

## Greatship Ramya

Well Stimulation Vessel class notation with second-generation FlexSTIM system

### APPLICATIONS

- Large-volume, high-pressure stimulation operations
- Hydraulic fracturing, acidizing, and sand control treatments
- Well flowback and surface well testing
- Nitrogen lifting
- Coiled tubing interventions

### BENEFITS

- Increases operational flexibility and job frequency with storage and blending capacities that accommodate a range of applications from large acid fracturing operations to small squeeze treatments
- Minimizes nonproductive time by delivering high-pressure stimulation operations even in rough seas (through Sea State 5)
- Maximizes operational efficiency and accuracy with experienced vessel and stimulation crews, state-of-the-art data acquisition and automation systems, and fit-for-purpose pumping and blending equipment
- Expedites well testing with unique flowback and testing equipment packages

### FEATURES

- Installed horsepower: 8,000 hhp
- Proppant storage: 260 m<sup>3</sup> [9,183 ft<sup>3</sup>], upgradeable to 460 m<sup>3</sup> [16,247 ft<sup>3</sup>]
- Noncorrosive fluid storage capacity: 763 m<sup>3</sup> [4,800 bbl]
- Corrosive fluid storage capacity: 222 m<sup>3</sup> [1,400 bbl]
- Nitrogen storage capacity: 53 m<sup>3</sup> [14,000 galUS]
- Liquid additive storage capacity: 37.9 m<sup>3</sup> [10,000 galUS]
- Methanol storage: 140 m<sup>3</sup> [880 bbl]
- Blending capacity: 31.7 m<sup>3</sup> [200 bbl] of corrosive fluid
- Two POD\* programmable optimal density blenders, including one designed for the HiWAY\* flow-channel fracturing technique



*To perform efficient stimulation and well testing operations, the pumps on Greatship Ramya deliver up to 8,000 hhp with a variety of configurations to enable flexibility in rates and pressures.*

*Greatship Ramya* has completed more than 1,200 efficient, effective stimulation treatments and well testing operations in Indian waters since 2015. From simple acid stimulation to complex fracturing operations, the onboard equipment and experienced crew and engineers ensure maximum efficiency and effectiveness.

With DP2 dynamic positioning and a pair of tunnel thrusters in stern and bow, the vessel steadily holds its position in Sea State 5 and has operated through the toughest monsoon conditions in western offshore India. Two main engines and controllable pitch propellers provide propulsion during transit and positioning at platforms or rigs.

### Equipment, storage, and mixing options improve flexibility

Based on the FlexSTIM\* modular offshore stimulation system, the *Greatship Ramya* includes four distinct equipment packages to maximize efficiency of proppant pumping, acid stimulation (matrix or fracturing), nitrogen pumping, and surface well testing operations. The unique well testing capability enables the vessel to not only perform stimulation treatments but also flow back wells to achieve stable production and measure the results. In addition, the modularity of the second-generation FlexSTIM system provides the flexibility to perform modifications to increase specifications to meet operational requirements in a short time frame.

The vessel's current stimulation capability enables delivery of the latest Schlumberger technology offerings for fracturing (including the HiWAY technique and Salik\* local-sand-enabled flow-channel fracturing service) and matrix acidizing (including OpenPath Reach\* extended-contact stimulation service and the MaxCO<sub>3</sub> Acid\* degradable diversion acid system).

The vessel is designed to cater to high-frequency operations with fully automated mixing capability that can deliver fluids in low-pressure lines at rates as high as 17.5 m<sup>3</sup>/min [110 bbl/min] for rapid real-time mixing and delivery. The efficient connectivity among flow systems also ensures multiple flow contingency options for each piece of equipment.

### Automation ensures efficiency and accuracy

Operations are completely controlled through the stimulation control room, where equipment data acquisition, cameras, and real-time software ensure consistent and accurate performance. A stimulation laboratory next to the control room provides quality assurance for fluids being pumped downhole.

# Greatship Ramya

## Greatship Ramya Specifications

### Marine data

#### Dimensions

Length, m [ft]	72 [236]
Breadth moulded, m [ft]	17 [56]
Depth moulded, m [ft]	8 [26]
Max. loaded draft, m [ft]	6.3 [20.6]

#### Performance

Trial speed, knots	13.8
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#### Capacities

Deadweight, Mg at 6.3-m draft [tonUS at 20.6-ft draft]	~3,650 [-4,023]
Freshwater, m <sup>3</sup> [bbl]	1,100 [6,919]
Base oil, m <sup>3</sup> [bbl]	220 [1,383]
Fuel oil, m <sup>3</sup> [bbl]	1,000 [6,290]
Methanol, m <sup>3</sup> [bbl]	175 [1,100]
Roll-reduction tanks, number	2

#### Thrusters

Bow thrusters (2), kW	900, tunnel
Stern thrusters (2), kW	400, tunnel

#### Auxiliary engines

Shaft generators (2), kW	1,600
Diesel generators (2), kW	460
Stimulation generators (2), kW	910
Emergency generator, kW	90
Supply system	440 V, 60 Hz, 3-phase

#### Accommodations

One-person cabins	6
Two-person cabins	22
Hospital	2 beds
Total berths	50

#### Anchoring equipment

Windlass	Anchor-and-mooring winch
Anchors (2), kg [lbm]	1,700 [3,747]; high holding stockless
Chain cable (2) length and diameter, m × mm [ft × in]	330 × 42 [1,082 × 1.65]

#### ROV support

ROV plug-in wiring connections from deck	
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#### Testing and flowback package data

Surface safety valve Max. pressure, MPa [psi]	SSV-GHC-840 69 [10,000]
Sand filter Max. rate, m <sup>3</sup> /d [bbl/d] Max. pressure, MPa [psi]	SFBP-ABB-770 795 [5,000] 69 [10,000]
Choke manifold Max. pressure, MPa [psi]	FMF-GHC-839 69 [10,000]

#### Stimulation data

#### Treatment pumps

Total pump power, kW [hhp]	6,000 [8,000]
High-pressure pump 1 Nominal plunger size, in Max. pressure, MPa [psi] Max. rate, m <sup>3</sup> /min [bbl/min]	4½ 103 [15,000] 2.0 [12.6]
High-pressure pump 2 Nominal plunger size, in Max. pressure, MPa [psi] Max. rate, m <sup>3</sup> /min [bbl/min]	3¾ 138 [20,000] 1.4 [8.7]
High-pressure pumps 3 and 4 Nominal plunger size, in Max. pressure, MPa [psi] Max. rate, m <sup>3</sup> /min [bbl/min]	5½ 69 [10,000] 2.9 [18.8]

#### Acid blenders and centrifugal pumps

Corrosive fluid blender tanks (3), m <sup>3</sup> [bbl]	11.2 [71]
Tanks for 35% raw acid (3), m <sup>3</sup> [bbl]	75.5 [475]
Blending centrifugal pumps (3) max. rate, m <sup>3</sup> /min [bbl/min]	15.9 at 344 kPa [100 at 50 psi] with blender tanks
Seawater centrifugal pumps (2) max. rate, m <sup>3</sup> /min [bbl/min]	15.9 at 344 kPa [100 at 50 psi]
Diesel delivery centrifugal pump max. rate, m <sup>3</sup> /min [bbl/min]	9.5 at 344 kPa [60 at 50 psi]
Liquid additive storage tanks, L [galUS]	Two at 7,570 [2,000], four at 3,785 [1,000], and four at 1,892 [500]
Liquid additive delivery pumps	Three CAT 2521, four CAT 6021.ESLB, two Waukesha 220, and one Bredel 50

#### POD blenders and silos

POD blenders 1 and 2 <sup>†</sup> Max. fluid rate, m <sup>3</sup> /min [bbl/min] Max. proppant rate, kg/min [lbm/min]	SBS 614 5.5 [35] 4,082 [9,000]
Header tank, m <sup>3</sup> [bbl]	15.9 [100]
Proppant silos, m <sup>3</sup> [ft <sup>3</sup> ]	Two at 25 [883] and one at 10 [353]
Bulk tank for silo (2), m <sup>3</sup> [ft <sup>3</sup> ]	100 [3,531]

#### Noncorrosive fluid storage

Mud tanks (8), m <sup>3</sup> [bbl]	99 [623]
Diesel tanks (2), m <sup>3</sup> [bbl]	99 [623]

#### Nitrogen pumps and storage

Nitrogen pump	NPS343Z
Hazardous area classification Max. rate, m <sup>3</sup> /h [ft <sup>3</sup> /h]	Zone 2 5,100 at 60 MPa [180,000 at 10,000 psi]
Nitrogen tanks, m <sup>3</sup> [galUS]	Two at 18.9 [5,000], two at 7.5 [2,000]

<sup>†</sup> Proppant blender 2 is enabled for HiWAY technique.

Three-phase separator High-liquid phase rate, m <sup>3</sup> /d [bbl/d] Low-liquid phase rate, Mm <sup>3</sup> /d [MMcf/d]	Sep-C-787 2,289 [14,400] 4,530 [160]
Surge tank, Max. pressure, kPa [psi]	GTHP-AB-FFZ1428 344 [50]
Burner Max. rate, m <sup>3</sup> /d [bbl/d]	BRN-HCB-89 1,430 at 2,068 kPa [9,000 at 300 psi]

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