SCORPION™
HIGH-QUALITY, FULLY COMPOSITE PLUGS

Nine

SHIVI ENERGY SOLUTIONS

A DIFFERENT KIND OF ENERGY COMPANY

Nine Energy Service isn't your typical oilfield services company. Our success stems from a culture driven by performance and flawless well site execution. We have the world-class resources to perform both conventional and unconventional completions, cementing and wireline services while partnering with our customers to develop smarter, customized answers that drive efficiencies.

Nine is the culmination of accomplished oilfield service companies and decades of industry experience. Merging these best-in-breed companies results in the perfect blend of cutting-edge capabilities, modern equipment, skilled technicians and experienced, forward-thinking leaders.

Our leadership represents years of experience, a well-earned track record of serving clients and a strong vision making Nine an undeniable force in the industry.

UNCONVENTIONAL SIMPLICITY

The Nine Energy Scorpion Composite Plug delivers a dependable, durable and cost-efficient method for temporary zone isolation during stage fracs in both vertical and horizontal wells.

With a proven track record of success, Nine's Scorpion Plug offers a variety of plug sizes ranging from 3.5" to 5.5" – giving you choices when you need them.

CASING SPECS				PLUG SPECS						
O.D. inch (mm)	Weight Range lb/ft (kg/m)	Min. I.D. inch (mm)	Max I.D. inch (mm)	O.D. inch (mm)	I.D. inch (mm)	Length inch (mm)	Ball Size inch (mm)	Pressure Rating psi (Mpa)	Configuration	Features
3-1/2 (88.9)	9.2-10.2 (13.7-15.2)	2.92 (74.2)	2.99 (76.0)	2.71 (68.8)	0.75 (19.1)	15.6 (396.2)	1.25 (31.8)	10,000 (69.0)	Ball Drop	Full Composite, Ceramic Buttons
4 (101.6)	11.6 (17.3)	3.43 (87.1)	3.43 (87.1)	3.00 (76.2)	0.75 (19.1)	17.5 (444.5)	1.25 (31.8)	10,000 (69.0)	Ball Drop	Full Composite, Ceramic Buttons
	9.5 (14.1)	3.55 (90.1)	3.55 (90.1)	3.12 (79.2)	0.75 (19.1)	22.3 (566.4)	1.25 (31.8)	10,000 (69.0)	Ball Drop/ Ball in Place	Full Composite, Ceramic Buttons
4-1/2 (114.3)	9.5-13.50 (14.1-22.5)	3.92 (99.6)	4.09 (103.9)	3.65 (92.7)	1 (25.4)	22.4 (569.0)	2 (50.8)	10,000 (69.0)	Ball Drop/ Ball in Place	Full Composite, Ceramic Buttons
	13.50-15.10 (20.1-22.5)	3.83 (97.2)	3.92 (99.6)	3.42 (86.9)	1 (25.4)	23.3 (591.8)	2 (50.8)	10,000 (69.0)	Ball Drop/ Ball in Place	Full Composite, Ceramic Buttons
5 (127.0)	18.0-21.4 (26.8-31.8)	4.12 (104.8)	4.28 (108.6)	3.78 (96.0)	1 (25.4)	20.9 (530.9)	2 (50.8)	10,000 (69.0)	Ball Drop/ Ball in Place	Full Composite, Ceramic Buttons
	18.0 (26.8)	3.90 (99.1)	4.28 (108.6)	3.90 (99.1)	1 (25.4)	22.8 (579.1)	2 (50.8)	10,000 (69.0)	Ball Drop/ Ball in Place	Full Composite, Ceramic Buttons
5-1/2 (139.7)	20.0-26.8 (29.8-38.7)	4.50 (114.3)	4.78 (121.4)	4.18 (106.2)	1 (25.4)	22.3 (566.4)	2.38 (60.5)	10,000 (69.0)	Ball Drop/ Ball in Place	Full Composite, Ceramic Buttons
	17.0-23.00 (23.1-34.2)	4.67 (118.6)	4.95 (125.7)	4.37 (111.0)	1 (25.4)	22.2 (563.9)	2.38 (60.5)	10,000 (69.0)	Ball Drop/ Ball in Place	Full Composite, Ceramic Buttons

SUPERIOR DESIGN AND EFFICIENCY

The Scorpion Plug has a shorter length with fewer buttons on its upper slips. This packer design reduces the risk of breakage seen with ceramic slips commonly used with competitors' plugs.

FEATURES

- Packer-style composite plug
- Single elastomer element – compression energized
- Segmented back-up rings
- Single grip opposing slips
- Ceramic gripping buttons
- Molded and filament wound composite material for optimized performance
- 1.75" O.D – 2.375" O.D frac balls can be utilized for the Scorpion plug
- Pumpdown ring available

GO WHERE OTHERS CAN'T

With its extended range composite plug offering, Scorpion provides you with a unique opportunity to operate within a restricted wellbore ID. Keep going and keep your competitive edge.

The scorpion extended range plug is a great solution for wellbores with casing pages, over torqued collars or other restrictions that present a problem with conventional size frac plug deployment.

EXTENDED RANGE FRAC PLUG
TECHNICAL SPECIFICATIONS

SIZES AVAILABLE EXTENDED RANGE					
Casing Size	Casing Range	Plug O.D.	Plug I.D.	Plug Length	Operating Range
4.0"	2.75" - 3.35"	2.60"	.75"	30"	10K, 300°
4.5"	3.25" - 4.00"	3.12"	.75"	33"	10K, 300°
5.5"	3.90" - 4.78"	3.78"	.75"	33"	10K, 300°

*Pictured on opposite page.

- 10,000-psi pressure rating
- Sets securely in up to P110-grade casing
- Ceramic button slips allow a secure set in hardened casing (i.e. ICY Casing)
- Compact and easy running
- Utilizes unique “lug” design on the top and muleshoe bottom ensuring that the plugs do not spin during drill out; lug shoe also available
- Can be drilled using conventional tubing or coiled tubing
- Materials used in construction conducive to a wide range of environments
- Composite material – eglass, epoxy resin, fiberglass woven material
- Elements – nitrile, 80 durometer
- Ball S.G. – 1.8, other S.G balls available

NINE ENERGY PROCEDURES

Nine recommends the following procedures for the Scorpion Composite Plug

RIH PROCEDURES

- Once plug is made up to setting tool, in preparation to pick up, care needs to be taken to prevent tool string weight from being stacked on plug, this can be achieved by utilizing a roller dolly.
- Recommended RIH speed is 250-320 FT/Min. It is important to understand pump rates and well survey effect tool speed, therefore making it critical winch operator is continually monitoring pump down process. (See recommended running tables for horizontal pump down applications)
- If a plug is RIH to any depth and unable to be deployed, requiring plug to be pulled out of hole, it is recommended replacing plug and not re-running.

BALL SEATING PROCEDURE

- It is recommended to displace ball no faster than 25 bpm. Rate should be slowed approximately 50 bbls prior to landing. Slow rate and land the ball at no more than 10 bbl per minute.


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MILL TYPE

- If milling 5.5 NES Scorpion composite plugs, it is recommended to utilize a JZ Tri cone Bit
- A 4 5/8 Varel Rock bit has proven to be effective in 20# casing. A 4 ½" Varel Rock bit has been proven to be effective in 23# casing.

MILL SIZE

- Recommended Bit OD is approximately 97% of casing/tubing ID. (Example – 5-1/2" 20# casing has an I.D. of 4.778" would yield a recommended 4.625" OD Bit) Undersized mills increase the possibility of sticking due to coring of the plug after milling multiple plugs with the same mill in the hole.
- The use of oversize bits is effective for finer milling or grinding of the plug when required and for milling of multiple plugs. This allows for extended bit life over the number of plugs attempting to be removed. Recommended bit OD can range from 95% to 97% of casing/tubing ID. Larger watercourses to allow sufficient cutting removal should be addressed when using the oversized designs. Longer milling times per plug are not uncommon (dependent on number of plugs to mill out).

MOTOR TYPE

- Any (2-7/8” and 3-1/8”) Motor with a bearing pack should be used in composite plug removal applications.
- RPM ranges should be in the 250 – 600 range dependent on motor size used.
- WOB capability should be in the 1,000 – 3,000 lbs. range when milling on composite plugs, also depending upon motor size. High WOB may be required to stabilize a spinning plug in order to complete the milling process and not all motors are sufficiently rated for this application.
- Coil tubing torsional yield should be at least twice the minimum output torque of the motor being used. This is especially important when running larger motors with higher torque ratings.
- Larger diameter coil tubing will generate less friction loss, allowing higher pump rate capacity for a given pressure. It will also reduce the annular flow area, which will increase the annular velocity to assist in hole cleaning.
- Pump rates should be sufficient to maintain fluid velocities sufficient to carry the cuttings and clean the hole. Special attention needs to be paid to this when using commingled milling fluids with nitrogen.

GENERAL MILLING PROCEDURE

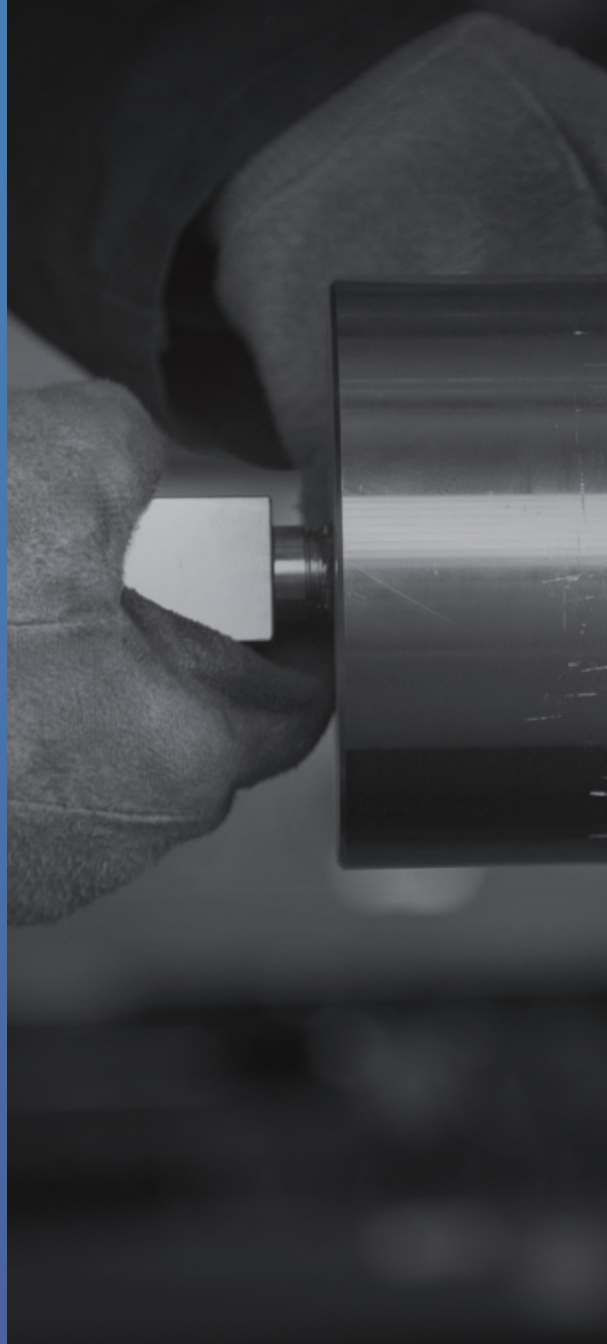
- Make up coiled tubing connector and perform pull test. Inspect connector to ensure no movement has taken place and that connection was maintained. Tighten coiled tubing connector and repeat test again ensuring that a posttest inspection reveals no abnormalities.
- Install dual flapper check valve, hydraulic disconnect, (and potentially a circulating sub, agitator, and jars). Pressure test BHA to ensure no leak is detected.
- Install motor / bit and pressure test at various anticipated flow rates through BHA. Log "off-bottom" pressures at each flow rate.
- RIH with minimum pump rate in effect following recommended running procedures for CT unit while going on the hole.
- Slow coil tubing running speed when within 1000' of plug or tag depth to start milling. Maintain a safe running speed until plug is tagged.
- Once tag is made, pick up approximately 6' to 10' and increase flow rates.
- Note pump pressure prior to proceeding to bottom.
- Set down on the plug and establish positive milling WOB via monitoring of differential pressures.
- Patience should be exercised as a cutting pattern is established. Multiple stalls can characterize this period until such time as the mill has had an opportunity to establish a cutting pattern.
- Continue slacking off weight as differential pressure indicates plug removal.

TIPS

Try to mill using a minimum to mid-range flow rate. Maximum flow rate will hydraulically lift the milling BHA off of the plug. You can correct this with more WOB. Drill off of differential pressure readings, not WOB. Your WOB will fluctuate. Keep your differential pressure reading constant.

If you get to the point that the plug is not milling up in a timely fashion (probably due to spinning), pick up 3' – 5' off of the plug and run into it applying the max weight the coil company and motor parameters will allow to be applied to the bit without exceeding WOB limitation of the motor. This will assist you to get the plug locked up or stabilized and/or establish a new cutting pattern for the mill. No (or minimal) increase in pump pressure readings when applying additional WOB can also be a signal that the plug may be spinning. Lifting from bottom and impacting the plug with a downward blow can on occasion be helpful. Caution and operator judgment on the force of the blow should be exercised.

When removing plugs that have the different pressure below the plug greater than the pressure above, proceed slowly through the top eight to twelve inches of the plug allowing the pressures to equalize.



RECOMMENDED RUNNING TABLES FOR HORIZONTAL PUMP-DOWN APPLICATIONS

The recommended running table is to be used as a guideline when pumping composite plugs in deviated or horizontal well bores. Customer and Nine Operator experience and preferences should be taken into account when planning all composite plug pump down operations. Failure to run the plug inside these parameters can lead to pre-setting. Line tension is not taken into account with these recommendations, the wireline operator is responsible for maintaining a safe line tension during pump down operations to avoid pumping the BHA off the wireline.

Nine Energy 5.5" Scorpion Frac Plug – 4.37" O.D.		Safe parameter for 5.5" 17# 4.89 in ID Casing																												
		Line Speed (ft/min)																												
4.37 in OD		100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750		
Pump Rate (BPM)	5	9.493513	7.431049	5.368585	3.306121	1.243657																								
	6	13.04219	10.97972	8.917258	6.854794	4.79233	2.729866	0.667402																						
	7	16.59086	14.5284	12.46593	104047	8.341004	6.27854	4.216076	2.153612	0.091148																				
	8	20.13953	18.07707	16.01461	13.95214	11.88969	9.827214	7.76475	5.702286	3.639822	1.577358																			
	9	23.68821	21.62574	19.56328	17.50082	15.43835	13.37589	11.31342	9.25096	7.188496	5.126032	3.063568	1.001104																	
	10	27.23688	25.17442	23.11195	21.04949	18.98703	16.92456	14.8621	12.79963	10.73717	8.674705	6.612241	4.549777	2.487313	0.424849															
	11	30.78556	28.72309	26.66063	24.59816	22.5357	20.47324	18.41077	16.34831	14.28584	12.22338	10.16092	8.098451	6.035987	3.973523	1.911059														
	12	34.33423	32.27176	30.2093	28.14684	26.08437	24.02191	21.95944	19.89698	17.83452	15.77205	13.70959	11.64712	9.584661	7.522197	5.459733	3.397269	1.334805												
	13	37.8829	35.82044	33.75797	31.69551	29.63305	27.57058	25.50812	23.44565	21.38319	19.32073	17.25826	15.1958	13.13333	11.07087	9.008407	6.945943	4.883479	2.821015	0.758551										
	14	41.43158	39.36911	37.30665	35.24418	33.18172	31.11926	29.05679	26.99433	24.93186	22.8694	20.80694	18.74447	16.68201	14.61954	12.55708	10.49462	8.432152	6.369688	4.307224	2.24476	0.182296								
	15	44.98025	42.91779	40.85532	38.79286	36.73039	34.66793	32.60547	30.543	28.48054	26.41807	24.35561	22.29315	20.23068	18.16822	16.10575	14.04329	11.98083	9.918362	7.855898	5.793434	3.73097	1.668506							
	16			44.404	42.34153	40.27907	38.2166	36.15414	34.09168	32.02921	29.96675	27.90428	25.84182	23.77936	21.71689	19.65443	17.59196	15.5295	13.46704	11.40457	9.342108	7.279644	5.21718	3.154716	1.092252					
	17					43.82774	41.76528	39.70281	37.64035	35.57789	33.51542	31.45296	29.39049	27.32803	25.26557	23.2031	21.14064	19.07817	17.01571	14.95325	12.89078	10.82832	8.765854	6.70339	4.640926	2.578462	0.515998			
	18							43.25149	41.18902	39.12656	37.0641	35.00163	32.93917	30.8767	28.81424	26.75178	24.68931	22.62685	20.56438	18.50192	16.43946	14.37699	12.31453	10.25206	8.189599	6.127135	4.064671	2.002207		
	19								44.7377	42.67523	40.61277	38.5503	36.48784	34.42538	32.36291	30.30045	28.23799	26.17552	24.11306	22.05059	19.98813	17.92567	15.8632	13.80074	11.73827	9.65809	7.613345	5.550881		
	20										44.16144	42.03651	40.03651	37.97405	35.91159	33.84912	31.78666	29.72419	27.66173	25.59927	23.5368	21.47434	19.41187	17.34941	15.28695	13.22448	11.16202	9.099555		
	21												43.58519	41.52272	39.46026	37.3978	35.33533	33.27287	31.2104	29.14794	27.08548	25.02301	22.96055	20.89808	18.83562	16.77316	14.71069	12.64823		
	22														43.00893	40.94647	38.88401	36.82154	34.75908	32.69661	30.63415	28.57169	26.50922	24.44676	22.38429	20.32183	18.25937	16.1969		
	23															44.49514	42.43268	40.37022	38.30775	36.24529	34.18282	32.12036	30.0579	27.9954	25.93297	23.8705	21.80804	19.74558		

Nine Energy 5.5" Scorpion Frac Plug – 4.37" O.D.		Safe parameter for 5.5" 20# 4.78 in ID Casing																											
		Line Speed (ft/min)																											
4.37 in OD		100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750
Pump Rate (BPM)	5	12.78973	10.24117	7.692614	5.144055	2.595496	0.0469																					
	6	17.38653	14.83797	12.28941	9.740849	7.19229	4.64373	2.095171																				
	7	21.98332	19.43476	16.8862	1433764	11.78908	9.240524	6.691965	4.143406	1.594847																		
	8	26.58011	24.03156	21.483	18.93444	16.38588	13.83732	11.28876	8.7402	6.191641	3.643081	1.094522																
	9	31.17691	28.62835	26.07979	23.53123	20.98267	18.43411	15.88555	13.33699	10.78843	8.239875	5.691316	3.142757	0.594198														
	10	35.7737	33.22514	30.67658	28.12802	25.57947	23.03091	20.48235	17.93379	15.38523	12.83667	10.28811	7.739551	5.190991	2.642432	0.093873												
	11	40.3705	37.82194	35.27338	32.72482	30.17626	27.6277	25.07914	22.53058	19.98202	17.43346	14.8849	12.33634	9.787785	7.239226	4.690667	2.142108											
	12	44.96729	42.41873	39.87017	37.32161	34.77305	32.22449	29.67593	27.12738	24.57882	22.03026	19.4817	16.9314	14.38458	11.83602	9.287461	6.738902	4.190342	1.641783									
	13			44.46697	41.41808	39.36985	36.82129	34.27273	31.72417	29.17561	26.62705	24.07849	21.52993	18.98137	16.43281	13.88425	11.3357	8.787136	6.238577	3.690018	1.141459							
	14				46.5152	43.96664	41.41808	38.86952	36.32096	33.7724	31.22384	28.67529	26.12673	23.5787	21.02961	18.48105	15.93249	13.38393	10.83537	8.286812	5.738252	3.189693	0.641134					
	15						46.01488	43.46632	40.91776	38.3692	35.82064	33.27208	30.72353	28.17496	25.6264	23.07784	20.52928	17.98072	15.43216	12.88361	10.33505	7.786487	5.237928	2.689369	0.140809			
	16								45.51455	42.96599	40.41743	37.86887	35.32031	32.77175	30.2232	27.67464	25.12608	22.57752	20.02896	17.4804	14.93184	12.38328	9.834722	7.286163	4.737603	2.189044		
	17										45.01423	42.46567	39.91711	37.36855	34.8199	32.27143	29.72287	27.17431	24.62575	22.07719	19.52863	16.98007	14.43152	11.88296	9.334397	6.785838	4.237279	1.68872
	18												44.5139	41.96534	39.41678	36.86822	34.31966	31.77111	29.22255	26.67399	24.12543	21.57687	19.02831	16.47975	13.93119	11.38263	8.834073	6.285513
	19													46.56214	44.01358	41.46502	38.91646	36.3679	33.81934	31.27078	28.72222	26.17366	23.6251	21.07654	18.52799	15.97943	13.43087	10.88231
	20															46.06181	43.51325	40.96469	38.41613	35.86758	33.31902	30.77046	28.2219	25.67334	23.12478	20.57622	18.02766	15.4791
	21																	45.56149	43.01293	40.46437	37.91581	35.36725	32.81869	30.27013	27.72157	25.17301	22.62445	20.0759
	22																			45.06116	42.5126	39.96404	37.41549	34.86693	32.31837	29.76981	27.22125	24.67269
	23																					44.56084	42.01228	39.46372	36.91516	34.3666	31.81804	29.26948

Nine Energy 5.5" Scorpion Frac Plug – 4.37" O.D.		Safe parameter for 5.5" 23# 4.67 in ID Casing																											
		Line Speed (ft/min)																											
4.37 in OD		100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750
Pump Rate (BPM)	5	18.22892	14.87824	11.52756	8.176884	4.826205	1.475525																					
	6	24.55525	21.0457	17.85389	14.50321	11.15253	7.801853	4.451174	1.100495																			
	7	30.88158	27.5309	24.18022	20.82954	17.47886	14.12818	10.7775	7.426822	4.076143	0.725464																	
	8	37.2079	33.85722	30.50654	27.15587	23.80519	20.45451	17.10383	13.75315	10.40247	7.051791	3.701112	0.350433															
	9	43.53423	40.18355	36.83287	33.48219	30.13151	26.78084	23.43016	20.07948	16.7288	13.37812	1.02744	6.676761	3.326082														
	10			43.1592	39.80852	36.45784	33.10716	29.75648	26.4058	23.05513	19.70445	16.35377	13.00309	9.652409	6.30173	2.951051													
	11					42.78417	39.43349	36.08281	32.73213	29.38145	26.03077	22.68009	19.32942	15.97874	12.62806	9.277378	5.926699	2.57602											
	12							42.40914	39.05846	35.70778	32.3571	29.00642	25.65574	22.30506	18.95438	15.60371	12.25303	8.902348	5.551669	2.200989									
	13									42.03411	38.68343	35.33275	31.98207	28.63139	25.28071	21.93003	18.57935	15.22868	11.878	8.527317	5.176638	1.825959							
	14											41.65908	38.3084	34.95722	31.60704	28.25636	24.90568	21.555	18.20432	14.85364	11.50297	8.152286	4.801607	1.450928				
	15												44.63473	41.28405	37.93337	34.58269	31.21201	27.88133	24.53065	21.17997	17.82929	14.47861	11.12793	7.777255	4.426576	1.075897		
	16														44.25969	40.90902	37.55834	34.20766	30.85698	27.5063	24.15562	20.80494	17.45426	14.10358	10.7529	7.402225	4.051546	0.700867
	17																43.88466	40.53398	37.18331	33.83263	30.48195	27.13127	23.78059	20.42991	17.07923	13.72855	10.37787	7.027194
	18																		43.50963	40.15895	36.80827	33.4576	30.10692	26.75624	23.40556	20.05488	16.7042	13.35352
	19																				43.1346	39.78392	36.43324	33.08257	29.73189	26.38121	23.03053	19.67985
	20																						42.75957	39.40889	36.05821	32.70753	29.35686	26.00618
	21																								42.38454	39.03386	35.68318	32.3325
	22																										42.00951	38.65883
	23																											44.98516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