



*Novel Epoxy  
Technology for  
Corrosion Protection*  
新环氧技术  
在重防腐领域的应用

# NET Vision 新技术的远见

## NEW NEEDS

**ENVIRONMENT**

**PERFORMANCE**

**SAFETY**

**COST**



## NEW TRENDS

▶ **Surface preparation flexibility** (dry & wet)

▶ **Solvent-free coating**

▶ **Surface & humidity tolerance**

▶ **Edge-retention**



Grit blasting use is being banned

使用喷砂处理已  
开始受到禁止



Used grit is a dangerous waste,  
costly and difficult to manage,  
种有害的废物，  
且費用高  
使用后的砂是——  
处置困难

28/05/2004 12:54

# HYDROBLASTING

高压水喷射清洗





HUMIDITY & FLASH  
RUST TOLERANCE  
对湿度和闪锈很宽容





HIGH  
ADHESION  
很强的附着力

20 MPa  
2,900 Psi  
90% 1st coh.  
10% glue

2004 6 8



PROFILE  
NOT  
NEEDED

无需粗糙度



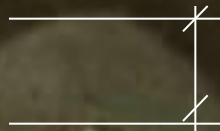
Hydroblasted  
welding seam

高压水喷射清洗处理  
过的焊缝

60% COESIVA  
40% ADESIVO



EDGE RETENTION  
74-100%  
边角保护达74-100%





# *Key Features of NET*

## *新技术的主要性能*

- Moisture tolerant solvent-free epoxy  
对湿气很宽容的无溶剂环氧
- 100% VS  
100%体积固含量
- Low VOC (< 150mg/L)  
VOC含量低(< 150mg/L)



# *Key Features of NET*

## *新技术的主要性能*

- No relative humidity restrictions  
无相对湿度的限制
- No dew-point restrictions  
无露点限制
- Compatible with UHP water jetting (including immersion service)  
与超高压水喷射相兼容(含浸润服务)
- Edge retentive (> 70%)  
边角保护性能, 高达70%





# *Application Features of NET*

## 新技术施工特性

- No surface profile requirements...  
无需表面粗糙度要求
- Can be applied over damp surfaces...  
能在潮湿的基材表面上施涂
- Can be applied over flash-rust...  
能在有闪锈的基材表面上施工
- ...including immersion service  
能用于浸润服务



# *Application Features of NET*

## 新技术施工特性

- Up to three hour pot-life  
高达3小时的混合使用时间
- Standard airless application  
标准化的无气喷涂施工
- Brush and roller application  
刷涂和滚涂施工亦可



# *Performance Features of NET*

## 新技术性能特征

- Very high adhesion (up to 25 MPa)  
超高的附着力（高达25 MPa）
- Dual-bonding mechanism  
双重连接机制
- Compatible with Cathodic Protection  
与阴极保护相兼容





# *Performance Features of NET*

## *新技术性能特征*

- MIL-23236C approved (Type VII, Classes 7, 17, 15b)  
通过美国军队MIL-23236C标准
- IMO PSPC type approved (ABS, Lloyds, GL)  
通过国际海事组织的《保护涂层的性能标准》
- 20 years service life in immersion (ballast)  
在浸润状态下具有20年的服务年限

The image shows six rectangular steel plates arranged on a light brown wooden workbench. The plates are organized into two rows of three. The top row consists of three smaller plates, while the bottom row consists of three larger plates. Each plate has a distinct yellowish-brown, textured surface, characteristic of hydroblasting. The top-left and bottom-left plates have a small, dark, rectangular notch cut into their upper-left corners. The top-middle and bottom-middle plates have a dark, semi-circular mark on their upper-left corners. The top-right and bottom-right plates are plain. The background is slightly out of focus, showing a workshop environment with a white bucket on the left and a wooden wall on the right.

Hydroblasted plates before  
IMO PSPC testing with NET  
按照PSPC标准，测试新技术前的、  
已高压水喷射清洗处理的钢板

26 12:28PM



# *NET Clients (examples)* 新技术的受益者

- » Petrobras (offshore & marine)
- » Pemex (offshore)
- » Aker (offshore)
- » Queiroz Galvao (offshore)
- » Sembcorp (marine & offshore)
- » Keppel (marine & offshore)
- » Atlantico Sul (marine & offshore)
- » US Navy and Coast Guard
- » Transocean (offshore)
- » BP (offshore)
- » Polar /Conoco-Philips (Marine)
- » Mobil (offshore)





# *NET Preferred Situations*

## 新技术推荐使用场所

- Tank coating without dehumidifiers  
没有去湿机的储罐
- Surfaces with condensation  
存在冷凝作用的表面
- Hydroblasting as surface preparation  
用高压水喷射清洗作为表面处理
- Outside work without dew-point restrictions  
无露点限制的室外工作
- Coping with flash-rust without need for rust inhibitors  
对付闪锈而无需防锈剂



# *NET Preferred Situations*

## 新技术推荐使用场所

- Stringent VOC regulations  
严格的VOC规定
- Edge-retention to save edge grinding & stripe coat costs  
要求边角保护以节省边角打磨和预涂
- Use water after surface prep to keep chloride levels low  
使用水后, 使得氯化物浓度在表面处理后保持很低
- Safer work environment, no danger of fire.  
更安全的工作环境, 没有火焰的危险
- Concurrent hot works (no solvent paint, water blasting)  
热工可同时进行(无溶剂挥发, 水喷射)

wash & paint in one go  
边洗边喷一气呵成



Recovering 3 days worth of  
continuous blasting simply  
by washing



# painting @ night in Singapore 在新加坡夜间施工



Flash rust allowed  
允许闪锈存在

Allowed level of flash rust  
允许闪锈存在





Getting chlorides OK in one go  
With hydroblasting  
使用一次高压水喷射清洗, 氯化物  
达到标准



Water jetting standard: SSPC SP12 WJ2  
水喷射标准: SSPC SP12 WJ2

11 5 2002



# Tank coating 储罐

Do it without dehumidifier and over  
flash rust (WJ2M)

未使用去湿机和闪锈存在下施工





Going back after 5 years to find 0%  
breakdown over 10,000 m2 total area \*  
5年后回来复检, 在超过10000平方米面积  
里, 无任何破裂脱落等

\* ABS independent inspection report



Do it with hydroblasting,  
without dehumidifier and over  
flash rust (WJ2M).

Again...

再次测试, 未使用去湿机和闪锈存  
在下施工



Condition after UHP hydroblasting,  
before Novel Technology application  
超高压水喷射清洗后, 施工前的状况

2004 1 25



Hydroblasting is safer and does not impact other job fronts  
高压水喷射清洗很安全，不会影响前面其他工作的进行。



在新加坡，没有露点限制和湿度宽容是至关重要的。  
因为经常下雨...



No dew point restrictions and humidity  
tolerance are critical in Singapore: always raining...

26 3 2003





# *NET Guide to Chase Value*

## *asking the right questions...*

- Can you do the job with standard coatings?  
你能用常规涂料来完成任任务吗？
- How much can you save by not using a dehumidifier?  
不用去湿机你能节省多少？
- Cannot use grit blasting: how valuable is it to use hydroblasting keeping the same service life expectancy?  
不能使用喷砂打磨：要保持相同的服务年限，使用高压水喷射清洗有价值吗？
- Painting outdoors & around the clock: how much time & money can you save if you can blast & paint regardless of dew point & humidity levels, including at night?  
在室外涂装？：如你能不在乎露点和湿度，包括在夜间施工，你能节省多少时间和费用？



# *NET Guide to Chase Value*

## *asking the right questions...*

- Abrasive waste to get SP10: how much do you pay to dispose of 60 or 80 Kg/m<sup>2</sup> of used abrasive media?

磨料废物：你需支付多少钱来处置60或80Kg/m<sup>2</sup>的已使用的磨料？

- Complex job with many fronts: how much are you willing to pay to be able to weld & cut in the vicinity of blasting and paint activities?

前面许多复杂的工作：你愿意付多少钱，使得在打磨和涂装附近能够进行焊接和切割？



# *NET Guide to Chase Value*

## *asking the right questions...*

- Big external surfaces to coat: is it valuable to blast day & night without worrying about losing the surface standard?

室外大面积涂装：日以继夜的打磨而不必担心丧失标准，这样做是否有价值？

- How about recovering 3-days worth of blasting by simply HP washing and painting immediately after?

只是用高压水洗恢复3天前的打磨状态，然后立刻涂装，你意下如何？

- How much would you save if you were able to reduce edge grinding from 3mm to less than 1 mm?

如你能减少3mm至1mm内的边角打磨，你将能节省多少？

- How much would you save if you were able to reduce from two to a single stripe coat?

如你能从2道预涂中减少1道预涂，你将能节省多少？

# *Atlantico Sul Case*

UHP hydroblasting  
at block phase

在分段阶段使用超高压  
水喷射清洗方法





# *Atlantico Sul Case*

UHP hydroblasting at  
block phase  
在分段阶段使用超高压水  
喷射清洗方法



# Atlantico Sul Case

Welds and damages are  
hydroblasted to WJ2  
焊缝和损伤处被高压水清洗至  
WJ2

The intact shop primer can be retained.  
未触及到的车间底漆仍可保留



# *Atlantico Sul* *Case*

Weld areas after UHP:  
aspect before application  
of NET

焊接区域在超高压水喷射清洗  
后，施工新技术之前的状况



# Atlantico Sul Case

35 ESP 165 mm  
54.8 PSIG  
15.3 MPA

60% COESIVA  
40% ADESIVO

Impressive Novel  
Technology adhesion  
over hydroblasted welds  
在高压水喷射清洗过的焊缝上，新  
技术有着超强的附着力





# *Atlantico Sul Case*

## **Shipyard's conclusions: 船厂结论**

**Manual abrasive blasting: 70 sq.m/day 人工喷砂打磨: 70 平方米/天**

**Hydroblasting: 90 sq.m/day 高压水喷射清洗: 90 平方米/天**

**To remove water is much easier and faster than remove abrasive.  
Some vacuum units are available for complex geometries.  
清除水比清除砂又快又简单。对于复杂结构, 几台吸尘器就能解决。**

# *Atlantico Sul Case*

First Suez  
Max with  
NET concept





# *Atlantico Sul Case*

First Suez  
Max with NET  
concept





# 国内案例

Petrobras N-513, N514 (May 2012 to Aug 2013)

巴西石油公司 N-513 和N514项目



KEEP OUT  
NO ALLOTT

2013-04-07 15:36:10







2013-04-27 15:14:14





2013-04-27 15:14:40





2013-04-27 15:14:49





2013-04-27 15:30:12





2013-04-27 15:36:12





2013-04-27 15:38:53






2013-04-28 08:15:29









2013-04-28 08:37:29

# More Benefits 更多益处

Blocks can be hydroblasted and painted faster. 分段结构能被更快地水清洗和涂装		Cost & labor reduction and overall increase on the yard capacity.减少费用和人工, 整体提高船厂产能
Dehumidification not required, can paint outdoors. 无需除湿, 能在室外涂装		Savings in energy costs and yard flexibility.能源节省, 增加船厂营运的灵活性
Reduced delays due to weather constraints. 减少由于天气原因的延误		Avoids delays due to chamber queues & stoppage because of high humidity.避免由于高湿度引起的等候和停止所造成的延误
Concurrent works possible. 可以与其他工作同步进行		Saving time: hydroblasting and painting with solvent-free materials allow for concurrent hot works to take place. 节省时间: 新技术允许热工同时操作
Avoiding ricochet damage: more shop primer can be retained. 避免其他损伤: 减少车间底漆的用量		Material (paint thickness), labor & time savings; lower risk of failure.节省材料, 人工和时间, 降低失败的风险



## More Benefits 更多益处

Reduced edge grinding 可减少边角打磨		Reducing from two to one stripe coat saves time and labor cost. 两道预涂改为一道预涂, 节省时间和人工
Reduced number of stripe coats 减少部分预涂		Saving time and labor cost. 节省时间和人工费用
Reduction of volume of paint by 36% 减少用漆量36%		Faster paint application, cost savings (reduced inventory, number of drums to deal with, etc) 涂装施工更快, 降低成本(库存等)
Solvent release reduced by 81% 减少溶剂释放量81%		Huge improvement of environmental and H&S friendliness of the yard activity. 对船厂生产的环境、健康、安全有着巨大的改善





## CONCLUSION 结论

- Novel Technology is changing the game in the anticorrosive market.

新技术改变了防腐市场的行当。

- The time & cost advantages of pursuing the new concept are enormous.

新概念追求时间和成本优势是巨大的。

- And now the concept is recognized, tested and used to an extent that makes it fully acceptable by owners.

新概念现已被认识，检验和完全接受。

# THANK YOU



May 7, 2010  
The first ship built with  
the NET concept, a  
Suez-Max tanker, was  
christened in Recife by  
Mr. Lula da Silva,  
President of Brazil



# *Additional Cases*

## *附加案例*



# Transocean

## D534



LETTER OF RECOMMENDATION:

Singapore, 13 June 2007

To Whom It May Concern:

Euronavy's ES301 solvent-free coating system was selected by Transocean and used for the tank refurbishment works performed onboard Transocean's drill ship Discoverer 534 during the first half of 2007 at Sembawang Shipyard, Singapore. All hull tanks have been treated with ES301 system, from ballast and drill water tanks to grey water, black water, fuel oil, brine and base oil tanks, bilge holding, side fills and mud pits. Some of these tanks were previously coated with a soft coat system that had to be removed. The remaining tanks were previously coated by epoxy systems.

The ES301 two-coat system (2 x 150 microns, 300 microns total DFT) was applied over full hydroblasted steel surfaces to the standard WJ2 (SSPC SP12). A surface condition of WJ2M (flash rust level as per SSPC Vis 4 Visual Guide) was allowed before the application of the first coat, together with a maximum chloride level of 70 mg/m<sup>2</sup> (indeed the chloride level before ES301 application was always below 20 mg/m<sup>2</sup>, thanks to the use of hydroblasting). No restriction on humidity levels was imposed.

Our choice of this coating system was due to its particular features. ES301 can be applied without dew point restrictions over flash rusted steel surfaces prepared by Ultra High Pressure hydroblasting. Euronavy was able to provide the coating performance guarantee for long term service life demanded by Transocean. Traditional coating systems can only assure this kind of performance guarantee if using abrasive blasting and dehumidification during blasting, application and curing steps.

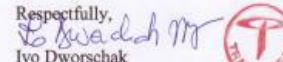
Thanks to the joint factors of using hydroblasting, having no solvent release during coating application and curing and ES301 having high surface tolerance properties we have been able to complete the surface preparation and coating application without any delays and with the further advantage of proceeding with hot works and other activities in the vicinity of hydroblasting and painting works without the constraints we used to have when requiring abrasive blasting and solvent-borne coatings. Moreover the coating application inside tanks did not require the use of dehumidifier.

Final quality control of the applied ES301 system was focused on pull-off adhesion tests, performed after full curing of the system. We found average values ranging from 1200 to 1900 psi (8.3 to 13.1 MPa) and averaging 1500 psi (10.3 MPa), this being considerably higher compared with the usual benchmarking for this kind of application and more than double compared with the minimum acceptable value of 725 psi (5 MPa).

Considering the benefits experienced during this coating system application, the extended guarantee, the ability of using hydroblasting as surface preparation method and the very good observed final quality (pull-off adhesion) we do not hesitate to state our full satisfaction with the choice of Euronavy's ES301 system. On top of the product-related satisfaction we also want to state our appreciation for the excellent work of Euronavy's Inspection Team, which performed outstandingly and gave us total confidence that the application was fully performed accordingly to Euronavy's standards.

In case you need additional information please do not hesitate to contact the undersigned.

Respectfully,



Ivo Dworschak

Sr. Project Manager - DrillShips "Discoverer 534"; "Discoverer Seven Seas"

e-mail [idworschak@houston.deepwater.com](mailto:idworschak@houston.deepwater.com); phone: (65) 9821-1061

TRANSOCEAN





# *Luis I Steel Bridge Case*

## *路易铁桥工程*

- A 30,000 m<sup>2</sup> XIX century steel bridge loaded with lead based paint, laying over an Unesco World Heritage Site
- Spec asked for stringent waste control measures.
- Water jetting & NET where introduced as a spec option.
- Motivation: huge waste disposal and containment cost reduction, durability, lower impact on urban surroundings.
- Key: teaming up with a contractor, lobbying to assure rules enforcement, SNCF approval and water treatment.
- Result: we got the job and set a standard for other bridge refurbishment jobs in Portugal.



# *Luis I Steel Bridge*

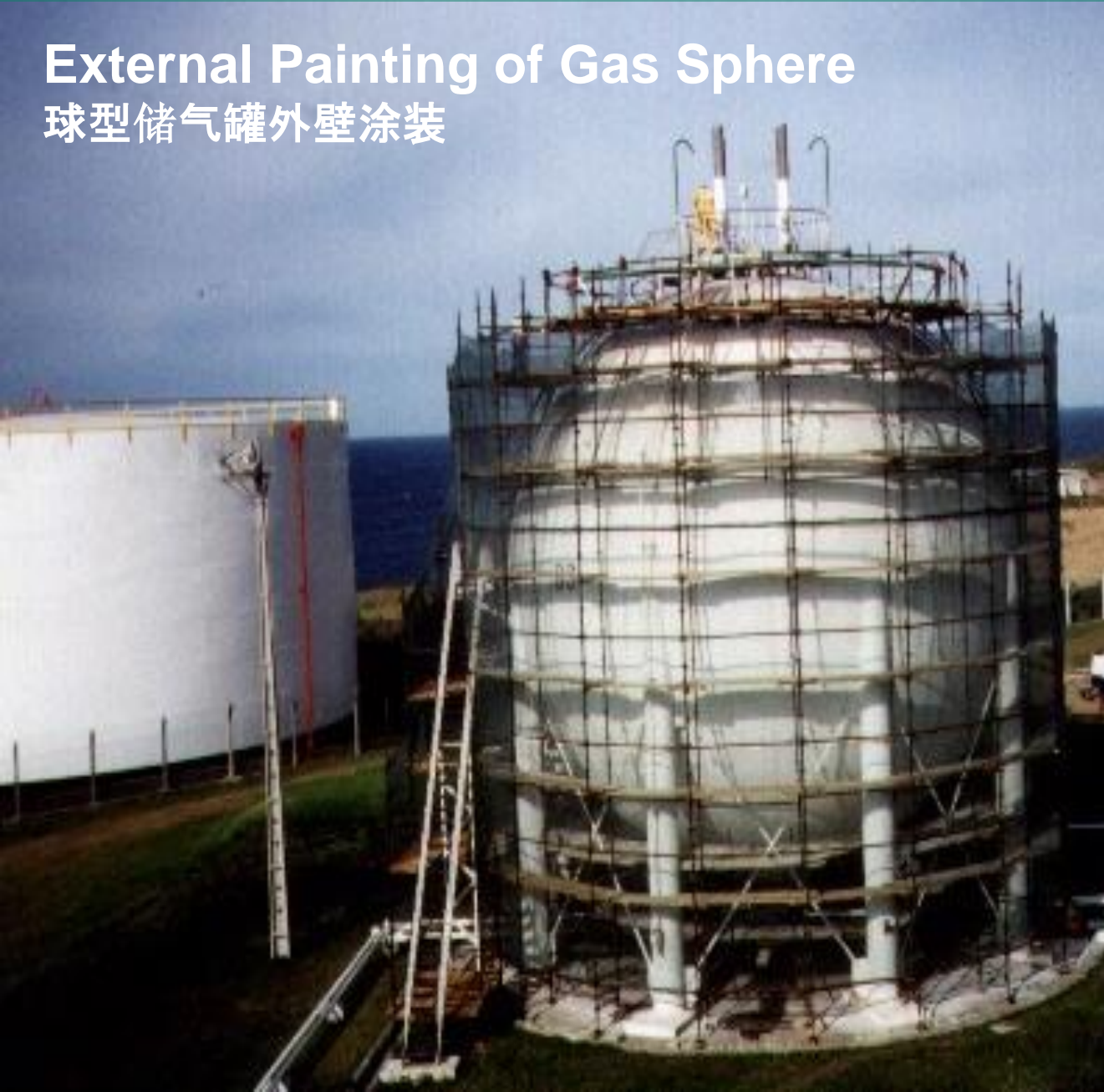
Red lead

Water jetting

- 2100 tons of abrasive NOT used 未使用2100吨磨料
- 2100 tons of toxic waste NOT produced 未产生2100吨有害物
- 10 tons of VOCs NOT released 未释放10吨VOC
- 35% overall job cost reduction 节约35%整体工程费用

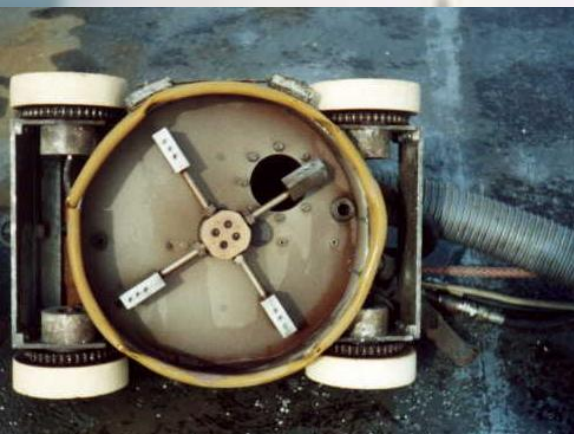


## External Painting of Gas Sphere 球型储气罐外壁涂装



**Hydroblasting with robot  
units on closed circuit:  
perfect situation for tank  
farms, chemical industry  
or energy.**

**和强力设备一起对封闭圆柱体  
进行高压水喷射清洗，特别适合  
化工和能源的储罐**







*THANK YOU  
ALL !*

*感谢大家  
并预祝成功！*