Cause analysis and preventive measures of casing damage in Punan Oilfield

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Abstract: South region of casing damage Wells based on the statistics of Portugal plane and vertical distribution characteristics, combined with dynamic production of oil and water Wells, drilling pressure, measures, Wells and water injection cycle switch formation pressure and oil and water Wells casing damage reason analysis and summarizes the classification, find out the main factors of influence of casing damage, and put forward the effective measures of casing to prevent, reduce the speed of casing damage and to improve oilfield development effect.

Key words: Punan Oilfield; Casing damage; Cause analysis; Casing prevention.

1. Introduction

Since the development of Southern Portugal, there have been 194 casing losses, including 50 oil Wells and 144 water Wells, which are mainly divided into fault blocks no. 3, 4 and 8 in southern Portugal, accounting for 53.1% of the total casing losses. In this paper, 82 casing losses Wells in southern Portugal from 2010 to 2018 were compared and analyzed.It is found that the main causes of casing damage in southern Pu area in recent years are fault occlusion, high water injection intensity, influence of drilling control, poor cementing quality and so on. The longitudinal comparison and analysis mainly focus on the mudstone layer of The 1st, 2nd and 3rd member of The Nen and the mudstone interlayer of the main oil layer of the Pui group. It can be seen from the plane distribution that the block with complex fault structure is prone to forming high pressure abnormal area and sheath damage, such as The Third and fifth fault blocks in Punan.

As long as there are three types of casing loss in Grape oilfield: deformation, stage-off and rupture, the water well deformation and rupture are the main ones, accounting for 72.3% of the total casing loss.

It can be seen from the figure that the faults in the plane are mainly NE trending, so this fault is mainly a stretch fault system in the early stage. In the late stage, the influence of the near-Sn extension on Nanpu no.2 fault is mainly reflected in the nW-SE extension of Nanpu no.2 fault, which controls the formation of The No.2 buried hill.

2. Set of damage cause classification

Taking Pu 178-50 as an example, Pu Nan 7 fault block, casing failure horizon PI3-6JC, casing failure time 201811, this well is located in casing failure area, connected with 3 Wells 7P178-52 (casing failure was discovered in September 2002, layer PI9-11JC, N1).7P180-50 (Casing damage was found in November 2016, horizon PI3-4NJC), 7P176-50.

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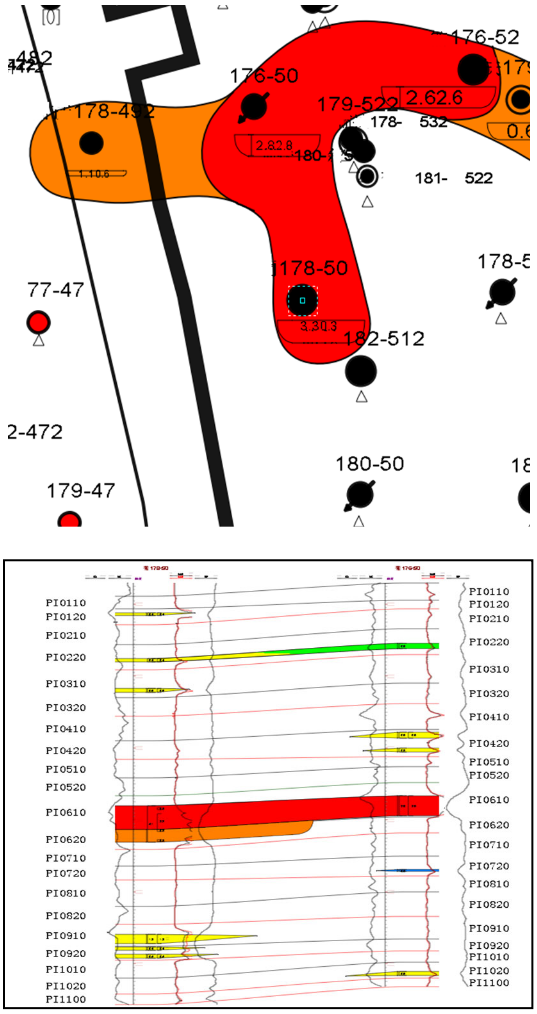

Figure 1: Depositional facies zone of Portuguese 178-50 I61

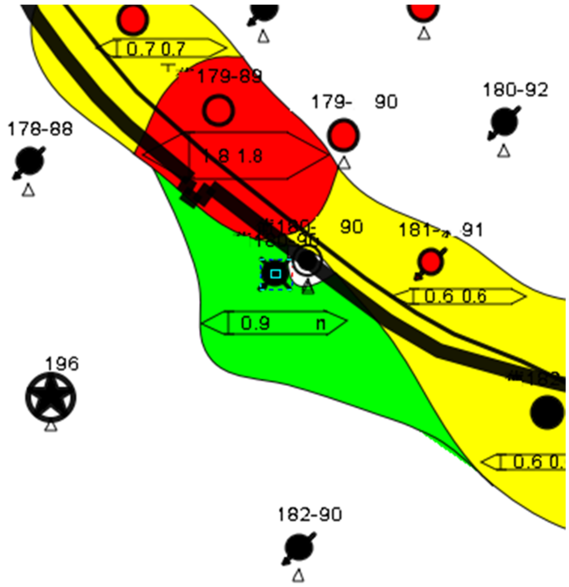

Figure 2: Depositional facies

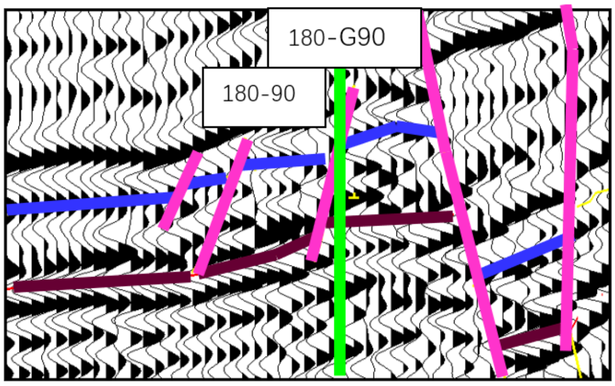

Figure 3: Seismic section of Well Pu 180-90

The casing damaged well Pu 180-90 is in Pu I5 reservoir. According to the analysis of seismic data interpretation results, pu 180-90 encountered a micro fault in Pu I5 reservoir. Because the existence of micro fault was not noticed, casing damage occurred in the replacement well Pu 180-Gen 90 later, and the casing damaged layer is in Pu I1 reservoir, and the fault fault is also in Pu I1 reservoir.These two casing losses were caused by micro-faults.

Nanpu no.2 buried-hill is obviously reformed by fracture cutting, mainly forming horst and single fault hill. The development of faults is regular and controlled by preexisting faults and stress field. Nanpu no.2 buried hill is located on the slope belt of Nanpu depression and Shaletian uplift. Nanpu no.2 buried hill is generally controlled by Nanpu no.2 fault, which constitutes the boundary fault of Nanpu no.2 buried hill and is separated from Nanpu no.1 buried hill. Nanpu no.2 buried hill is developed with nearly EW trending faults (see FIG. 3).

3. Poor cementing quality

Poor cementing quality leads to the injection of water channeling main oil layer interlayer, tender first section, tender second section bottom oil shale, providing access.Well Pu 178-134 is located in The First fault block of Pu Nan. The casing damage time was January 2018, and the casing damage position was N1. The distribution of perforation top and bottom boundary was 1059.70m and 1083.30m.The well itself is well developed, and the injection-production relationship is perfect, and there is no fault around the block. Analysis shows that the well casing damage is caused by the injection water channeling caused by poor cementing quality.

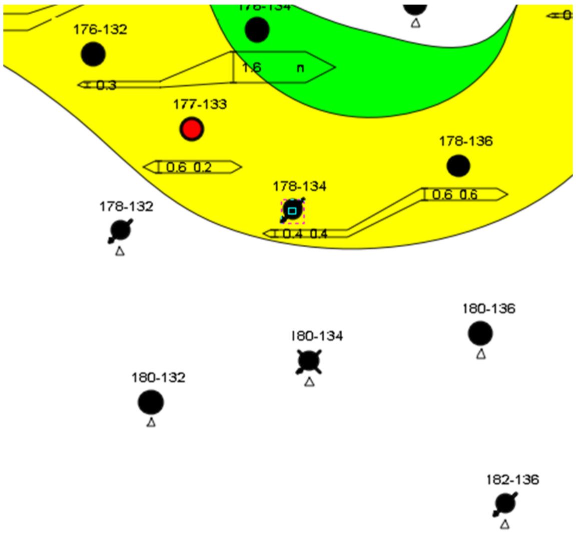

Figure 4: Depositional facies zone of Portuguese 178-134 I11

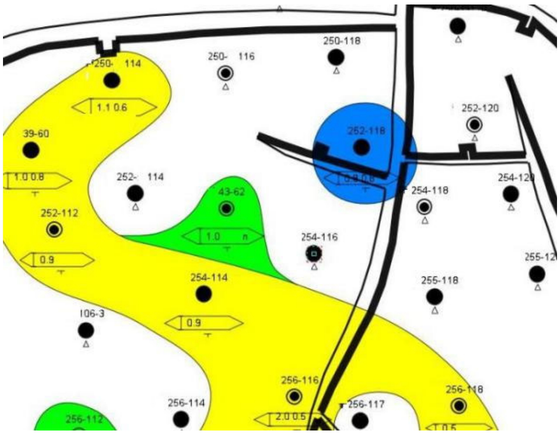

Figure 5: Depositional facies zone of Portuguese 254-116 I42

Pu 254-116 is located in The Fourth fault block of Pu Nan. The casing loss occurred in October 2018 at the casing loss position PI1-4JC. The well was put into production in January 2015, but there has been no water and no water injection effect.In April 2018, when the large pump was replaced, the tubing could not be pulled out. After analysis and checking the cementing quality chart, it was found that the cementing quality above the casing damaged stratum was poor, which led to the dislocation of the well in pi1-4JC mudstone interlayer.

This mechanism of segmented growth of main boundary faults controls the migration of trough, and thus the distribution of effective hydrocarbon stoves in different periods [1].In recent years, with the deepening of research, more and more scholars have realized that most of the trunk boundary faults have a segmental growth mechanism [2].Generally speaking, the growth of a single fault is characterized by the increase in the displacement of the ascending dip fault and the increase in the length of the ascending strike fault [3]. As for the relationship between the displacement of the fault and the length of the fault, many scholars have conducted a large number of quantitative studies by observing the morphology of faults in the field and established a variety of growth models. The simulation experiment of fault growth plays an important role in revealing the formation process of natural faults, and provides an important basis for the study of fault connection and stress[4].Fault growth stems from progressive deformation of fractures[5]. Studies on faults have gone through a process from the morphology of fault profile to the study of fault length and fault displacement[6]. Nanpu fault 2 has an important control action of buried hill, in order to study the growth of Nanpu fault 2 connection process and Nanpu no. 2 the control function of buried hill through the application of slip - distance curve and slip back stripping method to study the growth of the Nanpu fault 2 connection process, and the use of equilibrium profile to analyze its effect on the tectonic evolution of the buried hill. The results show that the Nanpu No. 2 fault is characterized by segmentalized growth, caledonian quiet structure, and widely distributed carbonate deposits. After the middle-late Caledonian uplift, the strata suffered from denudation. In view of the previous studies on the control effect of fault growth connection on qianshan in Nanpu depression, this paper applies fault backstripping technology to discuss the evolution of faults on qianshan.

4. Casing damage prevention measures

When it is found that the water absorption profile data shows single-layer inrush, profile control or water plugging should be carried out in time to alleviate the contradiction between layers and avoid excessive water injection intensity resulting in local high pressure and casing damage.

Local high pressure is easy to be formed in injection Wells with poor reservoir development, so injection distribution should be adjusted reasonably and combined with periodic water injection to prevent casing damage.

The investigation and analysis of single sand injection well should be strengthened, and the injection-production structure should be adjusted in time to control the development of abnormal high pressure layer, so as to prevent casing damage.

Strengthen the dynamic analysis of oil and water well on both sides of the fault, improve the injection-production relationship, strengthen pressure monitoring, timely find local high pressure, timely adjustment, and prevent sheet casing damage.

It is believed that the connection of faults is an important way for a large number of small faults to evolve and form large faults. Fault plays an important role in controlling the evolution of buried hill. Fault segmentation and connection process have an important influence on the distribution of subsidence center, migration and tectonic zone distribution, sedimentary facies and filling characteristics of strata in the same rift period in the basin. Strong folding occurred in The Indochinese period, and in the Himalayan Period, the Nanpu no. 2 fault was weakly active in the Shahejie sedimentary period and developed only in the north, forming the prototype of buried hill at this time. During the sedimentary period of Dongying Formation, the structure reversed slightly, which is also known as the Dongying Movement. At this time, fault no. 2 strongly extended southward, and buried-hill was formed and basically formed. The research results have certain reference value for oil and gas exploration in Nanpu sag.

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