While drillbits have evolved to keep up with the demands of drilling challenging wells, most underreamer technology used to enlarge the well has not. A new version of Weatherford’s RipTide RFID (radio-frequency identification) drilling reamer aims to narrow the gap.

Drilling while simultaneously enlarging hole sections can be an effective technique to save rig time; however, when modern drillbits are paired with an antiquated underreamer design, operators may not see optimum performance. While modern drillbits can handle the more abrasive formations of today’s deepwater campaigns, the same can’t be said for most underreamers, which suffer from excessive vibration and premature dulling in these extreme environments. To address the issue, Weatherford developed the ReamSync borehole enlargement performance system, which includes dull-grading analysis, cutter modeling, and the use of new PDCs with high thermal stability. The company then collaborated with cutter manufacturer US Synthetic to create a premium version of the RipTide drilling reamer featuring a new cutting structure and Deep Diamond PDC (polycrystalline diamond compact) cutters for challenging deepwater applications.

The key to ensuring underreamer performance is keeping the cutters sharp. When the drillstring rotates, tool vibration, thermal variations, and the abrasiveness of the formation cause the cutters to dull and impair reamer performance. To mitigate these issues, US Synthetic recommended its Deep Diamond PDC cutters for this application. Using a proprietary reattachment material in conjunction with US Synthetics’ patented manufacturing process, the Deep Diamond cutters have been developed to have thermal stability that is comparable to deep-leach performance, and substantial abrasion resistance, which is key to maintaining a smooth borehole.

“As a result of our collaboration with Weatherford, we learned about the RipTide reamer’s ability to minimize vibration and stabilize the reaming environment, and saw an ideal opportunity to apply our Deep Diamond technology,” says Rick Frost, international sales director/product management, US Synthetic.

Using the right cutters is only part of the solution. The other is putting them in the right place.

The original RipTide reamer uses triple cutter blocks that are plural set, which means each block is identical and cuts the same area. For extremely abrasive formations, however, Weatherford favors a single set design. In a single set design, the blocks are slightly offset, which enables each cutter to work evenly, in concert with each other, while distributing the work rate, which reduces vibration, says Eddie Valverde, drilling services business development manager – Western Hemisphere, Weatherford.

“In a 360° rotation, the cutters are all working evenly and removing the same amount of formation,” Valverde says. “The change from a plural set to a single set enabled us to drill a smoother borehole, with decreased vibration and, after adopting the new cutters from US Synthetic, it allowed us to drill through some very abrasive formations without dulling the cutting structure.”

With better cutter placement and improved abrasion resistance, the marriage of these two technologies created a more stable environment with less vibration, leading to better underreamer performance.

This new version of the RipTide RFID drilling reamer has been run in the Gulf of Mexico on two occasions for hole sections that kicked off after the salt layer and transitioned from the Miocene section (sandstone to shaly) into the very abrasive Wilcox sand.

“We have seen more than 75% improvement in the dull grading, which means we’ve had zero-dull grading on these two runs. Coupled with that, we were able to meet the client’s rate-of-penetration objectives, and we were able to finish the entire section in one run,” Valverde says. “Ensuring that the RipTide can make it down with zero-dull grading is very important. That gives the client confidence that the borehole is large enough to run casing and cement it properly.”