Weatherford

Case Study: Greenstream pipeline project, “wet-buckle” contingency and precommissioning services for 32 inch 322 mile (518km) pipeline in 3,600 feet (1,100m) water

Delivering product under pressure

Pipeline & Specialty Services

Precommissioning | Commissioning | Inspection | Shutdowns | Decommissioning

Introduction, Project Details and Challenges/Solutions:

Introduction:

During recent years, technology has allowed the exploitation of oil and gas reserves in increasingly deeper waters. In addition to floating production facilities and tanker transportation, pipeline construction companies have also developed their services to facilitate pipeline transportation of oil and gas reserves from deepwater installations. As a result, some construction companies have been required to obtain a real time solution for a “wet-buckle” scenario. In an ideal world, construction of offshore pipelines should be completed without any incidents. However, in the real world, and for a variety of reasons, sections of a pipeline can sometimes become damaged or even flooded during the laying process. Such an occurrence of unplanned flooding of the pipeline is known as “wet-buckling”. Since a pipeline is most likely to buckle during deepwater installation, it is important to have detection and correction methods in place at this stage. While few deepwater projects ultimately require a “wet-buckle” contingency during pipe lay, construction companies agree on the benefits of providing it as an insurance. If any buckling escapes detection during the installation, and is only discovered post installation, then the costs to correct the situation can be huge.

Figure 1: Greenstream route

Project Details:

The Trans-Mediterranean pipeline, known as the Libya Gas Transmission System (LGTS), or Greenstream, is 322 miles (518km) long, 32 inch diameter. The pipeline runs from Melitah, Libya, North Africa to Gela, Sicily, Italy (Fig. 1) and is located in water depths exceeding 3,600 feet (1,100m). The new onshore site was at the landfall in Gela.

Challenges/Solutions:

Weatherford very efficiently mobilised its temporary air compressor station (TACS[SM]) from the Bluestream project located in Russia to Italy. This project alone was a major undertaking as the full station travels as 150 standard sea containers. Several of the pieces of equipment required special permits to travel by road once inside Sicily. To facilitate the expedient arrival and assembly of all the equipment a holding yard and maintenance yard were established in advance of the main site being made available. This maintenance “Buffer Zone” allowed the equipment to be stored, sorted and maintained prior to making the final short journey to the main site where the sequence, laydown and position of each piece of equipment was as precisely engineered as any other part of the project.

Figure 2: Main compressor unit

Challenges/Solutions:

Weatherford engineers identified a potential problem in anticipation of high ambient summer temperatures in the central Mediterranean Sea area. These high ambient temperatures coupled with the prevailing winds potentially could cause a build up of heat within the confines of the banks of compression. The solution was to re-engineer the layout of the site and configuration of the manifolds. As a result of this foresight the TACS^{SM} was available 24/7 and during peak operational loads no unwanted heat build up occurred. Such was the success of the preparation and mobilisation of the *TACS* that from availability of the main site to mechanical completion took only 16 days. *TACS* was ready to provide emergency “wet-buckle” contingency services from August 2003 throughout the pipelay operations, precommissioning took place early in 2004 whereby the entire station was required to dewater and dry the pipeline. Dewatering operations were very efficient and very little residual water was left in the pipeline. The dewatering efficiency coupled with the high pressure nature of the air used in dewatering resulted in the drying operations being concluded ahead of schedule.

The *TACS* comprises 78 major components, plus 18 coalescing and carbon bed oil removal filters, flow meters, a centralised remote monitoring system, fuel pumping and distribution systems, and all support facilities (such as electrical generation, lighting, etc.). *TACS* was estimated to require approximately 40% less space than conventional compressor units, and consisted of 58 main combination compressors (Fig. 2), four feed compressors, eight high volume air dryers (Fig. 3) capable of dew points in excess of -76°F (-60°C), and eight boosters (Fig. 4). Each Weatherford engineered combination compressor unit consists of a rotary-screw compressor and horizontal reciprocating compressor, each one of which is capable of delivering 1,150scfm/min (33m^3/min) at 2,000psig (138barg); the entire station generated a total of 52,500bhp (39,400kW). The high pressure boosters were designed around a two stage horizontal reciprocating compressor and provided an additional stage of compression to meet the 3,625psig (250barg) final discharge pressure. This overall design proved to be the answer for Saipem’s requirement of maximised fuel efficiency and minimised footprint.

Figure 3: Dryers

Figure 4: High pressure booster

Results/Benefits and Summary:

Results/Benefits:

Weatherford was able to provide Saipem with a dependable and durable compression station for contingency and precommissioning for this pipeline project. Problems were faced and challenges overcome, and the successful completion of the work scope was proof to both Saipem and Weatherford that the TACS^{SM} and its completely self supporting inventory was an effective solution for this type of deepwater pipeline project. The installation of the *TACS* from availability of the site to mechanical readiness took only 16 days. Although few deepwater projects ultimately require a “wet-buckle” contingency during pipe lay, the benefits of having one in place become obvious compared to the costs incurred to correct the situation post installation.

Summary:

The *TACS* is a unique, mobile facility providing high specification air services for pipe lay construction companies operating in deep water, where the cost of not retaining an immediate remedial solution for “wet-buckles” during pipe lay could be huge. It is a proven synergised package that can provide dewatering capability of up to 64,000scf/min (1,800m^3/min) and 3,625psig (250barg) without the uncertainty of having to mobilise a large fleet of equipment at the last minute. As offshore pipeline developments venture into deeper and deeper waters, the *TACS* and its capabilities and applications will continue to evolve, meeting new technical challenges and requirements.

Weatherford provides a range of services used throughout the life cycle of pipeline and process facilities, onshore and offshore. Our global network of locations puts highly trained and experienced people, equipped with the latest technology, right at your doorstep. Pipeline & Specialty Services: **Delivering Quality Under Pressure℠.**

Go with solidly established pipeline expertise and technology.
Visit **weatherford.com/pss**, or e-mail **pss@weatherford.com.**

515 Post Oak Blvd., Suite 600
Houston, Texas 77027 USA
Tel: 713-693-4000
weatherford.com