

Coiled Tubing Purging

Most fluids pumped through coiled tubing (CT) are water (aqueous) based that can lead to corrosion if left inside the tubing and adds considerable weight to a tubing string leading to potential equipment damage during transportation. One critical step in preparing a coiled tubing unit (CTU) for mobilization after completing a job involves removing all these liquids from the CT by purging (blowing down), providing weight reduction needed for transportation, helping prevent corrosion, and addressing environmental concerns.

This best practice document will outline blowing down the tubing to reduce transportation weight combined with base-level corrosion prevention measures. If the tubing is anticipated to sit for more than three days, it is recommended that the short-term or long-term storage guidelines be followed.

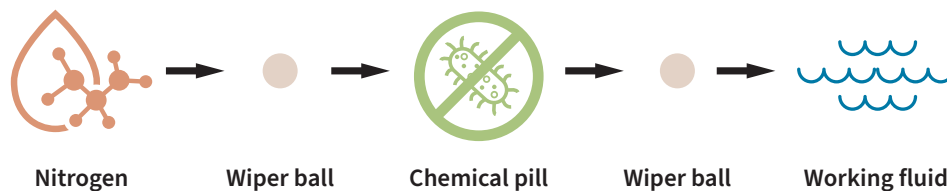
Nitrogen is the most common method to achieve fluids removal. The attached chart (page 2) specifies the minimum volume of nitrogen needed to purge based on tubing dimensions to achieve removal of 98+% of the fluid. It is recommended to use the highest nitrogen volume factor (thinnest wall) for your given string design, applied over the full length, and deliver the nitrogen at the recommended purge rates.

Note: Nitrogen is a compressed gas and can cause injury or death if not treated properly. Please refer to established HSE and operational procedures to ensure safety.

To achieve the maximum life of the tubing, it is essential to mitigate aqueous and microbial-induced corrosion (MIC), both of which can be controlled with the proper application of materials and processes and can occur within a short time after a job is completed.

Note: NOV highly recommends that you contact a company that can aid in a corrosion mitigation strategy by providing water testing guidelines and chemicals specifically tailored to meet the needs of coiled tubing.

At a field level, preventing aqueous corrosion involves removing as much residual water as easily as possible (blowing down) and coating all surfaces with a water-soluble corrosion inhibitor.



Microbial-induced corrosion typically occurs along weld seams and can be prevented by applying a non-corrosive broad-spectrum biocide. There are very limited open-market biocides that are truly non-corrosive and will kill the microorganisms typically found within oilfield fluids. Proper fluids testing and dosing are critical to achieving desired results.

Depending on the chemistry, the corrosion inhibitor and biocide treatments might have to be separated by a fluid spacer capped with two additional wiper balls or can possibly be mixed. It is essential to follow the recommendations of the chemical supplier regarding application methods.

Should you choose to pump the corrosion prevention measures, it is recommended to separate the corrosion mitigation fluid from both the nitrogen and fluid with a pig or ball. A displacement rate of 0.6 x purge rate should be used and then increase to the full purge rate once the final pig or ball exits the tubing for the remainder of the calculated volume needed.

Once blowdown and/or optional corrosion treatments are completed, the reel valve should be closed, and the tubing plugged to trap 7-14 psi (0.5-1 bar) of the dry nitrogen to prevent condensation from forming.

Disclaimer: Coiled tubing best practices and related information are provided for general information dissemination purposes only. All reasonable efforts were made to ensure the accuracy of all such information, but NOV makes no representation and gives no warranty with respect to the validity or fitness of such information for any particular customer's coiled tubing operations. The customer acknowledges that any use or interpretation of this information is at their own risk.

Nitrogen Volume Chart

Outside diameter (in.)	Wall thickness (in.)	Nitrogen requirements to purge fluid	
		Volume (scf/ft)	Rate (scfm)
1.000	0.087	0.66	
1.000	0.095	0.64	
1.000	0.102	0.62	550
1.000	0.109	0.59	
1.000	0.118	0.56	
1.000	0.125	0.54	
1.250	0.087	1.12	
1.250	0.095	1.09	
1.250	0.102	1.06	
1.250	0.109	1.03	
1.250	0.118	1.00	700
1.250	0.125	0.97	
1.250	0.134	0.94	
1.250	0.145	0.89	
1.250	0.156	0.85	
1.500	0.095	1.67	
1.500	0.102	1.63	
1.500	0.109	1.60	
1.500	0.118	1.55	
1.500	0.125	1.52	850
1.500	0.134	1.47	
1.500	0.145	1.42	
1.500	0.156	1.37	
1.500	0.175	1.28	
1.750	0.109	2.28	
1.750	0.118	2.22	
1.750	0.125	2.19	
1.750	0.134	2.13	
1.750	0.145	2.07	1000
1.750	0.156	2.01	
1.750	0.175	1.90	
1.750	0.188	1.83	
1.750	0.203	1.75	

Outside diameter (in.)	Wall thickness (in.)	Nitrogen requirements to purge fluid	
		Volume (scf/ft)	Rate (scfm)
2.000	0.109	3.08	
2.000	0.118	3.02	
2.000	0.125	2.97	
2.000	0.134	2.91	
2.000	0.145	2.84	
2.000	0.156	2.77	1150
2.000	0.175	2.64	
2.000	0.188	2.56	
2.000	0.203	2.47	
2.000	0.224	2.34	
2.000	0.236	2.27	
2.000	0.250	2.18	
2.375	0.134	4.31	
2.375	0.145	4.22	
2.375	0.156	4.13	
2.375	0.175	3.98	
2.375	0.188	3.88	
2.375	0.203	3.77	1350
2.375	0.224	3.61	
2.375	0.236	3.52	
2.375	0.250	3.41	
2.375	0.276	3.23	
2.625	0.134	5.57	
2.625	0.145	5.46	
2.625	0.156	5.36	
2.625	0.175	5.18	
2.625	0.188	5.06	1500
2.625	0.203	4.93	
2.625	0.224	4.74	
2.625	0.236	4.64	
2.625	0.250	4.52	
2.625	0.276	4.30	

Outside diameter (in.)	Wall thickness (in.)	Nitrogen requirements to purge fluid	
		Volume (scf/ft)	Rate (scfm)
2.875	0.156	6.38	
2.875	0.175	6.19	
2.875	0.188	6.07	
2.875	0.203	5.92	1650
2.875	0.224	6.28	
2.875	0.236	6.15	
2.875	0.250	6.01	
2.875	0.276	5.75	
3.250	0.188	9.21	
3.250	0.203	9.02	
3.250	0.224	8.76	1900
3.250	0.236	8.61	
3.250	0.250	8.43	
3.250	0.276	8.12	
3.500	0.188	11.87	
3.500	0.203	11.64	
3.500	0.224	11.33	2100
3.500	0.236	11.15	
3.500	0.250	10.94	
3.500	0.276	10.57	

Purging steps

1. Review the nitrogen volume chart to determine discharge rates and volumes based upon your coiled tubing string design. It is recommended to use the highest nitrogen volume factor.
2. Rig up and pressure test nitrogen source per your company's HSE guidelines and operating procedures.
3. Prepare corrosion and biocide treatments per the chemical supplier's recommendations*
4. Pump pig/ball*
5. Pump corrosion and biocide treatments per chemical supplier recommendations**
6. Purge with nitrogen at the recommended rates and volumes
7. Allow pressure to bleed off.
8. Close reel valve and plug tubing whip end to trap 7-14 psi (0.5-1 bar) of the dry nitrogen to prevent condensation from forming.

* Adhere to chemical vendor recommendations.

** Always recommended per Quality Tubing.