2.2.1 THE SLEEVE

The sleeve is a flexible pipe that, impregnated with resin, gets in the damaged pipeline so that this one sticks fast perfectly to the internal surface of the conduit. Besides, it(he, she) guarantees a good structure of support for the resin and allows the accomplishment of a new pipe with a few characteristics of uniform resistance. The absence of seams improves these results, since; it (he, she) offers a major resistance to the pressure caused in the transport of the products.

The sleeve is constituted by a sheet composed by a cap of felt covered externally by a cap of impermeable material, which can be PU, PVC, PE, etc. There exist sleeves of different diameters and made with materials of several thicknesses, between(among) 2 and 9 mm, for power like that to satisfy the requirements needed in every particular case. The more it (he, she) increases the thickness of the finished product, the resistance than the load of compression will be bigger. Whereas on having increased the thickness of the impermeable cap, it (he, she) increases also the mechanical resistance in phase of production (elaboration) and the resistance to the depressions in phase of impregnation. Nevertheless, in this case there takes place (is produced) a hardening of the sleeve that generates a resistance to the advance during the reversion.

The sleeves that are in use in presence of residual waters are of felt not fabric reinforced with polyester in the interior, and cap of polyurethane (PU) externally. As for the use for industrial or drinkable waters, where other levels of protection are needed, and in that the material must be completely a monopoly, it is the resin or the own(proper) sleeve, and to avoid this way the possible liberation of substances, it is necessary to to use sleeves of felt not fabric or fabric with stratum of chloride of polyvinyl (PVC) or polyethylene (PE).

Fig. 2.3: Composition of the sleeve.

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The complete thickness Sleeve + Resin and the thickness of the impregnated part they must be calculated based on the following parameters:

· Type of transported fluid

· temperature of the transported fluid

· diameter of the conduit

- *sección del conducto (circular, ovoide, etc.)*

· physical residual characteristics of the existing conduit (residual resistance to the static charges)

· depth of burial of the conduit

· environmental particular conditions tied to the process of application

Some companies like the S3 Soncini S.p. A. use a program of calculation and elements finished to verify the behavior in work of the coating.

This program allows to verify the thickness of resin of polyester reinforced with felt not fabric, also this one reinforced, considering the regulation ANSI, AWWA, C-950/81 for the static calculation of the flexible buried pipelines. The hypotheses of calculation considered to define the mathematical model, are the result of the obtaining of information provided by studies realized so much of type Geotécnic as (like) mechanically, since(as, like) for example, the typology and the weight of the area, and the surface overcharge. To be able to provide trustworthy information, it thinks that the conduit is completely cracked and that, therefore, the

pressure of the area is transmitted completely to the coating without the external conduit collaborates in some way.

Fig. 2.4: model and finished elements.

The model, therefore, develops outlining the area by means of two-dimensional elements (Plane) and the section of the pipe with elements unidimensionales (Beam), obtaining as final result a precise analysis of the tensions of every element of the subdivision. Of this form, it is possible to determine the thicknesses of the coating that must be used in every case, and also guarantee the structural suitability of l