Repsol well design and risk mitigation processes, the case of HPHT Jaguar-1 well (Guyana).
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Repsol. Regional Direction Exploration Latin America. 04/23/2015
1. Repsol Drilling Risk Mitigation Processes

- **PRE**
  - Well planning
  - Risk identification and prevention tools

- **DURING**
  - Execution
  - Emergency Management
  - Critical Response Resources

- **POST**
  - Environmental and Socio-economic Restoration
  - Business Continuity
Repsol Drilling Risk Mitigation Processes
PRE: Well Planning & Construction Process

Subsurface studies
- Basic well design
  - Visualization
  - Conceptualization
- Detailed well design
- Well Execution

**Well Design Options**
**Well Integrity**
BoWD
**Well Containment**

**TRSI-Subsurface information**
**TRWC-Well construction process**

EXP Studies
- Project initiation
- Options design
- Order LLI (if required)
- Option selection
- Tender & Purchase

TMD
- Form project team
- Prelim. Subsurf. Info. for Well Design
- Geohazard Report
- PDDP

Approved by central Assurance Group
Reviewed by Global Experts Team

Emphasis on Geohazard Prediction

12 to 24 months ------- 10’s people ------- Multi-M$ engineering
Repsol Drilling Risk Mitigation Processes
PRE: Drilling Hazard Identification and Prevention

WELL PLANNING HAZID

MAH BOW-TIE REVIEW

MAJOR HAZARD IDENTIFICATION

**DEFINE:**
- Threat Controls
- Recovery Measures
- Escalation Factors
Repsol Drilling Risk Mitigation Processes
DURING: Technical Standards, Supervision, MOC

REP Management of Change Process

REP Supervision and Reporting Structure

- Project Manager
- Project Superintendent (Shore/Camp Base)
- REP On-site Authority (“Company Man”)

HSE
Drilling Engineering
Logistics
Geology
Repsol Drilling Risk Mitigation Processes
DURING: Global Critical Emergency Management

Global Critical Emergency Management
Global Critical Response Team

Coordinators

Corporate
(Crisis Management Team) CMT

BST
Business Unit
(Business Support Team)

IMT
Realized MAH
(Incident Management Team)

Modular Response

CMT

BST

IMT

Realized MAH

CMT

BST

IMT

Maps to:

Oil Spill
Response

Well
Containment

Fire Fighting

Security

X
Repsol Drilling Risk Mitigation Processes
DURING: Critical Response Resources

**GLOBAL CRITICAL RESPONSE TEAM**
- Modularity
- Training
- Quick Activation

**GLOBAL WELL CONTAINMENT STRATEGY**
Wild Well Control Inc. MSA

**RESPONSE ASSETS**
Critical Management Centres & Situation Rooms
Located in Madrid, Houston, Port of Spain, Lima and Rio de Janeiro

**OIL SPILL RESPONSE STRATEGIES**
- Local – MAA
- Regional – OSRL (USA)
- Global – OSRL (UK)
Repsol Drilling Risk Mitigation Processes
POST: Recovery & Continuity

✔ RECOVERY
  - Environmental and Social Restoration
  - Compensation

✔ BUSINESS CONTINUITY – Lessons Learned
  - Restructuring of the organization
  - Realignment of the strategy
• Remote area supported by Trinidad and Tobago at 450 miles.
• Previous to the drilling of Jaguar-1, only one additional well had been drilled offshore in Guyana in 20 years.
• Very good level of Cooperation by Local Authorities.
Repsol Drilling Risk Mitigation Processes
The Jaguar 1 Well Case: PRE

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<th>2010</th>
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<tr>
<td>KOM</td>
<td>HPHT Well Definition</td>
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<td>LOI – Atwood Beacon</td>
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<td>Drilling Tender Process – Contract Awarding</td>
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<td>LLI – 12 Months Delivery</td>
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Project 100% Core Team = 35 people (extended team +20)
Repsol Drilling Risk Mitigation Processes

The Jaguar 1 Well Case: DURING

**Pore Pressure (psi)**

- Estimated Pore Pressure = 11,588 psi
- Actual Max. Pore Pressure = 15,545 psi

**Oil Sample**
- Oil Sample at 15,442ft
- Oil Sample at 15,955ft

**Depth (ft)**

- Prognosed Depth = 21,445ft
- Well Total Depth = 15,998ft

**MOC - Management of Change**

1. - 11 ¾ CSG due to high PP
2. - 9 5/8 conversion CSG into Liner
3. - Well abandonment

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R epso l Dr il l in g R isk Mitigation Processes
The Jaguar 1 Well Case: POST

Georgetown

1997

Plug and Abandon Decision - Successful
Project Cost US$ 230 Million
Feasibility Studies Jaguar-2 Positive
Georgetown Block Contract - Expired

Kanuku

2013

Kanuku Block – New Contract
Partners & Government aligned to redirect the project towards lower pressure environments
New 2D & 3D Seismic Campaign – US$ 30 Million

New Prospects Search in progress

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