The Chaglla Hydroelectric Power Plant concludes one of its most important stages in construction — the bypass of Huallaga River. Concluded nine months prior to the scheduled date, the river bypass is performed through a trunk tunneling in the left bank with 12.5 meters diameter and 1,125 meters length. After the conclusion of this stage, the dam will be constructed in the former riverbed.

Scheduled to start its operation in the beginning of 2016, this undertaking is considered an example of high-efficiency energetic project and it has reduced impact on social and environmental areas. It will be the largest generation plants in Peru, with a reservoir of only 4.6 square kilometers — a smaller area in comparison to the dimensions of similar hydroelectric plants in South America and the world.

It is the first worldwide asset of Odebrecht Energia. The plant holds 456 MW of installed capacity — enough electricity to supply 4 million people — diversifying the power grid and increasing the provision of energy in order to meet the country’s demand.

Odebrecht Energia was created in 2011 in order to invest in and operate assets in the energy generation sector. Odebrecht has over 1,400MW of installed capacity including hydroelectric power plants, wind energy parks, solar energy plants, as well as biomass projects and small hydroelectric power plants in development.

- Santo Antônio Hydroelectric Power Plant (3,150 MW) in Rondônia
- Teles Pires Hydroelectric Power Plant between states of Pará and Mato Grosso
- Corredor do Senandes Wind Energy Complex (108MW) in Rio Grande do Sul
- Solar Energy Plant — currently in implementation in Arena Pernambuco, Brazil (2014 World Cup Stadium)
- Chaglla Hydroelectric Power Plant (456MW), Peru (planned to be a milestone in the company’s global expansion)

The Chaglla Hydroelectric Power Plant is located between districts of Chaglla (Pachitea region) and Chanchao (Huánuco region, 420 meters from Lima, in Peru.)

5D planning and coordination improves construction by 20%
Implementing BIM as a standard across all Odebrecht projects

The challenge

The construction of this magnitude needed constructive methods that would help to reduce the impact on environment but help to keep the project on schedule concluding in 2015. Chaglla Hydroelectric Power Plant’s construction works is composed of the following structures:

- Trunk tunneling to river bypass of 1,125 meters length and 12.5 meters diameter.
- A 203 meters high dam and a small hydroelectric plant in the dam toe, which takes advantage of the sanitary flow of 3.69 cubic meters per second to be dumped in the dam that holds 6MW of installed capacity.
- The spillway of the tunnel is composed by three tunnels with a 2,838 meters length and 11 x 12.8 meters floodgates.
- The delivery of water will be of approximately 14,8 kilometers, a 7.6 meters high horseshoe junction, a 8 meters diameter and 6,5 meters base ranging from 0.5 to 5%.
- The main open engine room with a gross head of 369 meters high and a 400 MW of installed capacity.

Because of hydroelectric plant construction, the local production chain benefits from the preferred procurement of goods and services and agricultural products inside project influence zone. Further benefits will arise out of the qualification of producers of dairy products and the development of fish farms.

Infrastructure improvements are also planned, as for example the construction of the 25-km access road on the left bank of the river and the restoration of 40km of access way on the right. Overpasses and walkways for pedestrian crossing were also built, streets were renovated, sport practice areas were created and a mobile phone antenna installed.

The solution

During team visit to the field to map the needs of the company noted that one of the biggest opportunities of the construction process was have a flow of information more efficient between the design firm and the company local manpower. Harnessing the expertise of Autodesk training and certification in the team formed by the two companies, they implemented training and guided the project leadership regarding the adoption of BIM. With help from Autodesk, Odebrecht worked on a plan to implement BIM considering three pivotal aspects: people, processes and technology.

Technology—implement best practices using AutoCAD and Civil 3D for Dam and infrastructure Design, Autodesk 3ds Max for visualization, and Autodesk Navisworks for real 5D planning and coordination. Develop a plug-in between Navisworks and Corporative Engineering System of Odebrecht (SiEng) in order to fully integrate the time and costs with the digital model automatically.

Process—integrate the process within Engineering and Construction: an engineering partner developed some plug-ins inside Autodesk technology to improve the construction phase. These additional technologies now are used in Chaglla Project.

Improve the visualization and ongoing construction process by implementing Navisworks manage and 3ds Max. This changes the traditional method from Microsoft PowerPoint and 2D Images to 5D Simulation and visualization.

People—create a CAD management program. According to Juan Carlos Alfonso, Technical Account Manager at Autodesk, “With help from Autodesk, Odebrecht created a ‘CAD Management Program’ in order to create, maintain and leverage the best practices. These adherences to the technologies that allow for more precise visualization of the work illustrate how BIM can be the key to competitiveness in an industry where details can yield a relevant contract.”

The result

“With Autodesk, Odebrecht created a ‘CAD Management Program’ in order to create, maintain and leverage the best practices. This adherence to the technologies that allow for more precise visualization of the work illustrate how BIM can be the key to competitiveness in an industry where details can yield a relevant contract.

— Juan Carlos Alfonso
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"This proposal involves 5D that is the union of the three-dimensional visualization, proposed by BIM, and the dimensions of cost and time. When all this information can be interpreted together, we can support the director of contract effectively. The result is that we can transform islands of information into knowledge archipelagos”, explain Valter Sousa, IT Leader of Odebrecht Latin American.

- 5D Simulation now is in process to be implemented in all projects in Odebrecht Latin America.
- With the technology created inside the Autodesk Technology the users can be more productive (+20% or more in the construction and planning processes).
- Autodesk Certification is a key component of the process, with Autodesk certification the Manager can create a plan to develop the people in the projects.
- In the process to integrate the engineering partners all the organizations involved discover a new opportunities.
- All Odebrecht Organization knows the BIM concept and now they are working to implement as a standard.