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# MALLIK GAS HYDRATE PRODUCTION RESEARCH PROGRAM

## WEEKLY SCIENCE REPORT #7

MARCH 4 - 10 , 2008

AURORA RESEARCH INSTITUTE



### PROJECT STAFF ON SITE

#### INUVIK

NRCAN- S. Dallimore, M. Nixon

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J. Tomomoto

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D. Ashford, K. Martin

SKK-Y. Morikami, P. Primiero, , N. Sakiyama; JOE- M.

Kurihara, K. Funatsu; Tokyo Gas- T. Kawasaki

#### MALLIK SITE 69 hearty souls

NRCAN - F. Wright JOGMEC - M. Numasawa, K. Fujii

AURORA- L. Johnson, W. VanderBurgh, G. Serrano, L.

Bueno

SKK- K. Suzuki

### WEEKLY WEATHER

We are officially blaming the weather this year at Mallik on El Nino weather patterns that are giving severe winter weather throughout much of Canada. Again this week we were beset by storms with the Mallik road closing on March 6 and again on March 8 with blizzard conditions. Like all good Canadians we are now saying to ourselves, enough already about the weather, lets just ignore it and get on with our work.

### FIELD OPERATIONS

#### *The case of the sheared pipe ram*

Last week ended with the Blow Out Preventor (BOP) causing us problems and actually putting a stop to well operations. This week began with trouble shooting as two BOP technicians were flown in from Edmonton (one on a special charter from Yellowknife). The cause of the problem was quickly identified as a sheared pipe ram. Incredible but true!@@!##!

#### *The case of the awakening gas hydrate formation*

The BOP was back in operation on the morning of March 6<sup>th</sup> and field crews worked hard to gain any efficiency they could to make up for the lost time. Operations proceeded at a very quick pace through the tricky procedure of accessing the perforated test zone from 1097 to 1105m and setting the sand screens across the perforated testing zone.

The next operational step undertaken during the morning shift of March 7<sup>th</sup> was to run the completion string. This involved lowering the pump and borehole heater on production tubing and then strapping on electrical connections for each to the surface.



*The cause of the BOP problem encountered in week 6 was a broken pipe ram*

Operations were going well until the pump was lowered to about 500m. At this depth a slight gas mist was observed coming out of the casing. By 22:00 our formation was angry with our disruption and decided to flow. Our newly repaired BOP was put to work and we had to shut in the well. But.. and it was a big but, in order to shut in the well we had to cut the ESP cables. Drilling engineers are paid the big bucks to get the job done. No job can be more important than killing a flowing well. The well kill operation during the completion run was a true team effort. Conventional drilling practice had to be put on the shelf as we made a tentative diagnosis that the cause of the kick was dissociated gas hydrate that had 'melted' in contact with the 5% KCl brine that had invaded the formation we tested last year. Our well operations had opened up the formation and the free gas was flowing to surface. The Mallik gas hydrate brain trust and the Mallik operations team had to work together though the night to work out the next steps. Making things more challenging we also had to deal with the serious risk of freezing in the annulus in the permafrost interval. Adding more pressure to the situation we had to keep in mind that without cables to the surface from our pump and heater we were dead in the water for any testing.

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While the main crews on drill rigs generally work a formal 12 hour shift, during critical operations the supervisors and specialized contractors often work until the job is done. The challenge is working efficiently through tasks as you get more and more tired. The Mallik field team did more than an admirable job handling the situation. The kill sequence bleeding off the gas pressure and injecting a heavy NaCl brine solution (heavy pill). By midnight of March 8<sup>th</sup> the well was officially declared dead.. again.

Having our well back in our hands was a good thing but if we were to have any chance of undertaking production testing we had to recover and splice the heater and pump cables. The pump was also at a shallow position in the well then we had hoped for so we also had to consider if there were any operational risks in lowering the pump in the hole. The clock was also still ticking as the cold permafrost was freezing the fluid in the casing and with continuous DTS temperature data we knew it was freezing relatively fast. The only solution was to move quickly. Again our operations teams put out great effort and through the early morning hours of March 9<sup>th</sup> we retrieved and spliced the cables and lowered the completion to its target depth with the pump intake at 811m.

Busy week... what next? The day shift of March 9<sup>th</sup> was spent connecting and testing surface equipment which included water injection lines to Mallik 3L-38, flow lines to testing and equipment set ups for the down hole equipment. The spread of the equipment at surface is very impressive this year with many additions from last year. The concept is fairly easy however, simply follow the water and gas. At depth the test is started by turning on the borehole heater then turning on the pump. Initially we expected to draw down only water reducing the formation pressure conditions and therefore initiating gas hydrate dissociation. As the test continues, water (hopefully without gas) flows up the inside of the tubing and gas flows up the annulus. Gas, water and sediment arriving at the surface is carefully measured on both streams. Gas goes to the flare, water to storage tanks to be injected in Mallik 3L-38. Sounds easy, but more than 30 pieces of equipment of various dimensions are involved and more than 20 workers are required to from three separate crews (Nabors drilling, Schlumberger artificial lift and Schlumberger testing). Yet another tap dancing job for the IPM management team and even the JOGMEC and NRCan field and management teams!

After an incredibly challenging 3-4 days at 5:00 on March 10<sup>th</sup>, Kevin Martin got the call from the rig and the entire JOGMEC/NRCan/Aurora/SKK team in Inuvik came to the ARI meeting room to call through to the rig for final discussions and planning prior to starting the test. The heater was turned on at 10:40hrs and the test was officially kicked off when the pump was turned on at 12:40hrs or more

officially 18:40 Universal Time (UTC). After 7 long weeks our R&D program had begun in earnest!

## **R & D ACTIVITIES**

Folks.. your trusty reporter has only managed to catch a few hours sleep for several days now and frankly by next week's Science report our testing will be over. So I hope you will not be offended to wait for the details of our R&D work until next week.

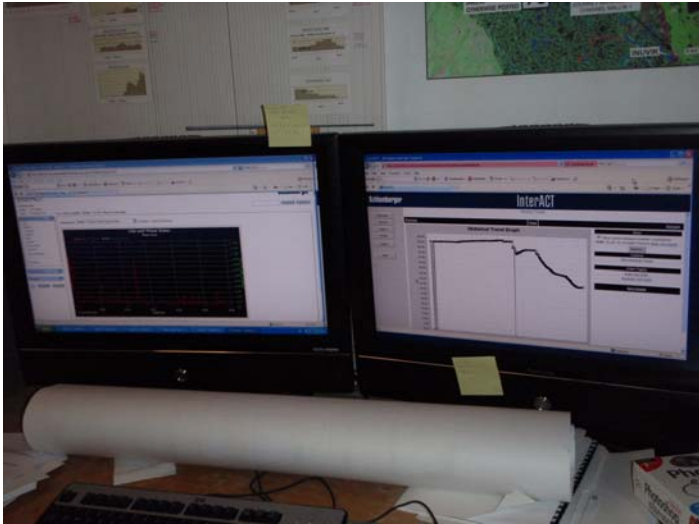
The following photo I think explains the nuts and bolts of where we are at. As I write at 12:00hs on the 11<sup>th</sup>.. we have had one darn amazing and beautiful gas hydrate test ongoing for more than 15 hrs! After more than four years of planning, thanks to the effort of a team of well over a hundred managers, scientists, engineers, oil field workers, cooks and bottle washers we have made history as frankly speaking this has not been done before! And just to tease you a bit.. the learning's to date are HUGE.

So stand by for next weeks science report and I will figure out just what I can release in this venue and what I cannot release.



**Mallik March 10:  
World's first sustained gas  
hydrate flare**

*Gerardo Serrano took this photo at 3:00am.. Gerardo I owe you a beer for this!.. pledge by SRD*



*Data streaming in real time to Inuvik from Mallik test.. plot on right shows the bottom hole flowing pressure stabilizing at about 7.5MPa (dark line on screen). The flow data on the left screen is top secret!*

## **Inuvik Contact Info**

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*Yasuda-san, Yamamoto-sans and their teams have happy faces after four hours of flaring gas at Mallik. Dallimore touches wood (his head) for good luck!*

**Missing in action is a field picture of Luis Johnson, Bill VanderBurgh, Gerardo Serrano, Fred Wright, Kasumi Fujii and all of the other workers in the field. Last but not least 'Iron man' Numasawa-san who has stayed at the rig camp the longest has been great!**