Drillstring Briefs: To hardface or not to hardface

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THE EFFORT TO EXTEND drill string life and to reduce overall drilling costs has been underway for many years. Some seventy years ago, D-55 and E-75 tubes received bucked on, counterbore weld, or shrunk on tool joints. Neither tubes nor tool joints lasted very long, so extending tool joint life with hardfacing was not a big issue. Using some of the drill string weight for bit weight was fairly common. If the tool joints wore out before the tubes, replacements in the field or in nearby machine shops could be done.

Unitized (flashwelded) drill string was introduced in 1939. This better drill string lasted longer by the introduction of better drilling practices. In time, it became obvious that tool joints generally wore out before the tubes. The economical answer to this dilemma was to hardface the tool joints; this was easier and safer with unitized drill string. The first applications were with cast tungsten carbide because this very wear resistant material proved itself every day on drag bits and on the teeth of rolling cutter bits.

It was observed that cast tungsten carbide particles, which were at or above the tool joint tong surface, did damage casing. Drill string shipments had to be packed carefully so that raised cast tungsten carbide did not rub against adjacent tubes during transport. When newly hardfaced tool joints were run inside casing, where the clearance was low, there were times when the casing appeared to "grow" and had to be torch cut before it hit the rotary table.

Casing wear has never been an acceptable side effect. Over the years, many products have been introduced in an effort to reduce tool joint wear and to eliminate casing wear. Our problem may be that we are trying to eliminate casing wear by using materials that offer less protection for tool joints.

In today's market, tungsten carbide hardfacing is still a factor, but now it tends to be sintered, rounded particles applied with a torch hot enough to put the surface particles into solution. There are many commercially available alloys (without tungsten carbide) and comparative testing continues. All strive to provide protection against tool joint wear, commensurate with that afforded by tungsten carbide, and without being more damaging to casing. Do remember that surface smoothness of all hardfacings is a factor and this ties in directly to side loads. A thousand pounds (lbf) on a small high spot (0.250 square inches) can be much more damaging than the same force on a large high spot (2 square inches).

Your job as an end user is to study all the options available and to pick that which is most economical in your part of the oil patch. Your goal is to extend tool joint life and minimize casing damage.■