

30th DCA Annual Congress – Rome

Drilling Tools Breaking Down Hole

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Subject :

Drilling Tools Breaking Down Hole



Questions:

What is the leading **root cause** of downhole **tool failures**? report?

What role could **real-time monitoring** and **predictive maintenance** play in preventing catastrophic downhole failures?

What are the most common actual causes of **drill pipe breakages** – material, fatigue, torque, bending, handling, or wrong operating parameters?

As a driller we know by the feel and measurements from gauges on the rig **how well a bore hole has been swabbed**. A decision is usually based on experience or checking data from the rig. Can **drilling data** be better used to produce efficient **identification and reduced risk** before pipe installation?

Calculate costs for lost drilling tools for the client **with and without a geological report**?

Discussion points

- Bore plan, design radius, consider combined radius !
- Consider the reamer radius, Reamers are rigid tools that do not as flexible as drill pipe like to be bent as much. An Easy rule of Thumb is to divide the reamer diameter in meters by 2 and multiply by 1000

Example a 500mm reamer has a minimum radius of 250m

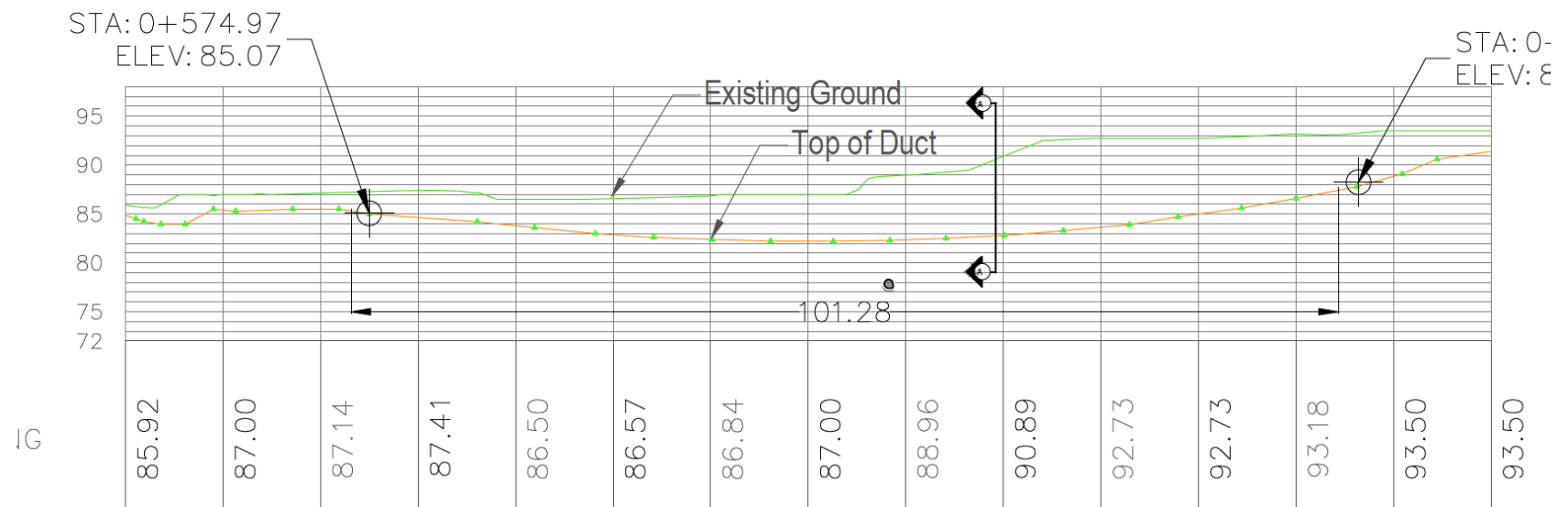
- Tooling inspection to either API spec RP7 G or NS2
- Clean mud with Sand content, ideally less than 0.25%, especially when running mud motors. Also run filter systems to prevent blocking nozzles And
- Regularly steam clean/pressure wash inside of tools to prevent corrosion and debris and blockages

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- Use Thread protectors on tools when not in use, and clean them regularly !
- Using correct pipe dope and apply correctly
- Use storage compound for long term storage of tools]
- Take accurate measurements of tooling before it goes down hole – This maybe fishing purposes
- Data is key !.... Record tooling hours, revolutions, mud flow, torque and push/pull forces for each project and compare reaming data with pilot hole data
- Plan reaming stages to remove similar volumes per pass and compare with mud pump capacity and bentonite cutting carrying capacity
- Use centralisers mainly when running in rock, typically 1-2” smaller diameter than pilot hole
- Torque connections to API or manufacturers specifications

Bore profile – Check

- Planned radius
- Combined radius
- Elevations of entry and exit relative to each other
- Geology
- Reaming stages



Tooling inspection

Visual Testing (VT)

- **What it does:** Relies on the naked eye or optical aids (like magnifying glasses or borescopes) to check external and internal surfaces.

Magnetic Particle Testing (MT / MPI)

- **What it does:** Applies a magnetic field to ferromagnetic steel components and dusts or floods the area with iron particles. Flaws disrupt the magnetic field, causing particles to cluster and outline the defect.

Ultrasonic Testing (UT)

- **What it does:** Sends high-frequency sound waves through the metal volume and analyzes the reflections bouncing back from internal boundaries or discontinuities.

Dye penetrant inspection (DPI)

- **What it does :** A non destructive testing method used to find surface breaking defects
- **Measuring the threads** with a certified inspector to check they conform to API specifications/standards

Cracks shown with MPI and Dye penetrant inspection



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Tooling inspection report example



Drill Pipe Inspection
Tally Sheet
API



Date 01/09/2026

Customer Location SLIMDRIL YARD

Work order 6932 page 20F3 P.O. No.

Nominal O.D. 65/8" Lbs/Ft 27.7# Grade S135 Range 2

Tooljoint O.D. 8 1/2 Nom. Wall 0.362 Conn. 65/8FH DS Bevel Dia 7 11/16

Customer tong space notification requirements

Tong space less than

Pin Box

 Pin & Box are getting short

Body						Pin						Box					
Log No.	Serial No.	Min Wall	Length Sh-Sh	Comments	Class	O.D.	I.D.	Tong Space	Bevel Dia	Conn Cond	Hard Band	O.D.	Tong Space	Shldr Width	Bevel Dia	Conn Cond	Hard Band
		70% 0.253 80% 0.290															
	10029	0.388				8 1/2	4 1/4	11 1/2	7 11/16	OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10102	0.375				8 1/2	4 1/4	11 1/2	7 11/16	CORR	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10071	0.362				8 1/2	4 1/4	11 1/2	7 11/16	OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10057	0.359				8 1/2	4 1/4	11 1/2	7 11/16	OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	FD/OK	NONE
	10076	0.370				8 1/2	4 1/4	11 1/2	7 11/16	FD/OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10066	0.364				8 1/2	4 1/4	11 1/2	7 11/16	OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10035	0.386				8 1/2	4 1/4	11 1/2	7 11/16	OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10017	0.384				8 1/2	4 1/4	11 1/2	7 11/16	CORR	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10087	0.380				8 1/2	4 1/4	11 1/2	7 11/17	CORR	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10100	0.372				8 1/2	4 1/4	11 1/2	7 11/16	OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	FD/OK	NONE
	10061	0.365				8 1/2	4 1/4	11 1/2	7 11/16	OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10028	0.359				8 1/2	4 1/4	11 1/2	7 11/16	CORR	NONE	8 1/2	15 3/4	11 1/16	7 11/16	FD/OK	NONE
	10125	0.363				8 1/2	4 1/4	11 1/2	7 11/16	CORR	NONE	8 1/2	15 3/4	11 1/16	7 11/16	FD/OK	NONE
	10011	0.372				8 1/2	4 1/4	11 1/2	7 11/16	CORR	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
	10109	0.358				8 1/2	4 1/4	11 1/2	7 11/16	FD/OK	NONE	8 1/2	15 3/4	11 1/16	7 11/16	OK	NONE
GOOD	9									9							
REJECTS	6									6							

Comments FIELD DRESS CARRIED OUT.

ALL SERIAL NUMBERS PREFIXED WITH 1821.

CORR :CORROSION
CR :CRACK
PRO :PROFILE
SD :SHOULDER DAMAGE
TD :THREAD DAMAGE
DV :DIAMETER VARIATION
PN :PIN NECK

EXP :EXPANDED
OT :OVERTORQUED
STJ :SHORT TOOL JOINT
MRF :MACHINE REFACE
BD :BEVEL DIAMETER
RF :REFACE
FD :FIELD DRESS

SAD :SLIP AREA DAMAGE
CS :COUNTERSORE DIA
WO :WORN
DAM :DAMAGED
ECC :ECCENTRIC WEAR
FL :FLUSH
PR :PROUD

Internal Plastic Coating Condition

- Coating intact with no visible deterioration
- Coating intact on more than 70% of surface and is not visibly flaking
- Coating is absent or deteriorated over more than 30% of the surface, or is visibly blistered
- Coating is absent or deteriorated over more than 50% of the surface, or is visibly blistered

Inspector G ENGLAND

Body Condition

N: New
P: premium
2: Class 2
3: Class 3
5: Class 5

Doc ID API 502



Seal face damage,
caused by possible
impact or over bend



Impact damage and
corroded threads

Note one bad connection can cause like a Virus in the string !



Scoring (from maybe a sheet pile or something)to the drill pipe can cause failure

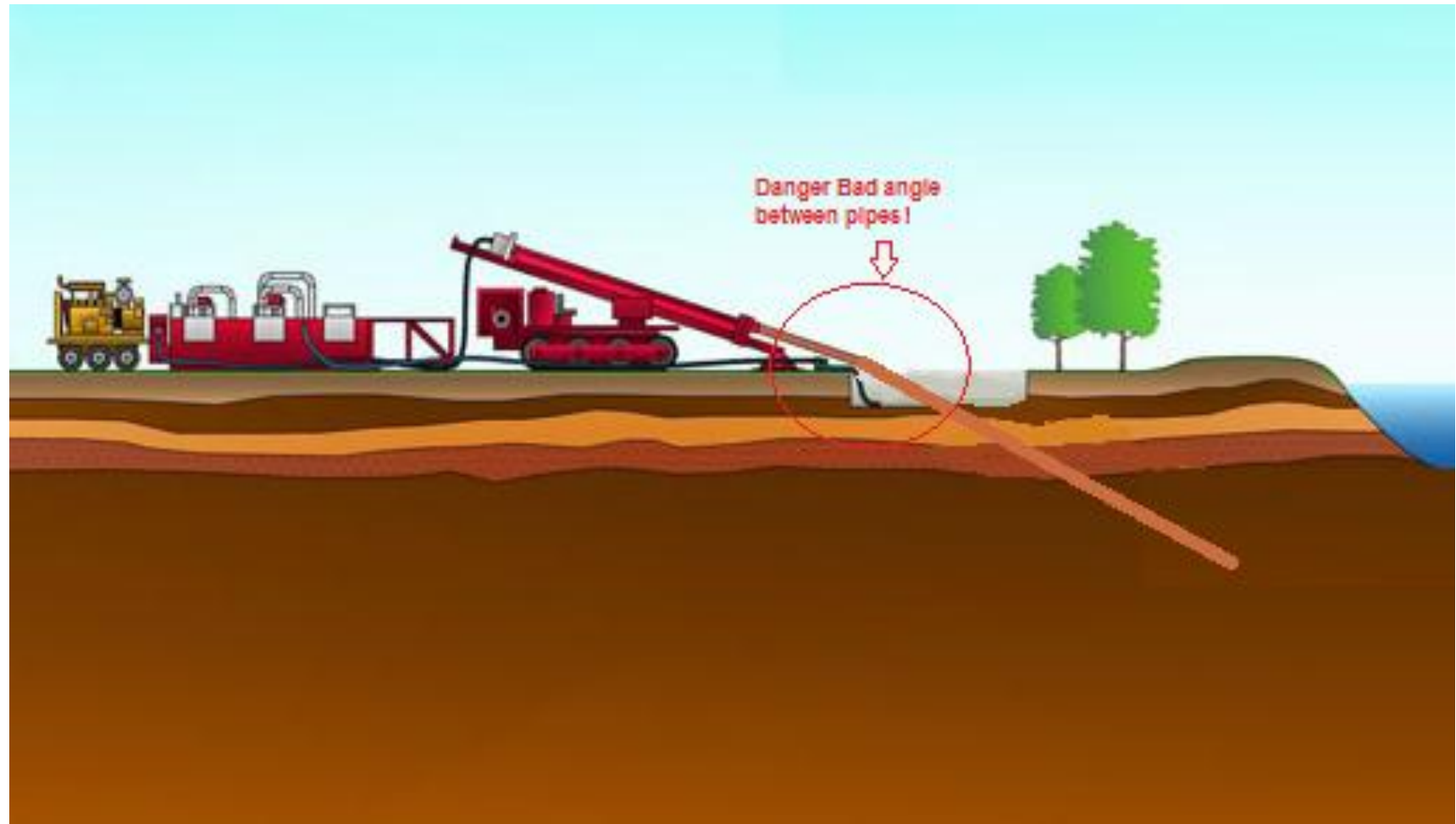


Cracks in the area of the friction weld on API pipe found during inspection



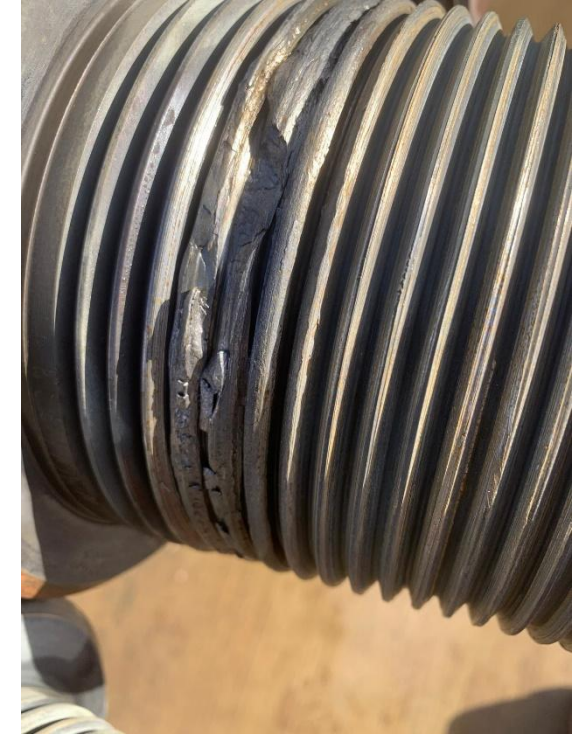
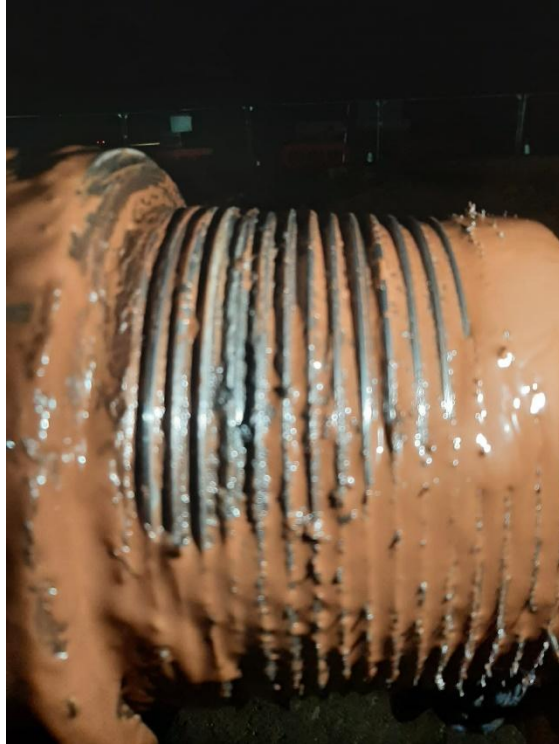
Cracks in the weld
because Rock reamer
used on a tight radius

Alignment of Drill rig – Drill pipe



Rig angle to drill pipe is critical to prevent thread damage

Alignment of Drill rig – Drill pipe



Damaged threads caused by poor alignment compressing the thread on the low side and pulling it on the upper side

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Correct way to dope threads to prevent galling

Full seal face and thread coverage important



Use Thread protectors, when tools are not being used and regularly clean them as they pick up grid and abrasive material



API - Torque chart

Torque is measured in
Ft –Lbs or NM

Not PSI or Bar !

CONNECTION					MAKE-UP TORQUE (FT-LBS)	TENSILE STRENGTH (POUNDS)	TORSIONAL STRENGTH (FT-LBS)
SIZE	TYPE	I.D.	O.D.	STRENGTH			
2"	I.F.	1"	2-5/8"		1,800	62,450	2,500
2-3/8"	REGULAR		3-1/8"	BOX	3,000		5,329
	I.F.	1-3/4"	3-3/8"	BOX	3,700	287,541	6,508
	I.F.	2"	3-1/2"	BOX	3,200	206,500	4,568
2-7/8"	REGULAR	1-1/4"	3-3/4"	BOX	5,760	452,661	10,148
	I.F.	2-1/8"	4-1/8"	BOX	6,100	409,869	10,808
3-1/2"	REGULAR	1-1/2"		PIN	7,900	639,916,	13,879
		2-11/16"	4—3/4	PIN	9,400	538,366	16,565
4-1/2"	REGULAR	2-1/4"	5-7/8"	BOX	21,749		38,278
	I.F.	2-13/16"		BALANCED	32,000		56,807
5-1/2"	FULLHO	2-13/16"	7-11/16"	BALANCED	47,700		76,410
6-5/8"	REGULAR	2-13/16"	7-7/8"	BALANCED	53,000		85,354
		2-13/16"		BOX	53,000		85,354
		3"	7-7/8"	BALANCED	50,000	1,748938	81,126
		3"		BOX	50,000		81,126
7-5/8"	REGULAR	2-13/16"	9—1/4	BOX	91,633		146,612
		2-13/16"	9-1/2"	BOX	91,633		146,612
		3"	9-3/16"	BALANCED	88,000		141,728
		3"	9-1/4"	BOX	88,000		141,728
		3—1/4	9-3/16"	BALANCED	83,000		134,753
			9-1/2"	BOX	83,000		134,753



Mud Motor failure possible causes

- Lack of servicing 125 – 150 hours
- Running through too tight radius
- Running in abrasive material with low mud flow, reducing the diameter of housing weakening it
- Drilling with oversize bit





Blocked Nozzle



Hole opener severely worn away due to impact damage to gage and poor hole cleaning causing wear to centraliser





Gage wear due to impact damage caused by poor centralisation and tool running eccentrically loading and unloading cutters as it rotates



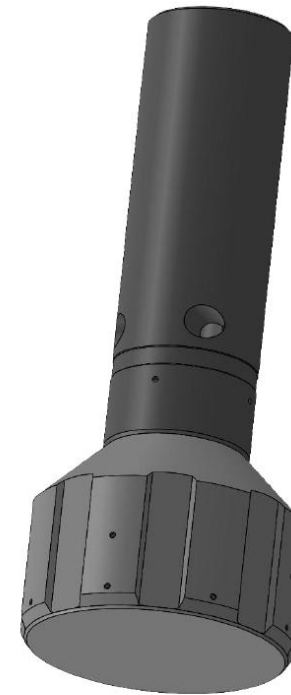
Centraliser wear caused by running on cuttings. Make sure centralisers have good hard facing and its regularly reapplied. If it wears into the softer body material wear will be much quicker

Also check mud flow and hole volume calculations

What happens when you do have a problem Recovery



Overshot Grapple



Fishing Magnet ...
remember Tungsten
carbide is non magnetic !



Flat bottom Junk
Mill

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Thank you for your attention!

Any QUESTIONS?

