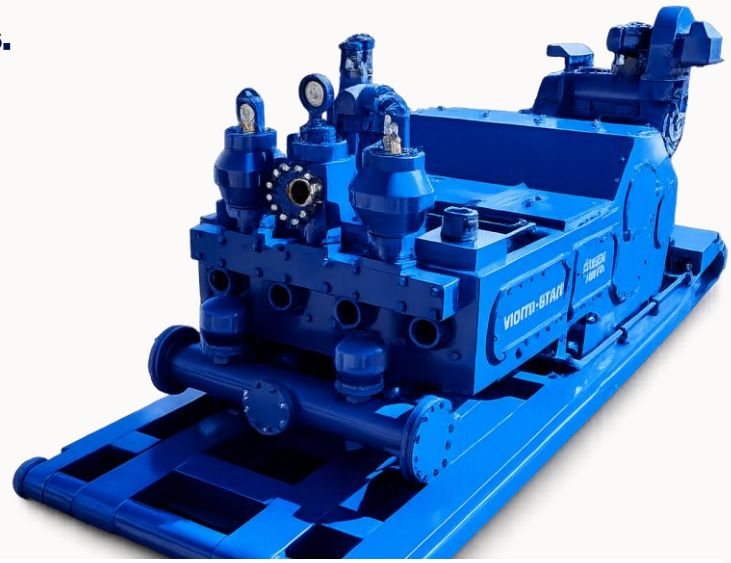
WHITE STAR
Pump Company®

White Star KSA Built Quatro 2450hp Mud Pump

Ideal for all offshore drilling and large land rigs.



- 2450 hp Quatro quadraplex mud pump manufactured in the Kingdom of Saudi Arabia to support increased IKTVA and local content goals.
- Up to 50% smaller in required pump room space and about 35% lighter than comparable conventional triplex pump packages (per comparison chart).
- Compact 4-piston design helps save space in all directions while increasing available pumping power in restricted offshore pump rooms.
- Near-zero discharge pulse helps deliver better MWD performance while reducing rig vibration and mud noise.
- High-pressure capability up to 10,000 psi for demanding offshore and high-performance drilling applications.

A new White Star Pump facility in Dammam will support faster delivery, local content objectives, and expanded regional service capability.

Quatro Quadraplex Mud Pump

Designed for Demanding Drilling Today, and into the Future.

Field proven since its introduction in 2006, the White Star Quatro™ 4-piston quadraplex mud pump represents a quantum improvement over conventional triplex mud pumps. Consider the inherent flaws in triplex mud pumps — wide, heavy designs that are expensive to transport; crankshaft and bearing failure leading to costly rebuilds; high-vibration operation; limited flow rates and pressure capabilities; and short product life cycles. The advanced Quatro goes beyond the limitations of triplex pumps, delivering reliable high-flow, high-pressure pumping performance that meets the needs of drilling operations, today and long into the future.

Innovative Design

The transition from a "triplex" to "quadraplex" naturally balances the pump. The fourth cylinder improves crankshaft timing, which means a smoother running pump with less vibration.

Fully Assembled Crankshaft

Fully machined and assembled crankshaft. No castings or welding. Shortest distance between cylinder and bearing of any mud pump. Virtually eliminates crankshaft flex.

Quality Construction

The Quatro boasts a quality workmanship that is second to none, with all components manufactured from the highest grade materials. All parts and components have mill cert traceability and go through a rigorous three-step quality assurance and quality control screening.

Revolutionary Fluid End Modules

The Quatro's fluid modules sitting inside the frame are in a class of their own. The innovative seal assemblies and revolutionary module mounting system, with only six bolts to remove, reduces module changes from hours to just minutes... it's all about up time!

More Power – Less Weight – Smaller Size

Spec	Triplex 2200 hp	Quatro 2450 hp
Input HP	2200	2450
Weight Complete	35–50 t	28 t
Unitized width	3.3m+	2m
Unitized height	4.6m	2.75m
Length over skid	5.5m	4.9m
Module change out	5–16 hours	25 minutes
Flow rate	1200 GPM	1597 GPM

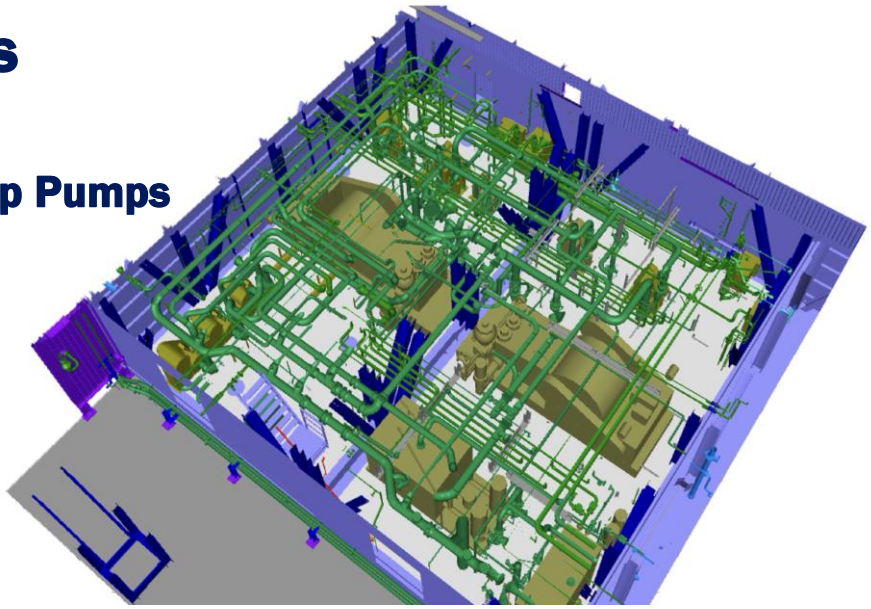
Shell offshore rig adds 130% more pumping power

Upgrading from (2) 1600hp mud pumps

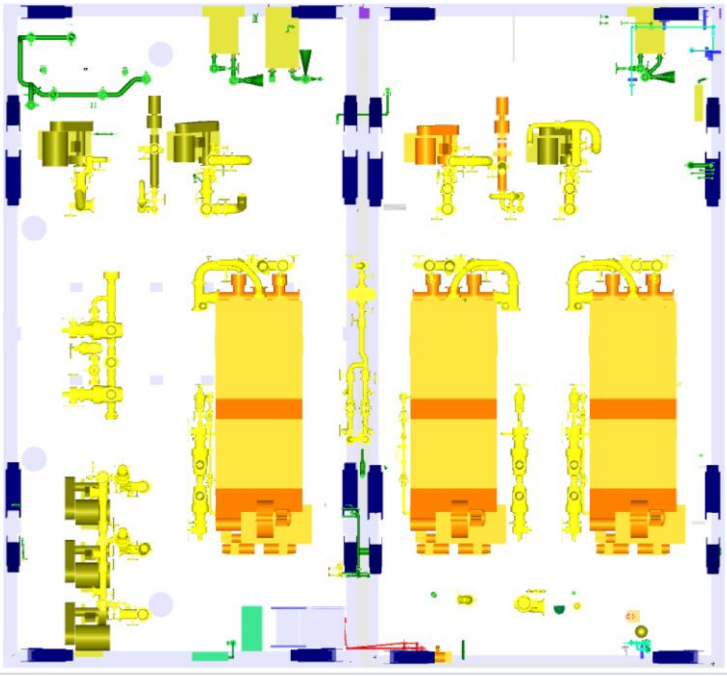
Two 14P 220 Pumps
(Proposed and rejected)

Before Three Quatro 2450 hp Pumps

- Shell pump room layout with two 14P 220 pumps
- Total power: 4,400 hp



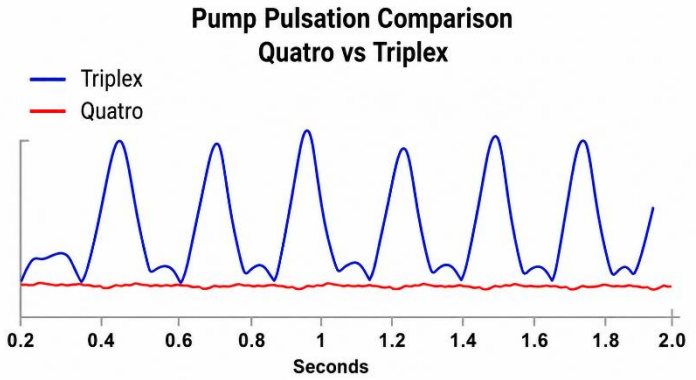
Three Quatro 2450 hp



- Shell pump room layout with two 14P 220 pumps
- Total Power: 7,350 hp
- Same installed weight as two NOV 14P 220 pumps

Near Zero Pulse. Better MWD

The Quatro's unique placement of pulsation dampeners removes the pulse before it arrives at the strainer cross and escapes downhole. This means near zero-pulse discharge and the lowest levels of vibration and mud noise, for exceptional MWD performance.



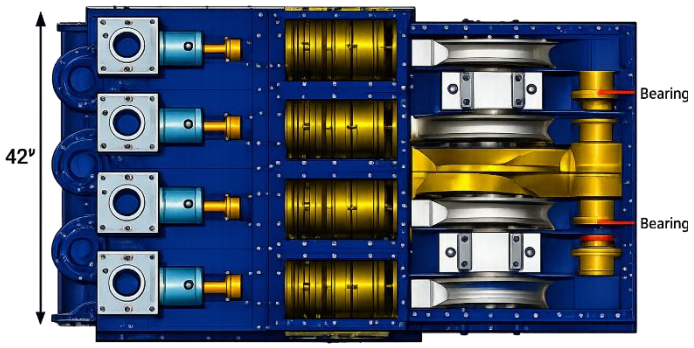
Quadraplex actual real-time data ref test Houston May 30th, 2009

The Quatro's almost pulse-free discharge is shown in red, overlaid against the typical theoretical discharge pulse and vibration of a triplex pump shown in blue. The Quatro's discharge data, obtained by the proprietary White Star Smart Safety Alarm System's Data Acquisition Sensors, further illustrates this pump's ultra smooth flow. To witness the Quatro's almost perfect discharge, visit **whitestarpump.com/1800** or contact White Star to schedule a live demonstration.

Unique Bearing Placement for Long Life.

The Quatro's radically different placement of the bearings along structural panels inside the pump, and between the cylinders, also delivers a number of key advantages:

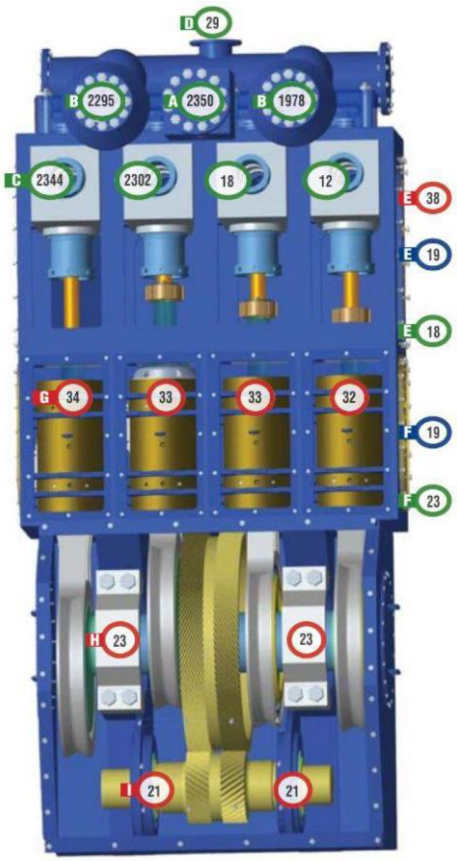
- Reduced peak bearing load
- Reduced crankshaft loading
- Extended bearing life
- Reduced pump vibration
- A more stable, structurally supported crankshaft



Real Time Monitoring that Reduces Downtime and Costs.

The WSP "Pump System Monitor"

Designed to detect and warn the operator of problems and maintenance issues in real-time, both locally and remotely. The WSP's proprietary data system allows the operator to closely monitor all aspects of the mud pump system. The data acquisition sensors will detect deviations from normal operating conditions and alert the operator long before they are perceivable by humans, thus creating a larger time window for preventing critical failures. Sensing whether the top or bottom valve in a particular cylinder is starting to leak or stick with 100% accuracy, the Pump System Monitor will reduce guesswork and down time.



A. Discharge pressure (PSI)
B. Pulsation dampener pressure (PSI)
C. Fluid module pressure (PSI)
D. Intake pressure (PSI)
E. Liner rinse pressure (PSI), flow (GPM), and temperature (Celsius)
F. Oil lube pressure (PSI) and flow (GPM)
G. Cross head and guide temperature (Celsius)
H. Bearing temperature (Celsius)
I. Pinion bearing temperature (Celsius)

More information on the science and field experience behind the advanced features of the Quatro can be found at **whitestarpump.com** or by speaking directly with your local White Star Pump Company agent.

Warranty

- Field commissioning at no additional cost
- 10 year limited warranty against manufacturers defect

QUATRO 2450 HP PERFORMANCE CHART – STANDARD

Stroke per min.			145	120	90	50
2450 hp	Hydraulic hp		2205	1825	1368	760
Liner size in. (mm)	Gal/stk (Liters/stk)	Max discharge pressure PSI (kg/cm²)	GPM - Gallons per minute LPM - Liters per minute			
9" (228.6)	11.02 (41.70)	2366 (174)	1597 (6046)	1322 (5003)	991 (3753)	551 (2085)
8.5" (215.9)	9.83 (37.19)	2652 (195)	1425 (5393)	1179 (4463)	884 (3347)	491 (1860)
8" (203.2)	8.70 (32.94)	2994 (220)	1262 (4777)	1044 (3953)	783 (2965)	435 (1647)
7.5" (190.5)	7.65 (28.96)	3407 (250)	1109 (4199)	918 (3475)	688 (2606)	382 (1448)
7" (177.8)	6.66 (25.22)	3911 (287)	966 (3657)	800 (3027)	600 (2270)	333 (1261)
6.5" (165.1)	5.75 (21.75)	4535 (333)	833 (3154)	690 (2610)	517 (1957)	287 (1087)
6" (152.4)	4.90 (18.53)	5323 (391)	710 (2687)	588 (2244)	441 (1668)	245 (927)
5.5" (139.7)	4.11 (15.57)	6335 (465)	597 (2258)	494 (1869)	370 (1401)	206 (779)
5" (127)	3.40 (12.87)	7500 (563)	493 (1866)	408 (1544)	305 (1158)	170 (643)
4.5" (114.3)	2.75 (10.42)	7500 (551)	399 (1511)	330 (1251)	248 (938)	138 (521)
4" (101.6)	2.18 (8.24)	7500 (551)	316 (1194)	261 (988)	196 (741)	109 (412)

**Only available with the "X" module. Rated strokes and horsepower 145 SPM @ 2450 Input horsepower. Liners available in 1/2" sizes. Hydraulic horsepower & flow rate based upon 90% mechanical efficiency and 100% volumetric efficiency. All data subject to change without notification*

Specification	Value
Max input hp	**2450**
Pump speed	145 SPM
Stroke length	10" (254 mm)
Max. piston size	9" (228.6 mm)
Min. piston size	4" (101.6 mm)
Fluid end working pressure	7500 PSI (51.71 MPa)
Max. flow rate	1597 GPM (6046 LPM)
Width	83.5" (2,121 mm)
Length	196.5" (4,991 mm)
Height	84.5" (2,146.3 mm)
Unitized weight (ready to run)	73,500 lbs (33,339 Kg)