

## Choice of Hardbanding Wires Can Make a Significant Difference Financially

Making the right hardbanding product decision can have significant implications on the overall cost of operating a drill string. With a properly trained labor force and attention to detail when specifying hardbanding products, the hardbanding industry can provide superior protection of valuable drill pipe along with the necessary attention to casing protection. With longer laterals and complicated well bore profiles, choosing a hardbanding material with the chemistry to provide the perfect balance of abrasion resistance, casing friendliness, and the reliability of multiple re-applications is becoming even more critical to reduce costs and drill pipe downtime.

The recent economic downturn in the oil and gas industry has shown us all that accessory service companies must provide methods to reduce cost and increase productivity. Improving products and procedures for hardbanding tubular goods is one way the hardbanding industry can contribute value. In fact, the decision on which hardbanding products and procedures to select can have significant financial implications. The requirement to remove and replace the hardbanding on drill pipe can have dramatic financial consequences.

The table below shows a financial model of choosing a hardbanding wire that can be reapplied indefinitely due to stability of the wire chemistry when compared to a hardbanding wire that requires removal due to instability.

Hardbanding that must be Removed Periodically Due to Instability					Hardbanding that Does Not Require Removal				
Application Log	Application Cost	Additional Cost For Removal and Buildup	Accumulated Cost	Estimated Dilution %	Application Log	Application Cost	Additional Cost For Removal and Buildup	Accumulated Cost	Estimated Dilution %
Initial Application	\$75.00	\$0.00	\$75.00	30	Initial Application	\$75.00	\$0.00	\$75.00	30
1st Reapplication	\$75.00	\$0.00	\$150.00	9	1st Reapplication	\$75.00	\$0.00	\$150.00	9
2nd Reapplication	\$75.00	\$0.00	\$225.00	3	2nd Reapplication	\$75.00	\$0.00	\$225.00	3
3rd Reapplication	\$75.00	\$0.00	\$300.00	1	3rd Reapplication	\$75.00	\$0.00	\$300.00	1
4th Reapplication	\$75.00	\$140.00	\$515.00	30	4th Reapplication	\$75.00	\$0.00	\$375.00	< 1
5th Reapplication	\$75.00	\$0.00	\$590.00	9	5th Reapplication	\$75.00	\$0.00	\$450.00	< 1
6th Reapplication	\$75.00	\$0.00	\$665.00	3	6th Reapplication	\$75.00	\$0.00	\$525.00	< 1
7th Reapplication	\$75.00	\$0.00	\$740.00	1	7th Reapplication	\$75.00	\$0.00	\$600.00	< 1
8th Reapplication	\$75.00	\$140.00	\$955.00	30	8th Reapplication	\$75.00	\$0.00	\$675.00	< 1
9th Reapplication	\$75.00	\$0.00	\$1,030.00	9	9th Reapplication	\$75.00	\$0.00	\$750.00	< 1
10th Reapplication	\$75.00	\$0.00	\$1,105.00	3	10th Reapplication	\$75.00	\$0.00	\$825.00	< 1
11th Reapplication	\$75.00	\$0.00	\$1,180.00	1	11th Reapplication	\$75.00	\$0.00	\$900.00	< 1
12th Reapplication	\$75.00	\$140.00	\$1,395.00	30	12th Reapplication	\$75.00	\$0.00	\$975.00	< 1

When reviewing the cost table, it is assumed:

- 1) That the life of a drill pipe connection will survive the duration of 12 hardband reapplications before the drill pipe is downgraded or scrapped.
- 2) When comparing the cost differences between a hardband material that must be removed and reapplied versus a hardband material that doesn't require removal, the difference in cost of 1 tool joint connection is \$420 USD (\$1,395 – \$975 USD) over the life of the connection.
- 3) For an assumed drill string of 700 connections, a savings of \$420 USD per tool joint for a hardband that doesn't require periodic removal equals a total savings of \$294,000 USD over the life of the 700 connection drill string.
- 4) Hardbanding application and removal costs are approximate and will vary based upon location and economic conditions.
- 5) The table also addresses the approximate dilution percentages as hardbands are installed and/or removed. With lower dilution percentages of the hardbanding due to not requiring removal, the hardbanding should last longer and further impact positive cost savings.

Duraband®NC can be applied an unlimited number of times due to the stability of the wire chemistry. Removal of some competitive hardbands after a number of applications as the wire reaches an undiluted, possibly unstable condition is expensive and time consuming.