

Application Guide

Choosing an LCM Package for the Permian Basin

The Permian isn't one formation. It's a stack of benches with very different loss-circulation behavior from top to bottom. A package that works in the Delaware doesn't automatically work in the Midland, and a package that handled last quarter's pad might meet a cavernous zone this quarter that laughs at it. Here's how to think through the selection.

Why the Permian demands a broader LCM package

Multiple stacked benches, naturally fractured carbonates, and locally vugular or cavernous intervals mean a single wellbore can pass through formations with wildly different permeability and fracture characteristics. A tight, low-permeability zone might need nothing more than routine mud-cake maintenance, while a fractured carbonate interval a few hundred feet away can take the entire active system in minutes. Building the mud program around one bridging particle size or one mechanism is a bet that the worst loss zone in the well matches what you planned for. The Permian punishes that bet more often than most plays.

Seepage to moderate losses: particulate bridging agents

For fractures and pore throats on the smaller end of the range, particulate LCM does the job by physically bridging across the opening. Mica flakes bridge with flat, plate-like particles across fractured or vugular formation faces. Walnut/ground nut shells (and the coarser granular grade) offer fibrous, resilient particles that resist erosion under continued circulation better than brittle mineral LCM, useful where the pill needs to hold up over an extended interval rather than seal once and be done. Cellulose fiber offers similar bridging mechanics from a biodegradable, plant-based feedstock. Cello Phane's thin, flexible, highly conformable flakes deform into the fracture face and eventually biodegrade, reducing long-term formation-damage risk where that matters for the completion plan.

When the fracture width is uncertain: engineered PSD blends

Where the estimated fracture width is genuinely uncertain, common enough in the Permian's variable bench-to-bench geology, an engineered particle-size-distribution blend (fine/medium/coarse, often combining calcium carbonate, mica, and fiber) applies particle-packing design principles to cover a wider range of fracture widths in a single pill, rather than betting on one particle size guessing right.

Severe and total losses: when particulate bridging isn't enough

Vugular and cavernous intervals, the openings that swallow full circulation in minutes, are past what particulate LCM alone can seal. A swellable/cross-linking polymer pill expands or cross-links on contact with water, closing large fractures, vugs, or cavernous zones that defeat conventional particulate treatments. Diesel oil bentonite (DOB, or "gunk squeeze") is the older, still-effective total-loss remedy: bentonite slurried in diesel to prevent premature hydration, pumped into the loss zone, where contact with formation water triggers rapid hydration into a stiff, hard-to-circulate plug. Which one to reach for first often comes down to rig-site logistics and prior experience with the specific loss zone as much as the chemistry itself.

Productive-zone drilling: the acid-solubility question

If the loss zone is also the productive interval, a real consideration across much of the Permian's horizontal, reservoir-drill-in footage, the LCM choice narrows further. Sized calcium carbonate is the acid-removable weighting and bridging agent purpose-built for this situation: it gives the operator a guaranteed way to remove the bridging material after completion via acid treatment, without the permanent formation damage a non-soluble LCM would leave behind in

the pay zone.

Frequently Asked

Why does the Permian Basin need a broader LCM package than other plays?

The Permian spans multiple stacked benches with naturally fractured carbonates, vugular and locally cavernous intervals, and formations ranging from tight to highly permeable, often within the same wellbore. That range means a single LCM product rarely covers the whole hole; a package built across particle size, mechanism, and severity tier gives a crew the flexibility to react to whatever loss behavior actually shows up.

How do I decide between particulate LCM and a total-loss remedy?

Start with the loss rate. Seepage to moderate losses respond well to particulate bridging agents sized to the estimated fracture width. Severe or total losses in vugular or cavernous intervals typically need a dedicated total-loss remedy like a swellable polymer pill or a diesel oil bentonite treatment, since particulate bridging alone can't seal openings that large.

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