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Please fill in your author name(s) and company affiliation.		
Given Name	Surname	Company
Qiangui	Li	Xinjiang Grand oilfield Technology Inc.
Zhigang	He	Xinjiang Grand oilfield Technology Inc.

## Abstract

Formation features that cause lost circulation include natural fractures, highly permeable zones such as gravels, and cavities. In most cases, the size of the loss channels is hard to characterize and changed under the action of stress. The uncertainties of the size of loss channels greatly increase the plugging difficulty, especially to severe losses.

Sealing under pressure has been used more and more in improving well bore pressure bearing ability in open hole during drilling complex formations. A high pressure sealing lost circulation pill system has been developed and optimized using lost circulation software and on the base of laboratory-scale experiments and field tests. Applying the high-strength flake lost circulation material (LCM) as the main plugging material, it is fit for the serious mud loss in deep wells. This pill system provides a stronger and more effective seal than traditional treatments.

LCMs has been selected by surface friction coefficient, LCM volume fraction and amount of contact deformation that are the main influencing factors of the strength and stability of the plugged zone. Through the lost circulation software based on big data, optimal particle size distribution of the pill system to seal serve loss has being achieved. The sealing efficiency and the pressure-bearing capacity are greatly enhanced. It was validated in many field trials in West China. Operational practices that facilitate the safe use of this technology with overbalance exceeding 4,640 psi are discussed.

There is a good potential for high pressure sealing lost circulation pill to be reconsidered as an effective approach for severe losses when the proper LCM's size, type and concentration are selected for a wider range of fracture widths. Curing losses using this pill system for a wider range of fractures widths is advantageous since it can cut time and cost compared to current practices.

With the development of the software it is now possible to select LCM and optimize the formula of high pressure sealing lost circulation pill system. This technology can also be used to guide the optimal design of different loss circulation treatments.