
Bulletin: 246

Event: Geothermal61

Date: Wednesday, 01 March 2006 (GMT+12:00) Auckland, Wellington

Field Trip Name: Wairakei Geothermal Power

Weather: Fine and warm again

Field Trip Place: Wairakei

Where's Donald: Taupo

Diary number of total: 2 of 4

Hi Everybody

What fantastic day, both weather wise and geothermal wise.

At 8.30 we were signing in and meeting with some of team who would to be our guides over the next three days, here at the Wairakei geothermal power station,. Elizabeth Whitelock, Eddie Buckley, Chris Morris and Sam Pook. There is so much to see and do we had to start by planning our opportunities wisely. By 9am we were away to the edge of the western bore field to four new wells called Wairakei 243 to 246. As we pulled up I was amazed to see they were only about 10m apart. I wondered if this was because there was so much geothermal water directly below, so I asked Sam. 'Oh no' he replied, ' They all go down 700 to 800 m, then duck off sideways in a curve. It's called directional drilling and we can extract the fluid from a 1 km radius from here. We also stand a much greater chance of intersecting a fault line or flow zone that way. However the great advantage is that we can keep the drill rig in one spot'.

Little did I know then that Sam's last sentence would become so very, very clear later today.

We went on with Sam to make a video of how a modern well is designed and operated. It is a great example of how the technology of oil and gas exploration has been transferred to geothermal drilling. By the well heads were stacks of mild steel pipe that would carry steam from a drill rig we could see poking over a hill nearby. They had yet to be assembled so I naturally went and sat inside one. It was odd listening to your own breathing echoing back at you. Although they had a temporary greasy lining they were not lined. 'The steam reacts with the steel to make magnetite, an iron oxide. This protects the pipe from the rest of the steam. The outside will be insulated with fibreglass and then weather protected with an aluminium sheeting. That's why all the other pipes you see look so shiny' explained Sam.

We headed along the pipe line leading from the well heads to Flash Plant 12. I smiled and thought of yesterdays diary with my reference to Flashing 12's. Quite a coincidence. Here at FP12 the 80 percent water and 20 percent steam mix from bores 243 to 246 would be flashed. Sam took me over to it adding, ' We spin the heavier water to the outside which is why the pipes enter on the side. The steam leaves through the middle. The 13 Bar water is allowed to expand by entering a bigger chamber. This drops the pressure and therefore the boiling point. We can turn the water and steam mix to 99 percent dry steam this way. Our turbines just love dry steam. The remaining water is still at 6 Bar of pressure and heads off to the silencer over there'. We headed to the east in the direction he indicated.

We parked by a fat chimney chugging away and spewing massive clouds of pure white water vapour high into the air. 'I can see this from home. That's 18km away', added Elizabeth with a smile. I was drawn closer by this silencer that seemed to be alive. I stood on the massive concrete foundations and they shook continuously. I could also feel the heat on my face from 10m away. When I mentioned this to Sam the answer was ' Little wonder. 1000 tonnes of solid water goes into this every hour at 160 degrees. It comes in at 6 Bar and leaves at 1 bar, that's atmospheric pressure. There is a lot of expansion going on in there'. I peered over the cloudy edge into a stream of bubbling water that cascaded away like that from a spilt cauldron. Have a look at the stream in the image opposite to see what 1000 tonnes per hour looks like.

Quickly we headed to our audioconference venue, perched on a fault scarp looking down 50m to the western bore field below. It stretched along the length of the fault line, but slightly to its south. We had two audioconferences here with geothermal questions from Y13 Physics and Y13 Geography both at Garin College, Nelson. Sam Pook tackled the first set and geologist Michael Rosenberg the second.

After a quick lunch we headed off with Eddie Buckley to the drill rig we had seen poking above the hill. I have been to drill sites before but had never seen anything like this. Some data may help to explain the drill rig and why Sam's comment about 'easier not to move the rig' became suddenly clear. It weighs 500 tonnes and is about 45m tall. It costs 45 000 dollars a day to run the rig and about the same for catering, accommodation, power, transport etc. It requires 50 big truck loads to move it. To transport it from Australia cost 2 million dollars alone. To drill each geothermal well costs 2 to 3 million dollars. The 4 holes it would directionally drill from here, should take 48 days. Each drill hole would be 3 km long. Not 3km deep note but 3km long because 'Deeper is not better'. The crew would eat, sleep and work on site for two weeks then have two weeks off. They worked 12 hour shifts. The drilling never stops.

It was mid afternoon and we had been lucky enough to arrive when only the first 6m of the 3000m had been drilled. However as we stepped onto the site Jenny gave us a 10 minute safety briefing, checked our clothing and safety gear. The most unusual thing she said was that we should watch the flag fluttering on the rig. If the alarm went off and we had to go to the assembly points we should always chose the one upwind of the rig, because of geothermal gases like hydrogen sulfide, sulfur dioxide and carbon dioxide.

The next hour was a video makers heaven so take a look. Eddie had us captivated with the explanations of casings, drill strings, drill bits, directional drilling, strata and a special opportunity to climb the long flight of metal stairs up to the drillers platform. For twenty minutes we watched as they carefully and skilfully got the drill string turning and advanced downwards. I have seen drillers use the massive tongs to do and undo sections on the drill string, but its only been in movies. The real thing was far more physical and difficult. The 500 tonne rig shook continuous from the effort. What a great end to the day.

A special thanks to Century Resources and Lindsay Fook for this opportunity today.

On a hot afternoon we tumbled into the vehicle and headed away. Tomorrow its off inside the power station itself. Chris tells us there is a Mixed Pressure turbine apart for servicing, so we are off for a look inside. Do join us.

Cheers

Donald

Competition clues for Wednesday

1. I work by a drop in pressure
2. I create flashed steam
3. I am manmade equipment that separates water and steam



One of the four new Wairakei well heads that lie only 10 to 14m from each other.



Flash plant 12 which serves several well. The steam and water mix enters on the left but leaves on the right separated from each other.



A silencer on the Wairakei field. Pressurised water enters from the left and leaves at atmospheric pressure on the right



Hot water escapes from the silencer and cascades at 1000 tonnes per hour down to the Waikato River



Sam Pook our steam field guide, enjoys a laugh by a new Wairakei well head



The drill site for Wairakei 248 is really a small mobile town. The rig alone weighs 500 tonnes



Eddie Buckley explaining the job of the casings behind him and drill string sections in front



Eddie with four different types of drill bit. The one boxed on the left is worth about the same as new sports car.



The Wairakei 248 rig has just bored 6m of its 3000m journey. Notice the drilling mud pouring back up into the well head cellar.



Ensuring sections of the drill string are tightly screwed together on the drill platform was a difficult, important and carefully completed task.