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Auto Suction Chemical Pump (ASCP) is a game changer for Well Stimulation at Pertamina EP Subang Field

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Abstract. Injection wells are a vital part of the oil production process at Pertamina EP Subang Field. Regular acidizing treatment is needed to maintain the reliability of injection wells. The high cost of acidizing treatment for injection wells is a significant financial challenge. Therefore, innovation is required to make costs efficient by independently performing acidizing treatment with the same quality as using a stimulation unit. This tool, the "Auto Suction Chemical Pump" (ASCP), can function properly after conducting research, simulation, making prototypes and conducting various experiments. After completing tests with good results, tools with upscaling sizes were fabricated using SS 316 material for acidizing stimulation activities at injection wells at Pertamina EP Subang Field. ASCP is a game changer in performing acidizing treatment on injection wells because it does not require external power but uses injection power from the well itself. By performing regular acidizing, the reliability of injection wells can be maintained so that oil production activities take place optimally. In addition, acidizing treatment using ASCP can reduce operational costs because it does not require a stimulation unit rental.

Keyword(s): Injection Well; Chemical Pump; Stimulation.

1 Background

Pertamina EP Subang Field is an oil and gas company in West Java with ten production structures, one of which is Jati Asri (JAS) (figure 1.1). JAS is a new structure which operating since 2014. JAS has peak production of 6400 blpd / 3250 bopd / 17 MMscfd and current production of 5700 blpd /1800 blpd / 3.2 MMscfd. From the beginning of the operation until now, production in this structure is still using Early Production Facilities (EPF).

Figure 1.1 Pertamina EP Subang Field Working Area

From the production performance graph (figure 1.2), we can see that water production is increasing. When production uses EPF, the produced water is sent using a road tank and injected into a structure from an injection facility. However, increasing water production will increase the operating costs for injection water treatment. Therefore, the construction of an emergency injection facility was carried out to reduce operational costs. The low quality of the injection water from the emergency injection facility causes blockages in the injection wells, so stimulation is needed to maintain the injection rate.

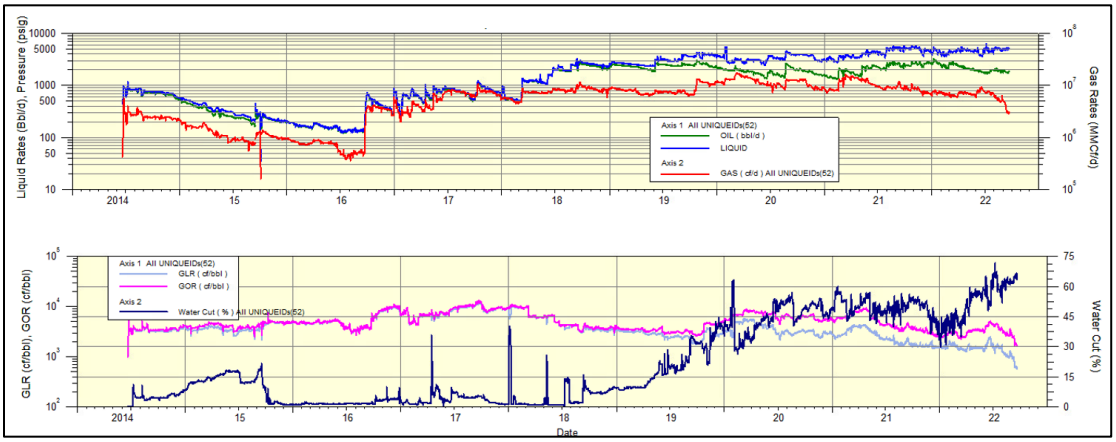

Figure 1.2 Jati Asri (JAS) Production Performance

The low quality of the injection water causes the injection wells to require acidizing stimulation quarterly for 350 million rupiahs per job. From a financial point of view, water injection wells are not a direct income-generating asset like oil wells. This concern challenges us to innovate to make a device that can perform stimulation independently with the same quality as using a stimulation unit so that it does not burden production costs.

2 Auto Suction Chemical Pump (ASCP)

Responding to management's challenge of acidizing stimulation independently, we conducted research based on best practices in the Hydraulic Jet Pump (HJP) design obtained from Kermit Brown's book “The Technology of Artificial Lift Methods Volume 2b”.

2.1 Design

The working principle taken is the vacuum that occurs due to the venturi effect, an increase in speed, and a decrease in pressure in the system (figure 2.1). After obtaining the working principle, the stimulation device is designed, and a fluid dynamic simulation is carried out. The simulation results show that the device can function properly (figure 2.2). The simulation shows that an appropriate combination of nozzle and throat size is required.

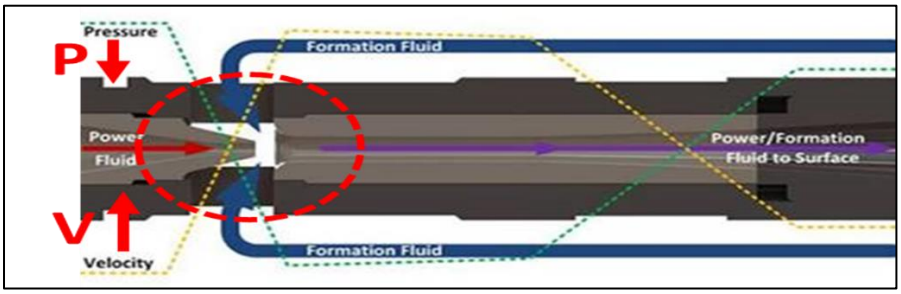

Figure 2.1 Working Principle.

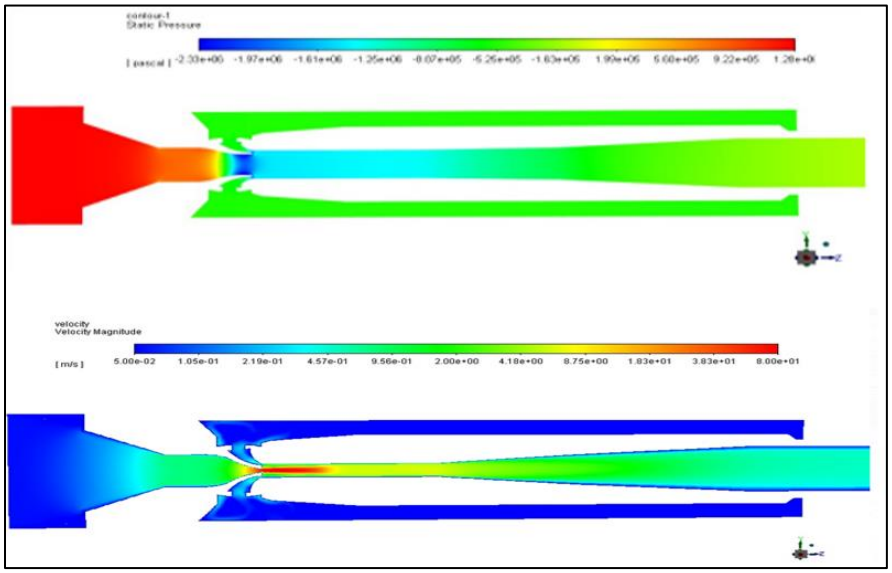

Figure 2.2 Auto Suction Chemical Pump Fluid Dynamic Simulation

2.2 Fabrication

After designing and simulating processes, it shows that the device can function correctly. ASCP prototype was made using 3D printing with a ratio of 1:1. Prototype can work well (figure 2.3). The following process is to fabricate as needed for acidizing stimulation using SS316, a corrosion-resistant material, at the cost of 20 million rupiahs for 1 set of ASCP in 2020.

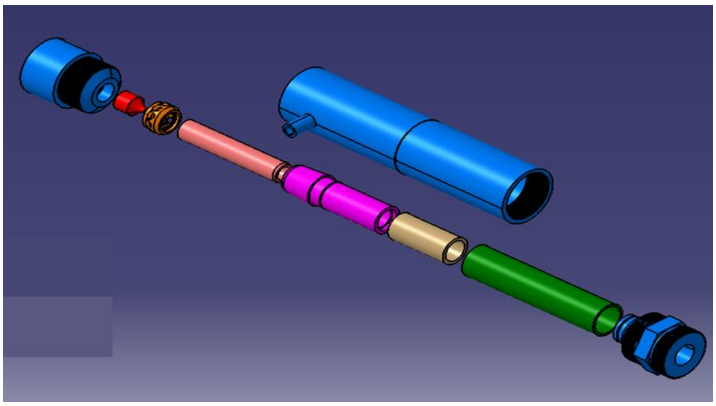

Figure 2.3 Auto Suction Chemical Pump 3D design

2.3 Trial

After the fabrication is complete, a trial is carried out on the injection well directly. This trial obtains the proper ASCP setting so that it functions optimally.

2.4 Full Scale Application

ASCP units have been continuously applied for acidizing stimulation in JAS structure injection wells since March 2022.

3 Evaluation

Acidizing stimulation in injection wells can be performed routinely as needed using ASCP so that the injection rate can be increased and the pressure in the injection wells is well maintained. The injection profile is shown in Figure 3.1. From the Hall Plot of the injection well, it can be seen that the well is in a stable phase, showing no difference in trends due to skin formation, as shown in figure 3.2.

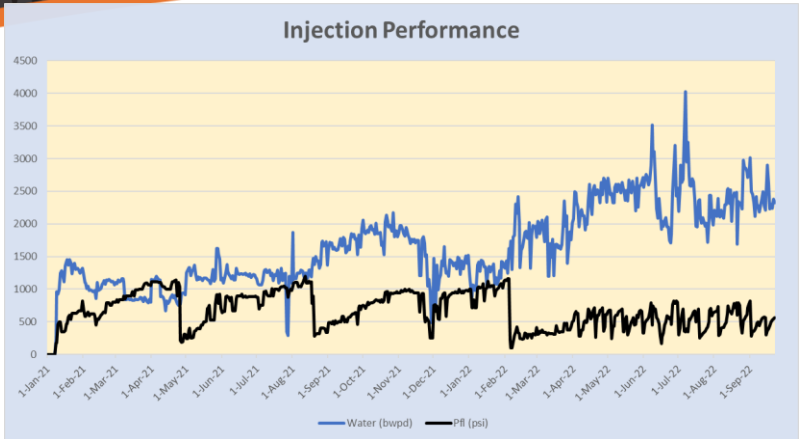

Figure 3.1 Well Injection Performance

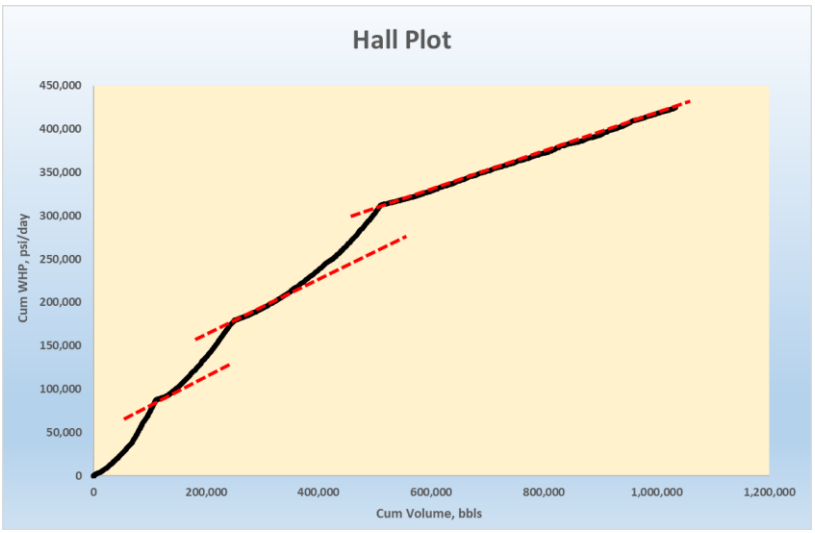

Figure 3.2 Hall Plot Well Injection

ASCP installation enables acidizing stimulation independently because the tool is compact, easy to operate, and does not require external power. After using ASCP in 2022, there is a reduction in acidizing stimulation with third parties from quarterly to yearly. After regular stimulation, SS 316 material used was deformed after two months, so we replaced it with SS 2316 to increase its lifetime with the cost of fabrication from IDR 20 million to IDR 30 million.

4 Conclusion

ASCP is a tool that enables acidizing stimulation independently because the device is compact, easy to operate, and does not require external power. Applying ASCP is the answer to the challenges given by management to maintain the quality of injection wells and reduce operating costs.

References

Brown, K. E. (1980). *The technology of Artificial Lift Methods* (Vol. 2b). PennWell Books.

Acknowledgments

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