Benchmarking of HSE Performance
For Oil & Gas Industries

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Outline of the Presentation

- Background & Observations
- Advantages of Benchmarking
- What is Benchmarking of HSE Performance
- What is to be done to Benchmark HSE Performance?
- Sources to Benchmark HSE Performance
- Benchmarking of Safety/Environment/Health Indicators-Case Studies
- Leading & Lagging Indicators @ KOC & its HSE Performance!
- Recommendations!
It is observed that most of the companies are focusing only on:

- Lost Time Injuries
- Man hours Achieved without Lost Time Injuries

This may some times mislead the companies !!!!!!!

Can we say that if a company has “Zero LTIs”, it is the best!

What about:

- Major Environmental Incidents without personal Injuries?
- Fire Incidents without Injuries?
- Motor Vehicle Accidents without Lost Time Injuries?
- Asset Damages without Injuries?
In order to achieve Continual Improvement in HSE Performance, we need to have a wide variety of Indicators covering the issues of:

- Health
- Safety
- Environment

Note: Nowadays Security is also being added in most of the companies. If that is the case, you need to pick up some good indicators on “Security” also.
Advantages of Benchmarking the HSE Performance?

- Benchmarking of HSE Performance will facilitate the companies:
  - To assess the HSE Performance with respect to the industry average
  - To understand the trend of various indicators?
  - To know what kind of Indicators are being used by the industry
  - To evaluate what is the overall average performance in the industry?
  - To determine the basis while setting the targets
  - And to Move forward based on the best practices being followed.....
What is Benchmarking?

- Benchmarking is the process of measuring an organization's internal processes then identifying, understanding, and adapting outstanding practices from other organizations considered to be best-in-class.

- Benchmarking is not simply about comparing the data...

- Benchmarking is more about continuously learning from others....
What is Benchmarking of HSE Performance?

- Benchmarking of HSE Performance is a planned process by which an organization compares its health, safety and environmental performance with others to:
  - Assess the Industry Trends & Average values of each indicator?
  - Verify what kinds of indicators are being used?
  - Assess where your company stands
  - Set your goals as per the evaluation & focus to improve further.

1. Assess the industry trends & Average values of each indicator!
2. Verify what are the Indicators being used by the industry?
3. Evaluate where your company stands with respect to the industry average?
4. Set your goals based on the evaluation & focus to improve further!!
Sources to Benchmark HSE Performance

- OGP Safety Indicators Performance Reports
- OGP Environmental Indicators Performance Reports
- OGP Health Performance Indicators Reports
- GCC Petroleum Companies Loss Prevention Statistical Reports
- IADC Reports

OGP : International Association of Oil & Gas Producers
GCC : Gulf Cooperation Council
IADC : International Association of Drilling Contractors

Note: These are some of the sources suitable for Oil Industry.
Way forward to Benchmark HSE Performance?

1. **Unify the definitions ; HSE Measures; Formulas etc…**
   - Inline with OGP or any other best entity….

2. **Identify** what are the indicators that you want to benchmark?

3. **Start Measuring** those in your companies (If not being done)

4. **Select the partner/ entity** suitable to your organization such as OGP/GCC…and start reporting to them as well…

5. **Compare the Performance** with respect to the industry performance based on the reports published & assess where you are?

6. **Compare the results**

7. **Set the new goals & adapt** the new approaches to improve HSE Performance.
Sample Reports and trend analysis of HSE Measures based on OGP/GCC
Benchmarking of FAR (Fatal Accident Rate)

### 2.2 Fatal accident rate (FAR)

- **Company**: 1.58 (1.33) | (19% higher)
- **Contractor**: 2.59 (2.03) | (28% higher)
- **Overall**: 2.38 (1.88) | (27% higher)
- **Onshore**: 2.87 (1.94) | (48% higher)
- **Offshore**: 0.89 (1.67) | (47% lower)

In 2012 there were 12 company fatalities (10 in 2011) as a result of 6 separate incidents.
- 5 of the company fatalities were as a result of a single incident involving a gas leak and explosion following the loss of mechanical integrity of a pipeline in Mexico.
- In 2012 there were 76 contractor fatalities (55 in 2011).
- 26 of the contractor fatalities were as a result of a single incident involving a gas leak and explosion.

Benchmarking of Safety Indicators-As Per OGP Safety Indicators Performance Report 2012
3.4 Lost time injury frequency (LTIF) by region

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<td>0.30</td>
<td>0.36</td>
<td>0.42</td>
<td>0.61</td>
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<tr>
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<td>0.29</td>
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<td>0.31</td>
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<tr>
<td>Middle East</td>
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<td>0.26</td>
<td>0.29</td>
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<tr>
<td>North America</td>
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<td>0.59</td>
<td>0.48</td>
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<td>South America</td>
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<tr>
<td>Overall</td>
<td>0.48</td>
<td>0.43</td>
<td>0.42</td>
<td>0.45</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Further analysis of the lost time injuries is presented in Section 3.5, where 5-year rolling averages of LTIF are presented for each of the regions.

Lost time injury frequency (LTIF)
The number of lost time injuries (fatalities + lost workday cases) per 1,000,000 hours worked.

3.3 Total recordable injury rate (TRIR) by region

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<td>Overall</td>
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<td>1.76</td>
<td>1.68</td>
<td>1.75</td>
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</tbody>
</table>

Submissions without information on medical treatment cases were filtered out, leaving a database of 3,651 million hours, almost 100% of the database (see Appendix A).

Total recordable injury rate (TRIR)
The number of recordable injuries (fatalities + lost work day cases + restricted work day cases + medical treatment cases) per 1,000,000 hours worked.
Benchmarking of LTIF (Lost Time Injury Frequency Rate)

Fig 5.1.3.1: Performance ranking of companies jointly with contractors – lost time injury frequency per million hours worked [Data page B-14]

- Orange bars: Company with contractors
- Black dots: Fatality in 2012
- Purple bars: Company only

Average companies with contractors 0.48

Top quartile

KOC

Benchmarking of Safety Indicators-As Per OGP Safety Indicators Performance Report 2012
Benchmarking of TRIR (Total Recordable Injury Rate)

Fig 5.1.2.1: Performance ranking of companies jointly with contractors – total recordable injury rate per million hours worked [Data page B-14]

- Company with contractors
- Fatality in 2012
- Company only

Average companies with contractors: 1.74

Top quartile

Benchmarking of Safety Indicators-As Per OGP Safety Indicators Performance Report 2012
Analysis of Lost Workday Cases by Category/By Activity

Benchmarking of Safety Indicators-As Per OGP Safety Indicators Performance Report 2012
2.8 Severity of lost work day cases

Fig 2.8.1: Severity of lost work day cases – company & contractors average days lost per LWDC (Data page B-4)

<table>
<thead>
<tr>
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<th>2012 (2011) severity</th>
<th>Relative to 2011 severity</th>
<th>Relative to 2007-2011 average severity</th>
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</thead>
<tbody>
<tr>
<td>Company</td>
<td>38.81 (41.06)</td>
<td>5% lower</td>
<td>9% higher</td>
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<tr>
<td>Contractor</td>
<td>41.28 (42.58)</td>
<td>3% lower</td>
<td>6% higher</td>
</tr>
<tr>
<td>Overall</td>
<td>40.74 (42.26)</td>
<td>4% lower</td>
<td>7% higher</td>
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<tr>
<td>Onshore</td>
<td>36.83 (39.84)</td>
<td>8% lower</td>
<td>5% higher</td>
</tr>
<tr>
<td>Offshore</td>
<td>45.99 (46.42)</td>
<td>1% lower</td>
<td>2% higher</td>
</tr>
</tbody>
</table>

- OGP member companies reported 53,325 days of work lost through injuries.
- The number of days lost was reported for 78% of the lost work day cases.
- The difference between company and contractor severity levels is 7% (contractor is 7% higher).
- The offshore LWDC severity is 25% higher than onshore.
Benchmarking of Environmental Indicators

### 1.3 Greenhouse Gas (GHG)

For E&P activities, CO₂ and CH₄ are the principal contributors to greenhouse gas emissions, with other gases such as N₂O playing a minor role. The CO₂ and CH₄ data presented above are used to calculate an estimate of the GHG emissions for the contributing OGP reporting companies, using the conversion to CO₂ equivalent (GHG = CO₂ + 21 x CH₄).

#### 1.3.1 Emissions per unit of production

Participating companies reported normalised emissions of 160 tonnes of GHG per thousand tonnes of hydrocarbon production in 2012. This represents a 1% increase in intensity compared with 2011 results (see Figure 1.3.1.1).

Regional averages for quantity

<table>
<thead>
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<th>Year</th>
<th>Offshore</th>
<th>Onshore</th>
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</thead>
<tbody>
<tr>
<td>2012</td>
<td>14.13</td>
<td>6.85</td>
<td>12.8</td>
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</tbody>
</table>

### 4.1 Quality (oil content) of produced water discharges

Figure 4.1.1: Oil discharged per unit of produced water discharged (milligrams oil per litre of produced water discharged)

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<th>Year</th>
<th>Offshore</th>
<th>Onshore</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>14.13</td>
<td>6.85</td>
<td>12.8</td>
</tr>
</tbody>
</table>
Benchmarking of Environmental Indicators

4.2 Quantity of oil discharged in produced water per unit of production

Number of oil spills > 1 barrel per unit of hydrocarbon production

Quantity of spilled oil per unit of hydrocarbon production—by region

Benchmarking of Environmental Performance - As Per OGP EPI Report
## Benchmarking of Health Performance Indicators

### Table 1
Gap Analysis Tool 2012 by company (16 companies took part)
Sorted by: average by company worst to best

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Benchmarking of HSE Performance as per GCC.

### GCC PETROLEUM COMPANIES LOSS PREVENTION STATISTICS - 2010

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<th>NAME OF COMPANY</th>
<th>NUMBER OF EMPLOYEES</th>
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<th>FAI</th>
<th>MTC</th>
<th>RDI</th>
<th>LTI</th>
<th>FAT</th>
<th>TRC</th>
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### MOTOR VEHICLE ACCIDENTS

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<th>Number of Fires</th>
<th>Amount of Fire Loss (U.S. Dollars)</th>
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Benchmarking of HSE Performance - As Per GCC
As per IADC!

- **LTI** **INCD Rate:**
  - \((\text{LTIs} + \text{FTLs}) \times 200,000\)/ Total Man hours.

- **DART** **INCD Rate:**
  - \((\text{RWTCs} + \text{LTIs} + \text{FTLs}) \times 200,000\)/ Total Man hours.

- **RCRD** **INCD Rate:**
  - \((\text{MTOs} + \text{RWTCs} + \text{LTIs} + \text{FTLs}) \times 200,000\)/ Total Man hours.

- **LTI** **FREQ Rate:**
  - \((\text{LTIs} + \text{FTLs}) \times 1000,000\)/ Total Man hours.

- **DART** **FREQ Rate:**
  - \((\text{RWTCs} + \text{LTIs} + \text{FTLs}) \times 1000,000\)/ Total Man hours.

- **RCRD** **FREQ Rate:**
  - \((\text{MTOs} + \text{RWTCs} + \text{LTIs} + \text{FTLs}) \times 1000,000\)/ Total Man hours.

(DART-Days Away (LTI) cases + Restricted Work/Transfer Cases); RCRD-Total Recordable
As per GCC Petroleum Companies Loss Prevention Statistical Report

- **Incident Rate:**
  - On-job lost workday cases with days away from work per 200,000 hours worked.

- **Incident Rate:**
  - Total On-Job recordable Cases (MTC+RDI+LTI+FAT) per 200,000 hours worked.
  - No of Accidents*1000,000/ Total Hours worked during the period

- **Incident Rate:**
  - Restricted duty cases per 200,000 hours worked

- **Motor Vehicle Accident Rate:**
  - No of MVIs per million kilometers driven.
Important Safety Indicators!

- **Fatal Incident Rate:**
  - The number of Company/Contractor fatalities per 100 million hours worked.

- **Lost Time Injury Frequency Rate**
  - The number of Lost time injuries (Fatalities + Lost workday cases) per 1,000,000 hours worked.

- **Total Recordable Injury Rate**
  - The number of recordable incidents per 1000,000 hours worked.
  - (Recordable injuries: FACs+ MTOCS+ RWCs)

- **Severity Rate of LWCs (Lost workday Cases)**
  - Average Days Lost per LWDC (Lost Work Day Case)
Important Environmental Indicators!

- **Gaseous Emissions**
  - Emissions per thousand tonnes of Hydrocarbon Production
  - Carbon Dioxide (CO2)- Emissions per Unit of Production
  - Methane (CH4) -Emissions per Unit of Production
  - Green House Gas Emissions--Emissions per Unit of Production
  - Sulphur Dioxide (SO2)-Emissions per Unit of Production
  - Nitrogen Oxides-Emissions per Unit of Production

- **Flaring (%of Gas Flared)** - Flaring per Unit of Hydrocarbon Production

- **Spills of Oil & Chemicals**

- **Oil Spilt per Unit of Hydrocarbon Production (Tons per Million Tons)**

- **Aqueous Discharges** - Oil Discharged per unit of produced water discharged

- **Discharges of Non Aqueous Drilling Fluids (NADF) on Cuttings**

- **Energy Consumption** - Energy Consumed per Unit of Hydrocarbon Production
Benchmarking of HSE Performance as per GCC.

Let us have a look!

What are the measures

(Leading Indicators & Lagging Indicators)

that are being maintained by KOC & it’s Performance?

(As Best Practices Being Shared)
Safety Observations & Conversations (SOC)

- 05-06: 1,232
- 06-07: 1,839
- 07-08: 2,786
- 08-09: 7,035
- 09-10: 12,332
- 10-11: 21,078
- 11-12: 28,329
- 12-13: 25,666
- 13-14: 26,223
HSE Performance @ KOC

No. of NearMiss

- 05-06: 70
- 06-07: 176
- 07-08: 310
- 08-09: 497
- 09-10: 1,606
- 10-11: 3,251
- 11-12: 3,730
- 12-13: 3,050
- 13-14: 3,626
No. of Site Verification Visit (SVV) of CAEs

- 2009-10: 1,502
- 2010-11: 3,999
- 2011-12: 4,622
- 2012-13: 4,753
- 2013-14: 5,043

No. of Site Verification Visit (SVV) of NCAEs

- 2009-10: 1,502
- 2010-11: 3,999
- 2011-12: 4,622
- 2012-13: 4,753
- 2013-14: 24,017
HSE AUDITS CONDUCTED DURING 2013-14

- Environmental Theme Audits: 15%
- Occupational Health & Hygiene Theme Audits: 7%
- Work in Progress Audits: 4%
- Safety Theme Audits: 22%
- General HSE Theme Audits: 20%
- Others HSE Audits: 26%

HSE Audit Register 2013-14
### 2013/14 HSE Induction Center Quarterly Report

#### Total No of HSE Sessions Completed
- **Q1:** 191
- **Q2:** 154
- **Q3:** 188
- **Q4:** 175
- **Total:** 708

#### Total No of Attendees
- **Q1:** 1,756
- **Q2:** 2,990
- **Q3:** 3,994
- **Q4:** 4,175
- **Total:** 19,064

#### Total No of Manhours
- **Q1:** 4,337
- **Q2:** 2,990
- **Q3:** 1,747
- **Q4:** 1,911
- **Total:** 8,404
Lost Time Injury Frequency Rate - LTIFR
Lost Time Injury Frequency Rate - OGP vs KOC

- OGP
- KOC

- 2005: 0.97 (OGP), 0.79 (KOC)
- 2006: 0.99 (OGP), 0.64 (KOC)
- 2007: 0.66 (OGP), 0.55 (KOC)
- 2008: 0.55 (OGP), 0.28 (KOC)
- 2009: 0.45 (OGP), 0.48 (KOC)
- 2010: 0.42 (OGP), 0.32 (KOC)
- 2011: 0.46 (OGP), 0.13 (KOC)
- 2012: 0.48 (OGP), 0.13 (KOC)
- 2013: 0.45 (OGP), 0.15 (KOC)
HSE Performance @ KOC

Percentage of Gas Flaring

- 2005-06: 17.18%
- 2006-07: 9.94%
- 2007-08: 7.72%
- 2008-09: 3.87%
- 2009-10: 2.66%
- 2010-11: 1.74%
- 2011-12: 1.29%
- 2012-13: 1.44%
- 2013-14: 1.24%
No. of Oil Spills

Year:
- 2002-03: 128
- 2003-04: 112
- 2004-05: 111
- 2005-06: 100
- 2006-07: 113
- 2007-08: 114
- 2008-09: 121
- 2009-10: 113
- 2010-11: 92
- 2011-12: 72
- 2012-13: 66
- 2013-14: 43
Recommendations?

- Always try to Benchmark your HSE Performance
- Make use of the expertise available. Be part of entities such as OGP, GCC, IADC…ETC. which is applicable to your company.
- You need not reinvent the wheel!
- Verify whether your measures are addressing the problems and enhancing the employees commitment to achieve?
- Evaluate your performance periodically
- Choose Right measures for your company Balanced Score Card
- Link each measure with some Tolerances/Targets.
- Set your targets/tolerances based on the Industry average values. If you want to improve further, you can have stringent targets/tolerances
- Have sufficient programs to achieve these targets/tolerances.
Thanks

With Best wishes from

HSE Group,
Kuwait Oil Company