# Chemical Treating and Gas Lift Simulataneously in Producing $CO_2$ Flood Wells (North Ward Estes)

Ed Payne
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# Background Information – Challenges Encountered in Producers at NWE while on $CO_2$ Flood

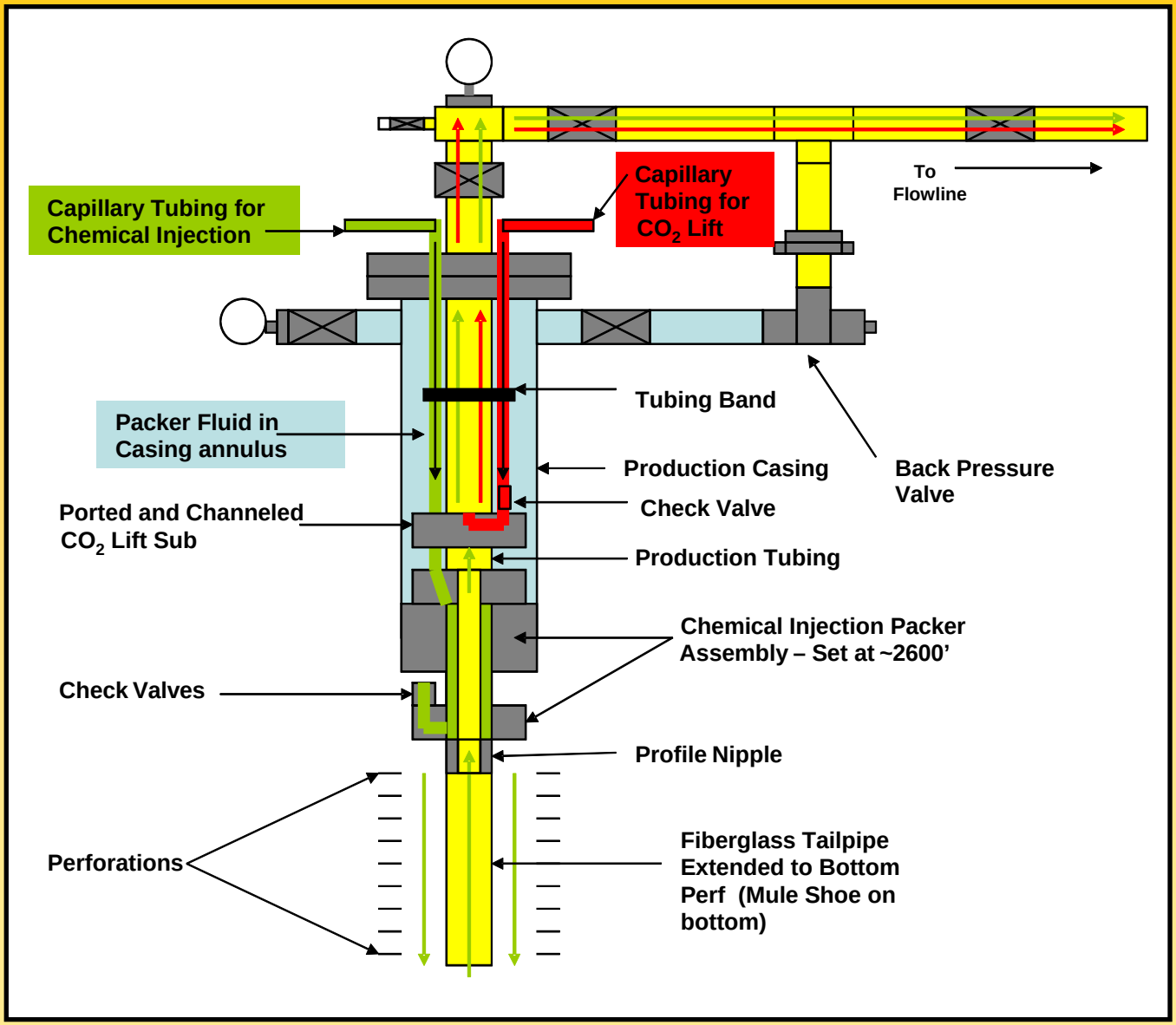
- Increased sand production by accelerated flooding create wellbore filling and loss of productivity.
- Increased corrosion failures by lowered PH, sand abrasion and erosion create artificial lift problems in frictional area's.
- Increased Calcium Sulfate scale deposition in perfs and downhole tubulars (decreased Calcium Carbonate scale tendencies with lowered PH and Temps).
- Addition of Asphaltene/Paraffin in perfs and downhole tubulars (mostly Asphaltene).
- All producing wells would or will experience any or all of the above problems!!!

# Deposition of Calcium Sulfate Scale and Asphaltene Inside of Production Tubing

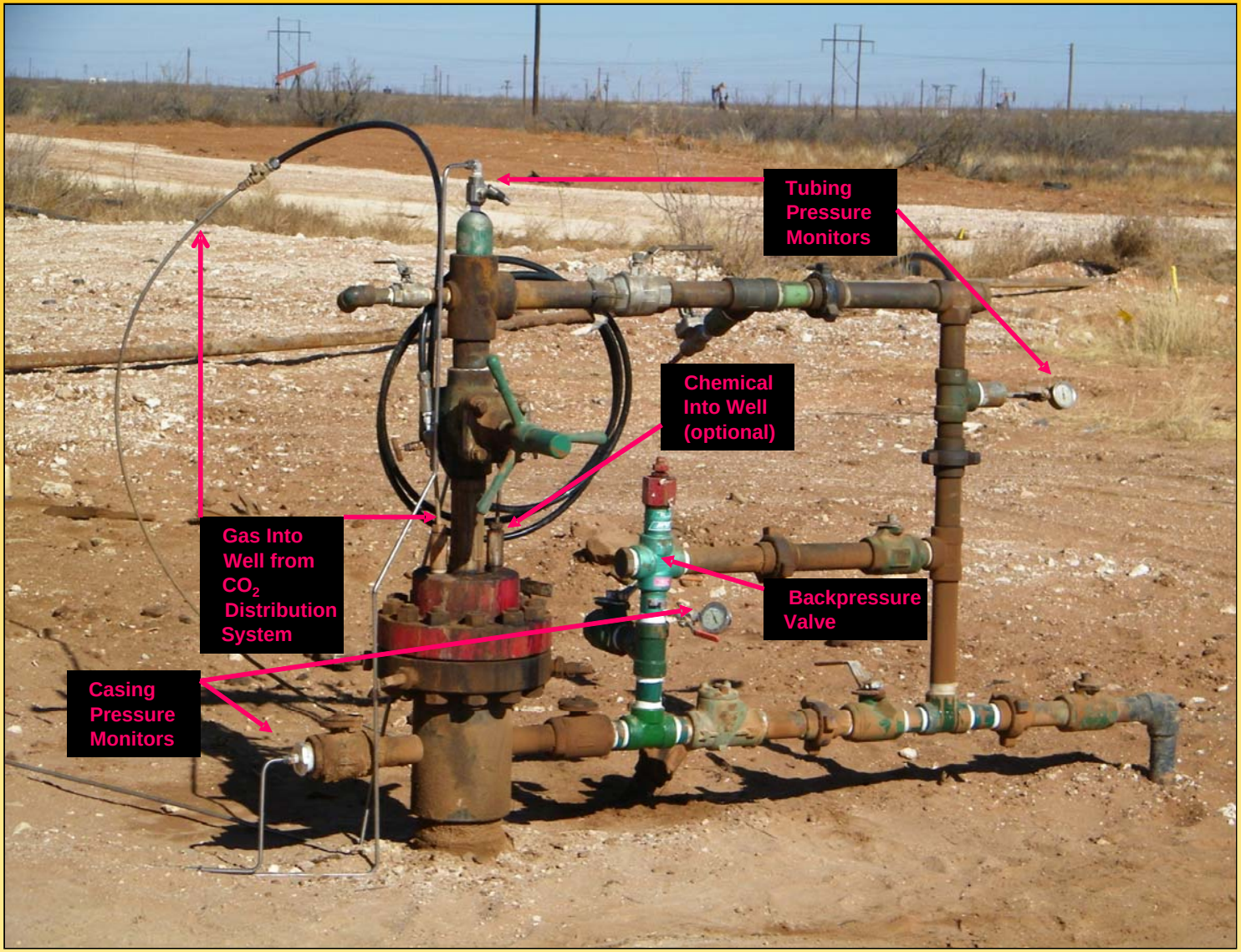
# Background Information – Continued – Things Tried/Continued to Combat Depositional Problems

- Fiberglass tailpipe to prevent Wellbore fill-up with sand.
- Lined tubulars, metallurgy, nickel plating, plastic coating for corrosion issues.
- Xylene spotting to remove Asphaltene/Paraffin.
- Scale conversion and acidizing to remove Calcium Sulfate scale.
- Asphaltene/Paraffin formation squeezes to prevent reoccurrence.
- Scale dissolver (hot and Cold) to remove Calcium Sulfate scale.
- Continuous chemical injection for Scale and/or Asphaltene mixed with $CO_2$ lift gas through capillary tubing when inserted concentrically into downhole tubing.
- Continuous chemical injection for Asphaltene mixed with produced water through capillary tubing when inserted concentrically into downhole tubing (for freezing wells).
- Continuous chemical injection for Scale and Asphaltene mixed with produced water into capillary tubing fixed to the outside of the production tubing and injected around the packer into casing/tailpipe annulus.

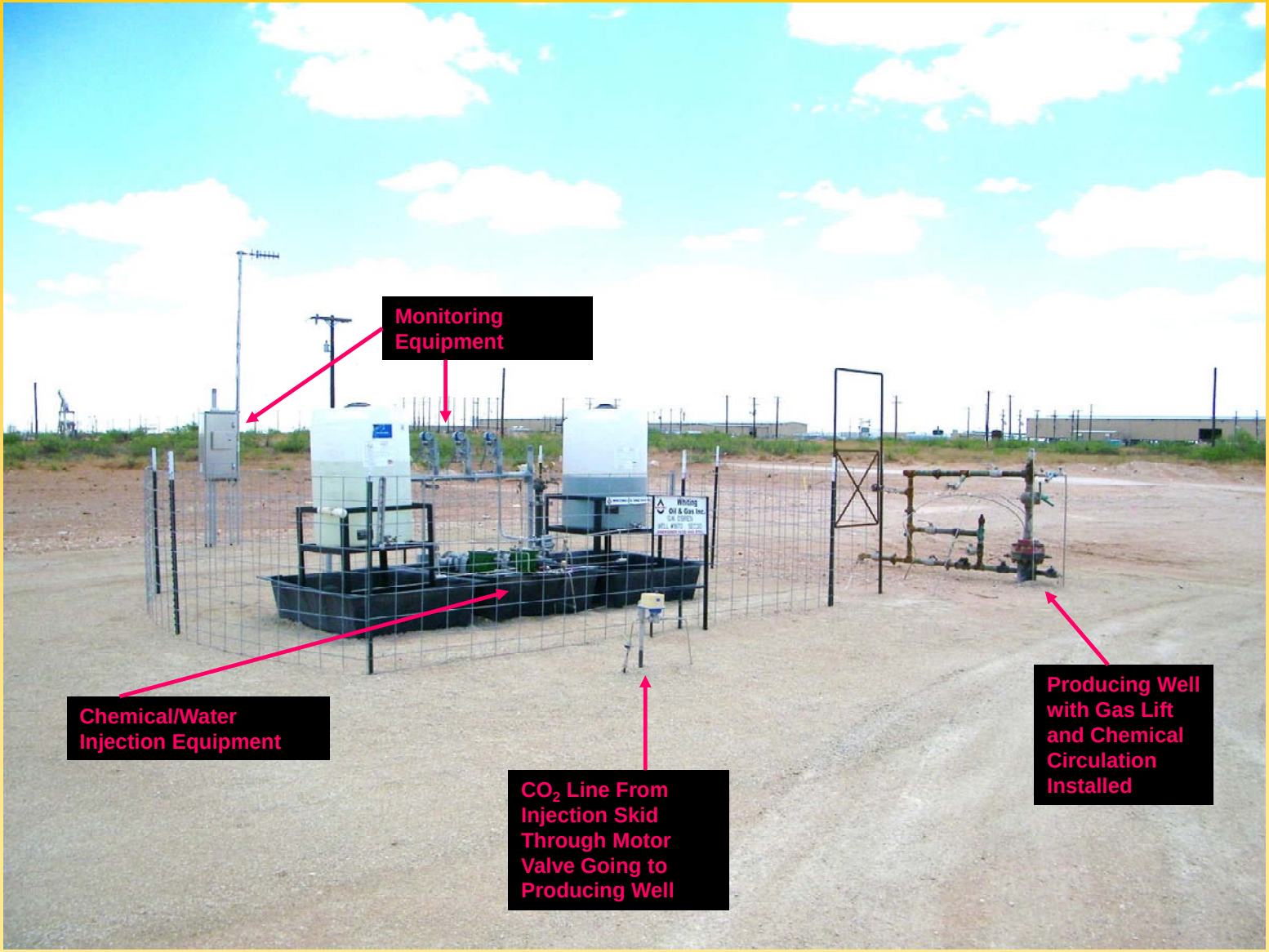
# Exteriorly Banded Capillary Tube System for Chemical Treating and Gas Lift



# Exteriorly Banded Dual Capillary System for Gas Lift Using $CO_2$



# Producing Well With Surface Chemical Treating and Gas Lift Equipment Installed



# Summary

- Our current surface stimulation approach for the removal of Scale and Asphaltene when tailpipe is installed has been effective and will be continued – spot Xylene & soak, spot dissolver & soak, Acidize.
- Chemical inhibitor squeezes are still being evaluated.
- When it becomes necessary to pull a producing well due to performance problems related to the deposition of Scale or Asphaltene, dual Cap strings will be installed to expand the current inhibition program of mixing and pumping chemicals from the surface – will continue to make system improvements as necessary and monitor performance closely.
- Gas lift is being performed by the use of the second Cap string and is working very well, the use of this method (banding Cap string to exterior of production tubing) over concentrically installed Cap strings has several advantages.
- All producing wells would or will experience any or all of the above problems!!!
- Gas lift rates are slightly higher due to straightening of Cap String.
- Can run multiple Cap strings when greater lift volumes are necessary.
- Can't become stuck or collapsed in hole with deposition or adverse forces.
- Can gauge/monitor production tubing ID and tag PBTD without the removal of Cap String.
- Can perform shut-in or active BHP surveys.
- Can perform shut-in temp surveys in tailpipe to detect gas breakthrough intervals without the removal of Cap String.
- Can run tracer surveys through Chem Cap string into casing annulus for gross production profiles, capacitance info can not be obtained.
- Can perform rig-less surface stimulations.
- Can inject produced water into GL Cap to help control freezing when not using for lift.
- Contractors are available for installations.