FIELD PROVEN

BLAZE® Rod Pump Parts – Increasing Run Times in Challenging Conditions

ENDURANCE LIFT SOLUTIONS

A FIELD PROVEN WHITEPAPER

Rod Lift, or sucker rod pumping, is one of the most prevalent forms of artificial lift used for oil extraction. Throughout the Permian Basin, this form of lift is easily recognizable by the pumping units dotting the landscape. These units, energized by a prime mover, drive the vertical reciprocating action that lifts and lowers the rod string connected to a downhole pump located below the surface [Image 1]. Relatively simple in concept, rod lift systems have evolved to meet the challenges of a changing production environment. New equipment designs, materials, and other solutions have been introduced to extend equipment longevity and reliability, even in the sandy, corrosive, and highly deviated wellbores associated with today's drilling and completions practices. These downhole conditions pose significant challenges to operators using rod lift, which can include excessive wear, more frequent wellbore interventions, and increased downtime.

This article highlights the improved run times a large producer in the Permian Basin was able to achieve by utilizing BLAZE®-treated components with their sucker rod pump wells.

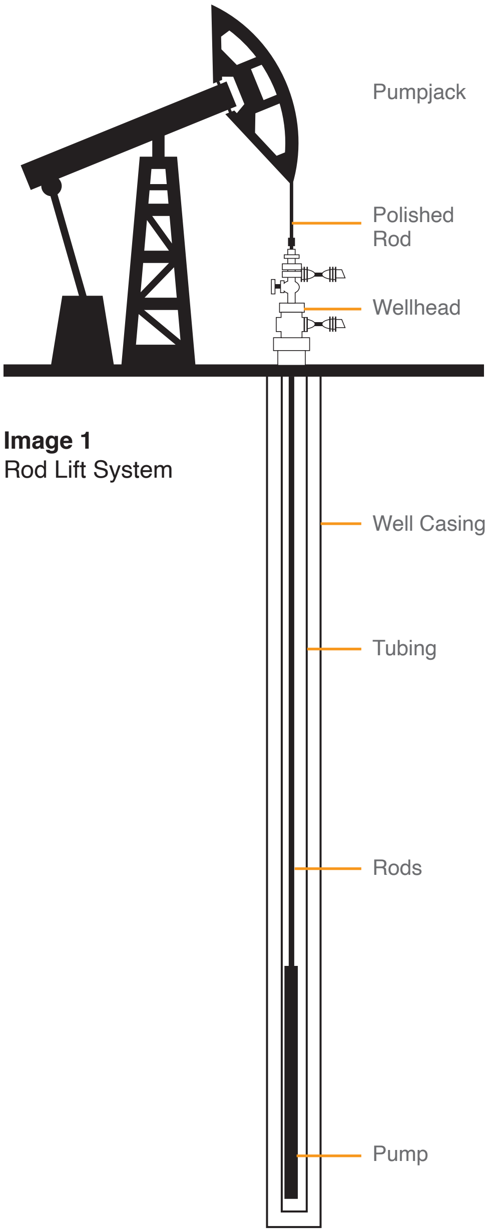


Image 1
Rod Lift System

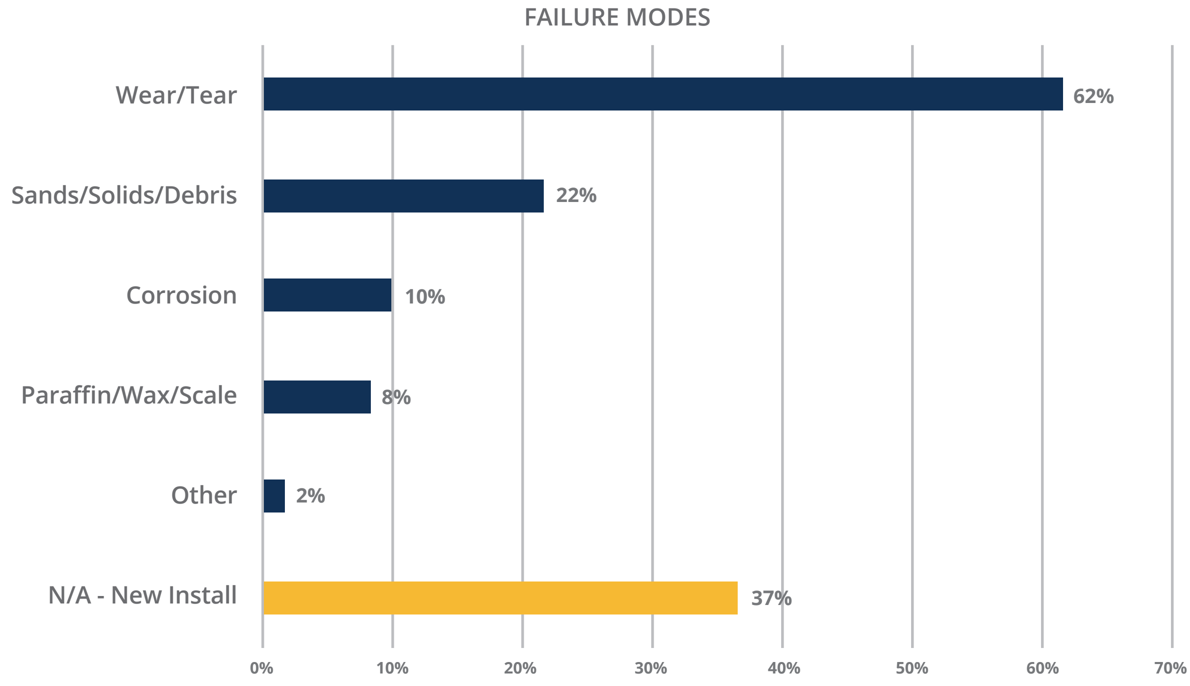
This article highlights the improved run times a large producer in the Permian Basin was able to achieve by utilizing BLAZE®-treated components with their sucker rod pump wells.

The producer began utilizing BLAZE® treated components in their downhole pumps in 2018. The company's goal was to address premature wear and short run-time performance, even as they pursued fluid levels deeper downhole.

As the producer placed pumps deeper in the wellbores, they would be set at increasingly higher deviations. The angle of the pumps in these deviated areas would naturally increase stress on pump components, most notably components located at the top of a pump. The added stress would result in excessive mechanical wear of these pump components, causing pumps to fail.

EVALUATION

For this evaluation, sixty (60) wells were analyzed to assess the performance achieved by incorporating BLAZE-treated components into the downhole pump design. The wells reviewed had pump systems installed between the years 2018 and 2022. Historical failure modes were primarily attributed to wear and tear, sand or solids, corrosion, or a combination of these factors [Graph 1].



Graph 1 - Failure modes of prior installations. Note: Percentages total more than 100% due to some wells having multiple failure modes.

RUN TIME COMPARISON

Table 1 reflects the initial run-time assessments for the 60 wells sampled. It's important to note that of the 60 wells reviewed, fifty percent (50%) had no comparison data as they were either new installs or had no prior run-time history recorded. Nonetheless, the improved run-time performance of the pumps with BLAZE-treated components was noteworthy:

Table 1 - Average run-time performance of BLAZE vs Non-BLAZE components		
Total Wells Reviewed	**60**	
Wells **With** Comparison Data	**30**	
	Run-Time (days)	
	BLAZE	**NON-BLAZE**
Max	1316	1268
Min	283	36
Average	**789**	**531**

Wells **Without** Comparison Data*:	**30**	
	Run-Time (days)	
	BLAZE	**NON-BLAZE**
Max	1960	n/a
Min	476	n/a
Average	**948**	**n/a**
***New installs (esp to rod conversion) or no prior run-time history available.**		

Since half of the wells had no comparison data, they were omitted from further evaluation; however, it is worth noting **only one well in this sample set has been pulled** - the remaining **29 installs are still running as of publication and have an average run-time of 948 days.**

The remaining 30 wells with comparison data were further evaluated to assess the performance achieved by utilizing BLAZE vs non-BLAZE components. **Table 2** highlights the run-time comparison of BLAZE vs non-BLAZE components for the same wells. Of these 30 comparison wells, 23 are still in operation.

As **Table 2** reflects, the BLAZE components have an average run-time of over 26 months - approximately nine months longer than prior run times of non-BLAZE components for the same well.

Table 2 - Run time comparison BLAZE® vs Other Materials – Same Wells

				(Days)		(Months	
WELL NAME	TVD	WELL TYPE	FORMATION	NON-BLAZE	BLAZE	NON-BLAZE	BLAZE
WELL 1	7,656	HORIZONTAL	WOLFCAMP A	482	1007	16.1	33.6
WELL 2	9,955	HORIZONTAL	WOLFCAMP B UPPER	307	1008	10.2	33.6
WELL 3	11,245	VERTICAL	MIDLAND VERTICAL	858	618	28.6	20.6
WELL 4	10,951	HORIZONTAL	WOLFCAMP A UPPER	420	616	14.0	20.5
WELL 5*	10,398	VERTICAL	MIDLAND VERTICAL	124	524	4.1	17.5
WELL 6	9,314	HORIZONTAL	LOWER SPRABERRY	251	1115	8.4	37.2
WELL 7*	9,325	HORIZONTAL	LOWER SPRABERRY	1154	426	38.5	14.2
WELL 8*	9,240	HORIZONTAL	LOWER SPRABERRY	594	520	19.8	17.3
WELL 9*	9,109	HORIZONTAL	LOWER SPRABERRY	117	322	3.9	10.7
WELL 10	9,256	HORIZONTAL	LOWER SPRABERRY	738	1072	24.6	35.7
WELL 11	9,178	HORIZONTAL	LOWER SPRABERRY	109	1220	3.6	40.7
WELL 12	9,608	VERTICAL	MIDLAND VERTICAL	1175	812	39.2	27.1
WELL 13	10,853	VERTICAL	MIDLAND VERTICAL	964	846	32.1	28.2
WELL 14	9,931	HORIZONTAL	WOLFCAMP B LOWER	455	1186	15.2	39.5
WELL 15	9,992	HORIZONTAL	WOLFCAMP B LOWER	1016	1085	33.9	36.2
WELL 16	9,909	HORIZONTAL	WOLFCAMP B LOWER	694	1316	23.1	43.9
WELL 17	9,904	HORIZONTAL	WOLFCAMP B LOWER	1268	882	42.3	29.4
WELL 18	9,327	HORIZONTAL	LOWER SPRABERRY	112	801	3.7	26.7
WELL 19*	11,009	HORIZONTAL	3RD BONE SPRING SAND	36	590	1.2	19.7
WELL 20*	11,069	HORIZONTAL	3RD BONE SPRING SAND	342	283	11.4	9.4
WELL 21	11,062	HORIZONTAL	3RD BONE SPRING SAND	537	1177	17.9	39.2
WELL 22	10,497	HORIZONTAL	3RD BONE SPRING SAND	291	555	9.7	18.5
WELL 23	10,782	HORIZONTAL	WOLFCAMP B LOWER	122	521	4.1	17.4
WELL 24*	11,021	HORIZONTAL	3RD BONE SPRING SAND	511	547	17.0	18.2
WELL 25	10,453	HORIZONTAL	3RD BONE SPRING SAND	134	532	4.5	17.7
WELL 26	11,603	HORIZONTAL	WOLFCAMP C	156	563	5.2	18.8
WELL 27	8,131	HORIZONTAL	WOLFCAMP A	355	928	11.8	30.9
WELL 28	7,923	HORIZONTAL	LOWER SPRABERRY	897	934	29.9	31.1
WELL 29	8,223	HORIZONTAL	WOLFCAMP A	727	916	24.2	30.5
WELL 30	8,261	HORIZONTAL	WOLFCAMP A	979	757	32.6	25.2
			AVERAGE	**531**	**789**	**17.7**	**26.3**

*Pump pulled. All others still active.

Incremental Run-Time, BLAZE® vs Other Materials – Same Wells

	Days		Months
AVERAGE>>>	**258**	AVERAGE>>>	**8.6**

PUMP COMPONENTS USED

The most commonly used components contributing to the run-time improvements include the rod guide, collet and nut, and traveling valve cage [Image 2]. Each of these components is found at the top of the pump and serves a critical role in the operation of the downhole pump. In addition, these parts are subject to extreme mechanical wear when pumps are set in deviated areas.

Rod Guide *Collet and Nut* *Cage*

Image 2 - Commonly Used Components

Table 3 - highlights the most commonly used components and the average run time days of BLAZE components vs non-BLAZE components.

Table 3 - Most commonly used BLAZE® components and average run-time comparison

		Average Run-Time (days	
Component	**Description**	**BLAZE**	**NON-BLAZE**
Cage	CGE 1-7/8" 2WG W/3/4" PIN	889	509
Bushing Guide	BSG B75N20-113 NUT HT OTC	872	495
Rod Guide	GDE G63-20 HPT RW CLT	877	473
Collet	BSG B75C20-113 COL HT OTC	895	558
Bushing Nut	BSG B21N25 NUT VR TO SR	748	558
Collet	BSG B21C25 COL VR TO SR	750	598
Rod Guide	GDE G12-25-125 VR BX VRT P	1004	627
Spiral Guide	GDE G72-206 SPIRAL BxP	872	915
Bushing Nut	BSG B75C25 COL HT OTC	761	654
Collet	BSG B75N25 NUT HT OTC	761	654
Cage	CAGE, 3W 3/4P TOP PLGR	761	654
Rod Guide	GDE G63-25 HPT RW CLT	736	729
Rod Guide	GDE G63-20-125 HPT RW CLT	1145	592
Collet	BSG B75C20-094 COL HT OTC	730	395
Bushing Nut	BSG B75N20-094 NUT HT OTC	705	395
Rod Guide	GDE G12-25 VR BX VRT PRT	741	274
Barrel Connector	CON, C21- BBL UPPER 2-1/2	1177	537

Table 4 - highlights the most frequently used combination of components and the average run time comparison of BLAZE vs non-BLAZE components.

Table 4 - Most frequently used combination of BLAZE® components and average run-time comparison				
			Average Run-Time (days	
Combination	Component	Description	BLAZE	NON-BLAZE
Combo A - HVR Pump	Cage Bushing Guide Collet Rod Guide	CGE 1-7/8" 2WG W/3/4" PIN BSG B75N20-113 NUT HT OTC BSG B75C20-113 COL HT OTC GDE G63-20 HPT RW CLT	883	509
Combo B - API Pump	Bushing Nut Collet Rod Guide	BSG B21N25 NUT VR TO SR BSG B21C25 COL VR TO SR GDE G12-25-125 BLZ VR BX VRT P	834	594

Given the success achieved, the producer has standardized on BLAZE pump components to address wear-related issues and extend run times for over 300 wells in the Permian Basin.

About BLAZE®

The BLAZE® surface treatment creates a slick, hard, intermetallic boride layer that (unlike coatings or platings) does not alter the part's dimensions. The slickness, hardness, and corrosion resistance of BLAZE treatment slows wear by protecting parts from the effects of abrasion, erosion, and corrosion.

BLAZE surface treatment is a form of surface hardening in which boron is diffused into the steel substrate. The process results in a diffused layer of boron at the surface of the substrate [Image 3]. While the treatment is not compatible with some materials, such as copper, aluminum, and resulfurized steel, it is proven effective on many ferrous and nonferrous materials used in the oil and gas industry.

Combining extreme hardness and abrasion resistance with excellent corrosion resistance, BLAZE® is proven to enable treated parts to outlast untreated parts in even some of the most challenging conditions.

The treatment can also be applied to pump components, couplings, trim kits, plungers, ESPs, and other artificial lift and related equipment.

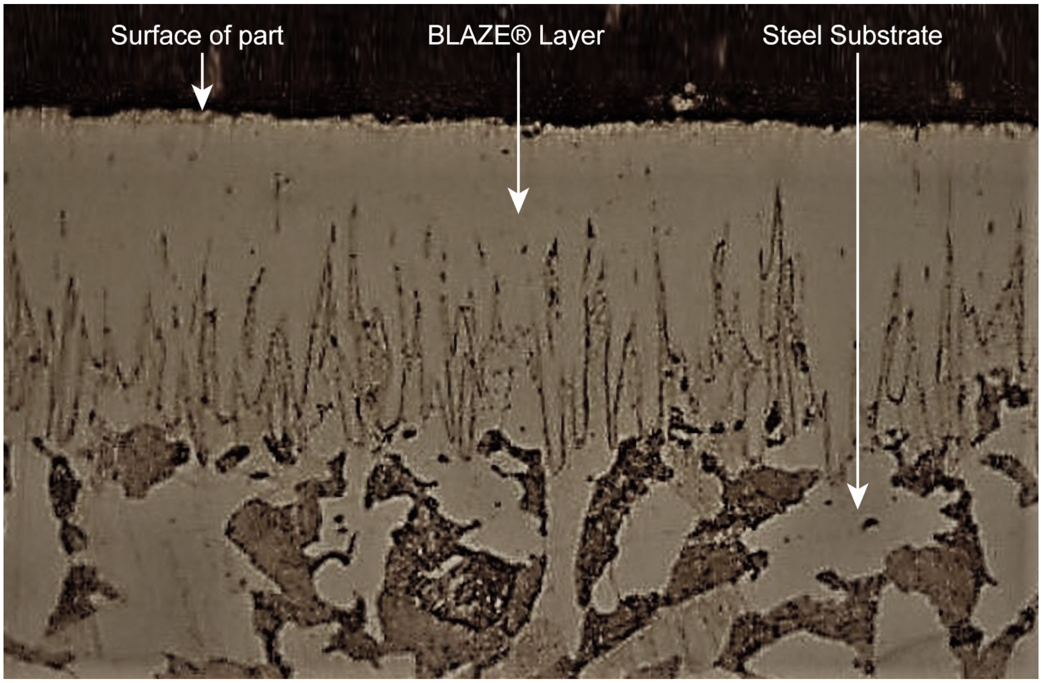


Image 4 - Microscopic view of the BLAZE® Layer

About Endurance Lift Solutions

Working in all major oil and gas producing areas in the U.S., Endurance Lift provides technology-enabled artificial lift solutions, including ESP, Gas Lift, Rod Lift, Plunger Lift, and Capillary Services.

For more information concerning
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