KEEP DRILLING WHEN OTHERS STOP

MATRIX LGS® VIV SUPPRESSION SYSTEM

Now available for sale or rent
**SYSTEM OVERVIEW**

- AVAILABLE FOR PURCHASE OR RENT
- 10 JOINTS WORTH OF BUOYANCY
- 6,000 FT WATER DEPTH RATED BUOYANCY
- REFURBISHED, AS-NEW CERTIFICATION / WARRANTY
- MANUFACTURED IN ACCORDANCE WITH API 16F (2017, 2ND ED)

**MATRIX LGS®**

The premise is simple: Matrix LGS® will allow you to keep drilling when you would normally have to stop. Based on eddy profiles for the Gulf of Mexico, this can translate into an annual increase of 20% more uptime during eddy current events saving around $15 million in lost time per annum.

Matrix LGS® delivers a significant increase in rig capability at a small capital cost and will give those who adopt this new technology a clear market advantage over competitors who don't.

LGS is a registered trademark of AMOG Technologies Pty Ltd.

**FIELD TESTED AND PROVEN**

The revolutionary Matrix LGS® was inspired by the Saguaro cactus whose modest root system manages to keep the slender plant upright even when buffeted by the strongest of winds. It's the cactus' grooved profile that ameliorates the effect of high winds by interfering with the vortex formation process. This is exactly what the Matrix LGS® profile does in high currents and gives it its enviable performance characteristics.
**SYSTEM DETAIL**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Uplift</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg</td>
<td>lb</td>
</tr>
<tr>
<td>6000’ - Black Band, Joint Total</td>
<td></td>
</tr>
<tr>
<td>(includes fasteners)</td>
<td></td>
</tr>
<tr>
<td>11051</td>
<td>24362</td>
</tr>
<tr>
<td>13595</td>
<td>29971</td>
</tr>
</tbody>
</table>

Notes:
- Riser incorporates 5 module sets per joint. 85’ buoyancy coverage on 90’ riser (94%)  
- Weights and uplift values exclude bare joints  
- Uplift calculated using sea water density of 1025 kg/m³  
- Buoyancy base colour - MCE White

**MATRIX LGS® KEY FEATURES**

- Significantly reduces VIV and drag when compared with conventional buoyancy  
- 20%-30% increase in raw operable current speeds. Reduces drag and resultant loads during deployment and recovery, riser disconnect, and riser hang off  
- Negligible buoyancy difference compared to conventional modules  
- In-situ performance is comparable to fairings  
- Easily stacked both vertically and horizontally  
- Can be used with existing riser handling and storage equipment  
- Permanent installation eliminates fairing assembly/recovery times.
TESTING AND PERFORMANCE

SUCCESSFUL LGS FIELD DEPLOYMENT VALIDATES PRODUCT’S CAPABILITY IN OFFSHORE OPERATIONS

Matrix and AMOG conducted field trials with 609 metres (2,000 feet) of LGS® at a depth of 1,980 metres (6,300 feet) in the Gulf of Mexico from July 2017. The trial validated, in an operational environment, the VIV and drag reduction characteristics derived from the high Reynolds number testing conducted at the National Research Centre in St John’s, Canada.

The riser used in the Gulf of Mexico was fitted with sensors that capture movement and vibration when deployed. Matrix then compared the data from the Matrix LGS® string with similar current profile data using a conventional, cylindrical buoyancy string. This allowed Matrix to further demonstrate the efficacy of the system in strong current conditions experienced offshore.

The field results and analysis taken from a strong current period in January 2018 showed that without LGS®, and with the same rig offset, the upper flex joint (UJF) angles would have exceeded 2 degrees for this period and made the rig inoperable.

~ Validated LGS model data confirms ~
- Annual operability improvement of using LGS buoyancy string - 12 days
- Average annual savings - $US12.7 million
- Based on LGS string section costing $1.4 million it would take only 1.35 days to pay back purchase cost

LARGE SCALE TESTING AT CANADA’S NATIONAL RESOURCE COUNCIL IN ST. JOHN’S, NEWFOUNDLAND

Large scale post-critical tests at Canada’s National Research Council Canada demonstrated that Matrix’s LGS® system reduced both VIV amplitude and the resulting drag coefficient. These tests supported findings of earlier smaller scale sub-critical testing. Importantly, the larger scale allowed the tests to work at higher Reynolds numbers (up to 1.6 x 10^6). This is well into the post-critical flow regime that would be experienced offshore.

- FIXED MODE TESTS - LOWER DRAG THAN FAIRINGS
  - The fixed drag coefficient over a range of towing speeds averaged below 0.6.
  - Level of drag is lower than that achieved by fairing-equipped risers and significantly lower than that achieved by a bare cylinder.

- FREE VIBRATION TESTS - VIV AMPLITUDE LESS THAN 0.25 A/D
  - VIV during the tests was minimal. The typical VIV amplitude was less than 0.25 diameters, a significant reduction from the earlier sub-critical testing. The reduction in VIV amplitude further reduced the amplification of the drag coefficient. The maximum total measured Cd was 0.8 including VIV amplification.

- SUPERIOR PERFORMANCE IN EXTREME CONDITIONS
  - A comparative evaluation of three identical risers (conventional buoyancy, conventional buoyancy with fairings and Matrix LGS®) in extreme current conditions clearly demonstrated the superior performance of Matrix LGS® when compared with fairings.

- IF USING CONVENTIONAL BUOYANCY STRING UJF ANGLE WOULD HAVE BEEN EXCEEDED
- LGS IMPROVED UJF ANGLE

MATRIX COMPOSITES & ENGINEERING

Matrix is a leader in the design, engineering and manufacture of composite and advanced material technology. As a trusted partner, we work with our customers to deliver practical material science solutions to their unique challenges. Coupled with our commitment to R&D, Matrix helps our customers achieve the impossible.

- World’s largest manufacturer of syntactic foams
- ASX listed (MCE) since 2009
- 21 patents in multiple jurisdictions
- Australia’s largest exporter of oil and gas equipment
- KEEP DRILLING WHEN OTHERS STOP

DESIGN & ENGINEERING

Matrix is committed to the research and development of technologies to help our customers, with R&D expenditures representing over 4% of turnover in 2017. Our global engineering network has offices in the USA and Australia, with representatives in 14 countries.

Over 25% of staff are degree qualified engineers or scientists.

- FACILITIES
  - Matrix’s primary facility and headquarters is in Henderson, Western Australia. The 80,000 m² site – with 22,000 m² under cover – has good access to sea (0.5 km), rail (20 km) and air (25 km) transport hubs and is licenced to store and process hazardous chemicals.

CERTIFICATIONS

Matrix’s success is founded upon good processes. Both quality and health and safety systems have been certified to international standards.

Matrix was also one of the first Australian companies to be awarded “trusted trader” status.
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26/02/2019