OIL & GAS

Introduction

Pipelines in DNV GL

Technology, Experience and Best Practice
BRIEF INTRODUCTION TO DNVGL
Our Purpose

To safeguard life, property and the environment
Industry consolidation
Global reach – local competence

150 years
400 offices
100 countries
15,000 employees
Organized to maximise customer value

MARITIME

OIL & GAS

ENERGY

BUSINESS ASSURANCE

SOFTWARE

CYBERNETICS

RESEARCH & INNOVATION
BRIEF INTRODUCTION TO PIPELINES IN DNVGL
We have extensive pipeline expertise and technology, with approximately 800 highly skilled experts working mainly with pipeline related projects around the world

For onshore and offshore pipelines and facilities
Supporting our customers with lifecycle competencies

We have competence and services covering all phases of pipelines transport systems:

- Planning
- Design
- Construction
- Operation
- Maintenance and repair
- Life extension
- Decommission
Setting the standards

- National codes: e.g. ASME, API and NORSOK
- International codes: e.g. ISO and NACE
- DNV GL Standards & RPs
- Technology development
  - Internal R&D
  - Joint Industry Projects

Pipeline Industry Guild

2016 award:
DNV GL - Evolution of Epoxy Technology - Red Roses Pipeline Reinforcement Project
Recent important acquisitions/mergers (Pipeline related)

- **2005: CC Technologies Inc**, North America (Colmbus):
  - 200 employees
  - Formerly Batelle

- **2012: KEMA**, The Netherlands:
  - 1700 employees (35 for pipelines)
  - Formerly Gasunie

- **2013: GL ND**, worldwide
  - 5000 employees (400 for pipelines/gas)
  - Formerly Advantica/British gas and Noble Denton
## DNV GL Pipeline Experts and Resources

### Offshore Pipelines:
- Norway (Høvik, Stavanger)
- UK (Aberdeen, London, Manchester)
- Denmark (Esbjerg)
- Germany (Hamburg)
- Brazil (Rio)
- USA (Houston, Columbus)
- Singapore
- Australia (Perth, Brisbane)
- Russia (Moscow)
- Abu Dhabi
- Malaysia (KL)
- Taiwan (Kaohsiung)
- Vietnam (Vong Tau)
- China (Shanghai)

### Onshore Pipelines:
- UK (Loughborough)
- USA (Houston, Columbus)
- Canada (Calgary)
- The Netherlands (Groningen)
- Mexico (Mexico City)
- Germany (Hamburg)
- Norway (Høvik)
- Abu Dhabi
- Singapore
- Malaysia (KL)
- Vietnam (Vong Tau)
- China (Shanghai, Beijing)
- Australia (Brisbane)

- [Halfwave](#)
- [DNV GL Software](#)
Research & innovation in DNV GL

- DNV GL spend 5% of our revenue on R&D and innovation

Strategic Research & Innovation

Strategy and long term R&I – Separate R&I unit on group level

Extraordinary Innovation Projects

- Pipeline for the future
- X-Stream
- SLIPipe
- Floatpipe

Cutting Edge Program (JIP initiation)

- Segment oriented projects, e.g. Pipelines, Subsea, Gas
- Focus on solving current industry challenges
- Initiation and support for JIPs

Step Change Innovation

- Data smart
- Big data
- Digitalization
- New ways of working
- New ways of reporting

Technology Leadership

- Profession oriented:
  E.g. material, hydro dynamic, NDT, Risk, foundation, flow assurance, etc.
Full portfolio of in-house, multidisciplinary capabilities

We can support the entire life-cycle, a specific topic or a specific project phase

- Mechanical design
- Hydraulic, process & flow assurance
- Compressors and pumping
- Pipeline software
- Corrosion, Coating & CP
- Welding and NDT
- Subsea, steel and concrete
- Material and components
- Marine Operation
- Foundation and geo-technic
- Inspection and QA/QC
- Hydrodynamics
- Environment services
- Risk and safety assessment
- Laboratory services
- Repair and maintenance
10 laboratories around the world engaged in pipeline related work

- Spadeadam Test Centre – UK (H2S)
- Columbus, Ohio, US (world’s biggest H2S lab)
- Høvik, Norway (just outside Oslo)
- Bergen, Norway (H2S)
- Singapore (H2S)
- Groningen, The Netherlands
- Loughborough Mechanical Testing, UK
- Newcastle Flow Centre, UK
- Hamburg, Germany
- Mulheim, Germany
Recent, on-going and planned Pipeline R & D projects

**Internally funded project:**

- Recently completed projects:
  - EOIP: Pipelines for the future – Pipeline technology for the next 10-15 years
  - EOIP: X-Stream - Deepwater Pipelines – Cost effective solution deep-water gas pipelines
  - Residual stress / strain for pipeline girth weld under high strain (measure residual stress)
  - Develop method for CTOD-SENT test method for sour service
  - Development of RP for AUT System Qualification
  - EOIP: - SliPipe – solution for HPHT pipelines
  - EOIP: - FloatPipe – solution for deep-water and difficult seabed
  - Service specification for verification – Onshore pipelines (2014)
  - Pipeline for the future (outlook 2030)
  - Efficient and Cost-Saving services for Pipeline industry
  - Risk based assessment to determine the effect of flow behaviour on pipeline integrity

- Currently ongoing:
  - Onshore pipeline standard
  - Global Pipeline Incident Emergency Response Service
  - Development of several new JIPs
Cooperation with leading pipeline industry players: The DNV GL Pipeline Committee (29 members)

- **Chairman:** Colin McKinon (Wood Group)

- **Operators (13):**
  - BP
  - BG
  - ChevronTexaco
  - Dong
  - ExxonMobil
  - Gasprom
  - Gassco
  - Mærsk
  - Petrobras
  - Shell
  - Statoil
  - Total
  - Woodside

- **Designers (2):**
  - WoodGroup
  - IntecSea

- **Manufacturer (5):**
  - JFE-steel
  - Tenaris
  - VM tubes
  - Tata-group
  - Europipe

- **Contractors (6):**
  - Allseas
  - Saipem
  - Subsea 7
  - Technip
  - Heerema
  - McDermott

- **Regulators (2):**
  - PTIL (Norway)
  - HSE GSI (UK)

- **Universities (1):**
  - NUS
**Recent, on-going and planned Pipeline R & D projects**

**DNV GL managed JIPs (52):**

- **Recently completed (16):**
  - HIPPS System Design - Phase 1
  - Ice pipe – Arctic pipelines
  - Spiral Welded Pipes for offshore use (Phase 1 and 2 completed)
  - Clad and lined pipe (Phase 1, 2 and 3 completed)
  - On-bottom stability design of small diameter, submarine umbilicals and cables
  - Treatment of residual stress in the ECA of pipeline girth welds under high plastic deformation
  - Pre-commissioning of pipelines guideline
  - Horizontal Directional Drilling guideline
  - ART ILI tool development
  - DNV-RP-F116 Integrity Management of Submarine Pipeline Systems – Phase 1 & 2
  - Update of DNV-RP-F101 Corroded Pipelines
  - Guideline - Design of pipeline spools - Phase 1
  - Fatigue of girth welds with defects
  - Sour service ECA/facture assessment guidelines
  - Welding of Field Segmented Induction Bends and Elbows for Pipeline Construction (Phase 1 & 2)
  - Update of RP-F111 Interference between trawl gear and pipelines
Recent, on-going and planned Pipeline R & D projects

DNV GL managed JIPs (52):

- **On-going JIPs (15):**
  - CO2 pipelines – phase 2
  - Development of ECA Guidelines in Sour Service
  - Development of ECA Guidelines in Sweet Environments for Offshore Pipeline
  - HPHT pipelines (merging of Hotpipe and Safebuck)
  - Yield Strength Determination for Large Diameter Pipelines
  - Continued Validation of ASME Procedure for Using Hardness to Estimate the Lower Bound of Pipe Yield Strength
  - Clad and lined pipe (Phase 4)
  - Guideline for Pipe-in-Pipe concept
  - Guideline for Installation Analysis of Pipelines, Umbilicals & Cables
  - Design and specification of Concrete Coating for Installation and Operation
  - Fatigue of girth welds with defects - Phase 1b
  - Duplex Stainless Steel HISC, Revision of DNV-RP-F112
  - VIV Assessment of Complex Rigid Jumper System
  - Standardization of SENT Test Method for Sour Service Environments
  - Onshore Hot tap branch connection Best practice
Recent, on-going and planned Pipeline R & D projects

DNV GL managed JIPs (52):

- Potential and in planning stage (21):
  - Spiral Welded Pipes for offshore use - Phase 3
  - HIPPS phase 2
  - Mechanical design of components for offshore pipelines
  - Reliability based fracture mechanics approach for pipeline girth welds
  - Free span assessment of pipelines in narrow trench
  - Local Brittle Zones
  - Study the collapse of pipelines with D/t < 15
  - Update of DNV-RP-F109 for calcareous soil and 3D non linear analysis
  - External MIC on onshore pipelines
  - FEA in fracture mechanics
  - Update of DNV-RP-F113 Pipeline repair
  - Revision of DNV GL recommended practice DNV-RP-F118 for Qualification of NDT
  - Reeling of HFW/SAW pipes
  - Pipeline life extension
  - Anchor damage in shallow water
  - Effect of Reeling on Sour Service Fatigue and Fracture Toughness of API X65 5L
  - Development of industry best practices for repair of pipeline girth welds
  - Vitality Pipe – methodology for life extension and reuse of flexible pipes
  - Design of rigid pipeline spools, phase 2
  - Harmonizing risk assessment for pipelines/Risk assessment of pipeline protection

Onshore pipeline standard
Examples of our pipeline training courses

- **Basic** – 2 days
  - DNV-OS-F111

- **Design** – 3 days
  - DNV-OS-F101

- **Trawling Interference** – 1 day
  - DNV-OS-F111

- **Corroded Pipelines** – 1 day
  - DNV-OS-F101

- **Global Buckling** – 2 days
  - DNV-RP-F110

- **PIM Offshore** – 2 days
  - DNV-RP-F105

- **Free Span** – 2 days
  - DNV-RP-F105

- **Cathodic Protection & Coatings** – 1 day
  - DNV-RP-F109

- **On-Bottom Stability** – 1 day
  - OS-F101 Updated

- **Ungraded**
END

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SAFER, SMARTER, GREENER

Ungraded