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EVALUATION OF THE SANDNESS OF THE NGRAYONG LAYER IN THE XYZ WELL OF PERTAMINA ASSET IV CEPU

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Abstract: Most oil and gas wells produce through sandstone formations deposited in marine or detrital environments. Marine sedimentary sands, in which most of the hydrocarbons are found, are often cemented with calcareous or siliceous minerals and may be heavily consolidated. In contrast, Miocene and younger sands are often unconsolidated or only partially consolidated with soft clays or silts. This formation, which is structurally weak, is unlikely to be able to withstand the movement of sand grains. When oils are produced at high flow rates, they can produce sands along with the liquid oil.

The movement of fluid through the sandstone reservoir creates stresses in the sand grains due to differences in fluid pressure, fluid friction, and overburden pressure. If this stress exceeds the formation holding force, then the sand grains and fines can move and can be produced with oil liquid. Rapid changes in the liquid production rate can cause unstable conditions which can result in increased sand production. When an oil well begins to produce water, this will often be an indication of the start of sand production. Muecke[1], demonstrated that particle motion occurs in a multiphase system when the wetting phase begins to move.

Even consolidated sandstone can be mechanically and chemically damaged over time as the reservoir is produced. The overburden stress on the sand grains will increase as the reservoir pressure decreases. The movement of water can dissolve the minerals that cement the sand grains and can change the production capacity of the formation fluid. Smooth migration can reduce permeability in the perforations. This can result in higher pressure drops in the wellbore and changes in formation stress. Formations cemented by calcite can be damaged by improperly designed acidification, and can result in increased production of sand.

Keywords: Evaluation, Sandness, Layer.

INTRODUCTION

Sand production from unconsolidated formations in oil and gas wells has been a universal challenge for the petroleum industry for a long time. The challenge encountered is not to avoid or stop sand production, but how to be able to maintain the productivity of commercial wells after sand control efforts are implemented. At the same time, the sand control method chosen must be justified by a reasonable payback time against investment costs [5].

In producing fluid, whether in the form of oil, water, or gas, from a production well, usually sand will also be produced. Excessive and uncontrolled sand production will be very detrimental and cause many problems, both for the performance of the well and for production equipment [6]. In general, the production of this sand is related to young and shallow formations that have little or no cementation to hold the sand grains together. And, as a consequence, when the wellbore pressure becomes lower than the reservoir

pressure, frictional forces on the sand formation occur as a result of fluid production. And if the formation friction force becomes greater, the sand will be drawn into the wellbore. These grains of sand will eventually clog the well or be produced on the surface [4].

The production of sand basically has no economic value at all, on the contrary, sand formations can not only clog wells but can also erode equipment and settle in vessels on the surface. Effective sand control practices in obtaining oil and gas from wells continue to be developed, because the costs and final impact of sand production are on the profits obtained, and the last resort that is usually taken is to close the well [2]. The success or effectiveness of controlling sand production in a production well is its ability to prevent excessive production of sand from the formation, while maximum well productivity can also be maintained [3].

One of the common and widely used methods for controlling produced sand in production wells is gravel pack. The sand of a certain size is placed between the perforation hole or drill hole wall and the liner, to restrain sand production from the formation to the drill hole. Selection of the appropriate sand and liner size based on formation sand analysis data (sieve analysis) is the key to success in controlling the sand problem [1]

The main challenges that occur during the production of heavy oil are not only the low oil gravity but also the sand content and high gas production. The known production history for the KW field shows high sand production, which results in most cases of subsurface pumps stalling due to sand buildup in the barrel. This condition affects the movement of the thrust in the barrel, resulting in no movement on the upstroke and downstroke. This also affects the efficiency of the downhole pump due to wear on the plunger due to sand which results in pipe leaks, resulting in crude oil flowing back into the barrel (leaking traveling valve) or leaking from the barrel back into the formation (standing valve leaking), which will cause large oil production losses. Another challenge is the buildup of sand in the pipe entering the well, which will block the flow of fluid and prevent it from reaching the pump. The presence of sand also affects the production flow path, causing high-pressure flow paths to become stuck due to the accumulation of sand in the channel pipe (sand bridge).

RESEARCH METHOD

This research is applied in nature, where to support the success of the research a descriptive and correlational approach is used.

Table 1. Materials and Tools

No	ITEM NAME	Sum	Unit
1	Pocket Notebook Classic	30	pcs
2	SanDisk Ultra 64 GB	30	pcs
3	Atom brand paper clip Uk.No. 5	10	Pack
4	Zipper File Map Plastic Zipper Joyko ZF-2539 Uk.F4	15	Pack
5	Pen Brand Faster C6	10	Pack
6	Clear Holder F4 Folio	11	Pack
7	HVS A4 Paper (Uk Kwarto) 80 mg	20	rim
8	Trigonal Clip	15	pack
9	Color Snowman Markers contents 12 pcs/box	10	Box
10	Laser Pointer Logitech R.400	4	pcs
11	Cartridge Printer Canon MP 237 Color Colored	5	pcs
12	Cartridge Printer Canon MP 237 Black Colored	5	pcs
13	Cartridge Printer HP 704 Color Colored	5	pcs
14	Cartridge Printer HP 704 Black Colored	5	pcs
15	Sea Gate Fire Cuda 1TB External Hard Drive	1	pcs

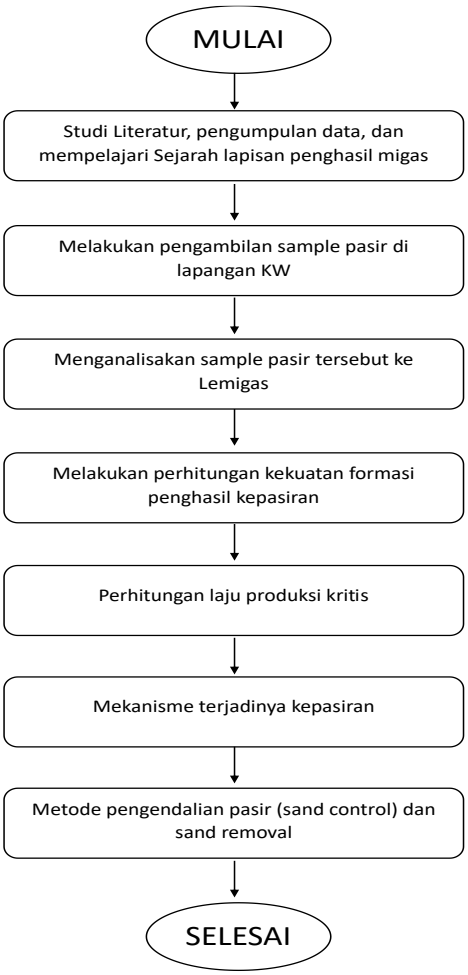

Figure 1. Research Procedure

RESULT AND DISCUSSION

The Ngrayong layer sand samples taken during well maintenance were then analyzed at the EP Lemigas Jakarta Laboratory, with the following test results report:

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LAPORAN HASIL UJI LABORATORIUM
REPORT OF LABORATORY TEST RESULT

No. Arsip/*Archive Number*	: 202301113	Satuan Kerja	: KP EKSPLOITASI
Nomor PK/*Work Order Number*	: 202301113/PKJ/6.1/VII/23	Kelompok/*Group*	: PEMBORAN DAN PRODUKSI

DISIAPKAN UNTUK PELANGGAN/*PREPARED FOR CUSTOMER*:

Nama/*Name*	: **POLITEKNIK ENERGI DAN MINERAL AKAMIGAS**
Alamat/*Address*	: Jl. Gajah Mada 38 Cepu 58315, Kabupaten Blora, Jawa Tengah
Nomor Telepon/*Phone No(s).*	: 0296 – 4218 97
Nomor Facsimile/*Fax. No(s).*	: 0296 – 4259 39
Nomor Surat Permintaan/*No. of service/Work Order Letter*	: B-499/PB.05/BPP/2023
Tanggal Permintaan/*Date of Order*	: 7 Juli 2023

IDENTIFIKASI LAPORAN HASIL UJI/*REPORT IDENTIFICATION*:

Lokasi Pengujian/*Place Of Testing*	: Laboratorium Pemboran
Nomor Laporan (LHU)/*Report Number*	: LHU/5.06.01.4.99/202301113
Disiapkan oleh/*Prepared by*	: Rachmi Kartini, S. T, M. T., Ph.D – Kepala Laboratorium
Disahkan oleh/*Authorized by*	: Arie Haans, S.T., M.T. – Ketua Kelompok
Tanggal Penerbitan/*Date of Issued*	: 2 Agustus 2023

DATA PERCONTOH/*SAMPLE DATA*:1

Nomor/*Number*	: 20230007332
Jenis/*Type*	: PASIR SUMUR XYZ
Identifikasi/*Identification*	: 1 (satu) kantong plastik pasir
Jumlah/*Quantity (volume)*	: 1 (satu) sampel
Tanggal Diterima/*Received Date*	: 7 Juli 2023
Tanggal Analisis/*Date of Analysis*	: 11 – 28 Juli 2023
Jenis Pengujian/*Test Type*	: Physical Analysis
Metode Uji/*Test Method*	: API RP 58 & 19-C

LAPORAN HASIL UJI selengkapnya disajikan pada halaman berikut:
The detailed report of the laboratory testing result is presented on the following pages.

Disahkan Oleh/*Authorized by*
Ketua Kelompok Pemboran dan Produksi

(Arie Haans, S.T., M.T.)
Tanggal/Date: .....

Diketahui Oleh/*Notice by*
Kepala,

(Ariana Soemanto S.T., M.T)
Tanggal/Date: .....

Semua rekaman, data, laporan, dan informasi lainnya yang dihasilkan pada analisa laboratorium akan dijaga kerahasiannya.
Menggandakan sebagian atau keseluruhan laporan hanya bisa dilakukan dengan ijin tertulis dari perusahaan.
All records, data, reports, and other information conducted in the laboratory analysis shall be treated as confidential.
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Hasil Pengujian hanya berlaku untuk percontoh yang diterima, dan bukan untuk kepentingan iklan maupun promosi.
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LABORATORY REPORT

Sample : PASIR SUMUR XYZ
Received from : **Politeknik Energi dan Mineral Akamigas**
Date received : 26 Juni 2023
Identification : 1 (satu) kantong plastik pasir

No : LHU/5.06.01.4.99/202301113
Date : 2 Agustus 2023

HASIL TEST DISTRIBUSI PASIR SUMUR XYZ

No	Mesh	Distribusi Pasir (%)	Komulatif Distribusi (%)	Perolehan 8/16 (%)	Perolehan 12/20 (%)	Perolehan 16/30 (%)	Perolehan 20/40 (%)	Perolehan 30/50 (%)	Perolehan 40/60 (%)
1	8	0.53	0.53						
2	10	0.16	0.69	0.50					
3	12	0.12	0.81						
4	14	0.11	0.92						
5	16	0.11	1.03		0.63				
6	18	0.13	1.15						
7	20	0.29	1.44			3.03			
8	25	0.84	2.29						
9	30	1.77	4.06				15		
10	35	3.61	7.67						
11	40	8.90	16.57					72	
12	45	27.95	44.51						
13	50	31.69	76.20						73
14	60	13.79	89.99						
15	70	6.06	96.04						
16	Pan	3.96	100.00						

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No : LHU/5.06.01.4.99/202301113
Date : 2 Agustus 2023

HASIL TEST PASIR SUMUR XYZ API RP 58

PASIR PEM Akamigas API RP 58			
DESCRIPTION	UNIT	RESULT	REQUIREMENT
Sieve Analysis 40/60	% wt.	96.67	96.0, min
Larger than 40 mesh	% wt.	0.00	max, 0.1 %
Retained on 45 mesh	% wt.	28.65	-
Retained on 50 mesh	% wt.	45.11	-
Retained on 60 mesh	% wt.	22.91	-
Smaller than 60 mesh	% wt.	1.75	max, 2 %
Sand shape :	Krumbein & Sloss (1963)		
Average Sphericity		0.6	Minimum 0.6
Average Roundness		0.3	Minimum 0.6
Acid Solubility	% wt.	14.769	1, Max
Turbidity	FTU	309	250, Max
Crush Resistance @ 2000 psi	% fines	4.80	max, 2 %

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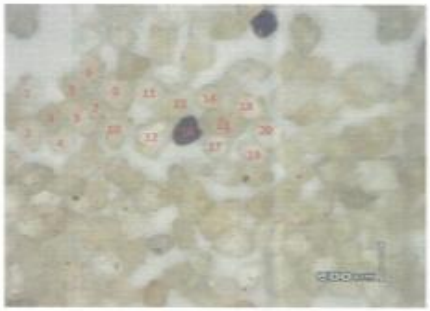
Date : 2 Agustus 2023

TEST RESULT PASIR XYZ

PHOTO DENGAN MICROSCOPE DENGAN PEMBESARAN 4OX

Pasir menggunakan mesh 40/60			
No.	Foto Sample	Roundness Kebulatan (Butir)	Sphericity (Bola/Partikel)
1	1	0.3	0.7
2	2	0.3	0.7
3	3	0.3	0.7
4	4	0.5	0.7
5	5	0.1	0.7
6	6	0.1	0.7
7	7	0.5	0.7
8	8	0.5	0.5
9	9	0.5	0.7
10	10	0.3	0.7
11	11	0.5	0.7
12	12	0.3	0.7
13	13	0.5	0.5
14	14	0.1	0.7
15	15	0.5	0.7
16	16	0.5	0.7
17	17	0.1	0.5
18	18	0.3	0.5
19	19	0.3	0.5
20	20	0.3	0.5
21	Rata-Rata	0.3	0.6
22	Spesifikasi	Minimum 0.6	



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Date : 2 Agustus 2023

HASIL TEST PASIR SUMUR XYZ API 19-C

PASIR PEM Akamigas API RP 19-C			
DESCRIPTION	UNIT	RESULT	REQUIREMENT
Sieve Analysis 40/70	% wt.	97.70	90.0, min
Larger than 40 mesh	% wt.	1.91	max, 0.1 %
Retained on 45 mesh	% wt.	28.04	-
Retained on 50 mesh	% wt.	42.61	-
Retained on 60 mesh	% wt.	19.62	-
Retained on 70 mesh	% wt.	7.43	-
Smaller than 70 mesh	% wt.	0.30	max, 1 %
Sand shape :	Krumbein & Sloss (1963)		
Average Sphericity		0.6	Minimum 0.6
Average Roundness		0.3	Minimum 0.6
Acid Solubility	% wt.	14.769	3, Max
Turbidity	FTU	308	250, Max
Crush Resistance @ 10000 psi	% fines	20.10	max, 10 %

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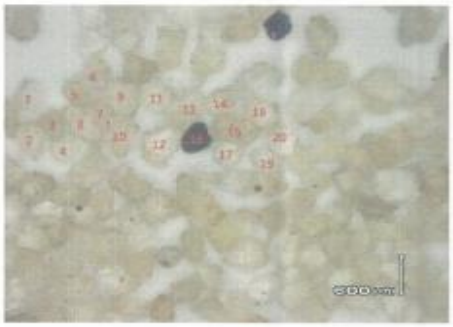
Date : 2 Agustus 2023

TEST RESULT PASIR XYZ

PHOTO DENGAN MICROSCOPE DENGAN PEMBESARAN 40X

Pasir menggunakan mesh 40/70			
No.	Foto Sample	Roundness Kebulatan (Butir)	Sphericity (Bola/Partikel)
1	1	0.3	0.7
2	2	0.3	0.7
3	3	0.3	0.7
4	4	0.5	0.7
5	5	0.1	0.7
6	6	0.1	0.7
7	7	0.5	0.7
8	8	0.5	0.5
9	9	0.5	0.7
10	10	0.3	0.7
11	11	0.5	0.7
12	12	0.3	0.7
13	13	0.5	0.5
14	14	0.1	0.7
15	15	0.5	0.7
16	16	0.5	0.7
17	17	0.1	0.5
18	18	0.3	0.5
19	19	0.3	0.5
20	20	0.3	0.5
21	Rata-Rata	0.3	0.6
22	Spesifikasi	Minimum 0.6	



Pengujian Eksploitasi Minyak dan Gas
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The XYZ Well is one of the oil production wells in the Ngrayong Structure of the KW Field. This well was produced using the Electric Submersible Pump (ESP) method due to low reservoir pressure as a result of the reduced production capacity of the KW Field. Apart from that, this well has a sand problem due to various causes which are interesting to research.

On February 2023, the production rate of XYZ Well it will be 1.2 Barrels (net oil) and 5.9 Barrels of water. After that, the well was turned off (no longer produced) for well maintenance to be carried out.

CONCLUSION

By looking at the results of the Test Result Report (LHU) from the Lemigas Laboratory, especially the roundness (result in 0.3) and sphericity (result in 0.6), it can be concluded that at the XYZ Well sand filtration can be carried out using the Gravel Pack method. Based on a literature review of several references related to sand problems that occur in oil and gas industrial fields, most of the resulting formation of sand is caused by producing oil and gas production well fluid at a production rate that exceeds

the critical production rate. Likewise, the researcher analysis of sand production in the XYZ Well in the KW Field. In the next research, researchers will conduct a study on overcoming the sand problem in the XYZ Well using the Gravel Pack method, because by using this method, fines migration can be filtered by gravel so that the sand grains are released from the sand, not produced and remains in the reservoir.

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