

International Operational Successes with Titan 5 RCD

BACKGROUND

Managing wellbore pressure and maintaining equipment integrity are critical for operational success in increasingly challenging drilling environments. During the drilling of a High-Pressure, High-Temperature (HPHT) well in Europe, a Titan 5 Rotating Control Device (RCD) was deployed to facilitate Managed Pressure Drilling (MPD) operations.

This case study focuses on the performance and longevity of the Titan 5 RCD and the 3090 Bearing Assembly under extreme downhole conditions. It offers insights into its operational resilience and maintenance demands throughout the drilling operations.

The 3090 Bearing Assembly was chosen as part of the MPD package due to the larger passthrough diameter compared to the 3078 Bearing Assembly. **Figure 1** below shows the specifications and pressure ratings for each.



		ARES 3078	ARES 3090
Maximum Outer Diameter		17 1/4" (438 mm)	17 1/4" (438 mm)
Passthrough Diameter		7 3/4" (197 mm)	9" (229 mm)
Total Height in TITAN 5		51.6" (1.31 m)	56.9" (1.45 m)
Total Height in ORION 5		51.6" (1.31 m)	56.9" (1.45 m)
Static Pressure Rating		5,000 psi (34.5 MPa)	5,000 psi (34.5 MPa)
Dynamic Pressure Rating	@ 60 RPM	3 000 psi (20.7 MPa)	3,000 psi (20.7 MPa)
	@ 100 RPM	2,500 psi (17.2 MPa)	2,330 psi (16.1 MPa)
	@ 150 RPM	1,500 psi (10.3 MPa)	1,500 psi (10.3 MPa)
	@ 200 RPM	**	250 psi (1.7 MPa)
Maximum RPM		200 RPM	200 RPM

Figure 1: Ares 3078 & 3090 Spec Sheet

A mud cross-unit was rigged underneath the RCD to circulate cold fluid, reducing the high temperatures of fluid returns from the annulus. This prevented early bearing failure and damage to the sealing element due to heat. This significantly increased operational hours and prevented any downtime caused by changing out the bearing under pressure.

OPERATIONAL SUCCESS

In case 1, the vertical well reached a total depth of 4155 mTVD (13631 ftTVD). MPD was online for the 8 1/2" (215.9 mm) hole section, drilled to 3883 mTVD (12740 ftTVD) and the 6 1/8" (155.58 mm) hole section, drilled to 4155 mTVD (13631 ftTVD).

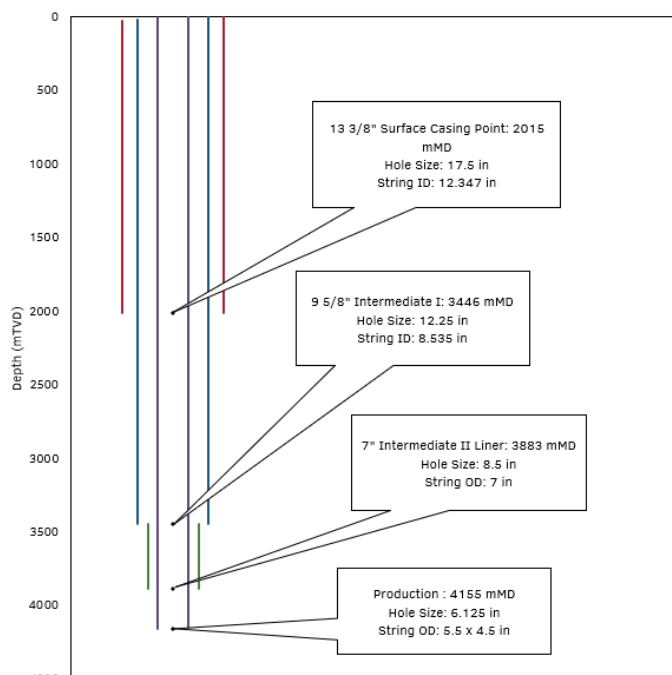


Figure 2: Wellbore Casing Profile

The well's vertical profile makes it particularly challenging to encounter gas pockets, as any kicks in the wellbore will reduce hydrostatic pressure. To mitigate this, constant bottom hole pressure (CBHP) was always diligently practiced, resulting in the RCD and the bearing assembly constantly being under high pressures.

Throughout the HPHT operations, the Titan 5 RCD, equipped with a 3090 bearing assembly, was subjected to temperatures reaching upwards of 110 °C (230 °F) and surface back pressures ranging from 30 to 100 bar (435 to 1450 psi). Additionally, the bearing assembly had an average rotation of ~90 RPM, with 5.5" (139.7 mm) drill pipe, as explained in **Figure 3**.

Despite these demanding conditions, the system maintained operational integrity throughout the job.

BEARING ASSEMBLY SUMMARY				
No.		1	2	3
Hours Logged		187	190	205
Bearing Assy Asset Number		X	Y	R2-X
Hole Depth (m)	From	3,453	2,039	3,883
	To	3,883	4,155	3,883
Drill Length (m)	Total	430	2,116	0
	Rotate	425	0	0
	Slide	5	2,116	0
Work Length (m)		948	2,065	1,320
Strip Length (m)		747	11,220	11,056
Element Work Length (m)		1,695	13,285	12,376
Time (hr)	Bearing Installed	187	190	205
	Rotating	160.17	46	64.75
Max of Hourly Avg RPM		140	40	80
Max of Hourly Avg Temperature (°C)	Flow Line	65	50	74
	Bearing	113	50	61
Casing Pressure (bar)	Overall Average	6	3	6
	Drilling Average	6	3	0
	Maximum	89	4	79

Figure 3: Ares 3090 HPHT Operation Summary

As shown in **Figure 3** above, the 3090 bearing assembly and the Titan 5 RCD recorded a combined total of 27,356 m (89,750 ft) of work length, with bearing R2-X being a rebuilt of bearing X, used solely for stripping in 7" (177.8 mm) liner, as per client's request.

With such vigorous operations, the Titan 5 RCD accumulated 582 operating hours. Notably, it required no maintenance intervention, exhibited no leaks, and showed no signs of gasket failure or degradation. This consistent performance under high thermal and pressure loads highlights the mechanical reliability of the Titan 5 RCD and the 3090 bearing assembly, reinforcing their suitability for extended deployment in HPHT applications and less complex wells.

MPD ENGINEERING AND OPERATIONS

The following accounts for all the MPD operations performed successfully in collaboration with Beyond Energy's Engineering team.

- Maintaining CBHP during drilling operations. This was achieved by compensating for AFL during pump-off events.
- Maintaining CBHP while Pumping Out of Hole (PumpOOH), Stripping Out of Hole (SOOH) and Running in Hole (RIH). Swab and Surge analyses were conducted before each operation to ensure the most accurate information is used.
- Successfully executing the client's first Managed Pressure Cementing (MPC) operation, with static back pressures reaching 100 bar (1450 psi).
- Providing quick responses to formation pressure changes to avoid well control events, minimizing non-productive time (NPT), as any formation can be over-pressured.
- Implementing early kick and loss of circulation detection. The Coriolis flow meter allows earlier detection of influxes and loss of circulation events compared to conventional systems (minimizing NPT).
- Maintaining the ARES Bearing Assemblies on location to minimize the risk of a premature failure.
- Ensuring a rapid response to the formation evaluation. The MPD system can evaluate the formation at any time needed during the drilling operations. The following tests can be performed with the MPD system:
 - Dynamic Pore Pressure Test (DPPT)
 - Dynamic Leak-Off Test (DLOT)
 - Dynamic Formation Integrity Test (DFIT)