Research Of High Temperature Tolerance Latex Slurry System
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ABSTRACT
This article presents a high performance latex material. By the studies of the stability behavior of different latex slurries, a suitable latex is developed. Matched with the relative cement additives, this kind of latex slurry shows better performances in high temperature environments such as lower fluid loss, adjustable thickening time, quick strength development, anti-gas migration and good resistance ability. The slurry formulations and its set cement performances are also studied. Moreover, the applications of the latex cement slurries in some high temperature wells are described.

KEY WORDS: High temperature; latex; slurry; cementing

INTRODUCTION
With the development of drilling technology in oil exploration and production, the well depth continuously increases, resulting in the increasing of bottom hole temperature. So how to maintain a good slurry performance in high temperature environment is becoming important for cementing operations.
The conventional slurries show high fluid loss, strength degradation, perforating damage in high temperature environment, therefore not meeting the needs of high temperature cementing. Adding suitable latex to a slurry, employing proper cement additives and optimizing their concentrations, a latex slurry is prepared that shows good performance with low fluid loss, high compressive strength and good rheological behavior. Moreover, the latex particles evenly fill in the fine gap of C-S-H gel, which prevents fracture forming and expanding, improving the set cement tenacity and its mechanical characteristics.

LATEX SLURRY PERFORMANCE STUDY
Latex Stability
By the emulsification, the latex particles evenly distribute in a latex solution with a thermodynamically metastable condition. However in the severe conditions such as polar ions, vigorous mechanical agitation and large temperature fluctuations, their stable structures will be destroyed. The latex particles will aggregate and flocculation happens. In a latex slurry there are many multivalent cations such as calcium, magnesium and aluminium from the hydration of cement, and other polar groups of additives, which can break the chemical stability of a slurry. Meanwhile the shearing force during the mixing and pumping process also presents a challenge to the mechanical stability of a latex. Moreover, the low storage temperature and high well temperature also call for high thermodynamic stability for latex (Li and Yao, 1997).

To increase the latex stability, it is necessary to design latex particle structure. By introducing strong hydrophilic carboxyl groups to distribute on the latex particle surface, the latex shows higher chemical stability than that using a physical absorption emulsifier. By adjusting the emulsifier concentration and its ratio to monomer, controlling latex particles size and their distribution, the latex with a soft core and hard shell structure, can be prepared to improve its impact resistance and temperature tolerance. A special emulsifier BCT-830L, which well matches with the latex, can shield the effect of cement high valence ions, further improving the latex stability. Product BCT-800L contains the above emulsifier and the latex.

The thickening tests at 40°C *0.1MPa and 100°C *60MPa for the slurries formulated with Styrene-butadiene latex (SBRL) and with BCT-800L are performed respectively to determine the latex stability. The test results are shown in table 1, “Stable” means the slurry thickness remain unchanged for 60 min at constant temperature under agitation. The results show that slurry with a low content of SBRL will flocculate at high temperature. If the SBRL content increases, the slurry becomes unstable and flocculates at atmospheric pressure. The slurry with BCT-800L containing the special emulsifier, can endure high temperature, high pressure and mechanical agitation, showing good stability. Moreover, increasing BCT-800L concentration doesn’t influence the stability of a slurry.