

## A modular approach to building polymer-based durable plugs

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Every oil well, after reaching the end of its life cycle, has to be permanently plugged and abandoned (P&A) in order to prevent the flow of hazardous fluids to the marine environment, groundwater, ground or atmosphere. However, a traditional P&A process can be very costly and time-consuming, especially in the offshore environment. Hence, an alternative solution is proposed to temporarily plug an oil well prior to abandonment, which would reduce the pressure build-up in the tubing and B-section and mitigate the risk for the rig entry. Ideally, the lifetime of such a plug would be 12-18 months and the solution could be directly pumped down the oil well. Our novel approach is based on the development of an environmentally friendly, polymer-based plug that has low gas and water permeability and the capability of autonomous setting as a plug when there is flow and a rough surface. The plug is formed by the cross-linking reaction of functionalized polymer microspheres into a rigid solid under the influence of high temperature. The plug is designed to withstand the extreme conditions of an oil well, especially high pressure, for extended periods of time.

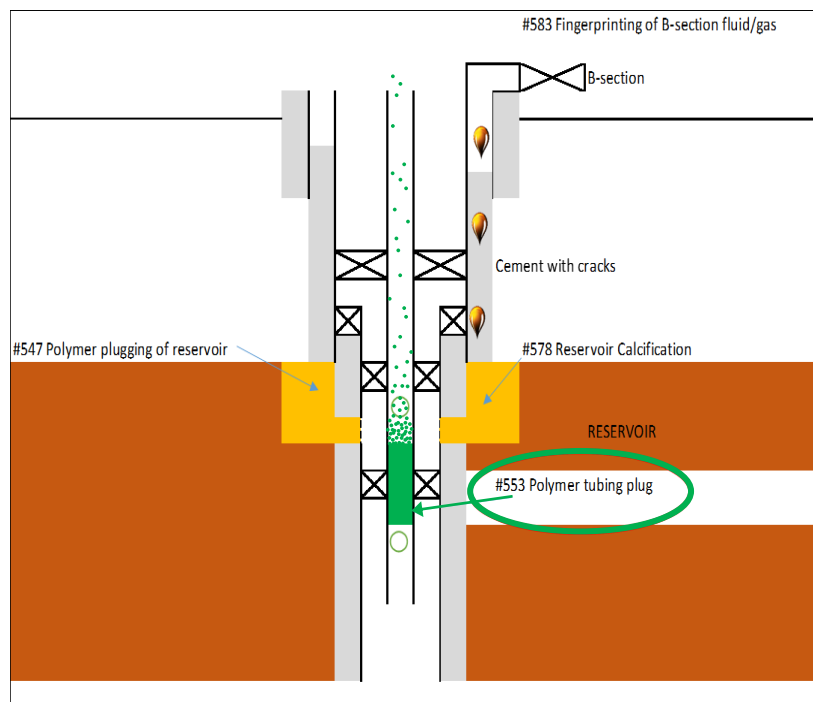


Figure 1 - Well barrier schematic with a polymer tubing plug (green rectangle) formed by covalent cross-linking of polymer spheres (green spheres)