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A.2.1. Pose mécanisée de câbles HT

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Résumé

Afin de réduire les coûts et les délais de réalisation de liaisons souterraines Haute tension, EDF a entrepris dès 1991 des études de faisabilité de pose mécanisée des câbles souterrains H.T. en s'appuyant sur son expérience acquise en moyenne tension.
Après deux expérimentations mises en oeuvre en 1992 et l'élaboration d'un guide de recommandations, plusieurs chantiers opérationnels ont été réalisés à partir de 1993.
La pose mécanisée consiste à ouvrir la fouille et poser simultanément les trois phases, un câble de terre et un câble de télécommunication éventuels ainsi que leur enrobage.
Les gains en termes économiques et de délais de réalisation laissent présager un développement de cette technique bien qu'elle ne puisse s'appliquer que dans des zones rurales au sous-sol peu encombré.

1) Context of the development of the mechanized laying of HV cables

The study of the mechanized laying of cables for underground HV lines (63 and 90 kV) falls within a large research and development project entitled "Insulated Cable HV Lines at Optimum Cost" which began during the first term of 1990.

At that date, it was envisaged that the implementation of underground HV lines would become more intense, on the one hand, due to the increase in the number of source substations, and on the other hand, due to the pressure of public opinion becoming more and more attentive to respecting the environment.

Since 1990, these forecasts have been confirmed and the protocol of August 1992 for the insertion of power networks in the environment signed between the french state and EDF has reinforced this position. EDF has committed itself to use the underground technique in certain areas (classified sites, registered sites, sites near historic monuments, and national and regional parks), in dense urban fringes and close to substations.

In order to reduce the investment costs, which are approximately three times higher than for an overhead line with an equivalent transmission capacity, action can be taken regarding equipment (cables and fittings) and the installation itself.

The first action was the development of a new technical stage for HV cables and fittings.

The second action consisted in reflexion on the mechanized laying of cables which appeared as a technical alternative, more economically viable than the traditional laying methods in rural areas. In this type of area, the cost of laying cables and civil engineering represents more than half the total cost of the line.

A.2.1. Mechanized laying of HV cables

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Abstract

In order to reduce the cost and time required for underground HV lines, in 1991 EDF carried out feasibility studies for the mechanized laying of underground HV cables based on its experience for medium voltage.
After two experiments in 1992 and the compilation of a recommendations guidebook, several operations were carried out in 1993.
The mechanized laying consists of opening the excavation and simultaneously laying the three phases, and possibly an earthing cable and a telecommunications cable as well as their covering.
Savings in time and cost allow us to imagine the development of this technique although it can only be applied in rural areas with uncluttered subsoil.

2) Development in the methods of laying cables

In France, the traditional method of laying underground HV cables is carried out in troughs (figure 1). This type of method, in compliance with Technical Regulation of 2 April 1991 was retained for the following reasons:
- Cable protected from external damage,
- Control of the direct heat environment of the cable,
- Protection of the environment in the case of a zero phase-sequence short-circuit due to a dielectric fault.

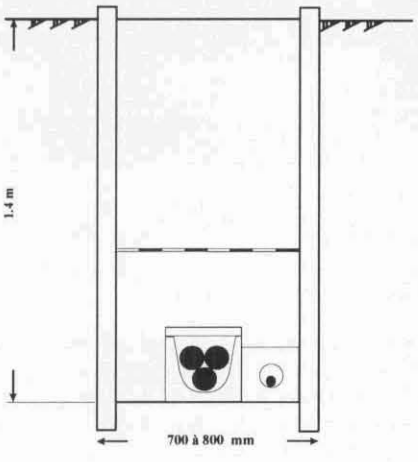

Figure 1

The cost of this installation technique is considerable because it requires wide trenches (0.70 to 0.80 m) with a depth of 1.40 m hence timbering is compulsory.

The first stage in the development of the laying methods consisted of replacing troughs by using a weak mortar mix