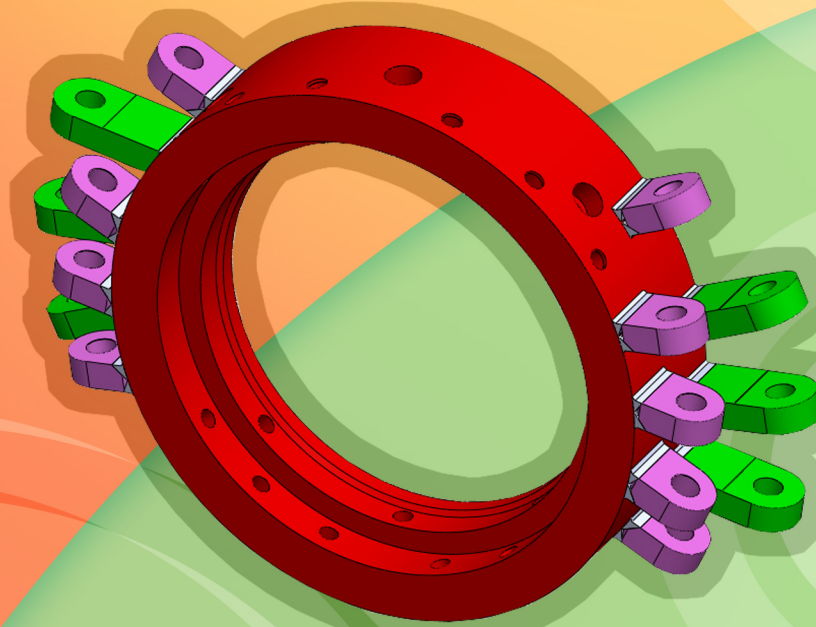


TENSION RING

Oil & Gas's Drilling Equipment is provided to jackup and floating rig drilling applications, which is a drilling riser system for deep-sea at least 10,000ft. In general, it consists of Risers, Diversers, Connectors, Tension Rings, Telescopic Joints and Hydril Pressure Control. Tension Ring is a part attached to telescopic joint forming termination point between riser system and tensioning system, which is used to provide better stability to riser string.

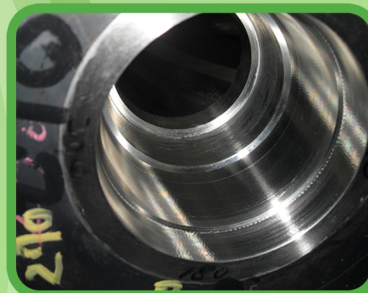


Key Fabrication Process

1 Welding

Dog Bore

- Inconel 625 Overlay welding : Overlay welding is the method to overlay welding metal at least 1mm thick with anti-corrosiveness, anti-abrasion and heat-resistance onto the base metal. In case of Inconel 625, it has excellent steel properties of high temperature and heat-resistance as well as low temperature/ high temperature acid-resisting fatigue strength, which is used as an welding metal with corrosion-resistance.



Padeye Welding

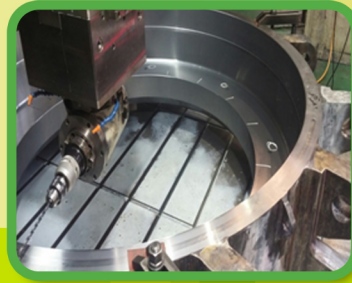
- Padeye is a lifting parts welded to the outer surface of tension ring body, in which welding strength is essential and load test is required after welding. Welding tolerance is $\pm 1.6\text{mm}$. To avoid deviation from this tolerance, marking or end piece shall be attached appropriately for the size of fillet welding before commencing welding. Energyen keeps required pre-heating during welding and post-heating conditions to meet the quality requirement.



2 Machining



• Dog Bore Machining



• Final Machining

3 PWHT

- Temperature : $610\text{ }^{\circ}\text{C} \pm 14\text{ }^{\circ}\text{C}$
- Hold Time : 2 hours



4 Test

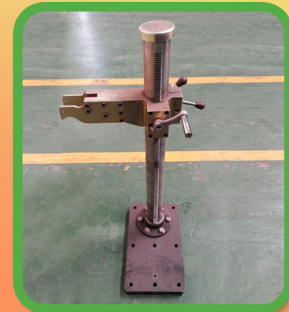
Load test

- Load test is conducted to demonstrate integrity of each Padeye. For each Padeye, 2 Padeyes shall be tested simultaneously for all Padeyes.
- Test Load : 225KIP(1000 kN)/Padeye
- Hold Time : 5 minutes
- Test angle shall be set up using Digital Protractor (digital angle/slope meter) and the tolerance is $\pm 1^{\circ}$.



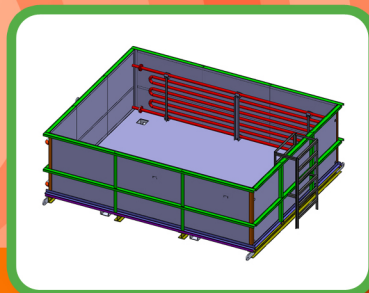
Hardness Test

- Hardness Test is conducted to check the hardness of base metal and welding section which shall compare the hardnesses before and after heat treatment.
- Hardness Range : 207~235 HBW,
- Test Method : Rockwell or Brinell hardness test applicable



5 Phosphate Coating & Epoxy Coating

- Phosphate coatings are a crystalline conversion coating that is formed on a ferrous metal substrate. Phosphate coating is employed for the purpose of pretreatment prior to coating or painting, increasing corrosion protection and improving friction properties of sliding components.
- Process: Pre-treatment -> Degreasing -> Washing -> Pickling -> Washing -> Phosphate Coating -> Cleaning -> Drying -> Inspection
- Phosphate Tank Size : W4,200 x L5,200 x H1,732
- Chemical Additives for Phosphate Coating : Accelerator 24, Additive 39, Gardobond 390, Gardoclean 543A, Gardoclean 543B, Gardolene P-Z, GB ADD 9951-1



• Phosphate Tank



• Epoxy Coating

Head Office 4th FL, Cheongsan Bldg, 38, Seochojungang-ro 2-gil, Seocho-gu, Seoul, 137-864, Korea Tel. +82-2-583-9761
Gunsan Factory 72, Jayumuyeok 2-gil, Gunsan-si, Jeonbuk, 573-540, Korea Tel. +82-63-472-7300
Gimje Factory 147, Yongji-ro, Yongji-myeon, Gimje-si, Jeonbuk, 576-972, Korea Tel. +82-63-542-8509

- ▶ E-mail : power@energyen.co.kr, business@energyen.co.kr
- ▶ Homepage : www.energyen.co.kr