



Factors influencing CaCO_3 scale precipitation and CO_2 - H_2O system in flowing water in natural water piping system

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Received 20 June 2009; Accepted in revised form 7 October 2009

ABSTRACT

This work considers the factors influencing CaCO_3 scale precipitation and CO_2 - H_2O system for flowing water in steel pipes. An experimental setup is used to simulate the pumping system of water supply in natural water piping system in which a certain amount of water is pumped at a certain pH, temperature, and flow rate as initial conditions. The pH values, temperatures and flow rates increase with the time of circulation of 5 h of each run. The pH of the water samples ranged from 7.2 to 8.0 and temperatures increase by 18–20°C when the flow rates change from 43.3 to 58.3L/min, respectively. Water samples investigated in this study exhibit high concentration of Cl^- , SO_4^{2-} and HCO_3^- as the major anions and Ca^{2+} as the major cation. Saturation ratio of calcite (Ω_{calcite}) increases from 0.03 to 0.10 units, consequently, the amount of scale precipitation increases from 0.2 to 0.4 mg CaCO_3 /kg of feed water. The concentrations of HCO_3^- and CO_3^{2-} decrease from initial to final conditions, while the concentration of CO_2 increases. The saturation with respect to CO_2 was found to be very low and decreases with increasing flow rate and temperature, this implies that CO_2 is released from the water, leading to an increase in the pH value and thereby increasing the possibility for CaCO_3 to precipitate.

Keywords: CaCO_3 precipitation; Natural water; Piping system; Flow rate
