

CHEMICAL PROCESSING

Shell Cuts Mars B Costs with RMB Products' Corrosion-Resistant Rotational Lining Solution



Diameter changes, wall penetrations and gussets that spanned the ID had to be protected with a uniform and uninterrupted bonded liner of modified HDPE.

The Mars oil and gas field is located in the Gulf of Mexico about 130 miles southeast of New Orleans and has been one of Shell's most important fields over the past 15 years. Shell initially developed the field using the Mars A 24-well tension leg platform. Given the field's sizeable resources, the company assessed the need for additional infrastructure to boost production at the field. The resulting Mars B project adds new infrastructure to the Mars field and will extend its production life to at least 2050.

Challenge

The Mars B infrastructure includes an Olympus tension leg platform, with 24 well slots and a self-contained drilling rig. This production platform has 16 caissons installed in the tension legs to assist with stabilizing the platform by controlling and distributing sea water. Because offshore platforms are highly susceptible to the aggressively corrosive effects of seawater, Shell was determined to use corrosion-resistant materials whenever possible.

Shell invited RMB Products to participate in the Shell Oil Deepwater Caisson Project in 2008. Shell's main objective was to find a corrosion-resistant replacement for the super duplex 2507 stainless steel caissons the company used previously. Shell needed fast production turnaround and required the alternative components to demonstrate equivalent or superior long-term performance.

At a Glance

Client: Shell

Industry: Chemical Processing—Oil & Gas

Manufacturing solution: Rotational lining with custom-compounded polymer

PROJECT GOALS

- Find an alternative to super duplex 2507 stainless steel components
- Decrease production turnaround time
- Maintain or improve component performance/life
- Meet or beat budget cost targets

REQUIREMENTS

- Provide exceptional resistance to seawater corrosion
- Address high mechanical-property demands
- Provide a turnkey solution
- Ensure uniform wall thickness in lining complex shapes
- Custom-compound polymer (HDPE) with antimicrobial additive

HIGHLIGHTS

- Delivered product in 18 weeks vs. 50 weeks for super duplex stainless steel
- Tested and validated all materials to ensure design-life requirements met for maintenance-free performance
- Saved Shell \$5 million in manufacturing costs
- On track for improved service life, reducing future maintenance costs and capital expense



Rotationally lined caissons (20' length by 30" diameter) readied for inspection and delivery.

Finally, Shell stipulated that production costs had to meet—or beat—the budgeted cost targets.

Solution

RMB Products consulted with Shell for more than two years during the design phase of engineering. The scope of the project included

- Design and engineering
- Custom material formulation and compounding (high-density polyethylene—HDPE—with added antimicrobial agent)
- Testing and validation
- Fabrication
- Preparation of the host structure
- Rotational lining with complex geometry
- Finishing, painting and delivery for inspection and acceptance

RMB Products provided in-house services throughout all phases of the project and delivered product in about one-third of the time required for stainless steel components.

Results

All aspects of the project ran smoothly and all project requirements were successfully met.

Project turnaround. RMB Products delivered product 18 weeks after Shell released the order for production, compared with the anticipated 50-week lead time for super duplex stainless steel. Both lead times included fabrication, preparation, finishing, painting and delivery for inspection and acceptance.

Product performance. Several parts of the project required rounds of testing and validation to meet Shell's stringent design-life specifications for maintenance-free performance.

- RMB Products used standard and proprietary preparation processes to enhance the receiving surface of the host material and better condition it for a successful coating application.
- RMB Products determined the manufacturing methodology to assure uniform wall thickness throughout the interior of the host structure. The complex shape varied in diameter, included multiple outlets and contained an internal component that transversed the interior of the caisson with four interlocking steel rectangular ribs.

- RMB Products and Shell collaborated to select high-density polyethylene (HDPE) for the lining material. Shell requested the addition of an antimicrobial element, requiring RMB Products to test modified batches of material until it achieved design requirements without affecting established mechanical properties.

Cost reduction. RMB Products satisfied Shell's budget requirements. The rotational lining technology saved Shell \$5 million on the caisson portion of the Mars B project. Relative to the overall project costs approximating \$1 billion, the cost-savings contribution was a modest amount. However, meeting or exceeding all other project requirements while generating significant savings was a winning combination for Shell. As Mars B moves ahead, the use of corrosion-resistant HDPE will increase operational life, reducing maintenance costs and long-term capital expense for Shell.

Customer satisfaction. The overall project went smoothly due to the ongoing successful collaboration of Shell and RMB Products. Shell engineers were highly satisfied with the value the alternative manufacturing materials and technologies provided for the project. Going forward, Shell has an additional arsenal of manufacturing options—with demonstrated advantages—that it can consider for future projects.

Partnering with United Pipeline

The Mars B project also utilized numerous long, straight sections of pipe with no complex geometry. For internal corrosion protection in these sections, Shell contracted with United Pipeline to install its HDPE Tite Liner® product. Tite Liner® is pulled through long pipe sections that are straight or contain gradual bends, and fits tightly against the inside of the host pipe. Rotational lining and Tite Liner® work well as complementary technologies in many HDPE projects. RMB Products and United Pipeline have partnered on such projects for more than 20 years. For more information about Tite Liner®, visit unitedpipeline.com.

About Shell

Shell is a global group of energy and petrochemical companies and one of the largest energy companies in the world. Houston-based Shell Exploration & Production Company focuses its exploration on the deepwater plays in the Gulf of Mexico. Visit shell.com to learn more about the company and the Mars B project.

About RMB Products

RMB Products is a leading supplier of engineered polymer products for critical applications in the aerospace, chemical processing, semiconductor and biopharmaceutical industries. Our success is based on helping customers lower capital cost and operating expenses through innovative manufacturing processes and high-performance materials.



To learn more about how our innovative solutions help you lower costs, visit our website at rmbproducts.com.