



## CaCO<sub>3</sub> scaling of oilfield produced water in “electrochemical pre-oxidation–coagulation sedimentation–filtration” process: reason, mechanism, and countermeasure

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### ABSTRACT

Chemical stability of oilfield injection water is a critical factor to avoid corrosion and scaling of water treatment devices and pipelines. Especially, Guangli oilfield (a branch of Shengli Oilfield) has achieved remarkable success in anti-corrosion by applying an electrochemical pre-oxidation process into strong corrosive wastewater treatment, while scaling was aggravated therefore. XRD, SEM, EDS, and chemical analysis demonstrated the major component of the scale deposit was calcite. Succeedingly, chemical analysis of produced water along the process showed that pH, concentration of calcium ions, bicarbonate ions, and suspended solids changed remarkably before and after the mixing reactor. Further studies revealed that the addition of water treatment chemicals (Na<sub>2</sub>CO<sub>3</sub>) in the mixing reactors induced the precipitates of CaCO<sub>3</sub>, which could serve as crystal seeds and resulted in the continuous precipitation of calcium ions. Moreover, calcite saturation ratio increased from 0.97 to 3.94 could contribute to the rise of pH and bicarbonate ions. Consequently, both of them created favorable conditions for crystal growth and incurred more severe scaling problem. The final scale inhibition experiments suggested that the amount of calcium carbonate scale could be mitigated through the dose of scale inhibitors.

*Keywords:* Produced water treatment; CaCO<sub>3</sub> scale; Scaling; Scale inhibitor

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