

Plug/Annular Cement Integrity Analysis and Fault Diagnosis of Mechanical Plugs

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With continuous well productions, the hydrocarbon potential of oil and gas wells decrease and become more difficult to exploit. The hydrocarbon potential is especially insufficient during later production stages, making it necessary to consider well plugs and well abandonment temporarily or/and permanently.

Appropriate plugging methods (mechanical or chemical plugs) can be selected based on the well type and working conditions available.

Considering the severity of cold Canadian seasons, the likelihood of leakage or even failure of plugs increases. With diverse and complex geographical features, leakage may lead to freshwater pollution, other colossal losses and can quickly escalate to catastrophic damages, which pose a great challenge for design and manufacturing of

more reliable, secure and effective plug devices to satisfy specific plugging and abandonment (P&A) operations.

In the pertinent literature knowledge, mechanical plugs have been widely utilized as an additional protection from the formation pressure or to reduce the usage of cement amount to plug abandoned wells, in terms of which, they can be mainly classified as mechanical bridge plugs and cement retainers. More specifically, there is a wide range of mechanical plug categories based on different classification approaches.