To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, BE Capstone Design Programs

Group #15 Gasket Retention System for Subsea Collet Connector

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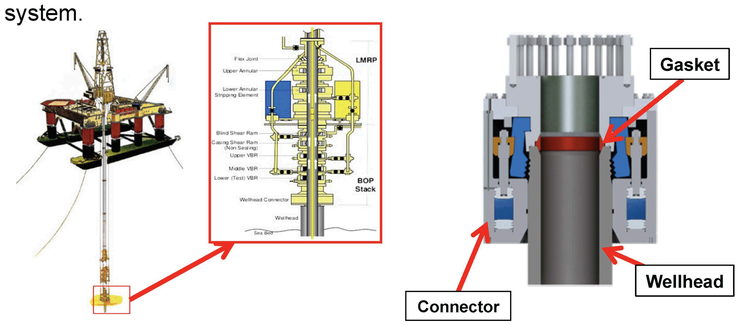
CAMERON

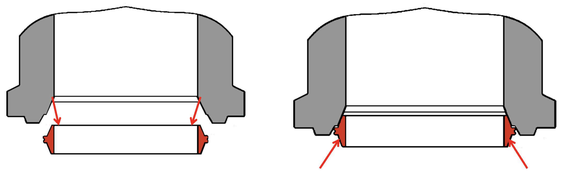
Background

During subsea drilling, a blowout preventer (BOP) is lowered on top of a wellhead to prevent large pressure kicks called “blowouts.” BOP’s are large specialized valves in redundant stacks that regulate pressure during the drilling process. The mechanism that connects the BOP to the wellhead is called a connector. Due to the vertical nature of the subsea field, the gasket for the connector must be held in place with a retention system.



Objective

Redesign a new robust system that retains and ejects a gasket, is easier to manufacture than the current design and has corrosion and contaminant mitigation in a subsea environment.

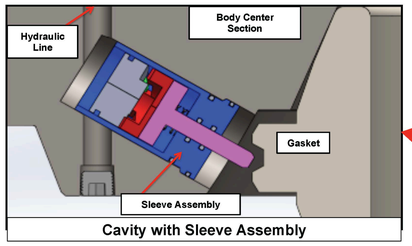


Safety

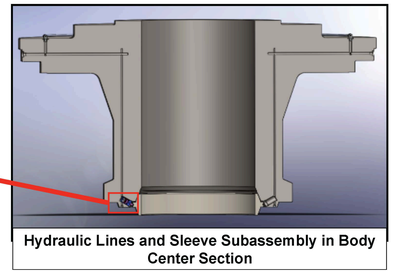
- Safety in design and manufacturing
  - Optimal factors of safety for all components
  - Proper PPE was worn in accordance with OSHA standards on safety equipment with regard to API and ASTM standards
- Safety in Testing
  - Properly rated equipment and fittings per ASME and API standards
  - Secured and isolated testing rigs in case of failure
- Site specific safety training
  - Oceaneering High Pressure Training
  - ASI Safety Training
  - Cameron Plant Safety
  - Cameron High Pressure Training

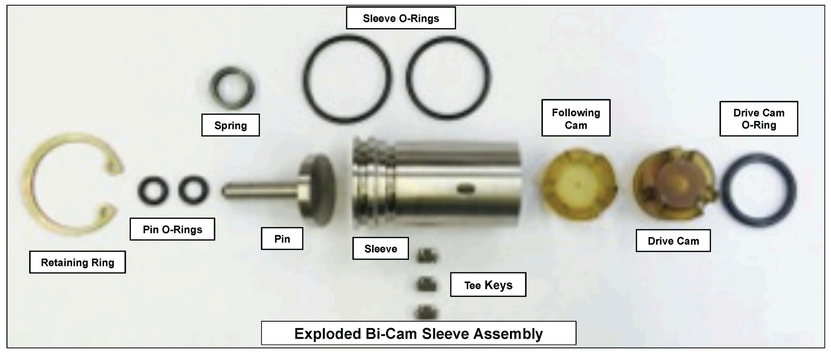
System Overview

The system ejects and retains the gasket with hydraulically actuated pins that move in and out by rotating on a cam system. The system works the same an ink pin does, each stroke moves the pin either in or out.



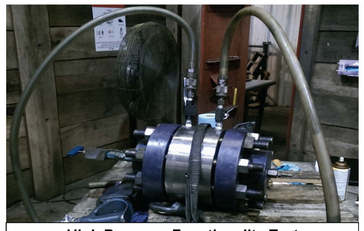
Cavity with Sleeve Assembly


Hydraulic Lines and Sleeve Subassembly in Body Center Section



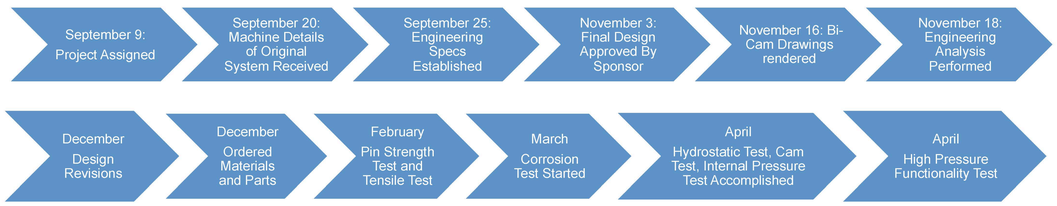
Exploded Bi-Cam Sleeve Assembly


Pin Strength Test


High Pressure Functionality Test


Corrosion Specimens in Oven

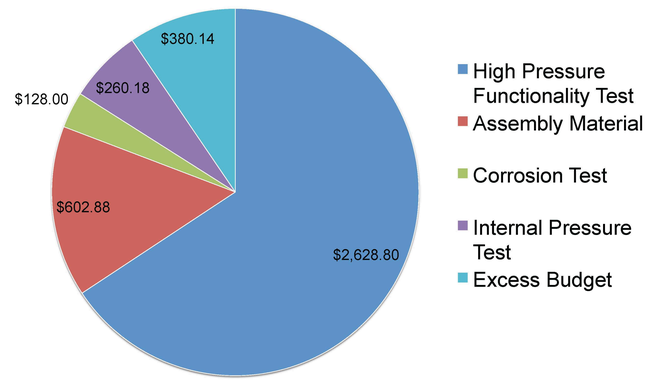
Timeline



Engineering Specifications and Test Results

Engineering Specification	Verification	Results
No welding processes	Achieved through design	
Works independent of other systems	Achieved through design	
Materials Meet Yield, Ultimate Strength per API	Tensile Test	316 Stainless Steel and Nitronic 50 passed
No Plastic Deformation, Minimal Deflection under 60 lbs for 6 pins	Pin Strength Test	No plastic deformation, .0009" max deflection
At 1500 psi internal, no leaks in system	Internal Pressure Test	Held 1500 psi
At 4500 psi, external pressure system sustains no leaks and remains structurally stable	Hydrostatic Test	Held 4500 psi with no structural damage or leaks
Less corrosion than original design	Corrosion	Original design corroded average of .24g, new design corroded average of .18g
Actuates 100% of the time	Cam Mechanism Test	20/20 passed
Actuates 100% of the time	Air Low Presssure Functionality	Actuates at 110 psi
Actuates 100% of the time; Actuates at 500 psi with 4500 psi on front end	High Pressure Functionality	Actuates at 500 psi with 4500 psi on front end

Testing and Prototype Budget



Special Thanks

Advanced Sealing International ASI
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CURBELL PLASTICS
OCEANEERING

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