

Baku-Tbilisi-Ceyhan Oil Pipeline Vital Link For East And West

by Atul Jain

The Baku-Tbilisi-Ceyhan (BTC) pipeline is the first attempt of its scale to extract and transport Azerbaijan oil reserves to the western world, covering three nations in its route.

The BTC pipeline in Turkey encompasses 1,076 km from the Georgia-Turkey border in the Posof District to the marine terminal being constructed at Ceyhan on the Mediterranean Sea. From the Georgian border, the pipeline crosses the provinces of Ardahan, Kars, Erzurum, Erzincan, Gumushane, Sivas, Kayseri, Kahramanmaraş, Osmaniye and Adana, terminating at Ceyhan.

The pipeline is designed to transport 50 MTPA (1 million bpd) of crude oil from Azerbaijan to Turkey. The Turkish section consists of 42-inch diameter, 924-km long and 34-inch diameter, 124-km long pipeline. The initial 22 km from the Georgian border to Pumping Terminal — 1 is 46 inches in diameter.

BOTAS Petroleum Pipeline Corp., the turnkey contractor awarded Lot-C, the pipeline and Block Valve Station construction work, the southernmost section of the project to Punj Lloyd-Limak JV (PLL JV) on Sept. 20, 2002. The scope of work included construction engineering and procurement for the pipeline and the block valve station including pre-commissioning. The pipeline will be operational later this year. Each Lot-A, B and C was treated as a separate construction project undertaken by the respective contractors.

Terrain

Lot-C encompasses the toughest geographical section of the entire project. The elevation varies up to 2,150 m from mean sea level. The pipeline passes through the Taurus Mountain Range and the high groundwater area of Kukurova plains. It also passes steep slopes, ecologically sensitive areas (ESA) and the Cokak Geographical Fault. Eighty percent of the pipeline section was in the slopes, ESA and high elevation. The dramatic terrain comprised rocky

steep slopes with an alignment of 30° to 39° and 70 km of mountain forests.

To work on these special areas of precarious slopes at dangerous heights and ecologically sensitive areas, the contractor followed specific procedures. Exclusive teams were formed to handle these specific areas, the members selected on the basis of performance and experience. Specific training was imparted to each member of these teams for working in the special areas.

To cater to the total length of the pipeline, the contractor established a main camp at Kosreli and four mobile camps at Andirin, Goksun, Yesilkent and Orenshire. Accommodation facilities of international standards were provided at all the camps with TV rooms, gymnasium, tennis courts, volleyball courts, ATMs, helipads, long distance call booths and other facilities.

Equipment

The contractor mobilized one of the largest fleets of equipment for this project including 115 excavators, 45 sidebooms, 24 dozers, 12 rock drill machines, 16 rock breakers, 16 screening plants,

65 dumper trucks and 94 flatbed trailers. More than 2,200 personnel from 12 nations were involved in Lot-C.

Construction Achievements

During the construction phase Punj Lloyd-Limak JV accomplished the following:

- Welded 201 joints of 42 inches diameter and coated 220 joints of 42 inches diameter in one day by a single automatic welding and coating crew, respectively.
- Lowered 5,006 m of 42-inch diameter pipeline in trench in one day by a single lowering crew.
- Lowered 10,575 km of 42-inch diameter pipeline in trench in one day.
- Reinstated 202 km right-of-way in one month.
- Longest river crossing, Ceyhan River of 587 m undertaken safely.
- Environmentally sensitive crossing of Zamanti River, crossed successfully.
- Achieved the longest cased crossing of 104-m, Adana-Osmaniye Motorway.



- First among all Lots in Turkish section to complete all construction activities including hydro-testing.

Health & Safety

Twenty-four-hour fully equipped medical facilities, manned by doctors, with ambulances were provided at each Camp. Focus on healthy food, regular mandatory health check-ups, strict guidelines while driving, training on safe usage of equipment and special terrain ensured that Lot-C had the best HSE record. Some additional accolades:

- Five star rating from British Safety Council after a stringent audit of the site.
- H&S award from BTC Co. in recognition of the commitment to health and safety in Lot C throughout the project period.
- No dangerous occurrence at site.
- No community unrest due to work.
- Total Advance Safety Audit (ASA): 10,782 Nos.
- Total Safety Observation (SOB): 151,420 Nos.
- Total Training hours: 133,688.

Environment

Lot-C is environmentally challenging and comprises 18 ecologically sensitive areas, and areas important for plants, with threatened floral species. Construction had to be done sensitively to preserve the area's ecological balance. Meticulous planning enabled completion of all construction work, including restoration, within the permitted timeframe. There were two active fault zones in this route. There were also three

major river crossings (Zamanti, Ceyhan and Mercin rivers), which are important due to a variety of aquatic life. Zamanti River is the second-most environmentally sensitive crossing in the entire Turkish section. Due to breeding of fish and migration of birds, there could be no work in this location except in March and August. Construction had to consider the steep, linear and cross slopes with erosion-prone areas to minimize its effect and reinstate the flora to its original glory.

Environmental protection was the primary task while working on this project. Some of the measures adopted were:

- Seeds of the threatened species were collected from the ROW and a greenhouse was established to germinate these for replanting after reinstatement.
- Waste management was diligently followed by auditing and approving licensed recycling agencies.
- A scientific approach was adopted to determine erosion potential along the ROW. Erosion-control measures like slope breakers, terraces and jute matting were used.
- An in-house laboratory was established to analyze the important soil and water parameters.
- Composting plants were established and maintained to generate more than three tons of organic compost used during reinstatement
- Banks of major and minor rivers were protected during crossings.

There were as many specialists as engineers for this project, including ecologists, botanists,

zoologists, ornithologists, archaeologists, soil experts, paleo-seismologists, landscape architects, geologists and a plant taxonomist.

Community Relations

A strong focus was spent improving the lives in communities along the ROW. More than 800 local meetings were held during the project to discuss important aspects of work with the ethnic population. Once villagers understood the importance of the pipeline, safety training sessions relevant to a construction site for the local population were conducted at village schools, municipalities and mosques. There were regular talks on health, sanitation and education. Health camps with doctors, nurses and medical supplies were regularly made available to villagers something that was especially appreciated in inaccessible, remote villages where transportation is a major constraint.

Traffic control marshals called "banksmen" were positioned at all major roads where the ROW crossed traffic. To minimize disturbance to the local community, the spread length was restricted in such a way that all activities, from front to back end, were completed within the shortest possible distance. All construction activities were carried out simultaneously and speedily, near inhabited areas along the ROW.

A community hall, water wells, canals and culverts were constructed for the villages along the ROW. Construction equipment was also used for community civil work in the villages. A practice is followed of hiring locals as laborers, every 50 km, which translates to two-three months in

terms of time, thereby providing employment, training and future job prospects to a large section of the population along the ROW.

Archaeology

Another interesting aspect of the project was the archaeological sites that were uncovered while laying the pipeline. As EPC contractors, PLL JV was responsible for archaeological monitoring during the pre-construction survey work and developed its own cultural heritage management procedures. This was done with the help of BTC, British Institute of Archaeology at Ankara, a charitable NGO from UK, and Oxford Archaeology.

Turkey's long and varied history, rich with Roman and Ottoman influence, was discovered while working on laying the pipeline. There were 22 important archaeological sites in the vicinity of the pipeline route. In addition, four chance finds were uncovered during the construction, one of which is a Roman bath that probably dates back to the third century.

Lightweight equipment was used to lay the pipeline at one archeologically sensitive spot along the ROW, as a detour was not possible because of thick forest and mountains on either side. However, to protect three other archaeological sites, one of which was an 800-year-old structure called the Meryemcil Castle, the pipeline route was significantly diverted. Several small graveyards dating back to the Roman era were also discovered along the route. *P&GJ*