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Past, Present, and Future Towing of Pipelines and Risers

R.J. Brown, R J Brown Deepwater, A subsidiary of TECHNIP USA

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Abstract

The history pulling and towing of pipelines on the seabed for the petroleum, water and waste disposal industries dates back to the late 40's, prior to the development of the marsh and first generation conventional pipelay barges. Since large tow horsepower vessels were not available, most of the first systems were pulled using anchored barges. In fact, one of the most notable was the 32km (19 mile) pull of a 32" oil export line from the Island of Khargu to Ganaveh on the coast of Iran in the Persian Gulf in 1960. As time went on, vessels servicing the offshore industry grew in bollard towing capacities to in excess of 250 tons. Utilizing this capacity permits the dynamic towing of pipelines over long distances. This paper briefly discusses the **Past**, before 1975 when pipelines and outfall lines were mostly pulled by anchored barges. The **Present** evolution in bottom towing installations is considered from the year 1975 to the year 2005. From 2005 onward **Future** this paper discusses the new concepts, for which the water depths are increasing dramatically, and are at present mainly in the development stage of the evolution.

Introduction

As pipelines are installed in deeper waters, their installation weights are increasing dramatically for resisting collapse. This requires very large offshore spreads to handle these installations. To help in this situation the engineer must now become completely cognizant of the entire process to design and install these deepwater systems. This applies to all pipeline installation methods as well as the towing technique. As in the design for any structure the engineer must intimately know and understand the environment in which the pipeline is to be installed and the foundation condition upon which it resides. This line must maintain its inplace and structural stability for its operating period with exposure to adverse on bottom conditions including high currents, seabed erosion and mass gravity flows. It is becoming obvious that the engineer must now think more creatively and utilize the environment in which the pipeline is being installed by taking advantage of the buoyancy systems that are available.

Since deepwater pipelines are designed to resist collapse and to have sufficient weight for their long-term operation, the net result is that they are very heavy and require additional buoyancy to be towed. This is often supplied as individual buoyancy units attached to the outside of the line or by placing the pipelines in a continuous casing. The continuous casing has many advantages permitting the designer to carry additional lines, insulate internal lines, carry umbilicals and purge the casing with nitrogen reducing the long-term corrosive environment. Many of the towed projects in the Gulf of Mexico have also included Pipeline End Manifold, (PLEM) on one end with an inline manifold (PLMM) and (SCR) integrated into the other end. Upon arrival at the final location the riser is lifted by the tow vessel and placed in clamps on the structure and either jumpers or the diverless deflect-to-connect tie-in system is utilized to connect the other end. The main advantage of the tow method is the ability pre-test the entire system prior to its departure from the beach. This paper discusses the latest installations, which can be employed for reducing the cost and risk for ultra deep-water installations. For the most interesting part, the writer suggests that the reader go directly to page 4 of this paper and start in the **Future** section.

Method of Pipe Make-up

Regardless of how pipelines are towed; on the surface, mid-depth or on the bottom, they are made-up on shore by one of two methods. These include perpendicular to the water Figure 1, or parallel with the water Figure 2. Each has its own advantages and disadvantages and prior to their use, a full evaluation of all the extenuating features and circumstances are required. The main differences are the perpendicular makeup is usually quite short and requires tie-ins during the launching period to assemble the line into its required length. Whereas the lines made up on the beach are assembled into one continuous length and can be tested prior the tows departure.



Fig. 1&2 Perpendicular and Parallel sites.