

Pipeline Rehabilitation with DENSOLEN-Tape System

For choice of a suitable coating material for pipeline rehabilitation, both technical performance and conditions of application have to be considered. The subsequent report of coating refurbishment on bellhole segments of a 40" oil-pipeline shows, that state-of-the-art DENSOLEN plastic tape systems offer a high performing and easy to apply method for coating refurbishment.

Coating system

The coating specification required the use of a polyethylene and butyl rubber based stress-class C-50 two-tape system according DIN 30672 and DIN EN 12068. Over and above that, increased peel strength and indentation resistance properties had to be provided by the offered tape system, taking into consideration the big pipe diameter and partly severe soil stresses. For critical areas, the specification demanded the use of rockshields for additional mechanical protection.

Final decision was made for DENSOLEN-System AS39P-R25HT (structure see **Table 1**). Proven by independent comparative tests, AS39P-R25HT was the only offered tape system fulfilling all specified requirements and particularly the increased peel strength requirements. The innerwrap three-ply tape AS39P self-amalgamates in the overlap area, forming a sleeve type and impermeable coating. By this the steel surface is reliably protected against corrosion. Due to its HDPE carrier film, the outerwrap DENSOLEN-Tape R25HT offers a big degree of safety against mechanical damages. DENSOLEN-Rockshield is a highly resistant polypropylene fibre fleece material, which by its low insulation resistance does not interfere with cathodic protection systems. DRM-PP 1000 Plus is used for the ad-

Fig. 1: Primer application by roller



Fig. 2: Tape wrapping with DENSOMAT KGR Junior with extension arms



ditional mechanical protection in rocky soil and in areas, where the pipe bed is in danger to be washed out. DENSOLEN-Rockshield DRM-PP 500 Plus is used for decoupling of the pipeline from surrounding clay soil.

Application

After complete removal of the old two-ply tape coating and after abrasive blast cleaning (resulting in surface cleanliness \geq Sa2) the pipe surface was inspected and pipe reinforcing methods were employed in areas with reduced pipe wall thickness.

Due to the short segment type of rehabilitation and due to the small pipe clearance, the DENSOLEN-Tape system was applied manually. Application of DENSOLEN-Primer MT25 was done by roller (**Figure 1**). Primer MT25 contains a special, less volatile solvent, which allows suitable drying times even under elevated ambient and pipe surface temperatures.

To ensure a constant tape tension and tape overlap, the subsequent tape wrapping was carried out with DENSOMAT KGR Junior hand wrapping machines. For the same reason, tape width was limited to 100 mm. By using tape rolls of up to 70 m (AS39P) and 100 m (R25HT) length, these wrapping machines require a minimum pipe clearance of

System	Total thickness Number of tape layers	2,9 mm 4
Primer		DENSOLEN-Primer
Innerwrap	Tape Tape thickness Thickness carrier film Thickness butyl rubber adhesive Number of tape layers	DENSOLEN-Tape AS39P 0,8 mm 0,28 mm 0,08 mm (outer) + 0,44 mm (inner) 2
Outerwrap	Tape Tape thickness Thickness carrier film Thickness butyl rubber adhesive Number of tape layers	DENSOLEN-Tape R25HT 0,65 mm 0,33 mm 0,32 mm 2
Additional mechanical protection (optional)		DENSOLEN-Rockshield DRM-PP 1000 Plus or DRM-PP 500 Plus

Table 1: Structure of DENSOLEN-System AS39P-R25HT



Fig. 3: cage-DENSOMAT KGR Junior with low weight aluminium frame

only 45 cm but also provide maximum roll change intervals.

For use on the big 40" pipe diameter, the DENSOMAT KGR Junior was initially equipped with low weight extension arms (**Figure 2**). In a later stage a modified "cage"-DENSOMAT KGR Junior (**Figure 3**) was employed, which allows a proper handling of the wrapping machine even under restricted trench width conditions.

DENSOLEN-Rockshield was applied after visual and high voltage testing of finished tape wrapping. Since it avoids employment of tensioning strips, this procedure is partic-

ularly simple. Segments of rockshield are tightly wrapped around the pipe and fused in the app. 10 cm wide overlap area by propane torch.

As a typical feature of pipeline rehabilitation with plastic tape systems, trench backfilling can start immediately after tape wrapping and application of rockshield has been finished. This allows a fast and continuous progress of work particularly in bellhole rehabilitation.

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