Study Committee B1

Insulated Cables

10878_2022

Increasing underground cable pulling lengths – a way to improve cost efficiency and reliability of projects

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A LONG-TERM WORK FOR RTE AND ITS CONTRACTORS

Laying configuration chosen by RTE

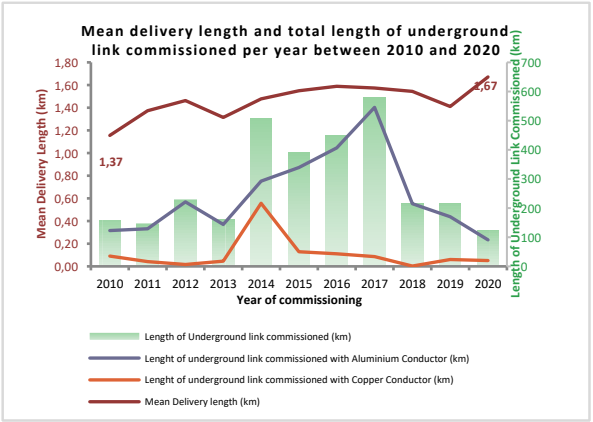
- **Installation of ducts (PVC or HDPE)** : to refill the trench as the installation progresses
- **Trefoil configuration** : beneficial with regard to EMF and induced currents on third-party structures

Increasing the length of cable sections (between joints)

- Reduce the **number of joints to increase reliability**
- **Optimise the number of interactions** between the cable manufacturer and the civil work company
- Decrease the **global cost** of a cable system

A tool to predict tensile forces

- Excel calculation tool developed in 2010 to calculate tensile and compression forces on cable
- Based on **CIGRE TB 194 "Laying & Installation Techniques"**
- Shared between **RTE, engineering consultancy companies and civil work companies** to maximise length of cable section depending on cable route



Engineering consultancy company

Cable manufacturer

Qualified companies

Civil work company

Achievements on cable sections

- **Increase the maximum tensile force** that can be applied to a cable
- The factory capability to **produce longer lengths of cable**
- **Increase the size of cable reels**
- **Increase the screen interruption AC withstand voltage level up to 25 kV**

Identify the projected cable route

- Demonstrate that each **cable section can be safely pulled**
- All solutions **to reduce the forces on the cable** have to be studied in order to **optimise the number of joint bays**

Cable pulling

- **Considered a "core business" :** companies are not allowed to subcontract this task
- The firm has to prove that the **pulling operation is safe for the cable** (calculations made twice : before and after civil work)

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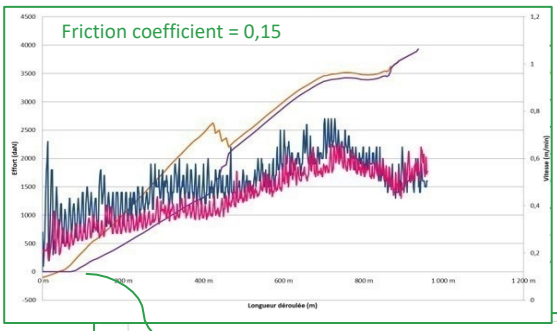
IMPROVE THE PULLING'S MODELLING

Development of a waterproof sensor

- Collects tensile forces **on the pulling head**
- By the end of 2022, **8 sensors** will be available to record data on many projects simultaneously

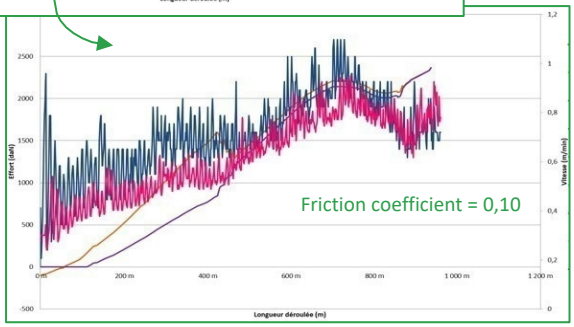


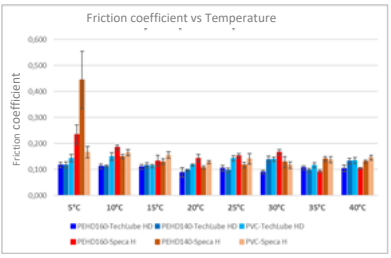
Theoretical and experimental curves comparison :

- **Theoretical forces are under-estimated** for the first part of the pulling (< 200 m)
- **Theoretical forces are over-estimated** for the second part (> 200 m)

→ Need to collect more results to achieve a robust mathematical model

Adjustment of the friction coefficient





Friction coefficient study

- Coefficient **independent** of T° !
- Reliability of the coefficient available in the tool

Partnership with the CEA Lab Grenoble

- **Goal :** monitor the pulling with a cable pulling forces sensor transmitting data in real time
- **Wireless system** : two antennas prototyped for **real time data transmission**
- **Results are encouraging** in urban areas

Real time monitoring is a "nice to have"

A trustworthy and reliable calculation tool is an essential