



# Djibi Electric Substation: Ivory Coast

*Every project has unique challenges and when it comes to an activity like power T&D, the impediments can often be frustrating and daunting.*

*Surmounting hurdles and commissioning a project within the time and cost budget is the aspiration of every project implementation agency. Every challenging project successfully commissioned not only enriches all project stakeholders but also creates new industry benchmarks. In this case study, we take a look at how Angelique International Ltd commissioned a 225kV substation in Ivory Coast despite all odds, and how, empowered by the success of this project, this rapidly-growing West African nation has become Angelique's geography of keen interest.*

**I**n February 2014, Angelique International Ltd clinched a Euro 10.5-million contract to build the Djibi substation in Ivory Coast, a West African nation that is known to be the largest cocoa producer in the world. Signed with the country's Ministry of Energy, Water & Petrol, and financed by the West African Development Bank, the contract placed by CI-Energies involved setting up a new 225kV substation equipped with 4x50MVA power transformers, line bays interconnecting the existing Riviera and Abobo substations, and a set of 15kV outgoing feeders to energize the adjoining residential and commercial areas. Notably, the project also involved setting up a full-fledged SCADA (supervisory control and data acquisition) system for remotely controlling substation equipment.

The contract was won on international competitive bidding with Angelique International getting the better of several contenders from China, Spain, Germany, France, Portugal, etc. Rattan Lal Labroo, Joint President – Power Group, Angelique International Ltd, told *T&D India* that the contract was fraught with challenges, starting right from the nature of the soil on which the substation was to be erected. There was also a change in project scope, well after much time and manpower was spent during the designing stage.

The terrain of the project site was highly uneven with a level-difference even reaching even up to 4m at some points. As blasting is not allowed in Ivory Coast, site leveling was tedious. Adding to the difficulties was the hard soil strata. Heavy rainfall, during April-July





and October in 2014 and 2015 compounded the problems. "Around 18,000 cubic metres of soil had to be transported across a distance of nearly 70 km," Labroo recalled. This involved some 2,000 truck trips. The approach road to the project site, which was around 5km, was muddy and this had a debilitating impact on the movement of man, machine and material, especially in the rainy season.

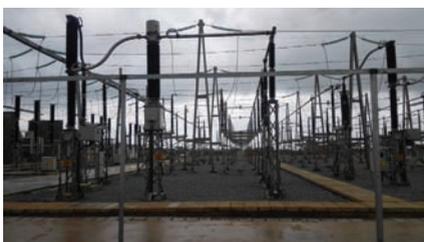
What also came to Angelique's aid was the company's prior experience in Ivory Coast. When the Djibi substation contract was awarded, Angelique had already completed the Ferke substation extension and the associated Ferke-Zegoua transmission line, and was in the midst of building a 90/16.5kV substation at Anoumabo.

**Change of design:** When the contract was signed, the substation was to have three voltage levels, namely 225/90/16.5kV. However, due to non-availability of access route for a 90kV transmission line,



that voltage level was dropped from the project scope. Angelique International had by then spent much time and manpower on the original substation design. However, it could catch up with the schedule, thanks to the modular design approach, explained Labroo.

**Movement of equipment:** A key challenge, as Labroo reminisced, was the movement of heavy and over-dimensional project equipment from India to Ivory Coast. To maintain high quality, Angelique International sourced best equipment from India in line with international standards. It may be mentioned that Ivory Coast does not as yet have manufacturing capability in the field of heavy electrical equipment like power transformers. Angelique sourced power transformers from the Mandideep works of CG Power & Industrial Solutions Ltd (formerly Crompton Greaves Ltd) in Madhya Pradesh. ABB India supplied circuit breakers, capacitor banks, isolators,





switchgear, SCADA systems, etc.

The project suffered a setback when it came to shipment of transformers. After reaching the Jawaharlal Nehru Port in Maharashtra, it was found that the transformers, after sealing the top portion, showed excess height than what was declared in the packing list. The transformers remained at the port for ten days before the situation was remedied and the consignment moved for onward shipment through an RORO (roll-on, roll-off) vessel.

There were more challenges in store. Even when the transformer consignment reached Ivory Coast, the muddy and slushy roads made the journey arduous. When it was time for the transformers to be unloaded from the trailers onto the site foundation, it was found that the crane capacity was insufficient. A stronger crane had to be pressed into operations.



**Rattan Lal Labroo,**  
Joint President – Power Group,  
Angelique International Ltd.

There were comparable challenges even when it came to project equipment other than transformers, which were also shipped by containers. Especially during the monsoons but even on other occasions, container-laden trailers were stuck on the access road compelling the deployment of hydra to unleash the trailers for onward movement. Working around the situation, Angelique International decided to stock containers at the port during the monsoons, bearing huge storage charges in the process. It was only when the roads were found to be in motorable condition were the containers moved to the project site.

These shipments were meticulously handled by Necotrans (for transformers) and Bollore (for other equipment)—both France-headquartered logistic solution providers, noted Labroo.

**Manpower:** When asked about manpower deployed at the project,

Rattan Lal Labroo explained that the entire technical and supervision team, representing the skilled force, came from Angelique International's workforce in India. However, temporary unskilled manpower was sourced from Ivory Coast, and was deployed largely for jobs like site leveling. Angelique's experience in dealing with the staff of the client CI-Energies was a pleasant one. "We found the officials to be dedicated, helpful and focused," observed Labroo.

**Positive impact:** When the Djibi substation was commissioned in October 2016, a new township in Djibi including a multispecialty hospital in the neighbourhood was energized. The substation command area saw holistic development—with new amenities, business activities and an overall uplift in comfort levels.

The successful commissioning of the Djibi substation also had healthy consequences for Angelique International. The 17-month long contract, apart from other successful commissionings in Ivory Coast, created a bonding between Angelique International and the West African nation. "The completion of both Anoumabo and Djibi substations helped us a lot in understanding the standards followed by the country. It also equipped Angelique International in comprehending the law of land better. These projects have consolidated opportunities for the organization to complete such type of challenging jobs in the region," summarized Labroo with satisfaction.

— Venugopal Pillai

