



STOPAQ®

Self-healing corrosion prevention & sealant technology

SEALFORLIFE

شركة
الباب
ALBAB
التجارية المحدودة
TRADING CO. LTD.



NACE®
INTERNATIONAL

JUBAIL SAUDI ARABIA
SECTION

Outline

- General Introduction to Corrosion.
- Highlighting the shortcomings of coatings in the Oil&Gas industries.
- Photo impressions
- Introduction to STOPAQ
- History and Evolution of STOPAQ (Timeline)
- International Approvals, Tests, and Reports on STOPAQ – Visco-Elastic Coating.
- Video Demonstration for the application of STOPAQ (Lay-barge and Subsea).

Corrosion

What is corrosion?

- Corrosion is a common occurrence in metals and is reflected as the degradation of metals through oxidation, bacterial growth, and electrochemical reactions .
- Consequences are hazardous, mainly in the Oil & Gas, and Water industries (pipelines and pipeline systems).
- Output of corrosion on the Oil and Gas, and Water industries is **highly expensive** in terms of rehabilitation and reconditioning of pipelines.

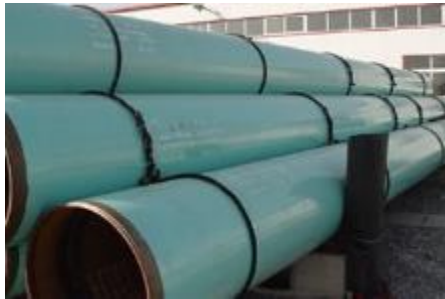
What induces corrosion to take place?

- Presence of water (Electrolyte)
- Presence of Oxygen
- Osmosis
- Microbiologically Induced Corrosion i.e. Bacterial growth in the presence of Nitrogen



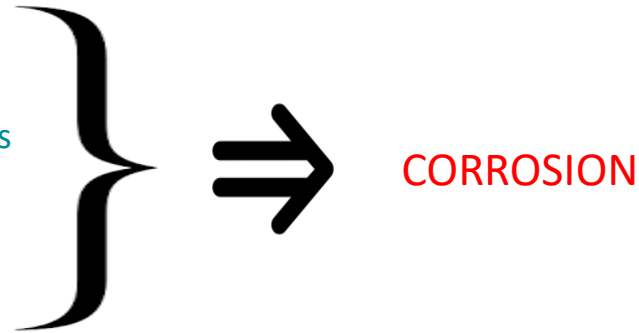
Conventional Anti-Corrosion Prevention

- Throughout history, the main concern for the oil & gas, and water operators/companies has been to establish the first line of defense against corrosion.
- Applying layers of coatings on to the substrates, acting as barriers for resistance.
- Several types of coatings are applied, mainly under controlled environments, out of which we note:
 - * *Fusion Bonded Epoxy (FBE)*
 - * *2LPO, 3LPO, Coal Tar Enamel,*
 - * *Asphalt/Bitumen, Liquid Coatings (Spray applied Epoxy, PU),*
 - * *Heat Shrinkable Coatings, and Tapes.*

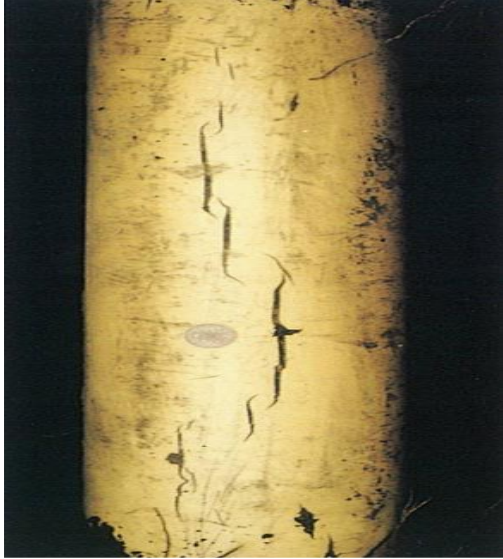


Shortcomings of Conventional Coating Systems

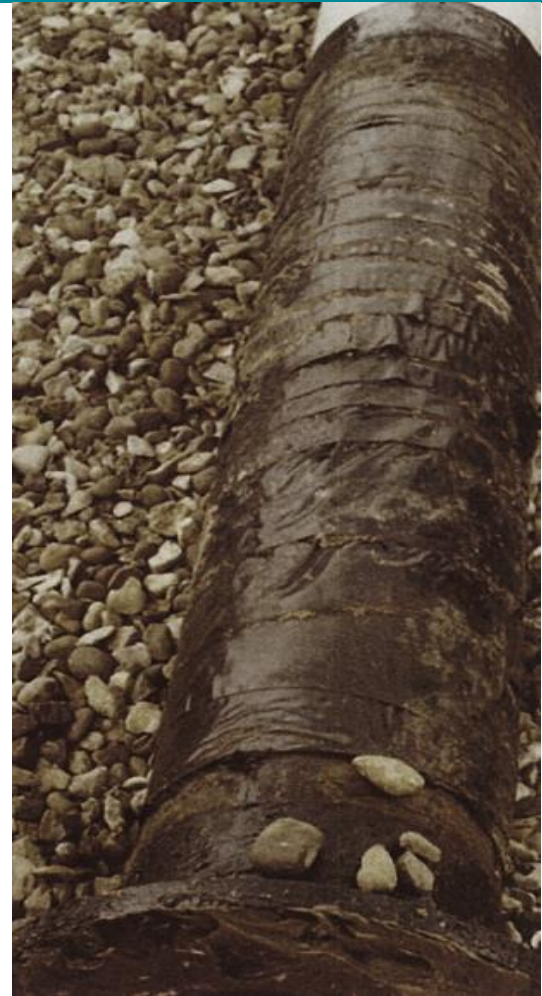
- All of the previously described coating systems witness flaws in the application, stresses, and defects, either at factory level or on field, all of which result in **failure** and **degradation** of the coating system.
- Managing this issue has been considered highly expensive, time consuming, and does not resolve the main problem which is corrosion.
- **Coating Degradation** is caused by all sorts of mechanical stresses, residual stresses , Cathodic Dis-bondment, UV reactions, Permeability, human error, poor mixing, poor application, poor surface preparation etc.
- **The results?**
 - * Loss of adhesion
 - * Mechanical Damages to both coats and substrates
 - * Cracking of the coats
 - * Cathodic Dis-bondment =>
 - * MIC



Failures



More Failures



Visco-Elastic Self-Healing Corrosion Prevention System: STOPAQ

What is a Viscoelastic material:

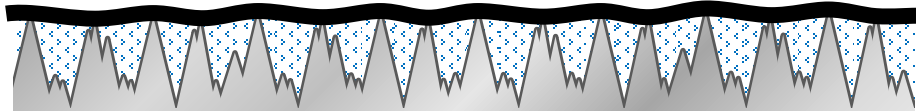
- Material that exhibits both viscous and elastic characteristics.
- Witnesses fluid like behavior.

STOPAQ: main properties and characteristics:

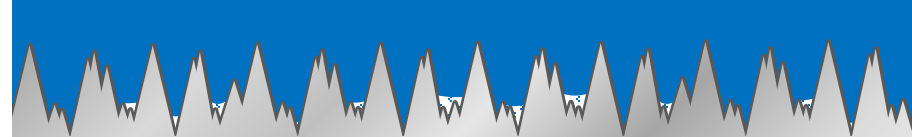
- A viscoelastic, and amorphous material,
- Adhesive to a Molecular level to all substrates,
- Cohesive,
- Fully resistant and impermeable to water (and WV), oxygen (among other gases),
- Unable to dis-bond,
- Inert to aging and weathering, whereby has no shelf life
- Requires minimal surface preparation => less incurred expenses for G.W
- Liquid with high viscosity.
- Operational Temperature between -45° C and +95° C.
- The material Flows due to its viscoelastic nature.



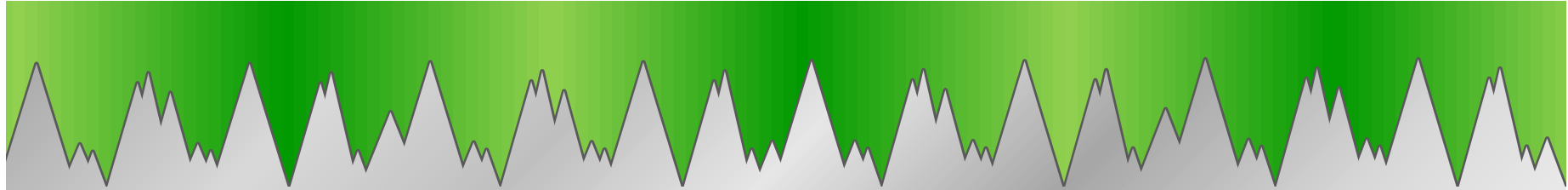
Adhesion to a Molecular Level (VanderWaals Forces)



Blasted steel surface, no inflow of coating



Blasted steel surface, partial inflow of coating



Blasted steel surface, full inflow of coating

How and Where did it start?

1983 – Sealing seawalls against leakage of water



1992 – started with manhole corrosion prevention

STOPAQ FN4100 START AT BK-GAS (SHELL), 1992



- Stopaq FN4100 submits
- to KIWA BRL K911/01,
- a government guideline
- for anticorrosion materials



1996 – NAM PIPELINE (first application on pipelines)



1996 – First production of STOPAQ Wrappingband



OGC, Applying STOPAQ in 1997



1998 – New lines for STOPAQ Wrappingband production were added



1998 – Trials of CZH - Aramco, Exxon, PDO, PDVSA



50 meter 56" Sabkha in Saudi Arabia. Success Trial in 1999



2001 - Stopaq Casing Filler – 1st application in Gulf Region



2001 - Stopaq Casing Filler Application worldwide



Russia
Poland
Ireland
England
France
The Netherlands
Abu Dhabi 2012
Australia 2012

2001 - SHELL Global Solutions “Approval”



Shell Global Solutions

CP 01 2045P
CONFIDENTIAL



Evaluation of Stopaq pipeline coating

- The STOPAQ Corrosion Preventative System is an **unique corrosion protection wrapping system** with special properties regarding the corrosion protection philosophy. It consists of a layer of visco elastic polymer and an ultraviolet resistant Outerwrap to provide mechanical protection.
- The corrosion protection performance of the STOPAQ System is regarded as similar or better than existing corrosion preventative systems for use in the field.
- Shell Global Solutions regards the STOPAQ System as a valuable development and intends to follow field experience within the Group for further evaluation.

ARAMCO Approval – 20th October 2001

Facsimile Cover Sheet

To: J. M. WAKIM, Gen. Manager
Company: Albab Trading Co. Ltd.
Phone: 857-9780 ext. 1207
Fax: 859-1563

From: S. A. AL-ZUBAIL
Company: Saudi Aramco
Phone: 874-5033
Fax: 873-0988

Date: October 20, 2001
Reference No.: CSD/ME&CCD/T-1145/01

Pages including this cover page: 1

Subject: Stopaq[®] System is Approved by Saudi Aramco

Ref: Your inquiry of October 15, 2001

MESSAGE:

Per your inquiry, we would like to inform that the Stopaq[®] materials were recently approved under the following stock numbers:

- | | |
|-------------------|-------------------------------|
| 1. S/N 09-000-436 | CZ H Wrappingband; 2 in. wide |
| 2. S/N 09-000-438 | CZ H Wrappingband; 8 in. wide |
| 3. S/N 09-000-442 | CZ H Wrappingband; 4 in. wide |
| 4. S/N 09-000-439 | PVC outer wrap; 3 in. wide |
| 5. S/N 09-000-440 | PVC outer wrap; 16 in. wide |
| 6. S/N 09-000-444 | CZ H Paste; 2 kgs. |
| 7. S/N 09-000-441 | Fiber CZ; 970 mm. wide |

Please contact A. A. Suller on tel. 873-4158 if you have inquiries.

S. A. AL-ZUBAIL, Supervisor (AA)
Cathodic Protection & Coatings Unit

Salih Al-Zubail 10/20/01

AAS
AAS:aas

cc: Coordinator, ME&CCD, E-7600, DH
ME&CCD L/B, CP&CU L/B; AAS L/B, Albab File

cc: Coatings Staff
Livelihood

2003 – 7 years after the application on NAM Pipeline



Patented products



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) EP 0 751 198 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
15.09.2004 Bulletin 2004/38

(51) Int Cl.⁷: C09K 3/10, E02D 29/14,
H02G 15/013, E04B 1/68,
C09D 5/08

(21) Application number: 96201796.8

(22) Date of filing: 28.06.1996

(54) Use of a fluid, non-setting preparation for protecting underground objects against corrosion
and method for sealing manhole covers

Verwendung einer fließfähigen, nicht-härtbaren Zubereitung zum Schutz von unterirdischen Objekten
gegen Korrosion und Verfahren zum Abdichten von Mannlochabdeckungen

Utilisation d'une préparation fluide et non-durcissable pour la protection des objets souterrains à la
corrosion et méthode d'étanchéification de couvercles de trou d'homme

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE

(30) Priority: 30.06.1995 NL 1000712

(43) Date of publication of application:
02.01.1997 Bulletin 1997/01

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(56) References cited:
EP-A- 0 024 882 EP-A- 0 244 738
EP-A- 0 359 273 EP-A- 0 366 969
WO-A-91/08253 DE-A- 2 100 478
DE-A- 2 361 911 DE-A- 3 824 485
FR-A- 2 256 231 FR-A- 2 393 831
GB-A- 2 106 307 GB-A- 2 283 185
US-A- 4 094 911 US-A- 4 962 151

• DATABASE WPI Week 8011 Derwent
Publications Ltd., London, GB; AN 80-19458c
XP002012959 & JP-A-55 016 163 (MIYAJI,
CEMEDYNE)

Remarks:

The file contains technical information submitted
after the application was filed and not included in this
specification

Totally unique: Visco-Elastic Characteristic. Patented in 2006



BASF Cooperation



2007 - Research & Development Centre



2007 - R&D Application Engineering



A photograph of a classroom where several students are seated at long wooden tables, working on papers. The room has posters on the walls and a map.

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2009 – Construction and Opening of the STOPAQ SAUDI Factory (KSA)



2009 – STOPAQ SAUDI Factory Opening



Test Area 6,000 sqm



Harbour Jetty Pile Coating at Testing Area



2011 - Subsea R&D / Training Center



New opportunities for Machine Field Coating



Such as:

- Coating **near** the Ditch
- Coating **inside** the Ditch
- Fully mobile coating operations

STOPAQ's Mobile Coating Plants, Application:

- Base coat (STOPAQ)
- Top coat for Mechanical Protection by STOPAQ Fast GRE / PVC



Girth-Weld Application



Protecting with STOPAQ



7 years experiment



STOPAQ is applicable under extreme weather conditions, anywhere



Field Joint Application and Wrappingband Machine



-30 Degrees Celcius – MODA Pipeline



Kingdom of Saudi Arabia +55 Degrees Celsius



Offshore – Lay-Barge Application



Offshore Girth Welds – Lay-Barge Application



120 km Rehab Project of Continuous Application - 56"



Coated pipelines – The Netherlands



Field joint Coating - High Impact Shield



Transition Lines, Gasunie N.V compressors station



LNG tanks - Croatia



Before and After



Flanges - Underground



Flange - Above ground



Protecting Valves



Small Pipes applications



Landing Base - PDVSA

Before



After



Vopak Rotterdam





Conclusions:

1. Prevents corrosion, Protects the substrates, for **decades** (non-aging with a 30-year warranty).
2. Easily and Safely applied to substrates (no pre-requisites)
3. Non toxic, non-curing.
4. Extremely **impermeable** to water, oxygen, humidity, and **chemicals** => Elimination of several corrosion related phenomena.
5. Applicable below ground, above ground, offshore, subsea, under hot, cold, wet, and chemically **aggressive environments**.
6. **Self healing, and will : remain adhesive on substrates and flexible, premanently.**
7. Traditional anti-corrosion systems are not meeting end-users' needs, whereby witnessing coating failures
8. Although we are being copied, however the copiers **have not** been able to manufacture the visco-elastic properties of STOPAQ, nor anything near the novel of STOPAQ's patented technologies.
9. Approved by all major O&G and Water operators, KIWA, Shell Global Solutions, ARAMCO, Exxon-Mobile, ADNOC, PDVSA, KOC, PDO etc...

International Approvals and Recognitions



أرامكو السعودية
Saudi Aramco



المؤسسة العامة لتحويل المياه المالحة
Saline Water Conversion Corporation



Shell

Global Solutions



Saipem



gasurte



Mission and Vision



STOPAQ will continue to develop visco-elastic self-healing corrosion prevention, insulation and sealing solutions for the protection of client's valuable infrastructural assets around the world, fulfilling all markets' requirements for a performance guarantee against corrosion, for life, flexibility and permanent bonding power, whilst ensuring respect for the environment and applicator

Thank you for your attention



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