Offshore Block B on Methane Reduction activities:
Belida Flaring Reduction

Presented To:
International Gas STAR Workshop
By Rismal Adriansyah & Krishna Ismaputra
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• Background and Flare Reduction Drivers
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Belida Facility Overview

Belida Field Locations

ConocoPhillips
ACREAGE MAP
COPI OPERATED

- SOUTH NATUNA SEA BLOCK ‘B’ PSC
- KUMA PSC
- SOUTH JAMBI BLOCK ‘B’ PSC
- CORRIDOR PSC
- WARIM PSC
- AMBORIP VI PSC
- ARAFURA SEA PSC

INDIAN OCEAN
Belida Field

- **Formation**: Delta (gas), Lower Arang (oil), Udang (oil)
- **Completion type**: Single string, Single/Two zone, Single selective
- **Field production (Sep'05)**: 30.89 BOPD; 160 MBWPD, 108 MMSCFPD
- **API**: 47 Deg
- **Discovered**: December 1989
- **First oil**: October 22, 1992
- **First gas**: June 18, 2003

18”, 12”, 12”, 12” (Fluid, Gas, Gas, BG2)

8” GL

12”, 8” (Crude, Fuel Gas)

DPPA

LGP

WHPB

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Drivers

- Belida facilities performance improvement including operation optimization
- Potential economic values from recovery of flared gas to be used as fuel or sales gas
- Increase focus on environment in terms of CO2 emission from flare emission
- Alignment with COP Position on Climate Change as part of COP Sustainable Development Policy
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Identified sources of Belida HP and LP flaring:

- Associated gas.
- Make up gas to gas lift requirement from the gas export.
- Controller Tuning.
- Lift Gas Compressor capacity.
Commitment to Reduce Flare in Place

Team charter developed to establish a flaring reduction process

Identify the sources of flare gas and developed plans to reduce or eliminate where possible

Fine tuning of the stabilizer’s operating condition

Study of associated gas utilization

Gas lift optimization

Valve inspection with special tools

Monitor & maintain the set point of PIC 2102 & no passing PSV

Minor facility modifications to reroute gas back through the processing system

Progression Effort – A Summary

Q1 2011
<table>
<thead>
<tr>
<th>Program</th>
<th>Purpose</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Process optimization (PIC setting)</td>
<td>● To maintain and making sure all PCVs are mostly in closed position thus limited gas was flared to these PCVs.</td>
<td>● Reduced flare around 1 mmscfd</td>
</tr>
<tr>
<td>● Replace LGC engine become Avon-200</td>
<td>● Higher HP, increase the gas lift injection rate to increase production, Increase capability taking gas from 1st stage separator</td>
<td>● Reduced flare from 1st separator</td>
</tr>
<tr>
<td>● Managing planned S/D and reduced unplanned shut down by improving reliability</td>
<td>● To start up well normally GEC gas used for lifting oil. The gas produced then directly to be flared.</td>
<td>● Will avoid flaring from re-start-up activities</td>
</tr>
<tr>
<td>● Used GEC as LGC during LGC Power Turbine (PT) replacement</td>
<td>● When LGC out of services, normally GEC gas used for lifting oil. The gas produced then directly to be flared.</td>
<td>● Reduced planned flare and LPO</td>
</tr>
<tr>
<td>● Re-route skim vessel off gas to VRU suction scrubber</td>
<td>● LP Flare opacity reduction</td>
<td>● Resulted in better Opacity</td>
</tr>
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Results Summary

The remarkable success from those efforts shown in the below chart:

Belida Flaring Rate Reductions

- **Flaring Rate MMSCF/Year**
- **CO2 Emissions - Tonnes/Year**

**Table:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Flaring Rate (MMSCFD)</th>
<th>Total YTD (MMSCFD)</th>
<th>Year</th>
<th>Flaring Rate MMSCF/Year</th>
<th>CO2 Emissions - Tonnes/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>62.504</td>
<td>208.971</td>
<td>2007</td>
<td>2483.5</td>
<td>361786</td>
</tr>
<tr>
<td></td>
<td>37.327</td>
<td></td>
<td>2008</td>
<td>1846.6</td>
<td>271477</td>
</tr>
<tr>
<td></td>
<td>44.14</td>
<td></td>
<td>2009</td>
<td>904.5</td>
<td>71461</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td></td>
<td>2010</td>
<td>541</td>
<td>14477</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2011</td>
<td>209</td>
<td></td>
</tr>
</tbody>
</table>

**Graph:**

- **Flaring Rate (MMSCF/Year):** 0, 30000, 60000, 90000, 120000, 150000, 180000, 210000, 240000, 270000, 300000, 330000, 360000, 390000
- **CO2 Emissions - Tonnes/year:** 60000, 90000, 120000, 150000, 180000, 210000, 240000, 270000, 300000, 330000, 360000, 390000
## Results Summary

<table>
<thead>
<tr>
<th>Year</th>
<th>Flare Rate (mmscf/yr)</th>
<th>Reduction (mmscf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>2,483</td>
<td>380</td>
</tr>
<tr>
<td>2008</td>
<td>1,847</td>
<td>636</td>
</tr>
<tr>
<td>2009</td>
<td>904</td>
<td>943</td>
</tr>
<tr>
<td>2010</td>
<td>541</td>
<td>363</td>
</tr>
<tr>
<td>Total</td>
<td>2,322</td>
<td></td>
</tr>
</tbody>
</table>

*) 2006 flare level of 2,863 mmscf – baseline.

Effort from 2007 – 2010 has successfully saved gas flaring about 2.3 BCF (equivalent to 2,392 BBTU) giving benefit of additional revenue in term of gas to sale and environmental benefits.
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Challenges

• Maintain flare when associated gas decreasing over time and increasing gas lift make up.
• Maintain unplanned shutdown and dealing with process anomaly
• Looking for ways to further reduce flaring
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Continuous Flaring Reduction Program carried out in Belida Facility from 2007-2010 has significantly reduced Flaring rates and given significant business and environmental benefits:

- Reduce CO2 emissions from 361,000 tones CO2 on 2007 to 14,000 tones CO2 on 2010
- 2.3 BCF additional gas sales
- Safe and steady operating conditions will lead to lower flaring volumes
- Continue to optimize and tune all our system to reduce the volumes of gas being flared
- Flaring level can be monitored continuously to provide feedback for review and follow up actions to any anomaly in order for these reductions to be sustainable
Thank You
Name : Rismal Adriansyah
Title : Manager Block B Western Hub Field / Offshore Operation
BU : ConocoPhillips Indonesia
Education : 1991 BEng Mechanical Engineering – University of Indonesia
Certificate : Profession Engineer (PE) from PII – Indonesia
Vice Technical Head from MIGAS - Indonesia
Service Yr : 19 year

Key Experience:
• 19 years professional experience
• Mechanical design & construction, Project Management, Business Development, Operations, Asset Management

Work History :
• Offshore Operation : Manager Block B Western Hub Field
• Asset Management : Coordinator Onshore Asset
• Onshore Operation : Manager Sumatra Field Manager
• Onshore Operation : Superintendent Operation
• Onshore Operation : Superintendent Project

Work History (cont..) :
• EPCI – Tripatra : Various position from Business Development, Project Management, Project Engineer, Senior Mechanical Engineer.

Interests
• Field development, process safety, A&OI, P & S, System and Structure, management
• Travelling, book reading and culinary

Others
• Married with three children's
• Living at Bogor, 40 km from Jakarta. Nice weather