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Power drive rollers pulling improvements

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Abstract: Pulling with power drive rollers may induce compressive forces on cable. This article analyses their origin and presents a model to evaluate cable tension during pulling. Downstream decreasing friction forces or light short length hawser assistance may ascertain everywhere positive cable tension .

Keywords: Power drive roller, pulling, hawser.

Résumé: le tirage par galets motorisés peut induire des efforts en compression sur le câble. Cet article analyse quelques origines et présente un modèle de calcul de la traction dans le câble. Une répartition décroissante des forces de frottement ou l'assistance d'une câblette permet de s'assurer d'un câble constamment sous traction e cours de tirage.

Mots clés:galet motorisé, tirage, câblette.

1. Introduction

Bends and/or lenght may impose too important pulling tensions to cables when laid by nose pulling. Cables are virtually free of tension with bond pulling or when pulling with power drive rollers.

When power drive rollers are used attention must be paid to any compressive forces which might result in uncontrolled cable bends between rollers. Rollers with identical characteristics rotate to the same induced cable speed giving equal pulling tensions. Any pulling tension is calculated by assuming roller characteristics and friction forces through friction coefficient. Practically due to possible parameters dispersion minimum pulling tension may be imposed by means of a downstream winch and long length hawser.

We propose to provide this minimum pulling tension by means of a light short length hawser driven by some power drive rollers downstream the cable nose.

2. State of art

The main pulling methods are described in reference [1].

2.1 Nose pulling

A direct pull is applied onto the cable nose and the pulling tension is taken by the cable itself. The table 1 displays the usual acceptable limits for unipolar cables.

2.2 Bond pulling

Cable is tied to a wire bond at regular intervals and the pulling tension is taken by the wire bond itself. The cable pulling tension and sidewall pressure are reduced to a minimum.

2.3 Power drive rollers pulling

A direct pull is applied onto the cable by regularly disposed power drive rollers. The cable pulling tension is reduced and sidewall pressure is defined in table 1.

Table 1–Nose pulling parameters for unipolar cables

Parameters	Range of value
Pulling tension (N/mm²)	
Conductor Cu	50 to 70
Conductor Al	20 to 50
Sidewall pressure (N/m)	
No metal sheaths	3.000 to 10.000
Corrugated aluminium sheaths	10.000 to 20.000
Lead sheaths	4.000 to 10.000
Bending radius	
D outer diameter cable	14 to 30D

3. Calculation method for cable tension

3.1 General formulation

The cable route is divided in sections whose the general index is i. A power drive roller i is placed downstream each section i.

$$G_i = G_{i-1} + (\Delta F)_i - C_i T \qquad (1)$$

where

G_i , G_{i-1} is the cable tension downstream the roller i, i-1.

$(\Delta F)_i$ is the increment of the induced friction force in the section i.

T is the nominal pulling traction of each power drive roller.

C_i is a correcting factor for each roller i.