

# **Erdöl-Erdgas Gommern GmbH**

*Evaluation  
Operation of Permanent Magnet in the oil production well  
Mesekehagen 2*

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worked out: Ihl, BE 1

Gommern, 8<sup>th</sup> of March, 1999

## 1. INTRODUCTION

When the crude oil cools down on its production way to the surface (< about 45<sup>0</sup> C), paraffin will be deposited in the tubing string (in Mha 2 from 0 - 260 m). This deposit reduces the tubing diameter and hence the production rate will decrease. For this reason regular treatments are necessary. At the well Mesekenhagen 2 the following treatments have been carried out so far:

- 1) Hot-oil treatment above the Tubing with 3 -5 cubic meters (once a week, costs about 20,000.-- DM/a)
- 2) scraping/cutting with various diameters (twice or three times a week, costs about 20,000.-- DM/a)

An alternative type of treatment is the use of magnets (MFC). Magnetic fields are to avoid depositing by interfering within the electron sheath of the paraffin molecules which results into a softer consistency of the paraffin.

Prior to the operation, the magnet is adjusted to the special conditions of each individual well. There are, however, some basic criteria:

- optimal flow rate through the magnet: 0.6 - 1 m /s
- production rate: 20 cubic meters/d +/- 25%
- GÖV < 500
- type of production: any type of production except for intermitted gas lifting

In Mha 2, a magnet with 32 magnetic circles has been operated. The magnet was purchased from Halliburton, Celle and installed by Erdöl-Erdgas Workover GmbH (Wireline-Service), Salzwedel, on December 1, 1998.

The following criteria are considered as indicators (oder: parameters) for a successful operation of the permanent magnet:

- hot-oil treatment twice a week
- scraping/cutting every four weeks
- and hence a reduction of operation costs of 20,000.-- /a

## 2. EVALUATION

First of all, the above basic criteria for the operation are compared to the conditions prevailing in Mesekenhagen.

<b>CRITERION</b>	<b>Produced</b>	<b>PSI</b>
flow rate	0.6 - 1 m/s	0.06 - 0.1 m/s
production rate	20 cubic meters/d +/- 25 %	17 - 20 cubic meters/d
GÖV	< 500	160 - 180

The flow rate was the only criterion that could not be adhered to.

Upon the installation of the magnet on December 1, 1998 weekly caliper logs were performed. There was not a single hot-oil treatment. During the first caliper logs deposits (tubing diameter < 48 mm) were observed so that scratching/ cutting had to be performed weekly. This type of treatment was continued by Jan. 25, 1999. The following positive effects could be observed:

- paraffin was delivered to the surface
- softer consistency of the paraffin and hence less time-consuming removal of the paraffin by scratching/cutting
- reduction of the main paraffin interval (diameter < 46 mm) of about 120-220 m (previously 0 - 260 m) and hence reduced formation of paraffin

Beginning with February 1, 1999 scratching/cutting was abandoned for the sake of hot-oil treatments. The intended number of treatments (twice a week) could not be carried out. In the second week there was a decline in the production rate from 91 cubic meters to 82 cubic meters. The reason is probably the intermittent operation (Fahrweise) of the well and thus the permanent heating up and cooling down of the tubing string (production: Monday to Thursday 15 h, Friday - Sunday DAM). Since March 22, 1999 weekly hot-oil treatments have been carried out. Again, the softer consistency of the paraffin has a positive effect on a better solution. In order to assess the effectivity of the hot-oil treatment a caliper log was performed on March 8, 1999 (after the hot-oil treatment). The paraffin deposits could be removed efficiently (diameter 58 mm without resistance (Freilauf) up to 180 m, with light resistance up to 260 m).

### **3. CONCLUSION**

The test of the permanent magnet in the well Mesekehagen 2 and the effectivity of the type of treatment can be considered as positive. It was proved that magnets are an efficient and economical method for the abatement of paraffin.

The original goal (hot-oil treatment every two weeks, scraping/cutting every four weeks) has not been achieved. Since in future only one type of treatment (weekly hot-oil treatment) will be applied, the positive effect was proved. Hence, the intended reduction of operating costs was achieved.