

Restarting Wells After Extended Shut-In Periods

WELL SHUT-IN CONCERNS SUCH AS LOWER TEMPERATURES, STAGNANT OR INCOMPATIBLE FLUIDS, AND THE ABSENCE OF PROTECTIVE CHEMICALS CAN CAUSE RESTART CHALLENGES FOR OPERATORS

OVERVIEW

Multi-Chem, a Halliburton Service, can provide expertise and solutions aimed at minimizing the challenges experienced while re-starting wells after extended shut-in periods.

Conditions such as lower temperatures, stagnant or incompatible fluids, and the absence or depletion of protective chemicals can lead to well restart challenges.

Developing a successful treatment program for paraffin, scale, solids, corrosion, bacteria growth and other challenges requires an understanding of previous treatment programs, how the well was shut-in and what the potential treatment solutions are.

CHALLENGES

- » Lower temperature
 - » Paraffin precipitation (when well temp. < wax appearance temp.)
 - » Can lead to blockages
 - » Gas hydrates
- » Stagnant or incompatible fluids
 - » Asphaltene precipitation
 - » Scale formation/solids sedimentation
 - » Microbial activity
- » Absence or depletion of protective fluids
 - » If shut-in occurred without any protective treatment or insufficient treatment
 - » Bacterial growth and corrosion

RESTART CHECKLIST:

- » Understand history of the production system
- » Evaluate procedures used to shut-in system
- » Explore application options and develop customized chemical treatment program
- » Recommend an ongoing maintenance program to help ensure asset integrity and production reliability



SOLUTIONS

A broad array of options are available to help remediate issues, but the best treatment and success depends on system set-up and actions taken to prepare a well prior to shut-in. Chemical programs in place prior to shut-in will likely need to be re-established.

Paraffin treatment

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| Solvents | <ul style="list-style-type: none"> » Dissolves precipitated paraffins independent of molecular weight or carbon number » Good option where heat, mixing are limited » Solvent becomes saleable product (enters crude oil stream) » Non-chlorinated |
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| Thermals | <ul style="list-style-type: none"> » Hot oil/hot water » Paraffin dispersant helpful to offset cooling over time |
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Scale/Solids treatment

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| Acid | <ul style="list-style-type: none"> » Calcium carbonate » Iron carbonate (corrosion product) » Iron sulfides <ul style="list-style-type: none"> » Can produce H₂S » Is reversible with pH increase |
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| Specialty dissolvers | <ul style="list-style-type: none"> » Barium sulfate and other sulfate scales » Iron sulfide <ul style="list-style-type: none"> » tetrakis (hydroxymethyl) phosphonium sulfate (THPS) and AcroClear® |
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| Surfactants | <ul style="list-style-type: none"> » General and sand-specific |
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Fresh start (establish once paraffin and scale/solids concerns are addressed)

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| Gas wells | <ul style="list-style-type: none"> » Treat liquid-loaded gas wells with a foaming agent |
| Bacteria growth | <ul style="list-style-type: none"> » Use a biocide to remove any growth during shut-in to prepare flow conduit such as tubing and surface lines |
| Corrosion | <ul style="list-style-type: none"> » A corrosion inhibitor treatment will re-establish a layer of protection against general corrosion mechanisms such as CO₂ and H₂S |
| Past and go-forward treatments | <ul style="list-style-type: none"> » Review and re-establish previous treatments, supported by periodic treatments during service life |



For a specialty chemicals treatment program characterized by superior service and chemical application expertise that maximizes the value of your assets, contact us at multichem@halliburton.com

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