SOLID CHEMICAL STICK APPLICATION FOR OPTIMIZTION OF GAS PRODUCTION

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ABSTRACT
Wide varieties of solid chemical sticks, when properly used, can be cost effective and increase production of gas wells. Determination of the right solid chemical stick is crucial for all applications. Analysis of water, oil, and determination of fluid column height, hydrocarbon content, chlorides, and bottom hole pressure and temperature are used to determine the proper formulation of solid chemical sticks.

For economic reason you can follow the 25-30% removal principal when using soap sticks. It is not unusual to find that if 25-30% of the water column is removed by soap sticks, an equal amount of back psi (25-30%) is eliminated from the formation. This allows a surge of gas that helps remove some additional water for a period of time. This is again achieved by proper selection of solid chemical sticks.

DISCUSSION

Chemical sticks are used to place a small amount of a particular chemical in a well, usually at the bottom or close to the perforated interval. Upon dissolution, the sticks will perform a needed function such as scale removal, foaming of water and or oil, corrosion inhibition, paraffin inhibition or numerous other functions.

The success, following the use of chemical sticks, will often result in the saving of considerable money by reducing wear and fatigue on metal equipment surfaces and time in labor cost and lost production for the oil and gas companies. Often, as in the case of water removal from gas wells, the increased production will pay for the treatment in a matter of hours.

Over the years technology and parameters have influenced the application and formulation of various types of solid chemical sticks.

Soap sticks in general are designed to foam the water in the tubing, therefore lightening the fluid column and allowing the formation pressure to unload the fluid from the well. They are usually either a hard stick in a cardboard tube or bag, or a soft stick or gel in a water soluble tube.

Oil foam sticks are designed on the same principle as the soap stick, but used in wells that have a fluid column composed of 75% condensate or greater.

Combination sticks of one-half soap stick and one-half oil foam stick are very beneficial in wells where there are unknown variables and also wells that produced 25-75% condensate.

Acid sticks are primarily used in water injection wells to remove carbonate scale and rust deposits and also to lower injection pressures. Success has also been experienced in some oil and gas wells in removing scale from the perforations more economically than conventional acid jobs.

Paraffin inhibitor sticks are oil soluble sticks that release paraffin inhibitor to help prevent paraffin deposition from crude oil in production systems. They will not remove deposits already in place.

Salt inhibitor sticks help keep salt in solution by a chelating action, which helps prevent salt build-up in the tubing and perforations of a gas well.

Scale inhibitor sticks prevent carbonate types of scale from down hole in oil and gas wells, casing, tubing and flow lines.

Corrosion inhibitor sticks can be formulated as oil soluble or water soluble. They are primarily used to control common corrosion problems found in producing oil and gas well systems.

Determining the right solid stick for your application is key to your chemical programs success. Several factors are needed to determine which formulation. Fluid column height, hydrocarbon content, chloride content, bottom hole temperature, and bottom hole pressure.

Fluid column height is a rarely known number; however a calculation of the reduction in surface pressure can give you some type of indication of the fluid column height. See table 1

Chlorides can effect the performance of a foam stick, therefore chemical sticks are formulated specifically to perform best in a certain chloride range. While a stick may foam in fresh water, it is possible for it not to foam in 50,000 ppm chlorides. Water analyses are needed to recommend or formulate the correct solid foam stick.

Hydrocarbon content in a fluid column will have a dramatic effect on the way a soap stick performs. Hydrocarbon content is part of the analytical data from water samples.

Bottom hole temperature will require a harder and slower dissolving chemical stick where it will fall further through the fluid column before dissolving, therefore foaming a larger section of the fluid column. Water soluble tubes are recommended to slow the dissolving time of the stick.

Bottom hole pressure if know, the psi at the well head can be subtracted from the bottom hole pressure to calculate the approximate fluid column height.

It is most important to know if the well is flowing or not, because if the well is dead, then there probably is not fluid movement down hole, foam sticks will not be able to create the foam required to encapsulate the fluid down hole, lightening the hydrostatic weight and lifting the fluid to the surface. If a well is dead, then it will be determined that gas generating sticks will be recommended to be use in conjunction with the recommended foam stick.

Tubing size is important, because it will greatly affect the volume of fluid to be removed down hole versus the size stick recommended. You also do not want to put a stick in the production string that is larger than the production string. It is best to try to use the stick diameter size manufactured that best matches up to the tubing size down hole.

Daily production rate is needed to determine not only how many sticks will be required to keep the well unloaded, but it also helps in determining how often we will need to set parameters of automatic soap stick launchers.

All of this information is used in determining the amount solid chemical sticks needed to unload or protect a well.

CONCLUSION

Well #1 recommendation will need a stick with higher *chloride foaming tolerances,* depth addition factors such as depth, flowing pressure, fluid level and bottom hole temperature will also be involved.
Daily production should also be considered.

Well #2 can be treated with a conventional fresh water foaming stick, therefore not requiring the higher *chloride forming tolerances*. Addition factor required are depth, flowing pressure, fluid level and bottom hole temperature. And once again daily production should be considered.

CALCULATION OF FEET IN FLUID IN COLUMN
Example Form*

Normal Flow Pressure	1200 psi
Present Flow Pressure	- 900 psi
Amount Of Drop in Pressure	300 psi

Pressure drop per ft of depth of water is .4330 psi

Pressure drop = feet of water in fluid column
PSI per ft. of depth

300 = 693 feet of water in tubing
.4330

*This is a rough estimate. Other factors can effect pressure loss between the formation and the well head

Table 1
Calculating feet of fluid in column

CALCULATION OF WEIGHT OF WATER
Example form using 23/8 EUE tubing

Feet of water 333
2 3/8 EUE tubing 4BBLS/1000 ft.
Amount of water = (4 x .3) = 1.2 BBLS
Weight of water = 1.2 x 42 gals/ BBLS. = 50.4 gallons
50.4 gallons x 8.3 lbs/ gallon. (ppm of salt is ignored) = 418.32
The initial slug usage of solid chemical sticks is often based on .005% by weight of water in well.
418.32 x .005% (of stick) = 2.09 lbs of chemical stick needed.

Addition EUE Factors

1" EUE tubing = 1.1 BBLS/1000 ft.
2" (2 3/8) EUE tubing = 4 BBLS/1000 ft.
2 ½''(2 7/8 EUE tubing = 6 BBLS/1000 ft.
3 inch EUE tubing =9 BBLS/1000 ft.
3 ½" EUE tubing = 12 BBLS/1000 ft.

Table 2. Calculation of weight of water

WATER ANALYSIS REPORT

SOURCE	WELL 1	WELL 2
Ph	7.4	7.6
Specific Gravity	1.056	1.017
Bicarbonate	142	1,947
Chloride	50,400	13,600
Sulfate	N/D	175
Calcium	3,800	160
Magnesium	681	N/D
Total hardness	12,000	400
Total Iron	40.15	6.25
Barium	375	100

PROBABLE COMPOSITION

Calcium Carbonate	186	648
Calcium Sulfate	N/D	N/D
Calcium chloride	10,084	N/D
Magnesium Bicarbonate	N/D	N/D
Magnesium Sulfate	N/D	N/D
Magnesium Chloride	2,657	N/D
Sodium Bicarbonate	N/D	2,007
Sodium Sulfate	N/D	256
Sodium Chloride	69,111	22,396

Scaling Tendency $CaCo_3$	80º F = 0.33	80º F = 0.63
Scaling Tendency $BaSo_4$	140º F = 1.23	140º F = 1.48

0.5 or above indicates tendency for calcium carbonate scale
1.0 or above indicates tendency for barium sulfate scale.
All Results In Milligrams Per Liter

N/E – Not Evaluated
N/D – Not Detected
N/R – Not Detected