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The Tideland Drillers. Laying of a Pipeline in a High Sensitive Nature Reserve

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Abstract

The consortium RWE Dea and Winter shall transported in 2004, 852.504 mt[N1)] of crude oil in special double hull tankers to the shore. The plan to lay a pipeline in a high sensitive nature reserve started in 2002. The onshore production of straight tracks up to 1.400 m started in summer 2004. The used material has been 1.4462, dimensions 6" x 11 mm, and 10" x 8 mm, pipe length 18 m.

The "orbital" welding process is patent-registered by Westfalen AG as EKONOR. It combines a secure and stable welding procedure with a camera online monitoring of the root. The line ends were connected in the excavation pit off shore. This was realized with weld ends of Ni basic alloy, in manual TIG welding.

Key words: *nature reserve, duplex material, orbital welding, EKONOR, Ni-basic*

Introduction

In 2005 we remember 18 years of successful and trouble free production of 14 million tons of crude oil in the German tide land. That means about 60% of German oil production came from the Mittelplate platform. Germany's biggest oilfield is managed by the consortium RWE Dea and Wintershall. Their goal is to optimize the capacity sustained with this new transportation concept. More than the potential 50 million tons of crude oil will be produced in a 10 years shorter time.

The consortium RWE Dea and Wintershall produced in 2004, with the associated on shore production, a total capacity of about 2 million tons from this oil field. In 2000 risky ship movements transported in that year 852,504 mt of crude oil with special double hull tankers to the tank fields onshore.

The new concept "Laying the pipeline in the tide land" started in 2002/2003. With the date of 16th October 2003, the government gave the approval for that project. The technical planning stadium started. The challenge was to avoid the high sensitive nature reserve, protection zone 1 from all negative activities during the operations. Deadline was the middle of June 2005. Short before the geese (Tadorna tadorna) start their moult.

NOTE N1: mt = metric ton, representing 1000 kg.

The about 11,000 m twin pipeline connection from the off shore platform to the on shore processing factory demands an amount of 100 Mil. €. Another 50 Mil. € were invested in a new drilling equipment. The T-150 is one of the moderns drilling equipment in Europe. To ensure the potential of the machine it was necessary to bring the drill up to 10.000 m horizontal and 3.000 m vertical in the ground.

From the beginning of Mittelplate oil production the consortium invests more than 615 Mil. €. Most of the amount was spent to fulfill the ecological requirements in the tide land.

The Plan Became Truth

In summer 2004 the works started in farm land near the shore, behind the levy. All the site equipment was placed. Special welding containers were set up. Living quarters and electrical equipment was installed. About 700 pipes of 18 m lengths were delivered. The starting shot of welding happened. Straight tracks up to 1,400 m became produced on shore. The material 1.4462 (duplex steel) acc. to VdTÜV guideline 418 with the dimensions 6” x 11 mm for the water reduction and 10” x 8 mm for the oil production were connected with an innovative welding procedure called EKONOR. It is patent-registered welding procedure by Westfalen AG. This automatically “orbital” TIG (141 EN ISO 4063) process combines a secure and stable welding procedure with a root camera online monitoring of the circumferential seam. UTP produced the welding wire, brand name UTP A 6808Mo, EN 12072-W 22 9 3 NL with diameter of 1 mm. As inspection bodies were appointed TÜV NORD and Germanischer Lloyd.

Joint preparation is done by manual electrical machining equipment. The U-joint has 11° angle, 2.5 mm gap, 0.2 mm throat according to the WPS KF-10.3-1 to -3. Pneumatic inside-clamping-device (jig / turnbuckle) worked with chilled argon (-120°C) and took also over the cooling and formatting of the weld zone. With this jigs the linear misalignment could be reduced to an acceptable measure. The welding procedure begins at 6 o'clock position up to 12 o'clock position upwards PF EN ISO 6947. After welding 180° of the pipe, the head has to be turned and the same procedure took place on the other half side of the pipe. The position PG EN ISO 6947 will be avoided. A specified overlap closed every run. In 4 layers, 1 root pass, 2 hot passes, 2 intermediate strings and 1 final wave bead, 11 mm weld deposit was melted.

All welding operators of the company KÖSTER AG were approved according EN 1418 and EN 287-1. EN ISO 15614-1 in combination with the national regulations VdTÜV 1052 and BVOT § 159 was the specified standard for the **W**elding **P**rocedure **Q**ualification **R**ecord (WPQR).

According to the contract, one test weld was taken while preproduction of the tracks. The test results were positive in X-ray, bend, tensile and impact test. Also without any objections were the macro/micro examinations. The randomly ferrite/austenitic test were also within the limits.

With the jig integrated camera every root weld was inspected and video stored. Also 100% X-ray testing was done. The repair rate was about 2 % over all.

A hydraulic test of every 1000 to 1400 m track completed the inspection measures. The test pressure for the DN 250 pipe was calculated with 240 bars and for the DN 150 pipe with 503 bars.

Another big challenge was connecting the line ends in the excavation pit off shore. This was realized with weld ends of Ni basic alloy (2.4602) and manual TIG welding. For this procedure a special welding chamber was developed by KÖSTER AG.

The Action from February up to 28th October 2005

February 2005 the horizontal drilling machines started their job. From 6 excavation pits the holes were drilled. 20 m under sea ground the pipes should be pulled (Fig. 1).

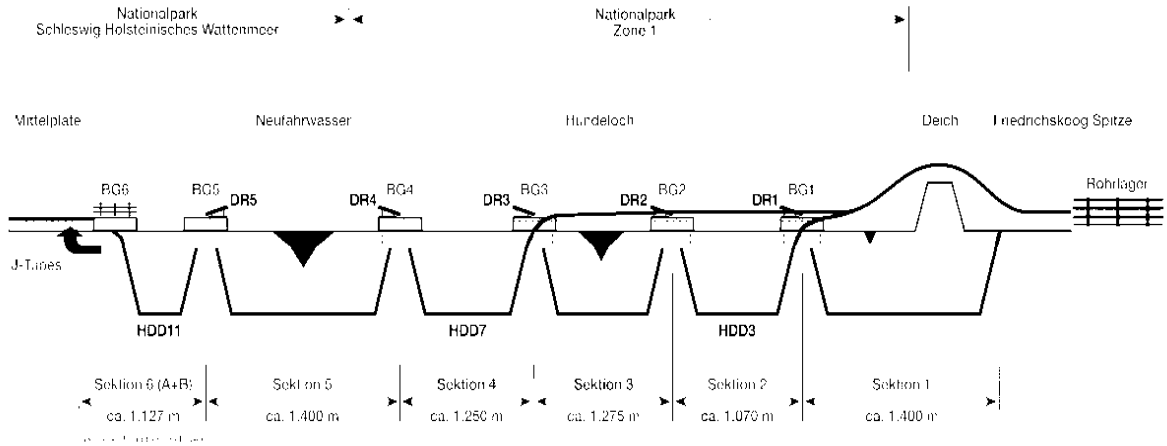

Fig. 1.

The connection in the pits was in the depth of 5 m below sea ground. The pulls started when the drills appeared in the next pit. The supplied track was connected to the drill and pulled through the hole. The Ni basic line ends could be welded and also inspected. The result was without any objections.

Exactly just in time the complete site equipment was demounted. The geese came to visit "their" tide land to do their moult in well known peace.

Conclusions

Raw materials and energy keep life on earth turning. A sensitive, economical and considerate exploitation of environment will give us the chance to stay for a long time on our blue planet. The above described project shows the investment of money to protect the tide land of possible accidents with ship transport of crude oil. This combination between ecological and economical requirements was also an engineering challenge. From October 28, 2005 the consortium produces oil up to this day trouble free.

We should take care in doing something with the planet earth. It´s only borrowed from our children.

References

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Foraje în zone cu maree. Lansarea conductelor într-un areal protejat ecologic

Rezumat

Consortiul RWE Dea şi Winter trebuia să transporte în 2004, o cantitate de ţiţei de 852.505 tone. Planul amplasării unei conducte de ţiţei într-o zona protejată (rezervaţie naturală) a început în 2002. Prefabricarea liniilor de conducte, cu lungime de până la 1400 m, a început în vara anului 2004. Materialul utilizat a fost 1.4462, cu dimensiunile de 6" x 11 mm şi respectiv 10"x 8 mm, cu lungimi ale ţevii de 18 m.

Procedeul de sudare "orbital" este o concepţie proprie, patentată şi înregistrată de Westfalen AG sub denumirea EKONOR. Acesta combină un procedeu de sudare sigur şi stabil cu o monitorizare a rădăcinii cusăturii sudate cu ajutorul unei camera de filmat "on-line". Îmbinarea capetelor de conductă s-a desfăşurat în interiorul puţurilor forate offshore. Îmbinarea capetelor sudate s-a realizat pe baza unui aliaj de nichel, utilizând procedeul manual TIG.