Sand Trapper to Mitigate Sand Issues on Sucker Rod Pump

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Abstract
Kurma Field is one of the largest steam flood oil fields in the world located in Riau Province of Sumatra, Indonesia. There are more than 6000 producer wells with depths of 350-700 ft, where most wells use sucker rod pumps as artificial lifts. Since the typical reservoir is unconsolidated sand with a steam environment, Kurma Field faces many pump failures due to sand problems, hence causing high oil loss. In 2019, there were more than 350 pump failures recorded. These failures are categorized as premature or repetitive failure, where pump run-life sustains only less than 30 days or pump failures occur more than 2 times a year. The pump stuck means that its plunger could not move in the upstroke or downstroke direction. Most pump failures involved sand as the main issue.

The size of the sand grain in Kurma field is categorized as fine sand, since P90 of Particle Size Distribution (PSD) is less than 20 µm which this size is much smaller than the clearance between the plunger and pump barrel (0.005 inch or 127 µm). Once the sand grain is trapped between the plunger and barrel, it will increase the chance of the plunger getting stuck and causing the pump failure.

The pump stuck begins with sand settling above the plunger. When sand grain enters and traps between the plunger and barrel, it causes the plunger to get stuck and cannot move upstroke and downstroke. Currently, there are many types of sucker rod pumps specifically designed to overcome the sand problem. Kurma Field has used several types of special pumps. However, those special pumps have not reached the expected pump run life yet. Additionally, there are challenges in the procurement process, delivery timeline, and higher pump prices limiting the implementation of those special pumps, especially in marginal wells.

To prevent sand from settling on top of the plunger, the artificial lift engineering team has innovated a special tool, installed above the plunger known as ‘Sand Trapper’. The primary objective of incorporating this tool is to effectively scrap grains of sand, hence it does not easily enter and trap between the plunger and barrel which may cause the plunger to get stuck when upstroke movement.

Initially, the Sand Trapper was exclusively employed for wells having premature failure with run-life less than 30 days or those experiencing repetitive pump failures more than two times within a year. However, its application has now become more widespread, encompassing wells with a historical sand issue, and running life below 100 days. Kurma Field has a digitized system capable of generating an exception signal for wells indicating pump failure. The system categorizes the OFF well whether it failed within the premature or repetitive failure group or not.
Currently, over 500 pieces of Sand Trappers have been strategically deployed across wells within the Kurma Field, particularly those plagued by historical issues of sand accumulation that have led to premature or recurrent pump failures. Data analysis showed that wells with a run-life of less than 100 days demonstrate the remarkable impact of Sand Trapper to extend the run life, elevating it from a mere 37 days to an impressive 181 days. With this increase in pump run-life, oil loss and well service costs that can be avoided have reached US$ 4.6 MM.