

# Crossing the Ghats: the Dabhol to Bangalore Pipeline

Through the mountainous, swampy, and forested slopes of the Western Ghats winds the Dabhol to Bangalore gas pipeline – an important project set to deliver much-needed gas and power to the states of Maharashtra and Karnataka in India.

The approximately 1,000 km pipeline, which is being implemented by the Gas Authority of India Limited will be part of an integrated national gas grid for the country, and will enable development of city gas distribution projects by catering to a large number of cities and towns.

The pipeline will transport up to 16 MMcm/d of regasified LNG from Dabhol in a southerly direction through the states of Maharashtra, Karnataka, and Goa, before terminating in Bangalore.

The trunkline consists of 250 km of 36 inch diameter pipe, and 497 km of 30 inch diameter pipe, with two spur lines – a 71 km, 18 inch line to Bangalore, and a 175 km, 24 inch diameter line to Goa.

Construction of the pipeline has been divided into ten spreads. In October 2010, Punj Lloyd was contracted to execute seven spreads, comprising 824 km of the pipeline's total length – Spreads A and B in Maharashtra, and Spreads C, E, F, G, and H in Karnataka.

At the time of writing, Punj Lloyd was in the process of constructing 824 km of the pipeline through both Maharashtra and Karnataka: 746 km of the trunkline from Dabhol to Bangalore, and 78 km of the Goa spur line. The remainder of the pipeline is being constructed by KazStroyService and the Advance Stimul Consortium.

In addition to the pipeline construction, Punj Lloyd's scope of work includes construction/installation of:

- 24 valve stations
- Seven intermediate pigging stations
- One dispatch terminal
- One receiving terminal
- SCADA
- Telecommunications
- Leak detection
- A fire and gas system
- A gas management system
- A solar power system.

Punj Lloyd Dabhol to Bangalore Pipeline Project Manager M. P. Ranawat says that pipelines do not often use solar power, and that this system – which provides back-up



A crossing being completed with horizontal directional drilling.



Preparing to lower-in the pipeline.

## PUNJ LLOYD'S PIPELINE PLAN OF ATTACK

Punj Lloyd formulated a unique execution plan to overcome the challenges of the Dabhol to Bangalore Pipeline including:

- Configuration of work in seven independent spreads
- Establishment of a total of seven camps, one camp in each spread
- Establishment of two co-ordination offices – one in the state of Maharashtra and one in the state of Karnataka
- Close monitoring of construction through video conferencing
- Increased number of mini crew in tough and undulating terrain, to ensure that the required productivity is achieved
- Pipe shifting by bulldozers and excavators with sledges on steep slopes, with the assistance of pontoons and boats across rivers
- Construction and maintenance of approach roads, bridges, culverts and logging roads
- Huge mobilisation of resources to meet the target completion date
- Mobilisation of 14 semi-automatic and eight automatic mainline welding crews, along with 45 tie-in crews for completion of the project.

power to the control buildings – is unique to the Dabhol to Bangalore Pipeline. The design, engineering, installation, and commissioning of the solar power system was done in-house through the company’s renewable arm, Punj Lloyd Delta Renewables.

“The stand-alone solar power system will meet the power demand of instrumentation/telecom equipment and an electrical lighting load of 1,000 watt-peak, while charging through the grid,” says Punj Lloyd Delta Renewables Chief Executive Officer Dr Tariq Alam.

### Toughing it out in the mountains of Maharashtra

The pipeline route presented both engineering and construction challenges, with 200 km of the pipeline passing through the difficult terrain of the Western Ghats in Maharashtra.

The Western Ghats is a mountain range that runs along the western coast of India and covers 160,000 sq km. Mr Ranawat says that the Western Ghats forms a complex network of river systems that drain almost 40 per cent of India, and is a sensitive biodiversity area with hundreds

of threatened species of plants, mammals, birds, and amphibians.

“This area consists of mountainous, rocky, and swampy stretches, as well as dense forest, with slopes ranging from 35–60 degrees. The hilly portion – criss-crossed by several small roads, tracks, and streams at short intervals – increased the number of crossings and tie-in joints. The undulating terrain also called for a large number of pipe bends – almost 60 per cent of the total number of pipes in Spreads A and B.”

Mr Ranawat says the toughest section of the pipeline route, and the biggest challenge to its construction, falls in Spread B, which includes the Amba Ghat, located along the Western Ghat crestline in Shahuwadi Taluk at an elevation of about 709 m above mean sea level.

“The region is covered by tall evergreen forest and receives annual rainfall of over 5 m over a four-month period,” says Mr Ranawat.

In addition to the Amba Ghat crossing, Mr Ranawat says that the Maharashtra section of the pipeline route traverses ten hilly regions in the Ratnagiri and Kolhapur districts. The pipeline also passes through the Deccan Plateau of the Western Ghat hills,

cultivated fields, and hard, rocky terrain in the Karnataka section.


“As most of the pipeline route in Maharashtra passes through difficult terrain, where approach roads were non-existent, Punj Lloyd had to construct and maintain the approach roads,” says Mr Ranawat.

“Special sledges and heavy towing equipment – including excavators, sidebooms, high-capacity bulldozers, and tractors – were used for transportation, hauling, and stringing pipes and bends in the Ghat areas.”

### Crossing with trenchless

The pipeline route included 27 river crossings, of which eight were horizontal directionally drilled (HDD). The longest HDD bore is 1,600 m at Ghatprabha River crossing.

“Four HDD crews, 21 auger boring crews, and ten river crossing crews have been mobilised for completion of the crossings alone,” says Mr Ranawat. “The route included 57 railway and national highway crossings, 237 major road crossings, and 276 other water body crossings.”

The Dabhol to Bangalore Pipeline is scheduled for completion in June 2012. 



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