner and Connector with no further work steps. The whole construction progress is not delayed by on-site liner-welding including lengthy pre- and post-processing needs.

Bilcon's Perfect Pipes are delivered ready for installation to the building site and can be immediately lifted into the starting pit. They form a complete pipeline after completion of each single jacking cycle. Therefore, the production efficiency of sustainable pipes by using the microtunneling process is increased and the economic viability of jacking measures in general is significantly improved.

Ambitious goals on the South-East Asian market

In the midterm Bilcon Industries pursues the ambitious target to achieve a leading position with Perfect Pipe regarding both product quality and manufacturing costs in the field of pipe jacking in Singapore and Malaysia. To ensure this aim an expansion of the available pipe geometries with further nominal widths is already in progress. Further production plants in addition to the existing main site in Singapore are being planned as well.

The founder and CEO of Bilcon Industries, Mr. Tan Leong Teck, summarises: 'The Perfect Pipe manufacturing system from Schlüsselbauer Technology allows us to produce high quality jacking pipes with different nominal diameters and consistent internal corrosion protection in a very short time. Along with the longevity it is in particular the use of integrated Connectors which guarantee an easy and safe installation on the building site that speak clearly for

Perfect Pipe. Combined with our well-regarded manufacturing competence this leads to an unbeatable combination of advantages that makes our system standing out from competitive products on the South-East Asian market'.

FURTHER INFORMATION



BILCON Industries Pte Ltd.
12 Tuas Avenue 16, Singapore 638935
T+65 6862 6331, F+65 6862 6332
sales@bilcon.com.sg, www.bilcon.com.sg

SCHLÜSSELBAUER

SCHLÜSSELBAUER TECHNOLOGY GmbH & Co KG
Hörbach 4, 4673 Gaspoltshafen, Austria
T +43 7735 71440, F +43 7735 714456
sbm@sbm.at, www.sbm.at
www.perfectsystem.eu

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