

Projects with Remote Installation (“Tube Post”) of Energy Cables in Ducts

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ABSTRACT

A method was developed to install energy cables into ducts and then further transport them through coupled ducts, like “tube post”, to any desired location, without the need to go there with material, equipment and labour. There is almost no limit to the FreeFloating distance over which cables can be transported. Many advantageous applications exist, like installing cables into crowded city centres from suburbs and offshore cables from shore. A land project with FreeFloating in Copenhagen is described, and a project in Thyborøn (Denmark), where offshore wind turbines were connected by array cables installed from shore, even at Beaufort wind force 8.

KEYWORDS

Energy cable; HV cable; Installation; Duct; Pipe; FreeFloating; Water; Pressure; Pig; City centres; Offshore; Wind Energy; Remote.

INTRODUCTION

Energy cables can be installed aerial or underground. In the latter case the cables can be direct buried or installed in ducts. Special methods have been developed to install cables into ducts using water under pressure [1,2,3,4]. A typical advantage is that operation is economical, direct installation with all material, equipment and labour at one (entry) side of the duct. Moreover, long lengths can be installed and the methods are friendly to the cable. Maybe the most appealing variant is FreeFloating where the cable, once installed in the duct, is flown further by the sole action of water, like “Tube Post”, from any convenient launch location to any desired destination location, almost without any limit to the distance over which the cable can be transported, the limits discussed in this paper. This technique already proved to work in an installation trial at a test site in Saint-Étienne-du-Grès (France) [3]. In this paper two projects are described with FreeFloating, a land project in Ballerup, a suburb of Copenhagen (Denmark), and the Nissum Bredning offshore wind farm project in Thyborøn (Denmark).

BENEFITS CABLE IN DUCT

Several advantages can be recognized for cable in duct solutions. In general cables can be removed or replaced without digging up. Protection in the pipe is even better than for direct buried cables [4], because of the free space in the duct, a well-known fact in Telecommunications. There are specific benefits for both land and offshore applications. On land ducts can be laid in short sections and then simply be coupled together. No need to keep trenches open for long lengths and long time, reducing neighbourhood disturbances. For offshore applications no cable armouring is needed, which allows to use standard “land” cables and save a lot on costs. Also AC losses are minimized. Additionally, the risk of cable damage is smaller because they are installed after the pipes (ducts) have

safely been laid into the seabed. The position of the pipe (i.e. also with respect to the seabed) can accurately be monitored using intelligent pigging, which has also been done in the Nissum Bredning project.

And last but not least all cables can be installed from a convenient launch location when using the FreeFloating technique, enabling to reach crowded city centres, tunnels, and national parks, without the need to go there with equipment, and even installing offshore cables from shore, also array cables between the offshore wind turbines. The latter enlarges considerably the offshore working window, allowing to keep on installing at bad weather conditions.

INSTALLATION CABLE IN DUCT (PIPE)

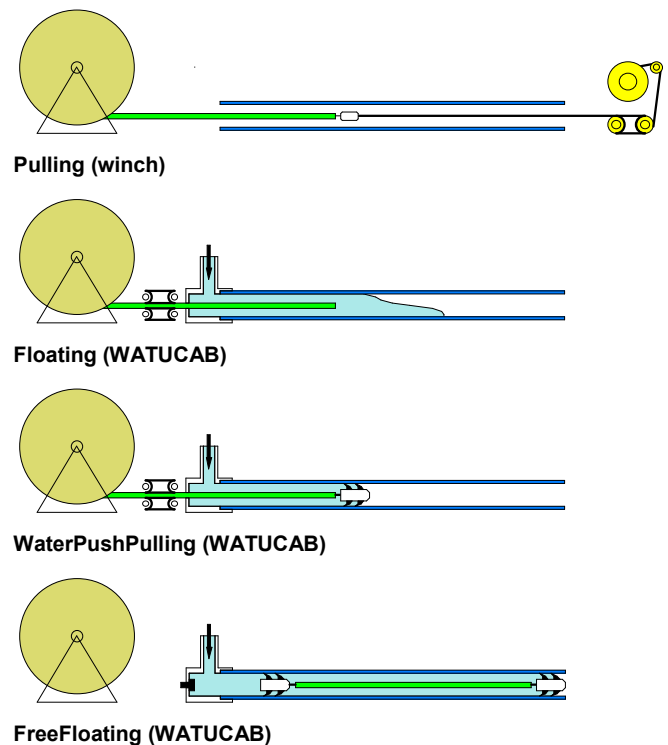


Fig. 1: Cable-In-Pipe installation techniques

Pulling (winch)

The traditional way to install cables into ducts is pulling them with a winch, see Fig. 1. For this first a pulling rope has to be installed. Also installation equipment and labour are required at both ends of the duct. Furthermore the capstan effect (friction of the cable under tensile load in bends) limits the cable lengths which can be installed in one pull. Synchronization between winch and drum pay-off is often troublesome. Three “WATUCAB” techniques, using water under pressure, have been developed to install energy cables into ducts, see Fig. 1. The typical drawbacks for winch pulling are taken away, and also the forces on the cable (and wear) are reduced.