

ONGC experiences with Methane Leak Detection and Measurement Studies

The Global Methane Initiative Partnership-Wide Meeting

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Agenda

- ONGC measurement study results
 - 2008 study (**Collaborative**)
 - 2009 study (**Collaborative**)
 - 2011 study (**In- house**)
- Opportunities for ONGC
- Potential Projects
- Future Plan
- Conclusions

ONGC's measurement study results

- USEPA and ONGC conducted four *onsite measurement studies* to assess key methane emission sources and potential mitigation measures (May 2008, Nov 2009)
- ONGC conducted thro' its inhouse team at 24 production facilities in 2011 (as of Oct 2011)



ONGC's measurement study results

In 2008 under USEPA-ONGC collaboration

Heera Platform

Uran Plant

Kalol in Ahmedabad Asset

Geleki in Assam Asset

Summary Results of Measurement Study, *May 2008*

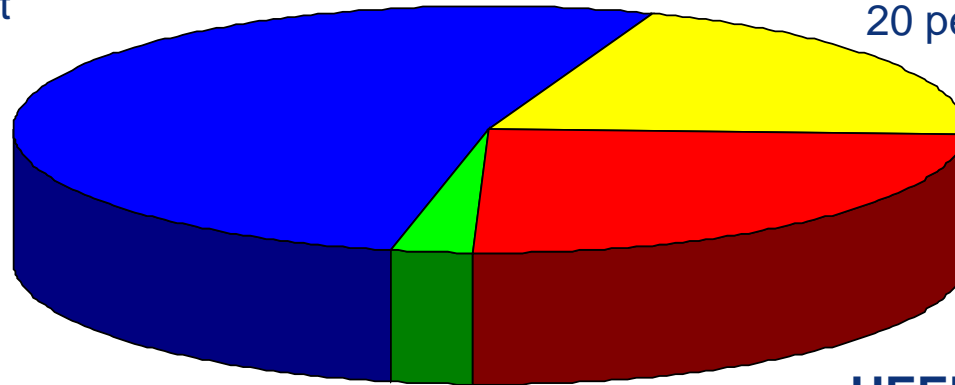
- Total 16.3 million m³/year methane emissions

URAN PLANT

8,522 thousand m³/year
52 percent

GELEKI - ASSAM

3,272 thousand m³/year
20 percent



KALOL - AHMEDABAD

426 thousand m³/year
3 percent

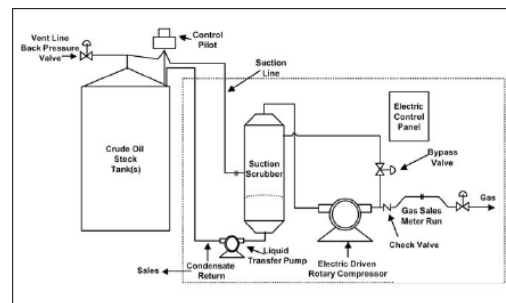
HEERA PLATFORM

4,061 thousand m³/year
25 percent

- In cases where measurements not possible due to physical access limitations, experts estimated emission rates based on previous measurement experience

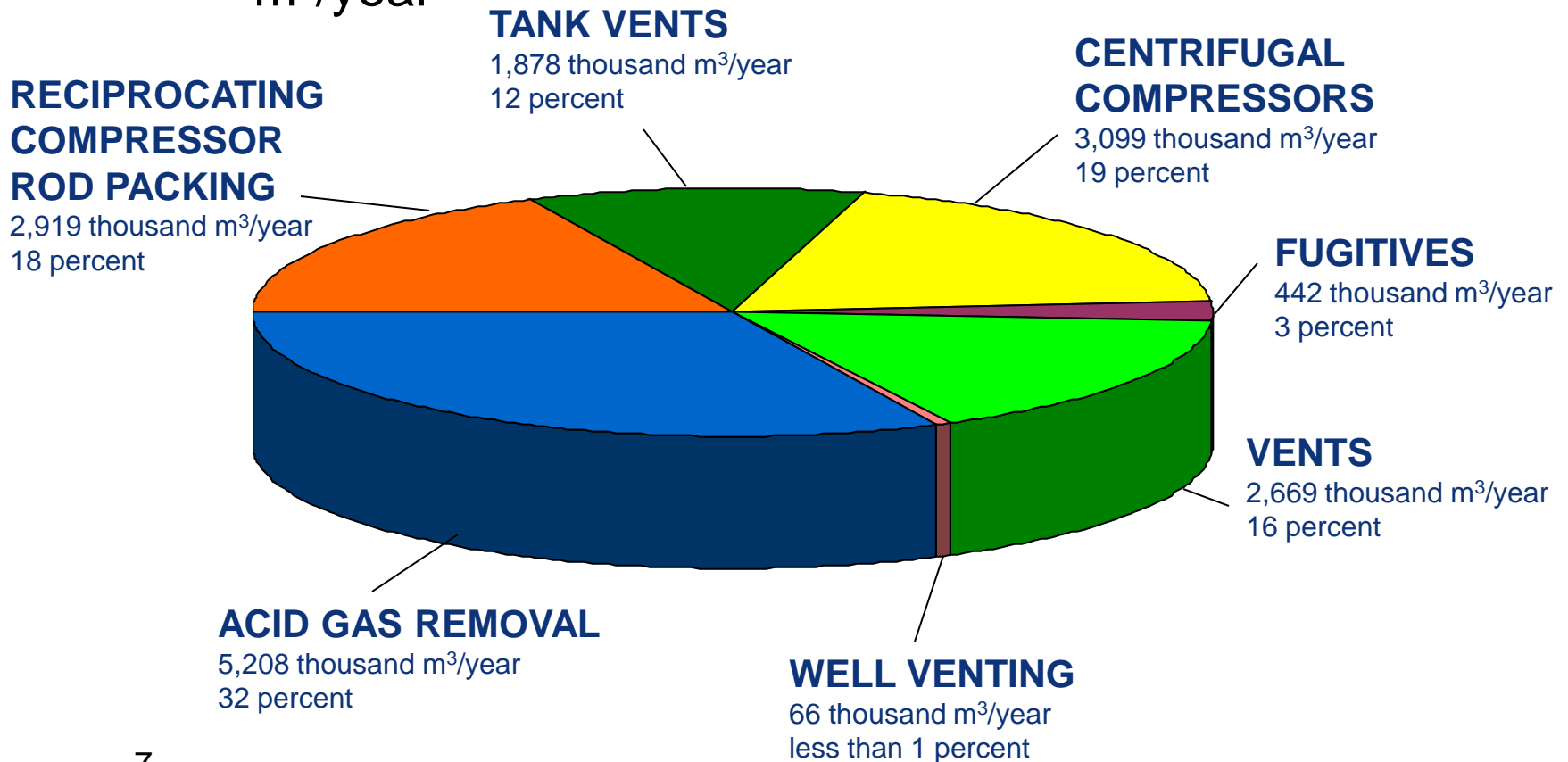
Summary Results of Measurement Study, *May 2008*

- Top 12 recommended methane recovery projects
 - generate Rs. 311 Lakhs/year from gas value
 - reduce methane emissions by up to 10.8 million m³ /year
- Projects also
 - increase production
 - recover natural gas liquids
 - potentially have carbon value
 - use field-proven and commercially available methods implemented by other worldwide operators



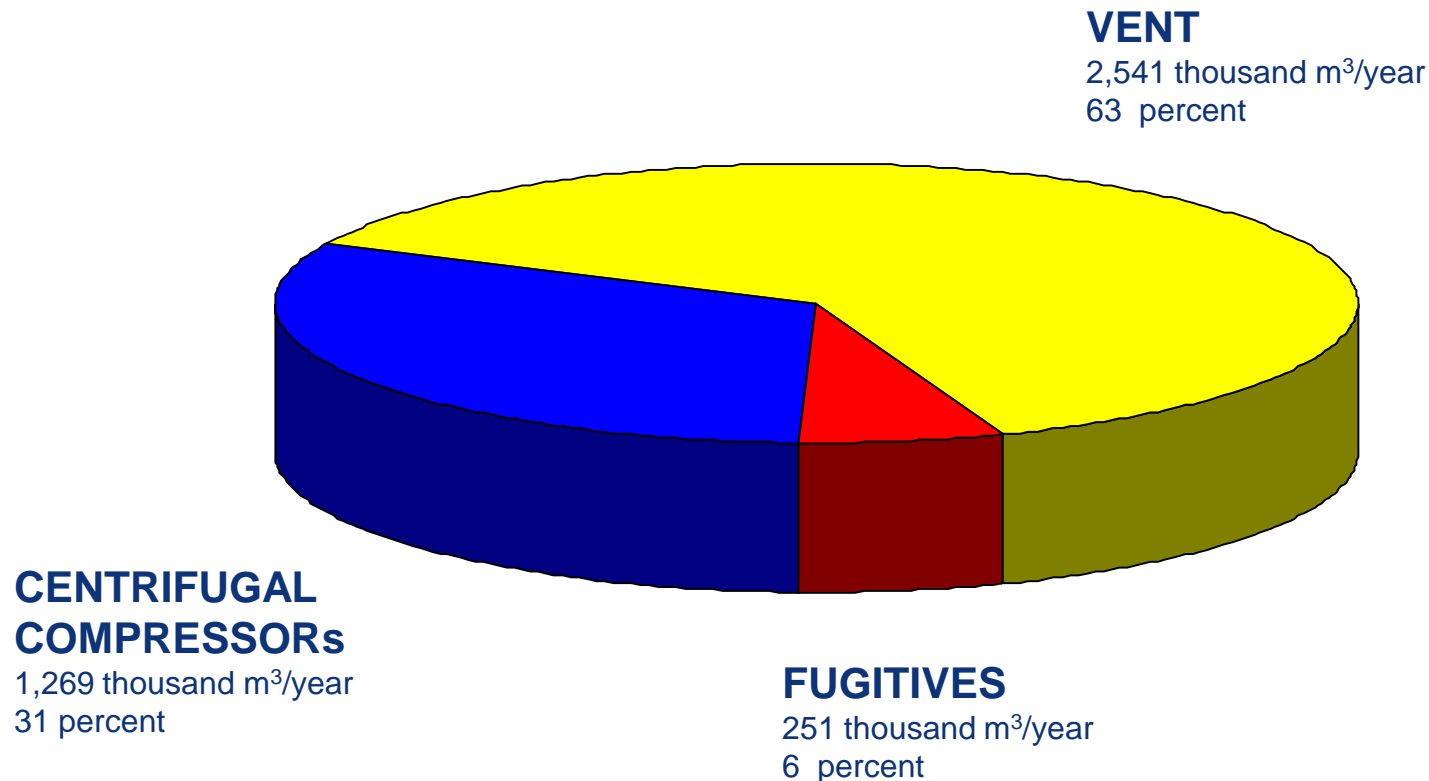
Overall Methane Emissions by Source

- Compressors, storage tanks, and acid gas removal vents contribute over 80 percent of the 16.3 million m³/year



Heera Platform Site Study Results

- Platform vent stack contributes over 60 percent of the 4.1 million m³/year methane emissions



Heera Platform Emissions and Revenue Opportunities

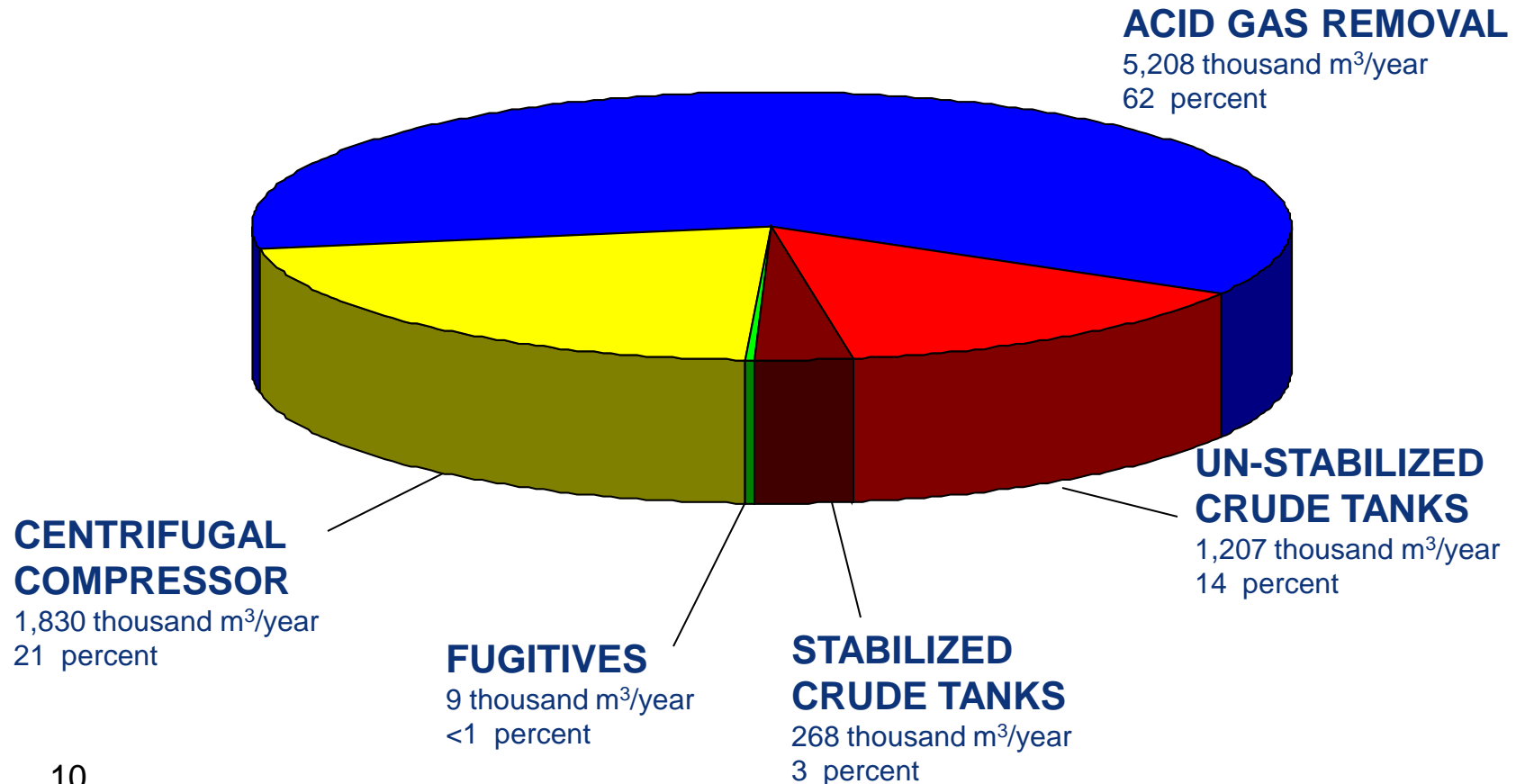
Emissions Source	Mitigation Option	Recoverable Methane (Rs./year)
Platform vents	Route vented emissions to vapor recovery unit	81 Lakhs
Wet seal oil degassing	Route vented emissions to vapor recovery unit	41 Lakhs
Equipment leaks	Conduct periodic leak survey and repair	8 Lakhs

- Payback range based on gas value:

0.2 to 1.4 years

Uran Plant Site Study Results

- Centrifugal compressor seals, fugitives, and storage tanks contribute 39 percent of the 8.5 million m³/year methane emissions



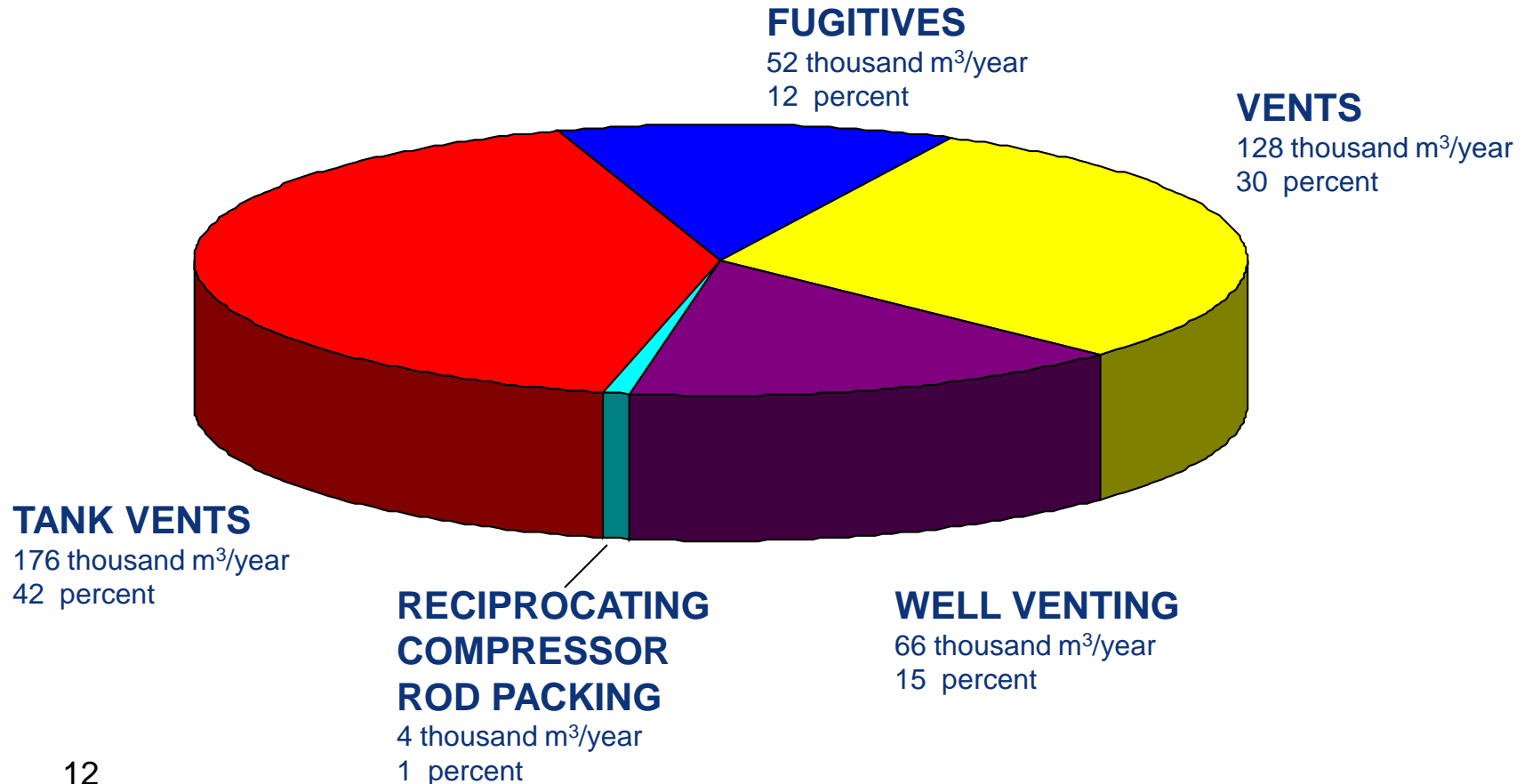
Uran Plant Emissions and Revenue Opportunities

Emissions Source	Mitigation Option	Recoverable Methane (Rs./year)
Centrifugal compressor wet seal degassing	Replace wet seals with dry seals	56 Lakhs
Un-stabilized crude tank	Route vented emissions to vapor recovery unit	220 Lakhs (as per actual data)
Stabilized crude tank	Route vented emissions to vapor recovery unit	9 Lakhs

- Payback range based on gas value: 0.2 to 4.0 years

Kalol – Ahmedabad Site Study Results

- Storage tank, well, and other vents contribute over 85 percent of the 0.4 million m³/year methane emissions



Kalol – Ahmedabad Emissions and Revenue Opportunities

Emissions Source	Mitigation Option	Recoverable Methane (Rs./year)
Vent stacks	Route vented emissions to vapor recovery unit	6 Lakhs
Storage tanks	Route vented emissions to vapor recovery unit	5 Lakhs
Well venting	Install beam gas compressors	3 Lakhs
Equipment leaks	Conduct periodic leak survey and repair	2 Lakhs

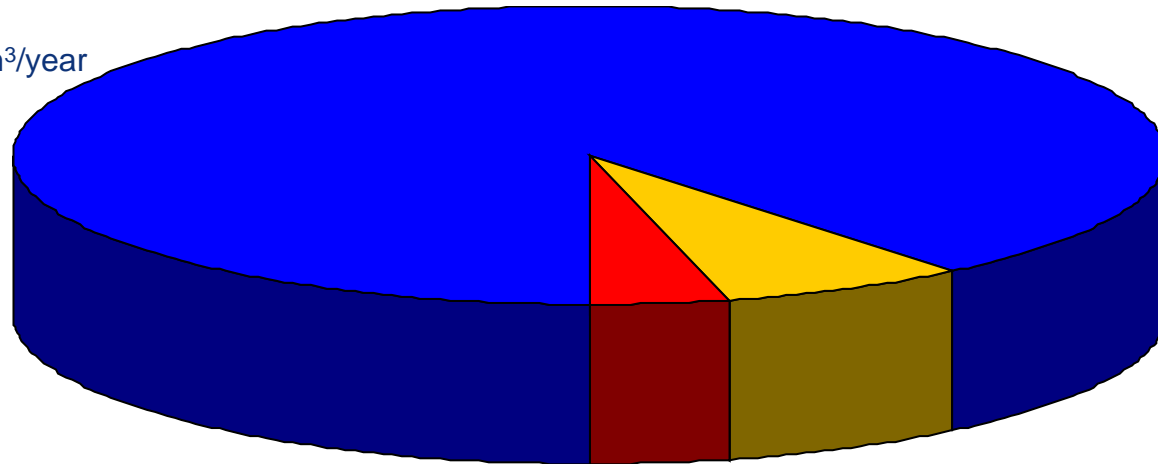
- Payback range based on gas value: 4.1 to 8.7 years

Geleki - Assam Site Study Results

- Reciprocating compressor rod packing contributes 89 percent of the 3.3 million m³/year methane emissions

RECIPROCATING COMPRESSOR ROD PACKING

2,915 thousand m³/year
89 percent



FUGITIVE EMISSIONS

130 thousand m³/year
4 percent

TANK VENTS

227 thousand m³/year
7 percent

Geleki - Assam Emissions and Revenue Opportunities

Emissions Source	Mitigation Option	Recoverable Methane (Rs./year)
Reciprocating compressor rod packing	Early replacement of rod packing	55 Lakhs
Oil storage tanks	Route vented emissions to vapor recovery unit	4 Lakhs
Equipment leaks	Conduct periodic leak survey and repair	3 Lakhs

- Payback range based on gas value:

0.8 to 10 years

Summary Results of Measurement Study, Nov 2009

Installation covered:

1. CPF Gandhar
2. Offshore SH Complex
3. Hazira Gas Processing Complex

CPF Gandhar

Over 2.74 million cubic meters (million m³) / year identified for reduction

1. Reciprocating compressor rod packing emissions: 1.78 million m³/year
2. Emissions from centrifugal compressor seal oil degassing vents: 0.4 million m³/year
3. Tank vent emissions (measured and estimated): 0.35 million m³/year
4. Emissions from leaking components: 0.2 million m³/year

Mumbai Offshore SH Complex

Over 8.74 million cubic meters (million m³) / year has been identified for capture

1. Vent emissions at 3.89 million m³/year
(represents emissions from 10" LP Surge Tank and Strip Gas vent)
2. Leaking components emissions at 3.87 million m³/year
3. Centrifugal compressor seal oil degassing vent emissions at 0.98 million m³/year

Hazira gas processing complex

Over 2.23 million cubic meters (million m³) / year identified for reduction

1. Reciprocating compressor rod packing emissions: .04 million m³/year
2. Leaking components emissions: 1.04 million m³/year
3. Glycol reboiler vent emissions: 0.15 million m³/year

Measurement study by in-house ONGC team

➤ Total 26 facilities covered: (Dec 2010-Oct 2011)

- **Ahmedabad Asset: Six Installations**

- ❖ Kallol- GGS IV, GGS VII, GGS VIII
- ❖ Nawagam- GGS III & GCP
- ❖ Jalora - GGS I

- **Mumbai Offshore:**

- ❖ BHS Complex
- ❖ Neelam Complex

- **Uran Plant**

- **Tripura asset: 4 Facilities**

- **Assam Asset: 13 Facilities**

Emissions and Revenue Opportunities- BHS platform

Source	Quantity (MMSCM/Year)	Suggested Mitigation Option	Revenue (Rs./year)
Equipment leaks	0.86	Conduct periodic leak survey and repair	27.5 Lakhs
Platform vents	4.6	Feasible technical solution reqd- e.g. use of screw compressor etc	147 Lakhs

Gas value at 3200/thousand m3; assuming 100% mitigation

Emissions and Revenue Opportunities- Neelam Platform

Source	Quantity (MMSCM/Year)	Suggested Mitigation Option	Revenue (Rs./year)
Equipment leaks	0.0074	Conduct periodic leak survey and repair	0.24 Lakhs
Vents	1.8	Recommend detailed engineering study for thro' screw compressor	57 lakhs

Gas value at 3200/thousand m³; assuming 100% mitigation

Emissions and Revenue Opportunities- AMD Asset

Source	Quantity (MMSCM/Year)	Suggested Mitigation Option	Revenue (Rs./year)
Storage tanks (GGs VII, GGS IV, GGS III, GGS I)	0.8	<ul style="list-style-type: none"> ❖ Very Low Tank emission except GGS VIII. ❖ Individual tank vapor mitigation not viable 	
GGs VIII	0.55 (Conservative)	Vented emissions - vapor recovery unit/ ejector system	24 Lakhs
Equipment leaks	0.21	Periodic leak survey based repair	9.2 Lakhs



Gas value at 4400/thousand m³; assuming 100% mitigation

Emissions and Revenue Opportunities- URAN Plant

Source	Quantity (MMSCM/Year)	Suggested Mitigation Option	Revenue (Rs./year)
Equipment leaks	0.15	Conduct periodic leak survey and repair	5 Lakhs
Tank Vapour	3.3 (Per the actual data)	Vapor recovery unit rehabilitated and working	10crores*

Gas value at 3200/thousand m3; assuming 100% mitigation

**VAP production 8T/day; @Rs 40000/T*

Emission Recovery Potential

- 7 installations- 30 MMSCM/Yr
- 9 installations – 9 MMSCM/Yr

(Emission from other 17 installations not incorporated)

Work yet to be undertaken at-

- More than 100 GGS & GCP

Measurements Study Equipments

Gas Find IR
Camera



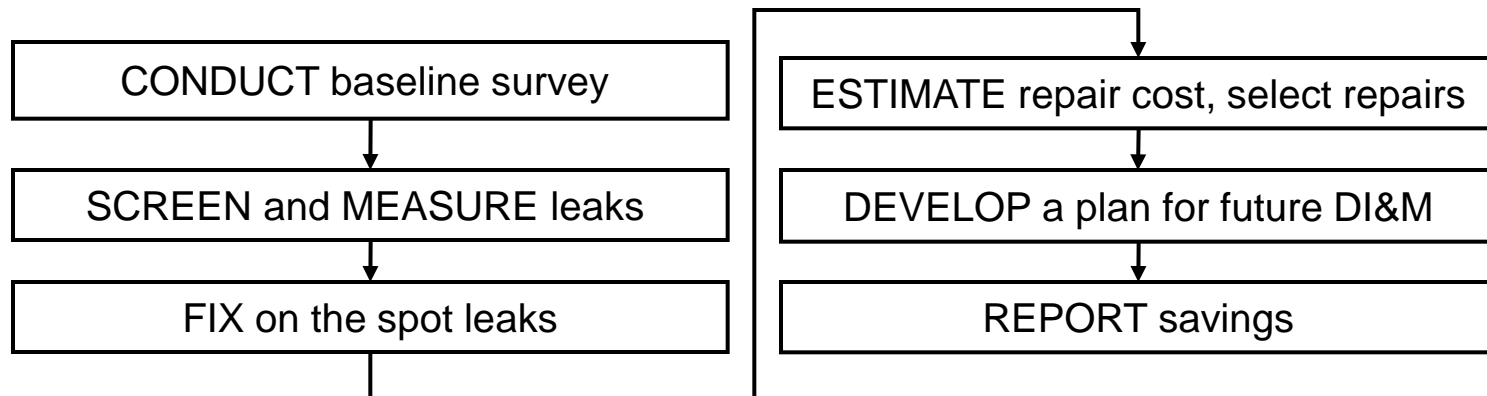
Turbine meter



Vent bags

Opportunities – Directed Inspection & Maintenance (DI&M)

- Methane leaks are invisible and often go unnoticed
- Directed Inspection & Maintenance
 - Periodic, directed surveys and measurement
 - Prioritize leaks for repair
 - Fix significant leaks that are cost-effective to repair



Achievements through DI&M

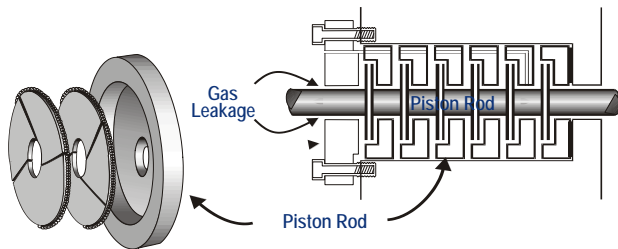
- 3.2 MMSCM (2008-09)
- 4.7 MMSCM (2009-10)

In 2011 there was no opportunities under DI&M practices

Opportunities - Reciprocating Compressors

- Reciprocating compressor rod packing impediments to sealing:
 - Dirt or foreign matter
 - Worn rod
 - Insufficient/too much lubrication
 - Packing cup out of tolerance
 - Improper break-in on startup
 - Liquids
 - Incorrect installation
- Determine economic replacement by:
 - Determining new packing leak rate and monitoring increases
 - Determining replacement cost
 - Replacing when leak reduction pays pack cost

Geleki - Assam: Replace Reciprocating Compressor Rod Packing



Net First-year Costs: 44 Lakhs

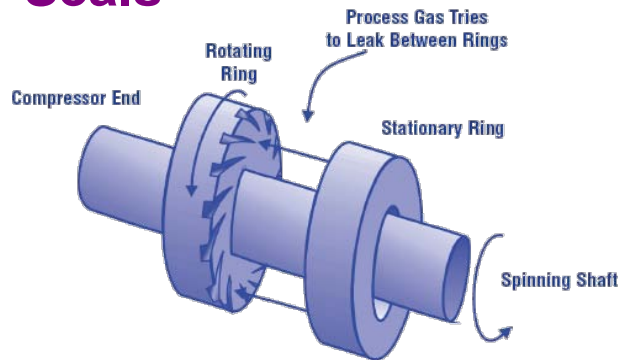
Payback: **0.8 years**

Methane Savsg: **2,843 thousand m³/year**
average

Opportunities - Centrifugal Compressors

- Centrifugal compressor wet seals emit methane at:
 - Seal face (small emissions)
 - Seal oil degassing sump (large emissions)
- Dry seals reduce emissions and operating costs
 - Series of rings create high pressure gas barrier
 - Eliminates need for seal oil barrier

Uran Plant: Replace Centrifugal Compressor Wet Seals with Dry Seals



Net First-year Costs: 119 Lakhs

Payback: **0.9 years**

Methane Savings: **1,742 thousand m³/year**

Methane saving potential projects in ONGC thro the use of VRU

1. Kallol CTF Complex Process tanks, Ahmedabad Asset
2. GGS VIII- Ahmedabad Asset
3. Uran: Already implemented

Future Plan

- To map all the production installations across ONGC for methane emissions and form a comprehensive fugitive emission inventory of ONGC.
- To incorporate appropriate technical interventions to reduce these emissions.
- Yearly monitoring.
- A system of yearly reporting of methane reductions



Conclusions

- Opportunities exist for ONGC
 - Evaluate and implement cost-effective projects
 - Seek to improve project economics through carbon markets
 - Dedicated methane emission identification and measurement team- *building capacity*
 - Gain recognition for efforts via promotion internally and to external stakeholders
 - Share learning and best practices with other Gas STAR companies (presentations, articles)



Thank you
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