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Pulling and Towing of Pipelines and Bundles

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Abstract

Pulled or towed pipelines can often offer an economic alternative to other methods of pipe-lay and these techniques are sometimes overlooked as an advantageous installation option. Based on extensive experience from recent projects carried out around the world, this paper will discuss bottom-pulling and towing, off-bottom pulling and towing, controlled depth towing, surface towing and the evolution of these methods.

The paper will illustrate the benefits and applications of each of these methods. From a 2.6km pull-ashore in Tierra del Fuego to a 3.2km off-bottom pull for a flat pack bundle in Peru, a description of a pull ashore and a pull offshore will all be described. A bottom tow in Libya will be described and an outline of the methodology for controlled depth towing will be given using a North Sea bundle project to illustrate the technique. The new Flow-Lay® technology for surface towing of pipelines, flowlines and bundles will be illustrated using a recent 5.5km tow in Ecuador as an example.

Surface towing is less well known than the other methods listed and the paper will explore the potential for this new surface towing technique to significantly increase the potential for installing pipelines in this manner.

Introduction

There are several techniques for installing pipelines by pulling and towing and similarly there are a wide range of applications for these methods.

Pulling and towing can often offer an economic alternative to other methods of pipe-lay or pipeline installation and is sometimes overlooked as an advantageous installation option. This is particularly the case in today's market, when specialist pipe installation vessel availability is at a premium.

The main objective of this paper, is to summarise the various methods, from established to newer (potentially less well-known) techniques and to briefly describe the theory and advantages of each. Once the basic methods are presented and understood, the applications for each will be described with examples to illustrate the processes involved. Simple selection criteria will then be presented to assist the reader to assess the range of pulling or towing solutions available for a wide range of applications.

Bottom-pulling is the technique frequently associated with landfalls and crossings and usually involves winching of a pipeline from offshore to onshore, or onshore to offshore and thereby includes the beach crossing. It may involve a river or estuary crossing, in which case the pipeline may be assembled on one side and pulled to the other. Bottom-towing is a development of the bottom-pull method and generally involves bottom-towing the pipeline or bundle over much longer distances.

Off-bottom pulling, as the term implies, is a method which has evolved from bottom-pulling but uses a combination of buoyancy and ballast chains so that the pipeline is elevated above the seabed. Ballast chains are used to keep the pipeline or bundle near the seabed and provide sufficient overall submerged weight and stability for pulling. For pipelines with no concrete weight coating, this method has distinct advantages. As with bottom-pulling, the technique has also been developed as the off-bottom towing method. It is used where pipeline or bundle towing over longer distances is required.

The Controlled Depth Tow (CDT) method is essentially a further development of the off-bottom tow method. By engineering the buoyancy and designing the ballast and drag chains to provide carefully calculated and controlled hydrodynamic properties, pipelines or bundles are designed to 'fly' when towed above a critical tow speed, i.e. to lift off the seabed so as to be towed at a 'controlled' depth below the surface and hence over obstructions on the sea bed but below the strongest area of influence of waves.

To achieve the required towing characteristics for a CDT, requires rigorous engineering and weight control but the method is well proven particularly for the North Sea, where it has been used very successfully over the last 3 decades. A CDT utilizes a steel carrier within which a number of flowlines are normally supported. There can be many