

# Epitaph of a Cracking Hardband

“All cracked up.... & Buried in the Mud”

**It is time for the drilling industry to say goodbye to cracking and spalling hardbanding materials.**

Today, some companies are being forced to spend significant amounts of time and capital on the resultant cost of cracked and spalled hardbands. Cracking can lead to casing damage, expensive tool joint repairs, and unnecessary fishing. This cracking and spalling is not needed and should be consigned to the past.

Duraband® NC. was introduced to the drill pipe industry over 10 years ago, it was the first truly 100% non-cracking, casing-friendly, hardband alloy. Spalling hardbands were no longer a concern. The consequent popularity of Duraband has persuaded other brands to come up with their own version of a crack-free hardbanding. The term “Casing-Friendly Non-Cracking Hardbanding Wire” is now often attached to marketing material of any new product which enters the market. However, the term non-cracking should not be thrown around so easily, nor should it be accepted so quickly. A true non-cracking product must have a stable welding metallurgy which ensures the ability to apply the product in multiple layers without concerns of cracking. This means it will remain casing-friendly during re-applications for the entire useful life of the drill string, and expensive repair costs and accelerated casing wear are avoided.

Duraband has proven that metallurgically it is possible to have a “Casing-Friendly Hardbanding Wire” that is non-cracking on the first and every application. It does not matter whether you are applying this hardband alloy onto a new tool joint for the first time or re-applying it for the third time, the hardband layer will be non-cracking providing that proper procedures are followed. The correct chemistry to achieve this was formulated after years of research and development.

Various products introduced to the market in recent years carry the claim of being non-cracking, but upon further examination it turns out these claims may not be accurate. To be considered crack-free, the product should never suffer from cracks on the first application or later re-applications. It must not begin to spall and should never have to be removed after 2 or 3 re-applications. A spalling hardband can easily become a sharp mill tooth against the casing. After the second and third application, hardbanding wires without a truly balanced, non-cracking chemistry start to show their true tendencies as welding dilution from the tool joint is minimized on each successive hardband layer. By the third pass, the hardband is normally 90-100% pure hardband wire and only about 10% parent steel. It is the later re-applications when problems of spalling and delamination begin, because unstable elements in the wire are more abundant in the welded layer. In other words, they are NOT 100% crack free after all.

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As shown in the above photos, the “delamination” of the current hardband verifies that the previous hardband is not a “true” non-cracking hardband alloy. The most likely cause is an unbalanced, unstable chemistry that begins to show its true properties after 2 or 3 re-applications.

Upon further investigation, the below pictures show that the delamination is not limited to the current hardband application. The delamination is presenting itself all the way down to the parent material of the heavy weight tool joint and potentially into the tool material itself.



As the delaminated (or spalled) fragments of hardband have to go someplace, they are captured in the drilling mud and screens, and brought to the surface. The problem is that depending on the size of these pieces of hardband alloy, there are multiple issues that can arise as this debris works its way to the surface. These fragments have a hardness of ~60RC, if they get stuck in between the tube/TJ and the casing, they can put gouges into either and cause major damage. The spalled hardband can also cause major damage specific components to the BOP, etc. Fishing for loose pieces of hardband is expensive and time consuming.

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The below pictures show that the cracking of the hardband goes below the first pass of the original hardband, when it was applied to the heavyweight pipe.



Not only can the delamination (spalling) develop between the second and third layer, BUT the migration of the cracks can propagate into the initial layer of Hardbanding wire, and potentially into the tool joint. When delamination (spalling) happens, the stated “casing friendly” hardband now acts like a milling tool, due to the sharp edges of the delaminated fragments of hard material.

In addition, the spalling pieces of hardband will most likely get caught in the screens or they will have to be fished out.

Cracking in hardbanding should have been consigned to the past. The introduction of Duraband® NC more than 10 years ago made cracking an unnecessary risk. The chemistry of the hardbanding material is paramount. Many products, marketed as non-cracking, have been proven to crack on first application or when dilution from the tool joint reduces with reapplication. When using a product with a stable chemistry like Duraband, multiple non-cracking hardband applications are possible. Only then does hardbanding serve its purpose, by safely protecting the drill string and casing.



Duraband after multiple applications