Global Rapid Intervention Package (GRIP℠)

AIR-MOBILE EQUIPMENT PACKAGE FOR SUBSEA WELL CONTROL RESPONSE

OVERVIEW

The Global Rapid Intervention Package (GRIP℠) suite of services features the third generation 15,000 psi RapidCap™ air-mobile capping stack, rated for 12,000 ft seawater depth. Owing to its unique gate valve-based design it is not only significantly lighter and more mobile system than conventional second generation ram-based capping stacks, but also eliminates the need for installing large Subsea Accumulator Modules.

Current second generation ram-based capping stack systems are heavy, weighing in at 150 tons or more; lack of readily available crane capacity, the requirement for over-sized loads, the dependency upon a specific class of vessel with the crane capability to deploy these bulky capping stacks, or the necessity for airfreight by a multitude of heavy lift aircraft, make deployment of these large stacks logistically complex and precludes rapid deployment. This results in response times to an incident location that are measured in weeks instead of days. Compliance with the regulatory requirements governing well control response can be comfortably met with the GRIP, but poses serious issues in being able to deliver conventional ram-based systems in a timely manner in comparison.

The modular design of the GRIP components enables mobilization on six flatbed trucks from a dedicated bonded storage facility, and can be air transported on a single Boeing 747-800F or Antonov 124 aircraft. The GRIP also includes an air mobile ’Top Hat’, debris-removal cutting tools, a wellhead dispersant interface and the means for containment if required. Coupled with Boots & Coots’ industry-leading engineering services, the development of the GRIP has introduced a major differentiator in providing the most rapid response possible to subsea source control incidents.

SUPPLEMENTARY SERVICES

To avoid unnecessary costs, improve accessibility and mitigate logistics issues, Boots & Coots can facilitate access to existing Halliburton global Testing & Subsea (TSS) services, coiled-tubing units and stimulation vessels. The TSS group can provide and deploy topside flow separation onto numerous vessels of opportunity. TSS separation packages are modular, with standardized flow packages to ‘daisy chain’ for large flow rates. Halliburton Coiled Tubing services, providing dispersant pumping capability, and Halliburton’s fleet of stimulation vessels, for use in the dynamic kill process, can be deployed quickly, reducing the transit time to location by weeks. This package places emphasis on the re-tasking existing, industry-proven systems.

DETAILS AND FEATURES

» Emergency response planning
» Well control contingency response planning
» Source Control Emergency Response Planning (SCERP)
» RapidCap™ Capping Stack deployment
» Plume force flowfield modeling
» Worst-case discharge modeling
» Soft shut-in modeling
» Top kill and dynamic well kill modeling
» Kick tolerance modeling
» Air and freight logistics planning with contingencies
» Access to digital response planning and logistics support
» Facilitation of access to the Halliburton fleet of stimulation vessels with capabilities of 6,500 hhp to 21,500 hhp
– Global access to numerous skid-based coiled-tubing units strategically placed near all major deepwater basins
– Modular topside separator packages for deployment on smaller vessels
– 100+ separator packages deployed globally
– 15,000-bfpd flow rate per package
– Halliburton “clean burner” design for reduced discharge emissions
» Wellhead/BOP interface check (TEI)
» Comprehensive eLearning Training Programs for Source Control Responders (TEI)
» Personalized training
» Risk-assessment facilitation and drill/exercise design and support
MAJOR COMPONENTS

» RapidCap™ Air-Mobile Capping Stack
» Blowout preventer (BOP) intervention skid
» Debris removal equipment
» Subsea dispersant equipment interface
» Digital response planning and logistics support

RAPIDCAP™ AIR-MOBILE CAPPING STACK

Features
» Modular design
» Dual-barrier compliant
» Capability of operating in 12,000 feet of water depth (fsw)
» 15,000-psi pressure rating
» 250°F (121°C) temperature rating*
» API Material Class EE Trim with CRA clad seal surfaces
» One 7-1/16-inch center bore w/ 2 x FAI Gate Valves
» Two 5-1/8-inch secondary flow ports with w/ 2 x FAI Gate Valves each outlet and 5-1/8-inch Chokes
» 15K DX 18-3/4” Bore, H4 Profile, 27” Mandrel Connector
» 40 mt tons dry weight, 38 mt wet weight
» BOP intervention – Remotely Operated Vehicle (ROV) skid unit
» Dispersant and hydrate inhibitor injection capability (50 gpm chemical injection rate)
» Two-minute shut-in capability (API RP 17W)
» 7-1/6” center-bore access to enable post-well kill intervention operations

* Higher temperature rating pending

BENEFITS

» Rapid deployment, air-deployable via 2 x Boeing 747-400F or 800F aircraft or 1 x Antonov 124 aircraft
» Metal-to-metal sealing gate valves designed to close against flow and pressure
» Minimal reassembly and testing required after arrival at staging location
» Smaller crane lifting capacity requirements
» Designed to be used as primary well-isolation device
» Serves as mechanical connection point for flowback in containment scenarios
» Attractive cost model

CONTAINMENT CAPABILITY

Features
» “Top Hat” modular, non-sealing cap, designed for use with or without RapidCap Capping Stack package
» Dispersant and hydrate inhibitor injection ports

BOP INTERVENTION PACKAGE

Features
» Subsea hydraulic power unit
» 50 GPM, c/w API RP 17W ROV hot stabs

DEBRIS REMOVAL PACKAGE

Features
» Subsea hydraulic shears, Genesis GXP Model 2500
- Jaw opening: 46 inches
- Jaw depth: 48 inches
- Reach: 21 feet, 9 inches
» Super grinder

SUBSEA DISPERSANT KIT

Features
» 2 x 500-foot 1-inch hydraulic flying lines
» Hydraulic flying lead (HFL) deployment frame
» Coiled-Tubing Termination Head
» Remotely operated vehicle (ROV) wands
GRIP Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Height (w/ wellhead Connector &amp; Test/Transport Stand)</td>
<td>23.4 feet / 7.13 meters</td>
</tr>
<tr>
<td>Width</td>
<td>162 inches / 4.11 meters</td>
</tr>
<tr>
<td>Weight (With Wellhead Connector)</td>
<td>40 metric tons dry</td>
</tr>
<tr>
<td></td>
<td>38 metric tons wet</td>
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<tr>
<td>Test Stand/Shipping Skid</td>
<td>96 inch x 96 inch</td>
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<tr>
<td>Wellhead Connector</td>
<td>15K DX 8-3/4 inch Bore, H4 Profile, 27 inch Mandrel</td>
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<tr>
<td>Maximum Rated Water Depth</td>
<td>12,000 ft / 3658 meters</td>
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<tr>
<td>Rated Working Pressure (Wellbore Equipment)</td>
<td>15,000 psi</td>
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<tr>
<td>Design Life</td>
<td>Storage: 20 years</td>
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<tr>
<td></td>
<td>Operational: 2 years’ subsea shut-in</td>
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<tr>
<td></td>
<td>Operational: 6 months flowing</td>
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<tr>
<td>Product Specification Level (Wellbore Equipment)</td>
<td>PSL 3</td>
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<tr>
<td>Temperature Rating (Structural Steel)</td>
<td>-20°F to 120°F (-29°C to 49°C)</td>
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<tr>
<td>Temperature Rating (Wellbore Equipment)</td>
<td>0°F to 250°F (-18°C to 121°C)</td>
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<tr>
<td>Minimum Seawater Temperature</td>
<td>35°F (2°C)</td>
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<tr>
<td>Rated Working Pressure (Hydraulic Control)</td>
<td>5,000 psi</td>
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<tr>
<td>Maximum Discharge / Vent Rate During Capping Operations</td>
<td>330,000 bpd</td>
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<tr>
<td>Erosion Rate</td>
<td>2.2 mm @ 14 lbs sand per 1000 barrels of oil</td>
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<tr>
<td>Maximum Gas Oil Ratio (GOR)</td>
<td>684</td>
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<tr>
<td>H₂S Content</td>
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<tr>
<td>CO₂ Content</td>
<td>&lt;30 ppm</td>
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