

ADDRESSING AN AGE-OLD INDUSTRY CHALLENGE

老旧设施的表面处理和涂层修复-创新应用 Spiderjet® 3000 机器人表面处理系统

Maintenance of offshore facilities, specifically surface preparation and coatings repair, remains integral to safe and sustainable operations. But in times of lower oil prices maintenance is often discounted on offshore installations. Many major Oil & Gas operators with aging assets are pressured to maintain production levels, reduce costs and stall non-essential maintenance. Delays to maintenance work provide immediate relief, but can seriously affect the long-term integrity of equipment, levels of production, and the safety of the personnel on board. But Robotics can also offer a solution here. 海上设施的维护，特别是表面处理和涂层修复，仍然是安全和可持续运行的必要组成部分。但在油价较低的时候，海上设施的维护往往不受重视。许多持有老化资产的大型油气运营商需要维持生产水平降低成本而停止不必要的维护。维护工作的延迟能立即缓解经济压力，但会严重影响设备的长期完整性、生产水平和船上人员的安全。但机器人技术可以提供解决方案。

AN AGE-OLD CHALLENGE 由来已久的挑战

Offshore assets face some of the harshest weather conditions, which are extremely destructive to their protective coatings. Large portions of the exposed surfaces on an offshore asset are made from carbon steel. Therefore, they are highly vulnerable to corrosion. This costs the global Oil & Gas industry an estimated \$1.372 billion per year (Source - NACE International website). The corrosive nature of the material, combined with the harsh environment, limited access, and safety challenges of surface preparation and repairs, makes for challenging operations.

海上资产面临最恶劣的天气条件，这对它们的保护涂层具有极大的破坏性。海上资产表面暴露的大部分由碳钢制成。因此，它们极易受到腐蚀。据估计，全球石油和天然气行业每年为此付出13.72亿美元的代价。该材料的腐蚀性，加上恶劣的环境、访问条件的限制、表面准备和维修的安全挑战，使得操作具有挑战性。

Operators are now recognizing that many of their assets are working beyond their expected life span, and see the benefits of effectively maintaining them. Maintenance plans involving innovative, best-in-class preservation activities can keep their assets operating for longer. This results in the highest yield from the deployment of safe, multi-disciplined personnel and state-of-the-art equipment. 运营商现在意识到，他们的许多资产已经超出了预期寿命，并看到了有效维护它们的好处。创新及一流的维护活动的维修计划可以使他们的资产运行更长时间。因此部署安全、多纪律人员和使用最先进的设备的产量最高。

A NEW-AGE SOLUTION 新时代的解决方案

With this in mind, Stork continues to monitor the market for innovative surface preparation products and methods to ensure we are at the forefront of emerging technology. This not only exceeds our clients' aging asset requirements but also improves the safety of our people. What's more, it minimizes the environmental impact and enables Stork to remain competitive in a low oil price market.

秉承这一理念，Stork继续关注市场创新表面制备产品和方法，以确保我们处于新兴技术的前沿。这不仅迎合了客户对老化资产要求，也提高了我们员工的安全。更重要的是，它最大限度地减少了对环境的影响，使Stork在低油价的市场上保持竞争力。

The Spiderjet® 3000 robotic surface preparation system is one such innovative product. It offers a safer and more efficient alternative to traditional hand jetting methods and forms part of our comprehensive range of jetting equipment for the maintenance and repairs of an asset.

Spiderjet® 3000 机器人表面处理系统 就是其中一款创新产品。它替代传统的手工喷射方式，提供了一种更安全、更有效的选择，是我们用于资产维护和维修的各种喷射设备的一部分。

Spiderjet® 3000 provides precise and efficient stripping of vertical, inclined and horizontal surfaces using ultra-high-pressure water, making it ideal for storage tank maintenance projects, helidecks, large deck areas, laydown areas, and bulkheads.

Spiderjet® 3000 可使用超高压水对垂直、倾斜和水平表面进行精确高效的剥离，使其成为储罐维护项目、直升机架、大型甲板区域、铺设区域和舱壁的理想工具。

The system attaches to the work surface by vacuum, which also contains the removed waste material and wastewater. It is remotely operated and offers maximum maneuverability via two individually, pneumatically driven wheels. This enables the jetting system to complete projects vertically and horizontally, on flat and curved surfaces. It can also be operated overhead and can remove existing coatings at a rate of up to 70m²/hr (753ft²/hr).

该系统通过真空附着在工作表面，同时也包含除去的废料和废水。它可以远程操作并通过两个单独，气动驱动的轮子提供最大的操作性。这使得喷射系统能够在平面和曲面上完成垂直和水平的任务。它还可以在高空作业，清除现有涂层的速度可达70m²/小时(753ft²/hr)。

IN PRACTICE 实践中

Work scope: Stork's Environmental and Decontamination division was tasked with the completion of coatings removal, surface preparation, and a full recoat of wellhead jacket decks and supports. The work scope was to be completed within a limited timeframe (21 days), on a North Sea installation. The area of work, measured at 925m² (9,957ft²), would have traditionally required conventional open-nozzle blasting and deck scrubbing to remove the extensive corrosion scale and defective deck coatings before the application of a remedial coating.

工作范围: Stork环境和净化部门的任务是完成涂层去除、表面处理以及井口导管架甲板和支架的全面重涂。工作范围是在北海的一个装置上，在有限的时间框架内(21天)完成。在925米(9,957英尺)的作业区域，传统上需要常规的开放式喷砂和甲板扒砂，以清除大量的腐蚀垢和有缺陷的甲板涂层，然后再使用补救涂层。

Solution: Stork suggested to use the the Spiderjet® 3000 for most of the work. After liaising with the client, a demonstration of the Spiderjet® 3000 was conducted at Stork's facilities. This provided the client with the confidence that the tool was fit for purpose and capable of completing the work scope within the desired 21-day timeframe.

解决方案: Stork建议在大部分工作中使用Spiderjet® 3000。在与客户联系之后，在Stork的设施中对

Spiderjet® 3000进行了演示。这为客户提供了信心，该工具适用并有能力在预期的21天时间框架内完成工作范围。

RESULTS & BENEFITS 结果与好处:

The system offered a safer and more efficient alternative to traditional hand jetting methods with reduced scaffolding, sheeting and containment requirements and increased removal rates. The Spiderjet® 3000 technology offers many efficiency benefits such as: 该系统提供了一个更安全、**更有效的替代传统的手工喷射方法，减少了脚手架、护板和密封要求**，提高了清除率。**Spiderjet® 3000 技术提供了许多效率优势，如:**

- Removes areas of corrosion efficiently; blasting speed twice as fast than conventional methods
- 有效去除腐蚀区域; 速度比传统方法快两倍。
- Eliminates encapsulation required. 免除封装需要
- Minimizes waste direct to containers. 尽量减少直接进入容器的废物。
- Eliminates fire and gas inhibition requirements. 消除了火焰和气体抑制要求。
- Reduces personnel on board and flight seating requirements. 减少船上人员和机位需求。
- Eliminates the need to clean up spent abrasive, scale, or coatings. 无需清理磨损的磨料、水垢或涂层。
- Does not require flogging of the decks prior to blasting operations. 不需要在作业前对甲板除尘。
- Does not require wash down prior to surface preparation. 在表面准备前不需要冲洗。
- Offers uninterrupted working in harsh weather conditions. 在恶劣天气条件下不间断工作。
- Provides Ultra-High Pressure (UHP) heating of the steel prior to coating application. 在涂装前对钢材进行超高压(UHP)加热

HSE BENEFITS 安全性方面的益处

- No dust. 没有尘土
- No hand and arm vibration recording required (HAVS). 不需要手和手臂振动记录(HAVS)。
- Very little noise; no requirement for double hearing protection. 很少的噪音; 无需双重听力保护。
- Reduced barrier requirements, which increases simultaneous working operations. 降低屏障要求，增加了同时的工作操作。
- No blast suit, blasting gauntlets or blast hood requirements. 无防爆服、爆破手套或防爆罩要求。
- Minimizes the need to build scaffold or use rope access on a vertical slope. 尽量减少在垂直斜坡上建造脚手架或使用绳索通道的需要

With these combined benefits, the Spiderjet® 3000 reduced manpower efforts by 52% and delivered a 40% cost saving. The Spiderjet's surface preparation capabilities combined with Stork's multi-skilled technicians form a formidable solution to address age-old challenges in a new and better way.

结合以上优点，Spiderjet 3000 减少了52%的人力投入，节约了40%的成本。Spiderjet的表面处理能力与Stork的多技能技术人员相结合形成了一个强大的解决方案，以新的和更好的方式解决由来已久的挑战。