



**DeepStar Measurement Project 8302
Improved Multiphase Metering for Subsea
Tiebacks**

**Presentation to RPSEA Seafloor
Technologies Forum**

Chip Letton

**Texas A&M University
9th March 2007**

1



**DeepStar Presentation to RPSEA Seafloor
Technologies Forum**

- **History of the DeepStar Project 8302**
- **Overview of the Elements of the Project**
- **Some Examples**
- **Way Forward**

2



DeepStar Project 8302 - History

- April 2005 - First Meeting of the Future DeepStar Steering Committee to discuss "gaps" in subsea metering. BP, CVX, ENI, COP.
- July 2005 - Subsea Metering Workshop put on by DeepStar. Open meeting, attended by 60.
- September-November 2005 - Using Workshop results, proposal made for DeepStar funding. Approved with high priority in DS balloting.
- January 2006. Work begun on a broad front to address four major topics.



DeepStar Measurement Project 8302 *Improved Multiphase Metering for Subsea Tiebacks*

Topics Addressed by the Project

In Situ Verification of Deepwater Multiphase Meters

Uncertainty Determination in Subsea Metering Systems

Phase Behavior Issues in Metering for Subsea Tiebacks

Multiphase Meter Integration for Subsea Tiebacks

4



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**In Situ Verification of Deepwater
Multiphase Meters**

Strategies for Subsea Meter Verification

**Subsea Meter Communications: Bandwidth,
Visibility, and Connectivity.**

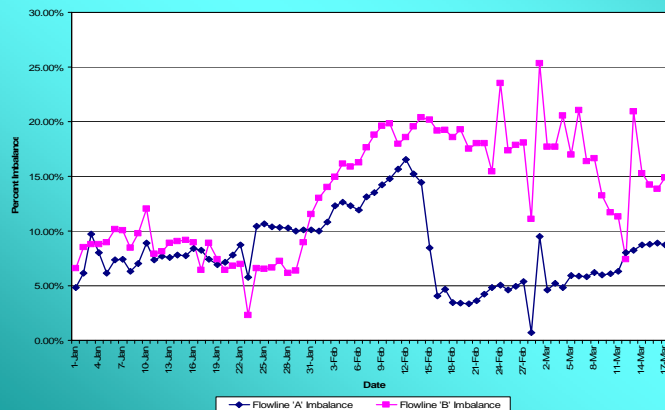
Fouling Effects on Meter Performance

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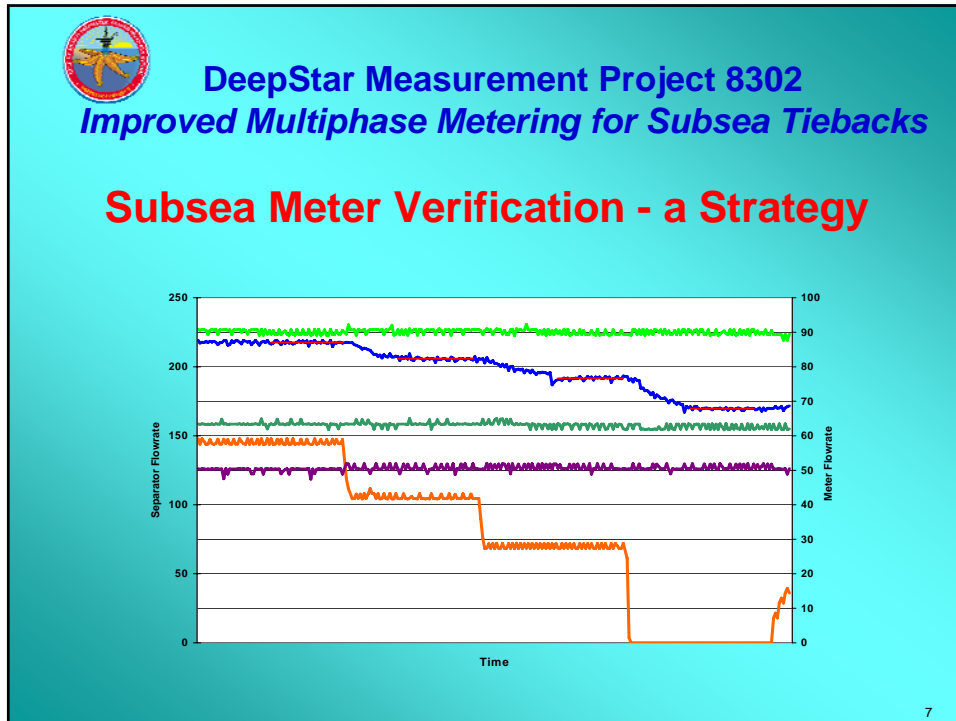


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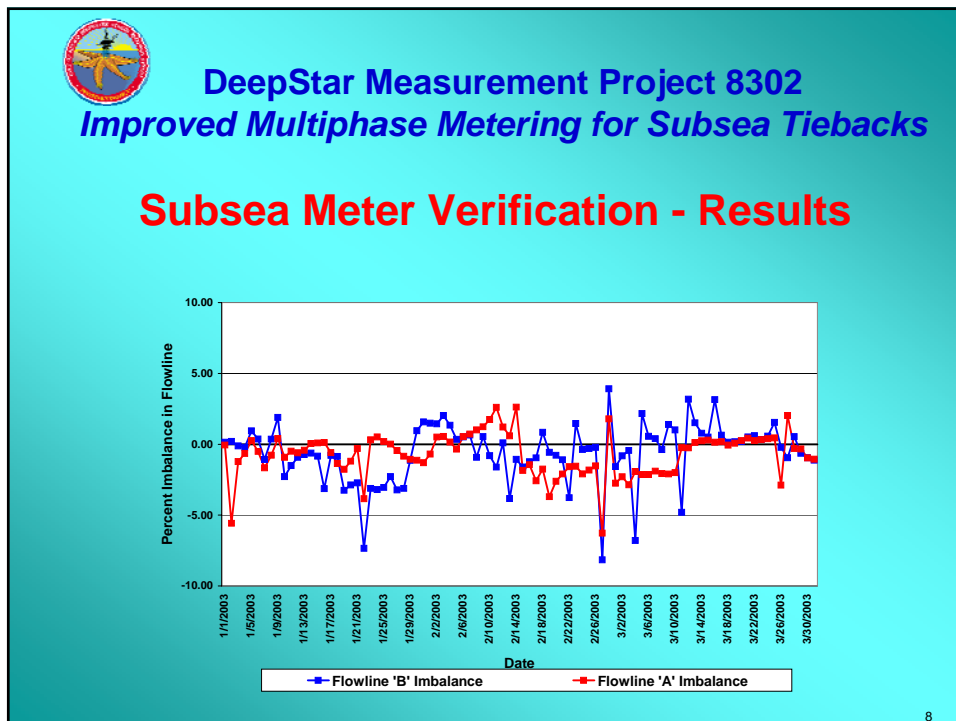
Subsea Meter Verification - Why?



6



7



8



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***In Situ Verification of Deepwater
Multiphase Meters***

Strategies for Subsea Meter Verification

**Subsea Meter Communications: Bandwidth,
Visibility, and Connectivity.**

Fouling Effects on Meter Performance

9



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Fouling Effects on Meter Performance

Goal. Collect information on the performance of all kinds of flow meters for which the device has been subject to various kinds of fouling phenomena, e.g. scaling, wax, asphaltenes, hydrates, etc.

10



**Scale Deposits on Meter Interior Near
Pressure Sensing Port**



11



Close-Up of Scale Inside Sensing Port



12



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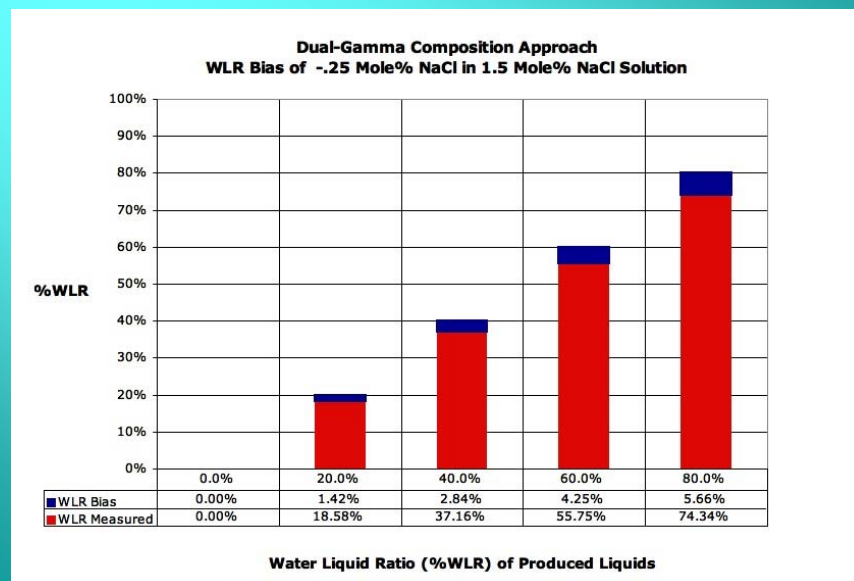
Uncertainty of Deepwater Multiphase Metering Systems - A Primer

Goal. Develop a report that explains all the sources of uncertainty in Deepwater Measurement Systems for Tiebacks, including both metering and traditional well-test approaches.

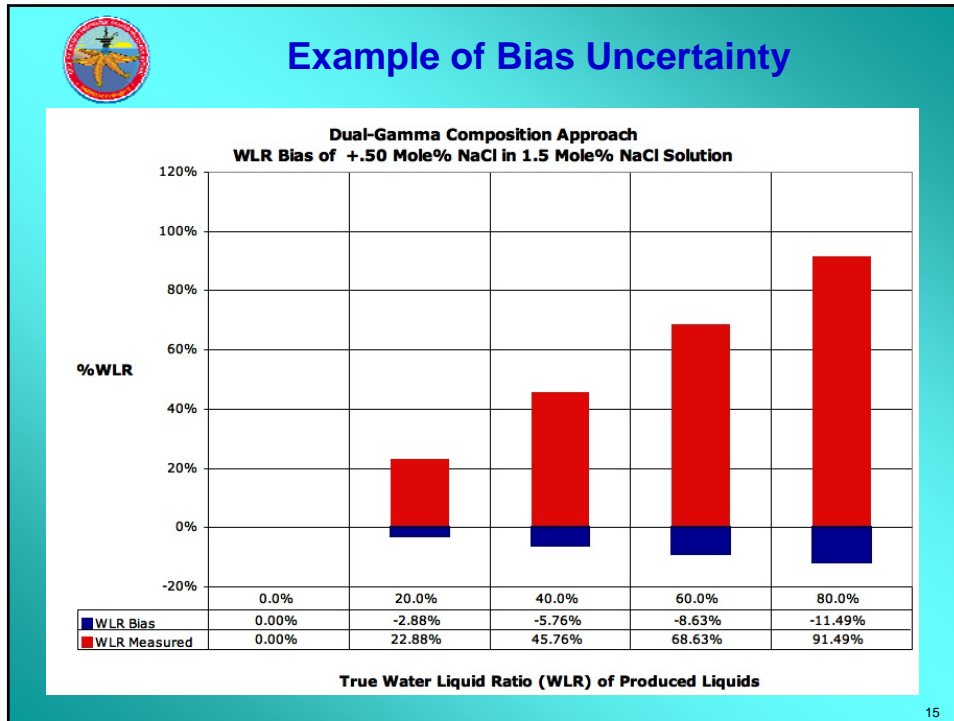
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Example of Bias Uncertainty



14



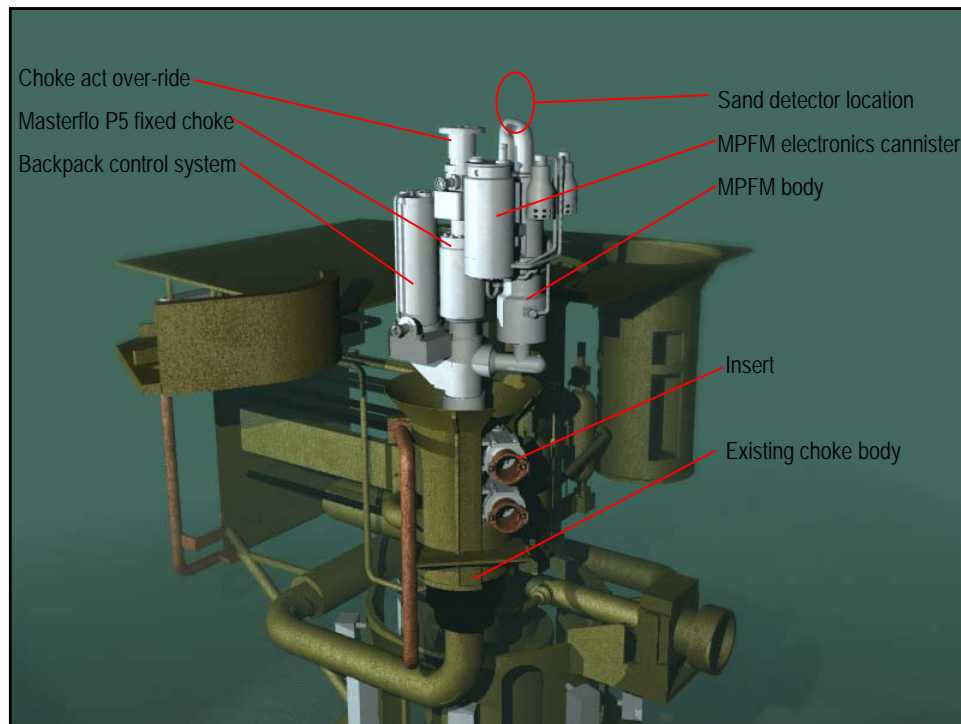
15

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Meter Placement in Subsea Architecture

Goal. To develop a document that summarizes various considerations when selecting specific subsea meter installation locations.

16



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Way Forward - Co-Branded Reports

- Subsea Communications
- Subsea MPFM Uncertainty Primer
- PVT Analysis for Subsea Meters
- Meter Placement in Subsea Architecture



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Way Forward - Follow-On Work

- **Verification Strategies**
- **Meter Fouling**
- **Deepwater Sampling**
- **Improved PVT Analysis**
- **Fault-Tolerant Measurement Approaches**

19



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Way Forward - New Topics

- **Virtual Metering - a Primer and Potential RP**
- **Metering Implication of HPHT Applications**
- **A “Generic” Approach to MPFM**
- **Downhole Meters**
- **Others?**

20



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21