

## **DENSOLID HDD - A New Field Joint Coating System for Steel Pipes Laid by Horizontal Directional Drilling**

Corrosion protective coatings of steel pipes laid by horizontal directional drilling are particularly stressed. Thermosetting compounds based on polyurethane or epoxides have proven their performance for the protection of welded joints of such pipes. The application of thermosetting joint coatings can currently be carried out by lamination procedures, resulting in glass reinforced plastics coatings, or by spatula in case of polyurethane based materials. Both application procedures require a certain period of time and come along with drawbacks, which are typical for the application of reactive resins. This report describes a new procedure for the coating of welded joint areas of steel pipes with polyurethane reactive resins. By use of a special casing system the complications of applying the coating material by spatula are avoided. Consequently one can take complete advantage of using polyurethane coatings for trenchless laid pipes without suffering from typical handling drawbacks.

Advantages of the new coating system:

- Any coating thickness can be applied in one step, which makes the procedure particularly fast and economic, compared to application by spatula or by lamination procedures.
- The coating material is applied from a two chamber cartridge, which avoids mixing errors and air entrapments resulting from manual mixing.
- The uncured coating is protected by the reusable casing system, which reduces the efforts and costs for a protective covering of the working area.
- The new procedure and material allows to very cost effectively produce field joint coatings which perform equivalent to three layer HDPE or PP factory coatings. By this the overall risk of coating damages is reduced and the use of pipes without additional mechanical protection (concrete or GrP) becomes a technically acceptable and cost effective alternative.
- The coating material meets EN 10290 (class B, type 3) and by this is designed to withstand high mechanical and corrosive stresses.
- The new application procedure results in coatings with even coating thickness and which are in alignment with the existing factory coating. The last feature further reduces the risk of coating damages.

Deviating from known casing systems for pipe coating, the present procedure and invention makes use of a casing system, which is closed and filled simultaneously. Only by this the casing method becomes applicable to desired coating thickness' of approx. 5 mm. If the casing was mounted prior to filling, an annular gap of only 5 mm would be too narrow and air

enclosures would be the result of filling such a pre-mounted casing. The simultaneous filling and closing procedure is made possible by use of a set of two tensioning strips and three bracing bars, which allow to close the casing from polypropylene sheet with a constant distance between casing sheet and pipe surface and which fix the casing in the already closed areas.

The principle of the new casing system is shown in the attached drawings and figures. Filling starts in 6 o'clock position and then proceeds at either side of the pipe. In 12 o'clock position, the casing ends overlap, which completely protects the coating material from ambient influences like rainfall, which would be detrimental to the coating unless tack free cured.

The overall working time (two workers) for coating of a 6" to 20" field joint, including blast cleaning and bevelling of transitions to the factory coating, is approx. 0,5 hours, which is significantly less than the working time required for application of polyurethane or epoxides by spatula or by lamination procedures.

The coating material DENSOLID HDD and the casing method have already been successfully used practice, as can be seen from the track record table below, which also contains projects scheduled for the near future.

Track record:

| Date   | Location          | Project                     | Drilling length | Field joints, nos. | Dimension | Line pipe coating | Owner                | Contractor                         |
|--|-------------------|-----------------------------|-----------------|--------------------|-----------|-------------------|----------------------|------------------------------------|
| <b>DENSOLID HDD, applied by spatula</b>              |                   |                             |                 |                    |           |                   |                      |                                    |
| Aug 04   | Münster / D       | crossing of waterway DoEmKa | 420 m           | 34                 | DN 600    | PP (6,5 mm)       | RWE WWE              | RMT - piping<br>LMR - drilling     |
| Jan 05   | Irun / E          | river crossing              | 600 m           | 57                 | DN 600    | PP (10 mm)        | Gas Euskadi / Enagas | ELECNOR - piping<br>LMR - drilling |
| <b>DENSOLID HDD, applied using new casing system</b> |                   |                             |                 |                    |           |                   |                      |                                    |
| Apr 05   | Dannenberg / D    | crossing of river Jeetzel   | 120 m           | 10                 | DN 150    | PE (2,5 mm)       | Avacon               | RTH - piping & drilling            |
| Jun 05   | Deutsch Evern / D | river crossing              | 120 m           | 10                 | DN 150    | PE (2,5 mm)       | Avacon               | RTH - piping & drilling            |
| July 05  | Visbeck / D       |                             | 320 m + 120 m   | 40                 | DN 80     | PP (5,0 mm)       | EMPG                 |                                    |
| July 05  | Seesen / D        |                             | 120 m           | 10                 | DN 400    | PE                | Avacon               |                                    |

Fig. 1: Assembly of casing system prior to filling. Version without spacer (a) and with spacer (b). 1 = tensioning strips, 2 = casing bars, 3 = casing sheet, 4 = spacer.

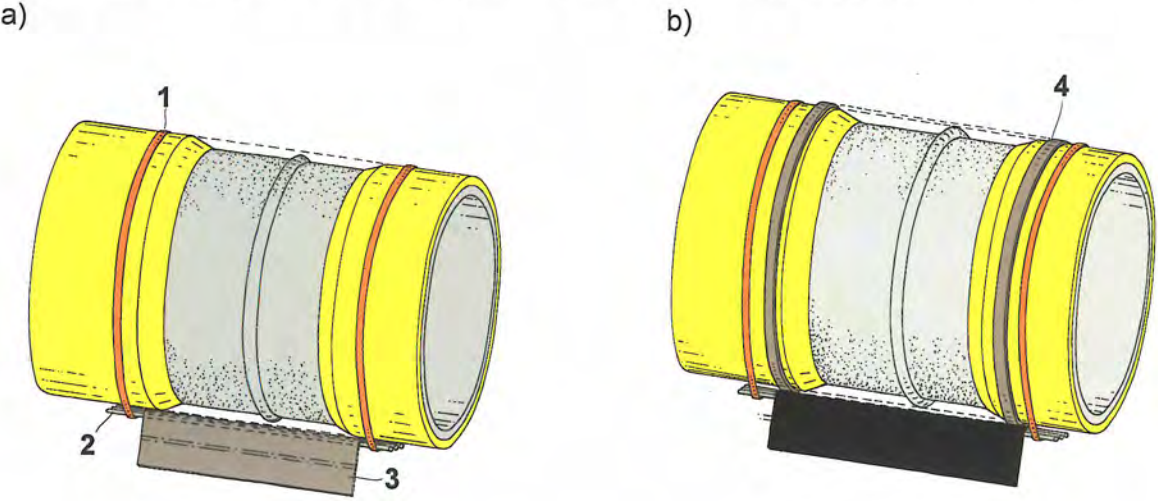


Fig. 2: Principle of casing following the filling process (cross section through pipe): a) Mounting of casing system before filling, b) filling from one side and closure of casing, c) casing closed on one side, d) filling from second side, e) overlap of casing ends, f) removal of casing

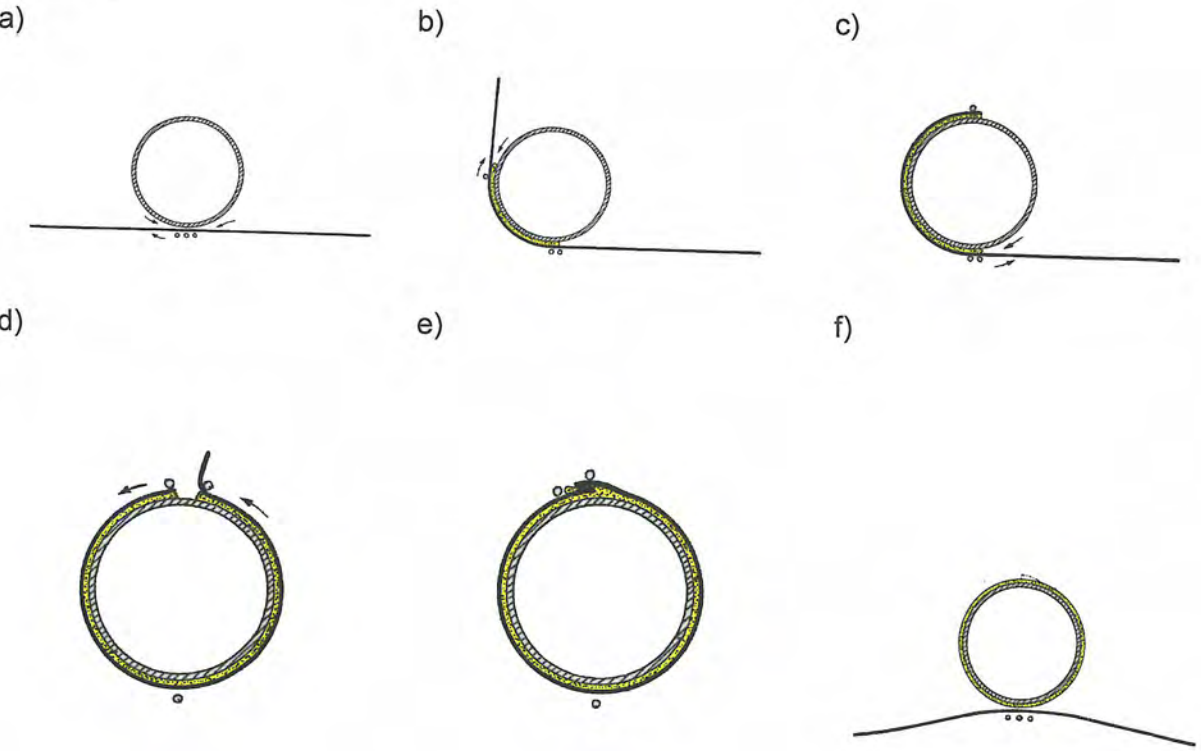


Fig. 3: Application of DENSOLID HDD (casing system). a) closing of casing by means of a bracing bar, b) filling of annular gap from two chamber cartridge, c) overlap of casing ends, d) removal of spacer after removal of casing, e) finished and bevelled joint coating, f) joint coating passing pipe supports.

a)



b)



c)



d)



e)



f)

