The APPLICATION of RAMMING TECHNIQUE in Pipeline Construction

Dr. Hans-Joachim Bayer, TRACTO-TECHNIK GmbH & Co KG, Reiherstr. 2, D-57368 Lennestadt, Germany, and Roger Atherton, TT-UK Ltd., Windsor Road, Bedford MK 42 9SU, United Kingdom

In several examples, ram application in general and especially in pipeline construction, is explained. Rams from the type Grundoram exists in different sizes and with different impact energy. Very common applications of Grundoram machines are dam site crossings of railways, highways, roads and streets, profiles for tunnels and outlets. Horizontal and vertical ramming job sites are demonstrated. Two main examples from job sites of 2008 show pipe ramming below streets for Saudi Aramco pipeline projects and an the removement of a stuck hole opener in a 3 km horizontal drilling project between Abu Ali and Berri Causeway in Saudi Arabia.

Pipe exchange with Grundoram Taurus under main highway in Saudi Arabia

In late 2007 Ian Logan of Directional Drilling working in the ‘Middle East’ contacted TT UK to seek advice and recommendation on Pipe Ramming. With project details and an overview of the proposed 30” pipe installation understood, TT-UK soon realised, with their years of experience and knowledge of the region, that this was a task for their ‘powerful’ Taurus (450mm) Grundoram machine.

After further consultation, discussions and a subsequent order, the Grundoram equipment was quickly prepared and shipped to Damman followed by a TT-UK engineer to assist in the commissioning of the Taurus on site.

The total length of 30” (special coated) steel oil pipe line to be installed under the highway was 110m,
ramming through sand. The sacrificial (dummy) 30” steel casing pipe was to be rammed out, (previously installed by Augur Bore method), by welding new 12m individual steel pipe lengths attached to the ‘existing’ sacrificial pipe through a specially fabricated reinforced steel pipe-pup to allow attachment of the Grundoram ‘Taurus’ to prevent the new steel oil pipe line being damaged during the ramming process.

After each 12m (average) pipe length was installed the next length was lowered for welding followed by xray and epoxy coating.

Average pipe-ramming speeds were in excess of 24m per/hour excluding stoppages between welding and preparation. The client went on to say that he was delighted with the powerful performance of the Taurus and it would be used on many under road crossings to be carried out in the Middle East in the future.

Grundoram Taurus comes to the rescue on the worlds longest undersea HDD recovery operation on the Berri Causeway project in Saudi Arabia

In 2007/8 a pioneering HDD project was started using Trenchless Technology on the Berri Causeway and Abu Ali Island on the Persian Gulf coast of Saudi Arabia. Two parallel 3,050 metre long steel pipelines were to be installed under the bay. The smaller one to be used as an oil trunk line (24”) and the larger one with a total steel pipe weight of more than 1,500 tonnes will serve as a water injection line (30”). Previously published press releases claimed these as the ‘world’s longest undersea HDD crossings ever undertaken.
In November 2008 TT-UK were contacted by the Middle East specialist HDD Contractor Digital Connection Co Ltd of Al-Khobar, Kingdom of Saudi Arabia (KSA). They sought technical advice and assistance in the recovery of a 42” hole-opener that had become stuck along with the 3 km drill string beneath the seabed during a pre-ream pass on the second of two under sea pipeline crossings.

The ‘Berri Causeway’ pipeline project in the Middle East (with high profile exposure to the Trenchless technology industry) was always seen as a big challenge, for example the length of the crossings but also the dimensions of the pipeline which would weigh more than 1,525 tonnes.

Whilst the first 24” oil pipeline had previously been successfully installed, unforeseen delays between the drilling process over a 12 week (non working) period had caused the drill string and the 42” hole-opener to become stuck on the second (30”) pipeline crossing/installation.
TT-UK renowned for their expertise in the supply and service of their high quality manufactured Trenchless Technology Equipment had little time to provide a solution to releasing the 3km stuck drill string and 42" hole-opener.

However, emergency discussions between TT-UK, the main contractor and the local drilling contractor quickly led TT-UK to respond to the challenge and recommend utilising their 'powerful' Grundoram Taurus impacting hammer combined with steel pipe adaptation's which were designed and formulated to transfer dynamic impact performance energies through special steel fabrications adapted to the drill string via the Grundoram dynamic impacting hammer.
Sharing the project information with other TT Group offices in the USA and Germany, TT-UK quickly drew up a strategic plan together with a technical proposal on how they believed the drill string could be freed up using ‘Dynamic Impact Vibration Energy’.

Whilst similar successful undertakings have previously been carried out worldwide, few have been attempted for releasing stuck drill rods over this exceptionally long distance with each drill rod weighing 480kgs. Dynamic impact vibration energies have normally been placed on the end of product pipes for assistance in completing HDD (Ram Assist), or for product pipe retrieval where the product pipe has become stuck using HDD techniques, few had previously tried with stuck drill rods due to the enormous ‘impact power’ which has to be contained onto a relatively small size drill rod (6/58") from a large impacting hammer in a usable and controllable process.
The Project owner is Saudi Aramco. The main pipeline contractor is Al Robaya and the HDD subcontractors are DCL and TATCO.

The combined efforts from all companies and the personal attendance on site of Roger Atherton, Business Development Manager for TT-UK and Peter Grass, Product Designer for Tracto-Technik, proved invaluable to the success and final retrieval of this problematic drill bore taking TT’s Grundoram and ‘Pipe Ramming’ technologies to a ‘new’ level of HDD ram assist, pipe/drill stem rescue method. Following bore-hole salvage this 30” x 3km water injection pipe-line was finally and successfully installed on January 13th 2009!

This rescue saved significant financial implications such as the total cost of a lost drilled bore. Any contractual penalties. Any ongoing cost delays in commissioning the final pipelines. All associated costs involved in planning a new bore and the actual costs of duplicating all the undertakings of a new bore/installation, etc…

42” hole-opener successfully retrieved in 10 days!
For further information please contact:

**Tracto-Technik GmbH & Co KG**

Postfach 4020  
D-57356 Lennestadt  
Germany  
Tel: +49 2723 808-0  
Fax: +49 2723 808-180  
Email: hj-bayer@tracto-technik.de  
Website: [www.tracto-technik.de](http://www.tracto-technik.de)

For more information contact:

**TT UK Ltd.**

10 Windsor Road  
UK-Bedford MK 42 9SU  
Tel.: +44 1234.342.566  
Fax: +44 1234.352.184  
Internet: [www.tt-uk.com](http://www.tt-uk.com)  
E-Mail: info@tt-uk.com