

SIP&T works in Sri Lanka on Waterfront Project



A huge project

Sri Lanka is an island nation off the Southeastern coast of the Indian subcontinent. After the 2004 tsunami, new planning regulations were approved in the coastal areas which have led to the construction of impressive tourist facilities for the country's economic recovery with a GDP value that grows from year to year. Today, Sri Lanka has the highest per capita income in South Asia, equal to over 6,000 US dollars, which is almost double that of India. The Waterfront Resort project was founded on this context: a multi-faced project which consists of a luxury hotel with over 1,000 rooms, a conference centre with a capacity of 2,500 guests, as well as entertainment facilities, swimming pools and casinos spread over an area of 14,000 m². A 37,200 m² international shopping centre, 245 luxury condominiums, apartments, offices and 2,500 parking spaces will be added to these buildings. The total cost of the project is 522 million dollars to be invested in 5 years. The target completion date is 2018. An ambitious complex which makes it difficult to assess the impact it will have on the social fabric of the country. In fact, these types of integrated resorts cannot be compared in Sri Lanka, even though they are very popular in the Asia-Pacific regions. Not having

SIP&T Kelly bars and rotary tools are the protagonists in the construction of one of the most luxurious complexes on the entire planet, the Waterfront Resort in Sri Lanka.

John Keells Holdings (JKH) - one of the largest groups listed on the Colombo Stock Exchange, the capital of Sri Lanka - has been awarded the work for the construction of what will be a regal complex among the most luxurious in the world: the Waterfront

Resort. The works will be carried out by a consortium led by Hyundai Engineering and Construction, the Korean Keangnam Enterprises and the local Nawaloka Piling. The latter wanted to be flanked by the Italian company, SIP&T, for the implementation of the Kelly bars and the necessary tools for the piling stage.



Upali Dharmadasa,
Chairman and owner of
Nawaloka Piling

business models available from which to extract forecast data leads to great uncertainty on the return on investment carried out by a consortium led by Hyundai Engineering and Construction with a 65% share of the project (equivalent to 339 million dollars), the Korean Keangnam Enterprises with 25% (equivalent to 130 million dollars) and the local Nawaloka Piling with 10% (equivalent to 52 million dollars).

Drilling specialists

Created in 1993 by Upali Dharmadasa, Nawaloka Piling is now a company par excellence in the piling sector and is involved in all major infrastructure projects in Sri Lanka. The company's mission is summarised in handling any challenge by creating a highly competitive environment in terms of quality, advanced technology and human resources. In addition, management is very sensitive to environmental and social issues because

« The perfect sizing of the kelly bar requires a careful study of soil, the precise knowledge of the maximum torque applicable to the kelly bar itself and the adequate tool to be connected to the equipment, for rapid and safe progress »



Lucia Ladalardo, SIP&T Sales Department

it is convinced that success inevitably affects respect towards nature and the growth of the entire population of the country. "The quality of a building greatly depends on what has been built underneath and in my case, the pilings" says Mr. Dharmadasa. We are building the Waterfront Resort in compliance with applicable regulations on buildings in a seismic zone, with the use of seismic isolation devices for all major projects. Day after day we strictly

monitor the high standard of quality and executive precision for both to be maintained".

Bored piles

Once the soil geological report was analysed and the loads involved were noted, the project choices were aimed at bored pile foundations being used, which is an element in common in most works. Overall, 1,196 piles must be made with a diameter ranging between 600 and 1,800 mm, at an average depth of 30 m and a total length of 35,880 m. Nawaloka is producing the piles with last generation European rigs with very high torque values of up to 400 kNm. It should be noted how the stratigraphy of the subsoil of the works in question consists of various layers of rock such as limestone, gneiss, marble, quartzite and granite. Rocks classified as very hard and whose average compressive strength ranges between 110 and 300 mPa. Furthermore, banks of rock with compressive strength of over 220 mPa, with almost continuous frequency, are found at a depth ranging between 24 and 30 m. Lucia Ladalardo, SIP&T Sales Department, explains



Some Drills during the works. The company is using machines constructed in Europe which develop very high torque values



Some rock samples taken from the site.



Pieces of rock extracted with the bored pile.



"When such values are noted, the traditional drilling techniques are significantly difficult, basically due to the problems related to the type of tools and the sizing of the kelly bars. All this slows down the works and leads to low productivity, excessive fuel consumption by the drill and its components possibly breaking due to the high stresses involved. Furthermore, using a wrong tool enhances its damage or in any case, having to restore the cutting edges too often. An even more delicate issue is that related to the kelly bars that are compatible with the rigs used. An incorrect size results in them breaking, which would have a negative impact, especially from an economic aspect since the kelly bar is in integral part of the rig with a significant cost." Thanks to the presence enjoyed by SIP&T in Sri Lanka for many years and in such a complex context, it has



Interlocking Kelly Bar for different types of rigs and for a depth of 30 m. Once the soil geological report was analysed and the loads involved were noted, the project choices were aimed at bored pile foundations being used, which is an element in common in most works. Overall, 1,196 piles must be made with a diameter ranging between 600 and 1,800 mm, at an average depth of 30 m.



SIP&T has also provided the Sri Lankan site with Tri-Blade Core Barrels, which thanks to their special shape, allow to break the cored rock by the Roller Bits and gather it inside.

Core Barrels Roller Bits that have rotating spherical caps as cutting edges made with tungsten carbide inserts which are highly resistant to abrasion and can pulverise rock.

developed unique rock tools, paying attention to the type of tool and its equipment. In detail, among others, Roller Bits Core Barrels have been provided, which are cutting edges of the rotating spherical caps made with tungsten carbide inserts which are highly resistant to abrasion and can pulverise rock. As a support, to split the rock by pulling the pole, the Italian company has decided to provide a Tri-Blade Core Barrel, which thanks to its special shape, allows to break the cored rock by the Roller bits and gather it inside. Considering the maximum depth to be reached is 30 m and the rigs with a long must, the kelly bars were made in three sections. A solution which gives increased strength and lightness compared to the four sections.

The design is based on the research

Ladalardo emphasises "The perfect sizing of the kelly bar requires a careful study of the soil geological report, the precise knowledge of the maximum torque applicable to the kelly bar itself and the adequate tool to be connected to the equipment, for rapid and safe progress. Prior to all this there must be a design that considers all the indicated parameters, with the addition of the mechanical characteristics of the materials used." Modern software supplied to the SIP&T technical department has in fact allowed accurate "stress analysis" simulations to be performed, using the finished parts method, and therefore, the critical points of each kelly bar have been identified and advanced technical solutions have been adopted from using special materials.

Solutions that have proven to be successful on site. After a short training phase, during which the operators of the rigs were explained what torque and thrust to apply, the average net rate of drilling was 0.8 m/h in granite, with compressive strengths of over 220 MPa. In addition, after having drilled 80 m (90 m³) of rock, all the rollers were in good condition. An impressive achievement, especially when one considers that it takes an average of 10 hours to drill 0.8 m of rock with a traditional core barrel. Using rigs of different manufacturers, kelly bars and tools proved to be particularly reliable and effective. This generated a balanced system, thereby achieving high productivity and minimised problems arising from the structural subsidence of the various components.