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# Coiled Tubing Inspection

Inspection Note 7 – rev 3 / Oct. 2002

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Coiled Tubing (CT) failures generally occur due to: a) Random Mechanical Damage (MekDmg  $\approx$ 25%); b) Corrosion pitting (PIT  $\approx$ 30%); c) Fatigue (FTG  $\approx$ 5%); d) Manufacturing and Handling induced damage (Mfg/Hndl  $\approx$ 10%); e) Errors and omissions (Err  $\approx$ 15%) and f) miscellaneous Other reasons (Other  $\approx$ 15%).

HP/HT STRIP



4.50" PIPELINE



DRILLING



OFFSHORE WORKOVER



BASELINE



FRAC



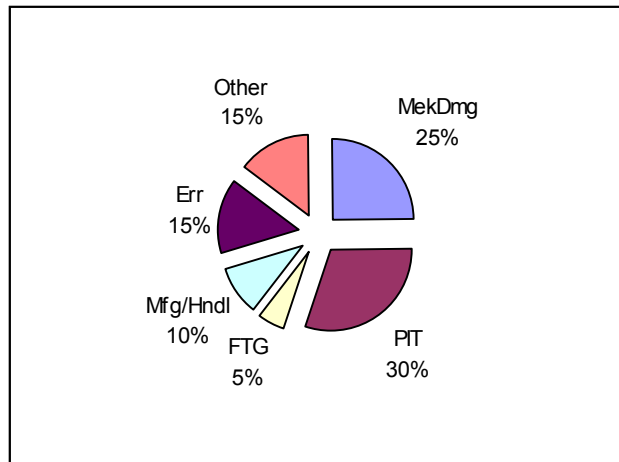
PRODUCTION



FATIGUE LINE TEST



FATIGUE FIELD TEST



Where CT inspection is concerned, general failure charts, such as the one above, are meaningless because they portray the CT failure causes as viewed by a certain organization or even a single individual over an undefined geographical area and CT deployment. On the other hand, CT inspection must always be focused to the specific application in the specific geographic area. For example, North Sea workover CT failures are mostly unrelated to production coil failures in Alberta Canada or to CT pipeline failures in the Gulf of Mexico.

To make things worst, generic “*CT inspection unit specifications*” are drawn and justified from those across-the-board failure charts under the false assumption that one inspection unit configuration will cover all of the CT inspection needs. STYLWAN, the pioneer of CT inspection, has learned through extensive worldwide experience that multiple focused inspection unit configurations are the only scientifically sound and cost effective solution to the CT inspection problems.

## work coil failures

Actual data from offshore CT workover operations indicate that approximately 46% of the failures are Fatigue related due to corrosion pits acting as stress concentrators. Furthermore, a similar Fatigue mechanism accounts for failures due to random mechanical damage, bringing Fatigue related failures closer to 80% of the documented CT failures. This does not include coils that were rejected from further offshore use during an onshore inspection. Wall thinning (wear, neck-down etc.) accounted for less than 5% of the failures. The majority of the remaining failures are attributed to field weld failures, CM weld pinholes, Errors etc.

Insignificant markers to the CT condition are the two CT industry darlings ***Ovality*** and ***Ballooning***. Combined, they were detectable in less than 1% of the failures. Laboratory analysis of CT failed sections indicates that 0.48% of those failed tubes had ballooning greater than 2% around the failure. One would reasonably then conclude that the “*CT inspection unit specifications*” would demand Fatigue detection first and foremost (see Inspection Note 8 on Fatigue).

## ElectroMagnetic Inspection



3D inspection head with 3.5” ID clearance, **Dynamic 3D-Scan (CoilScan)**, **Dynamic 3D-Scope (CoilScope)** – on the Top), **3D-Scan** (Bottom) and **PC** (Readout & Storage). **SkelpCheck** on the right.

The field configuration of the STYLWAN Three-Dimensional Finite Element Inspection (3D-FEI) equipment is always focused for the specific application through the ***Inspection-Profile*** that fine-tunes the ***imperfectionDNA*** through **MULTISLOPE** techniques.