

Oil & Natural Gas Technology

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Progress Report Second Half 2012

ConocoPhillips Gas Hydrate Production Test

Submitted by:
ConocoPhillips
600 North Dairy Ashford
Houston, TX 77079
Principal Investigator: David Schoderbek

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Executive Summary

Accomplishments

- Completed database QA/QC
- Completed data analysis

Current Status

- Final report preparation is under way

Introduction

Work began on the ConocoPhillips Gas Hydrates Production Test (DE-NT0006553) on October 1, 2008. This report is the eleventh progress report for the project and summarizes project activities from July 1, 2012 to December 31, 2012. Work in this period focused on database QA/QC, data interpretation and preparation of the final report.

Cost Status

Expenses incurred during this period were below the Baseline Cost Plan as shown in Exhibit 1.

COST PLAN/STATUS																		
Project Phase ==>	Phase 1, Site Ident.		Phase 2, Field Test Planning							Phase 3A			Phase 3B					
Baseline Reporting Quarter ==>	Q408	Q109	Q209	Q309	Q409	Q110	Q210	Q310	Q410	Q111	Q211	Q311	Q411	Q112	Q212	Q312	Q412	2013 budget
BASELINE COST PLAN																		
Federal Share	-	-	-	-	-	-	-	-	-	-	4,520,635	3,112,490	587,640	4,054,830	3,317,589	-	-	-
Non-Federal Share	288,378	167,366	390,875	333,875	170,699	287,451	285,490	287,451	287,451	473,210	945,515	208,429	528,165	4,689,209	3,536,625	150,000	150,000	170,776
Total Planned	288,378	167,366	390,875	333,875	170,699	287,451	285,490	287,451	287,451	473,210	5,466,150	3,320,919	1,115,805	8,744,040	6,854,214	150,000	150,000	170,776
Cumulative Baseline Cost	288,378	455,744	846,619	1,180,494	1,351,193	1,638,644	1,924,133	2,211,584	2,499,034	2,972,244	8,438,394	11,759,313	12,875,118	21,619,158	28,473,372	28,623,372	28,773,372	28,944,148
ACTUAL INCURRED COSTS																		
Federal Share	-	-	-	-	-	-	-	-	-	549,322	7,083,803	587,640	732,759	3,394,393	2,977,404	267,863	-	-
Non-Federal Share	121,012	186,099	275,348	354,447	352,324	358,001	227,367	255,579	308,855	473,210	945,515	208,429	1,872,480	4,848,847	2,821,034	430,268	109,379	-
Total Incurred Cost	121,012	186,099	275,348	354,447	352,324	358,001	227,367	255,579	308,855	1,022,532	8,029,319	796,069	2,605,239	8,243,240	5,798,438	698,131	109,379	-
Cumulative Incurred Cost	121,012	307,111	582,459	936,906	1,289,230	1,647,231	1,874,598	2,130,177	2,439,032	3,461,564	11,490,882	12,286,951	14,892,190	23,135,430	28,933,868	29,631,999	29,741,378	
VARIANCE																		
Federal Share	-	-	-	-	-	-	-	-	-	549,322	2,563,168	(2,524,850)	145,119	(660,438)	(340,185)	267,863	-	-
Non-Federal Share	(167,366)	18,733	(115,527)	20,572	181,625	70,551	(58,123)	(31,872)	21,405	0	0	(0)	1,344,315	159,637	(715,591)	280,268	(40,621)	-
Total Variance	(167,366)	18,733	(115,527)	20,572	181,625	70,551	(58,123)	(31,872)	21,405	549,322	2,563,169	(2,524,850)	1,489,434	(500,800)	(1,055,776)	548,131	(40,621)	-
Cumulative Variance	(167,366)	(148,633)	(264,160)	(243,588)	(61,963)	8,588	(49,535)	(81,407)	(60,002)	489,320	3,052,488	527,638	2,017,072	1,516,272	460,497	1,008,628	968,006	

Exhibit 1: Cost Plan/Status

Database

The Ignik Sikumi #1 database contains all of the information recorded during the field trial along with corrections and calculations performed. Data was recorded from a number of sources including an on-line gas chromatograph (GC), three downhole gauges, flow meters, pumps, temperature and pressure sensors, distributed temperature sensing (DTS), and water production rates. Schlumberger (SLB) provided the data logging for the entire test with data fed from other vendors, including Halliburton (DTS) and Expro (production, separation). All data were fed to a main data logger from the various sources (Figure E1) and recorded in a MySQL database with daily tables. Eight table types were used with variables categorized based on their function (e.g., flow, temperature, pressure, etc).

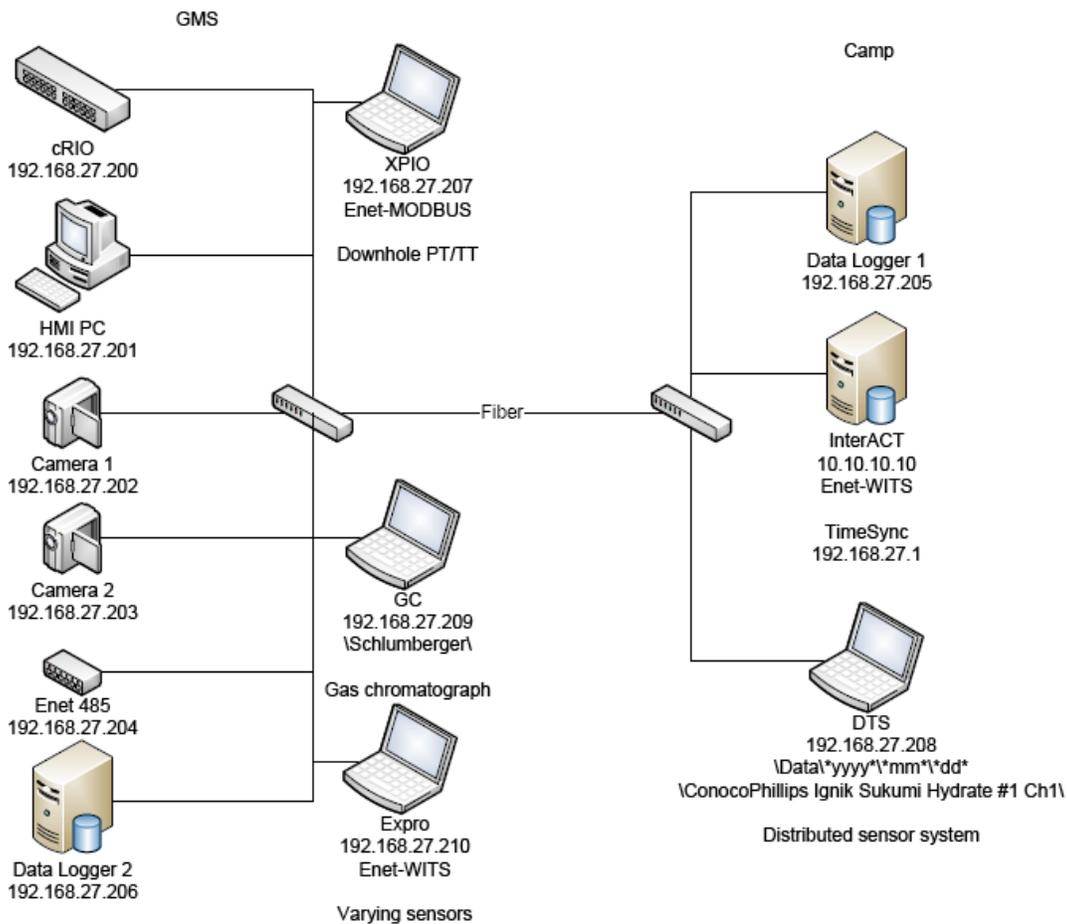


Figure 1. Data streams and data logger used during the field trial.

To help future interpretations of the field trial, a number of supporting documents have been included in the database. This includes the piping and instrumentation diagrams from EXPRO and SLB for all surface facilities. Volumes have been estimated for all surface lines/equipment in the injection and production streams as well as the wellbore volumes. An operations log gives a compilation of all the notes from the well supervisor, SLB, EXPRO, well work, and the production engineers during the pilot. A master

variable list is provided to identify each data stream including all available supplementary information (i.e., sensor type, model, calibration parameters, scaling parameters, etc). In addition, a supporting data document is provided which highlights known issues, lists corrections made to the raw dataset, and gives detail on how various calculations were performed.

The “clean” dataset was formed using the original data streams from each vendor. A number of corrections were made in order to create the “gold-standard” dataset. This included correcting for time-stamping errors, reprocessing all of the GC data, correcting data spikes and noise (especially from the downhole gauges), and renormalizing the DTS data. In addition, because of the large amount of data points, one-minute and five-minute time averaged datasets were created. All injection and production calculations were done using the one-minute time-averaged data. Spreadsheets containing all injection and production calculations are provided with the database as well.

The final database is in MS SQL 2008 R2 format and contains a data extraction tool that will allow users to extract CSV format files of select data. Finally, DTS playbacks in mp4 format have been provided at three ranges (full wellbore, 2150-2350 ft, and 2230-2280 ft) for the entire test.

Interpretation

Work to interpret the data has been completed and includes analysis of the following phases: perforation; injection; and injection. This work will be reported in the final project report that is currently being prepared.

