



Project Experience Handbook

Landfill gas to Energy Facility at the Nejapa Landfill site

El Salvador (April 06 – April 08)



Biothermica
Technologies Inc.

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Introduction

The landfill gas (LFG) to energy project at the Nejapa landfill site, El Salvador, has been a unique experience. The main purpose of this handbook is to share this experience with the readers by describing the main aspects of the project and our team's hard work in order to achieve all our technical, financial and social objectives. We also wish to thank our team for the success achieved and hope to inspire similar projects in other parts of the world, for a cleaner and healthier global environment.

1. Project overview

1.1. Location

El Salvador is a small country of Central America, with a total area of only 21,040 km² and an estimated population of 6 million (according to the 2007 census). The Nejapa landfill site is located about 15 km north-west from the country's capital, San Salvador. Nejapa and San Salvador are both located within the San Salvador department.



1.2. The Nejapa landfill

In operation since 1999, the Nejapa landfill site is annually receiving 650,000 tons of municipal solid waste (MSW) from the San Salvador urban area (2 million people) and has a potential capacity of 20 million tons. The landfill is operated under the standards and regulations of the Salvadorian Ministry of Environment, which include a recent obligation to collect and treat the leachate, and impermeabilize the bottom of the landfill with an appropriate geotextile membrane.

Nejapa landfill site, ▶
El Salvador – waste deposit area



1.3. Project activity

Solid waste compaction on landfill sites creates an anaerobic environment suitable for initiating methanogenic bacteria colonies. On a medium term basis, the anaerobic decomposition of waste can produce significant quantities of LFG, a mixture in similar proportions of methane gas (CH_4) and carbon dioxide (CO_2). LFG can be dangerous for the health of individuals and harmful to the environment, as it contributes to the creation of urban smog and greenhouse gas emissions.

In order to reduce these harmful effects, and to take advantage of an otherwise unexploited energy source, the project activity consisted in the recovery and utilization of LFG from the Nejapa landfill site by implementing a LFG collection and flaring system, with the vision of eventually operating a 6 MW LFG to electricity power plant.

The collection system now extends over cells 3, 4 and 5 of the landfill site, which displays a total of six (6) cells. The collection system is connected to two flares on site, designed to burn the collected gas and enable the generation of Certified Emission Reductions (CERs).

Surface emissions sampling by a Biothermica employee at the Nejapa landfill site during the first studies on the site (2004)



1.4. Actors

Biothermica

Biothermica is a technology corporation specialized in the thermal treatment of solid and gaseous effluents. The company is active in three (3) areas:

- LFG recovery and energy production;
- Air pollution control;
- Greenhouse gas (GHG) abatement and climate change.



For more than twenty (20) years, the company has supplied turnkey projects in the field of Volatile organic compounds (VOC) control, particulate filtration and LFG valorization, and has been responsible for the reduction of more than 10 million tCO₂e of GHG. Biothermica supplies the patented BIOTOX® regenerative thermal oxidizer (RTO) for VOC control and the VAMOX™ process for the control of underground coal mine ventilation air methane.

Since 1996, the company owns and operates a 25 MW LFG power plant in Montreal. Biothermica is currently developing and financing similar projects around the world under the Clean Development Mechanism (CDM) of the Kyoto Protocol, such as the Nejapa LFG to energy project in El Salvador.

Between April 2006 and April 2008, the company was responsible for all the phases of the Nejapa project, including its registration with the CDM Executive Board of the United Nations Framework Convention on Climate Change (UNFCCC), its construction, commissioning, operation, as well as CERs monitoring through its wholly-owned subsidiary in El Salvador, BioEnergia SA de CV. Biothermica was the identified Project Participant under the UNFCCC CDM rules and procedures.



BioEnergia

BioEnergia S.A de C.V. was incorporated in El Salvador in 2006 in order to build, operate, maintain and periodically expand the LFG collection and flaring system installed by Biothermica at the Nejapa landfill. BioEnergia's various tasks were achieved while respecting its employees' self-esteem, providing a safe working environment and allowing them to learn and take initiatives.

1.5. Key dates

The UNFCCC's CDM Executive Board confirmed the project's successful registration on March 11, 2006. A few months later, in June 2006, the Nejapa project became the first worldwide CDM project insured by the Multilateral Investment Guarantee Agency (MIGA), a member of the World Bank Group.

Biothermica then created the local company BioEnergia S.A de C.V. which built the LFG collection system from April 2006 to October 2006 and was responsible for project operations from October 2006 to April 2008.

The Certified Emission Reductions (CERs) generated by the project were sold to the government of Luxembourg through an Emission Reduction Purchase Agreement (ERPA) transaction signed in February 2007. A total of 215,782 CERs were generated between June 1st 2006 and April 24th 2008. The Nejapa project was sold to AES Climate Solutions in April 2008.

1.6. Team members

Canadian team

Biothermica ensured the continued presence of specialized engineers and technicians who stayed on site for various periods of time, dedicated to the development and successful operation of the project:

Guy Drouin, Eng., MBA – President, Biothermica

Guy visited the site several times to verify the installations and ensure the optimal progress of the project.

Frédéric Drouin, Eng., M.Sc.A. – General manager, BioEnergia

Frédéric lived in El Salvador from May 2006 to October 2006 and from January 2007 to August 2007, leading the construction phase and implementing an operational team.

Aurora M. Hernández, Eng., M.Sc.A. – Delegated general manager, BioEnergia

Aurora managed the operations team in El Salvador from December 2007 to June 2008.

Jean Pierre Franzidis, Eng., M.Sc.A. – Technical project director, BioEnergia

Jean-Pierre supervised all LFG collection system extension works and trained all employees from November 2006 to April 2008.

Luc Bisson – Construction manager, Biothermica

Luc supervised project construction from April 2006 to June 2006 and supervised operations during October 2006 and November 2006.

Sylvain Coulombe, Eng. – Director of engineering, Biothermica

Sylvain was responsible for the detailed engineering of the LFG collection system and the LFG flaring station

Van Nguyen, Eng. – Electrical engineer, Biothermica

Van made several trips on site to resolve electrical problems with the flare facilities and the control system.

Paulo Koeberle, Eng. – Chemical engineer, Biothermica

Paulo lived in El Salvador from August 2006 to February 2007, working on the design of an optimal water pumping system.

David Pineault – Gas emissions technician, Biothermica

David spent several weeks in El Salvador supervising gas assessment surveys and the installation of a water pumping system.

Guy Drouin's visit during the negotiation of the sale of the Project (Feb. 08) – from right to left: Aurora M. Hernández, Éric Joncas, Van Nguyen, Mario Lemus, Rigoberto Torres (front), Jean-Pierre Franzidis, Juan Canjura (front), Ernesto Chávez, Guy Drouin, José Franco Mendoza, Wilfredo Carbajal (front), Juan Esquivel (also named Eto), José Efraín Medrano and Mario Torres.



Salvadorian team

This team grew gradually to become an active and innovative working team which approached challenges as development opportunities. Each member of the team invested its energy in the development and success of the project.

Mario Lemus, Eng. – Operations director, BioEnergia (Since June 2006)

Franco Mendoza, Eng. – Construction director, BioEnergia (Since July 2007)

Iris Flores, Lawyer/MBA. – Administrative manager, BioEnergia (Since June 2006)

Rosibel Arévalo, Bach. Accounting – General accountant, BioEnergia (Since August 2007)

Ernesto Chávez – Transportation, security and sales, BioEnergia (Since June 2006)

Rigoberto Torres – LFG recovery system calibration supervisor, BioEnergia (Since June 2006)

Wilfredo Carbajal – Pipe fusion and pumping system supervisor, BioEnergia (Since May 2006)

Juan Esquivel – Drainage system supervisor, BioEnergia (Since June 2006)

Efraín Medrano – Construction technician, BioEnergia (Since June 2006)

Juan Canjura – Multiple task worker, BioEnergia (Since June 2006)

David Alegria – Multiple task worker, BioEnergia (Since March 2007)

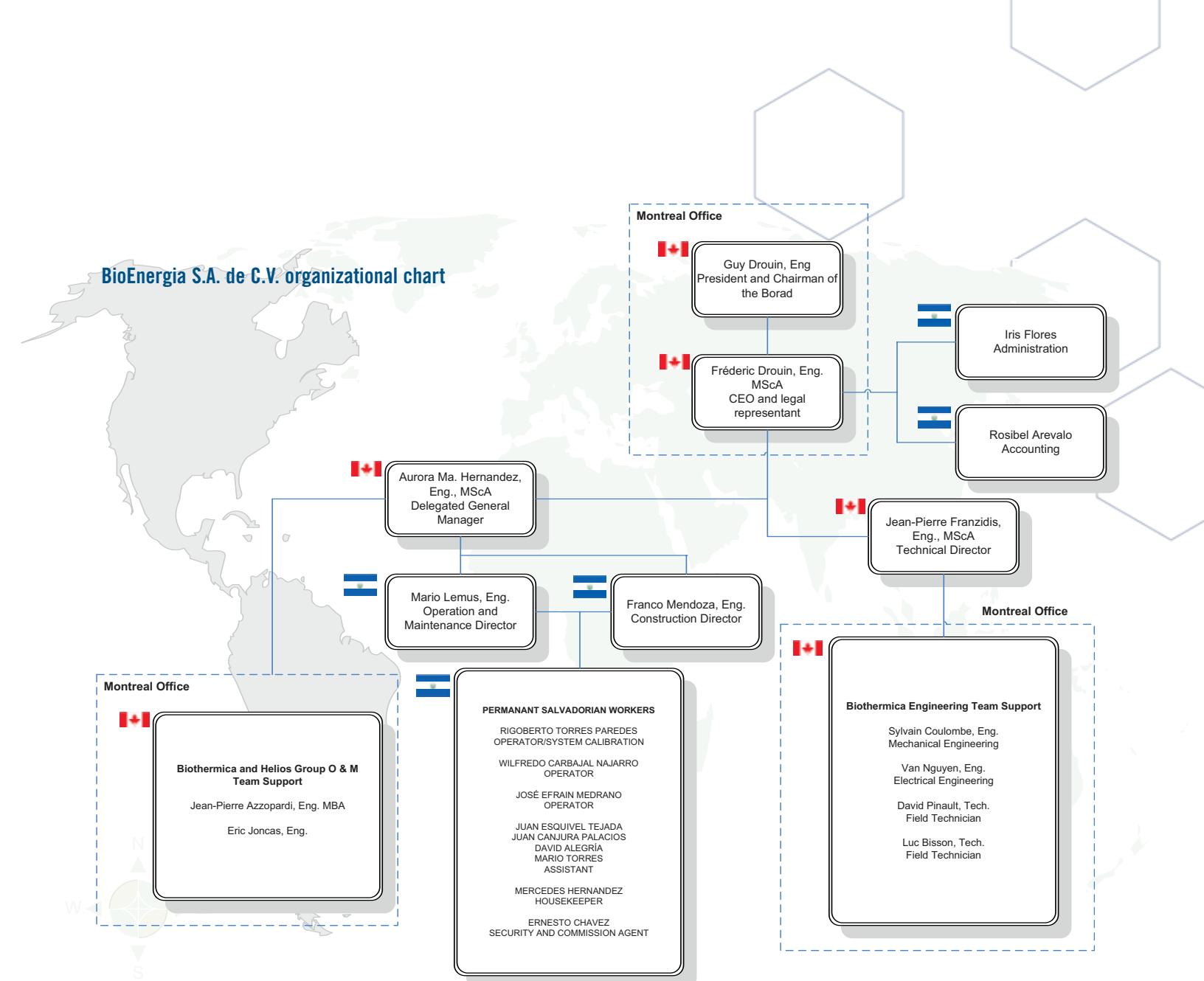
Mario Torres – Multiple task worker, BioEnergia (Since March 2007)

Mercedes Hernández – Domestic services, BioEnergia (Since January 2007)

Various temporary positions were also created, according to the needs of construction and operation activities.

Frédéric Drouin's farewell visit to the working team (May 08) – from right to left: Mario Torres, Efraín Medrano, Wilfredo Carbajal (front), Jean-Pierre Franzidis (back), Rigoberto Torres, Frédéric Drouin, Juan Canjura (front), Iris Flores, Franco Mendoza, Juan Esquivel, Mario Lemus, Rosibel Arévalo, Mercedes Hernández, Van Nguyen and David Alegria (back).





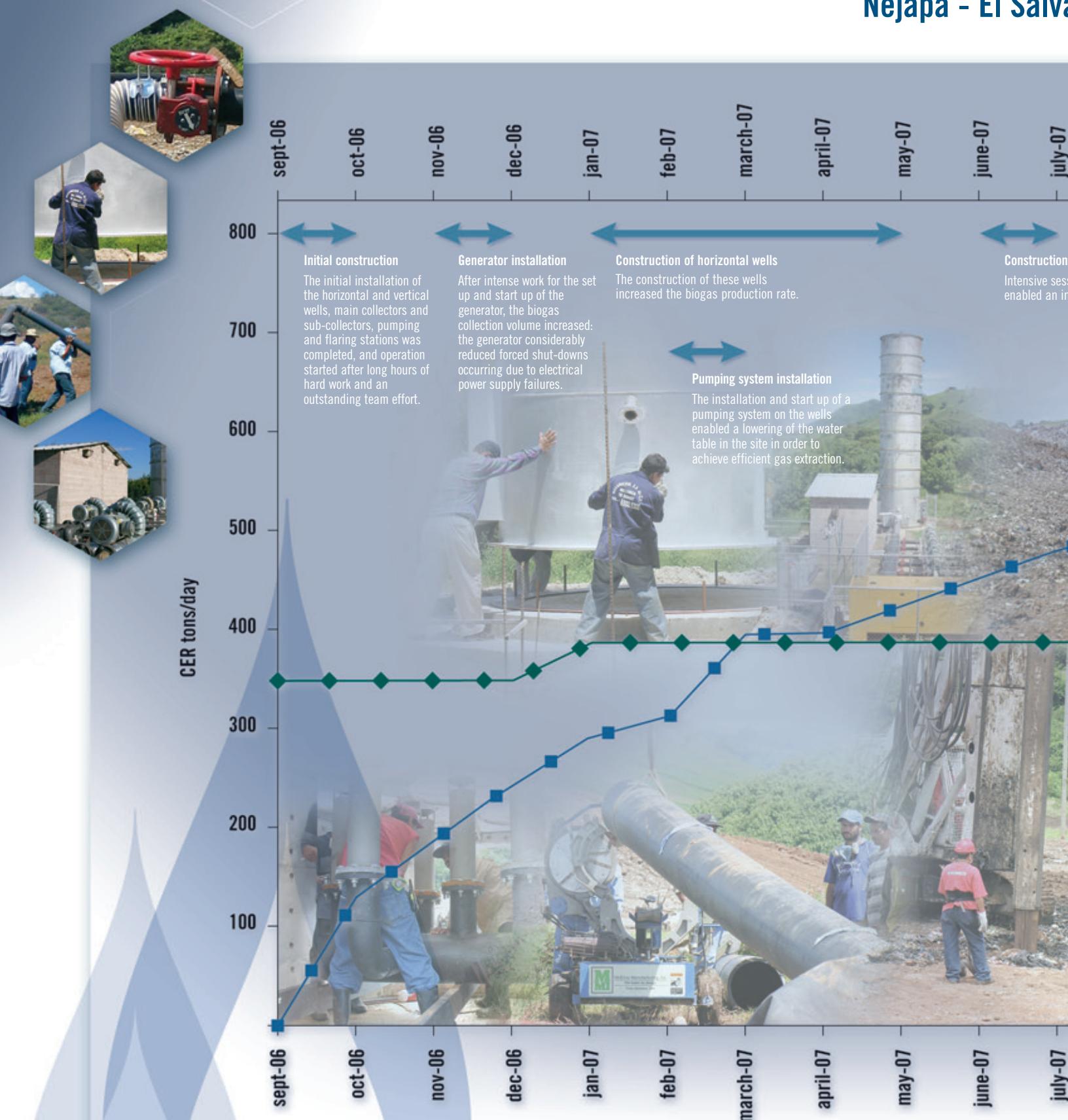
2. Construction and operation activities

The project's main activities are presented in two main areas: operation activities and construction activities.

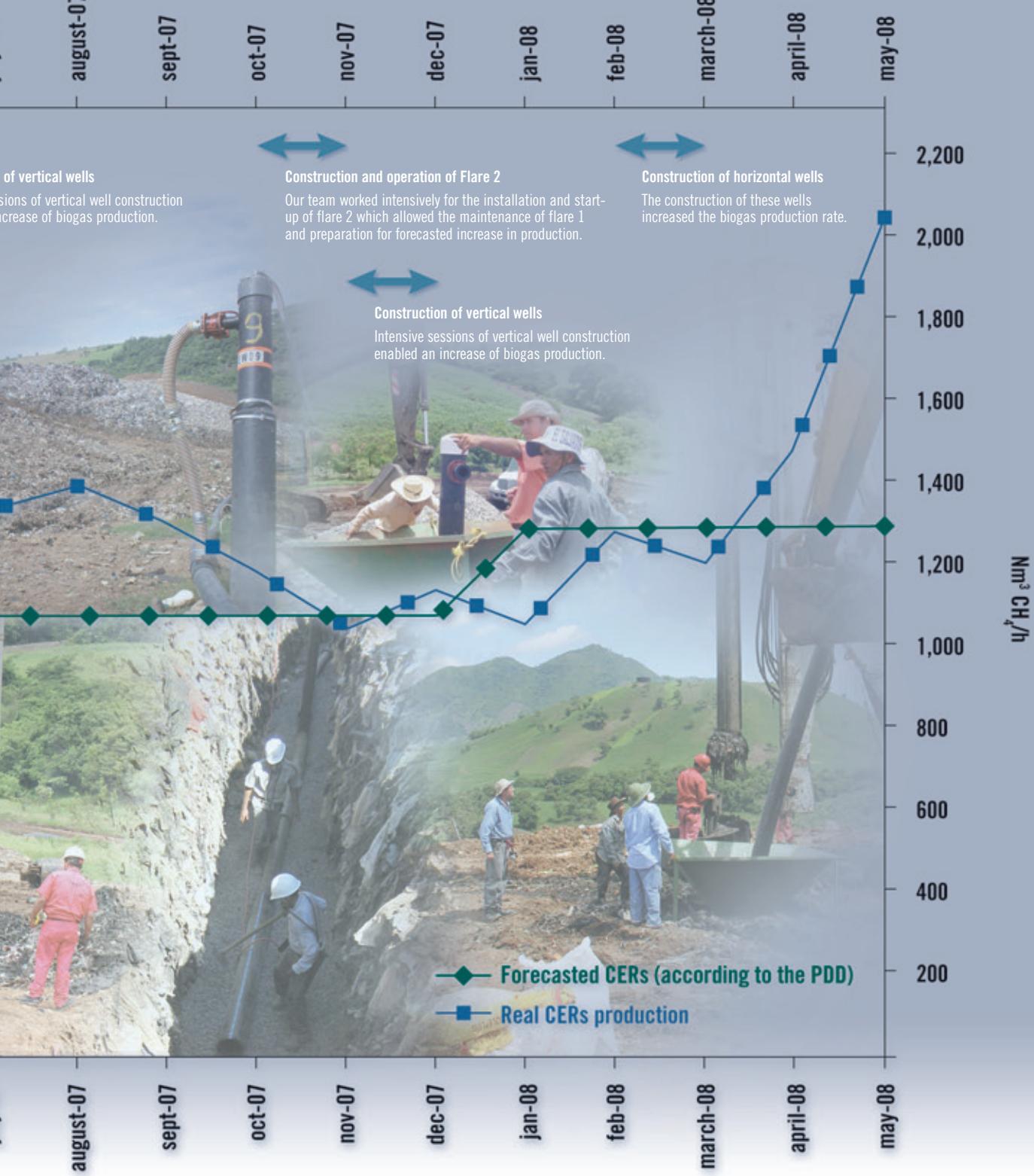
2.1. Construction

Construction activities graph (next page)

Construction activities Nejapa - El Salvador



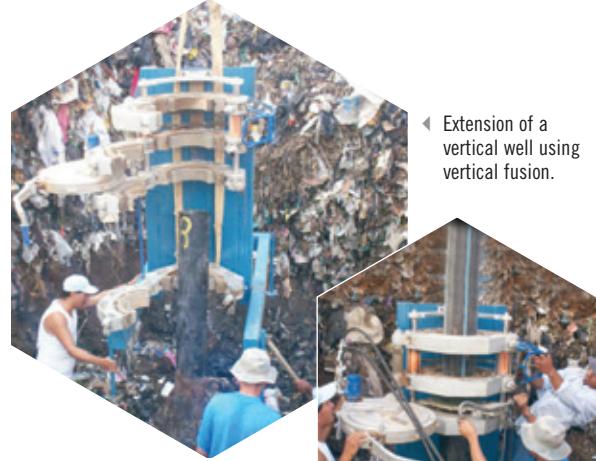
Biogas and gas production in Ecuador (2006-2008)



2.2 Operation

Well extensions

The growth of the landfill due to the increasing volume of solid waste resulted in the need for an extension of the collection system. An extension technique (vertical fusion) was therefore developed on-site by the working team. This technique was tried and improved until it became a skill mastered by several team members. Wilfredo Carbajal and Efrain Medrano in particular became experts in horizontal and vertical well fusion. This new activity presented several coordination challenges, but it successfully enabled an increase in CERs production.



Extension of a vertical well using vertical fusion.

Well calibration

The daily calibration of the collection system was an essential part of the team work in order to maintain an efficient functioning of the network. Rigoberto Torres calibrated each well on a daily basis using portable instruments, including a gas analyzer and a pressure device.



Rigoberto Torres calibrating wells

Flaring station and data acquisition

Mario Lemus collected and compiled data from the flaring station on a daily basis and produced daily reports of the amount of methane destroyed. He regularly adjusted the blowers' capacity in order to maintain an optimal vacuum in the gas recovery system, and was also responsible for general verification and maintenance of the flaring station and its surrounding facilities. Mario Lemus trained David Alegria and Mario Torres so they could be fully responsible of the flaring station area during the night shifts.



Mario Lemus at the flare station



Blowers at the flare



Control panel for flares and collecting system, operated and maintained by Mario Lemus



Compressed air, pumping and leachate evacuation systems

The high water content of the waste required an extensive leachate pumping system. Every well was equipped with pumps that were connected to a complete network of compressed air. Leachate pumped from the wells was delivered to the lagoons for proper treatment through an entirely dedicated pipe system. Pumps would frequently have to be cleaned or repaired and the air hose and pipe changed. All the team members developed valuable skills in repairing pumps.



Rigoberto and Juan ▶
repairing a pump

Gas collection system maintenance and drainage

In order to prevent the accumulation of condensate in the gas collector and sub-collector and to avoid blockage situations, Juan Canjura proceeded to the daily drainage of the collection system. He would also verify if there was a need for maintenance or repair and, after informing his supervisor Franco Mendoza, the group would proceed to work on the problem until it was resolved. These activities could include, for example, changing a valve or a pipe section.



Changing the drainage pipes – from right to left ▶
- Rigoberto Torres, Mario Torres, Efraín
Medrano, Juan Esquivel (sombrero), Wilfredo
Carbajal and Juan Canjura



◀ Gas recovery system maintenance



Verification of well production – right:
Guy Drouin, left:
Jean-Pierre Franzidis

3. Project experiences

3.1. Canadian team

Guy Drouin, Eng., MBA – President, Biothermica

The implementation of the Nejapa project was a great success for the entire project team, both Canadian and Salvadorian. It allowed the creation of solid relationships between individuals, which were essential to overcome the technical and other types of difficulties encountered throughout the project. The project allowed each individual to surpass himself because every human's dream was being accomplished, namely the improvement of living conditions and the reduction of GHG emissions.

Being the ultimate responsible of the project, I cannot but be proud of the work accomplished by the group, both in Montreal, with Sylvain and Van, as well as in El Salvador, with Aurora, Jean-Pierre, Fred, Luc, Iris, Mario, Franco, and the whole operations team (Rigo, Wil, Efrain, Juan, Eto, Juancito, David). They showed a high level of professionalism, perseverance and know-how throughout the project.

With deepest appreciations to all, Guy

Guy Drouin, Eng., MBA ▶



Frédéric Drouin, Eng. M.Sc.A – General manager, BioEnergia

The LFG collection and flaring system for the Nejapa site in El Salvador was a great challenge and without any doubt, the richest experience of my life. I arrived in El Salvador for the first time in May 2006, accompanied by David and Luc. One of the first people I met was Ernesto... I didn't forecast he would still be by my side a year and a half later... It was also during those first weeks of May that I started working with Rigoberto and Wilfredo, our first objective being to finish surface sampling, a crucial activity in order to determine the final design of the LFG collecting system.

From the start, I was very satisfied with Rigo's and Will's work, their diligence and efforts. The real test however started a few weeks later, during our first well perforation, in the middle of the rainy season! Such good memories: the nauseating smell, the drill under constant reparation, the cranes sinking in the waste... Thankfully, Mario's arrival and quick integration to the group, Saulo's eternal smile, the eagerness and constant cooperation of every member of the team made our task a lot less difficult. I remember my discussions with Jacques, we felt privileged to have started this project with such a great team... we loved the people with whom we worked, and that feeling never left me.

A few months later, around the beginning of October, operations were officially starting for our collection system. What a relief! Three intensive months of construction during which every member of the team, both technical and administrative, personified as Iris, gave an outstanding and constant effort, without which nothing would have been possible...

In January 2007, I returned to El Salvador after an absence of three (3) months and joined my co-worker Jean-Pierre. A great challenge awaited us, we had to double the production within six (6) months... I wondered how we were going to achieve this. Then followed an intense period during which we invested all of our energy to expand the collection system. New horizontal and vertical collectors were placed, thanks to Franco's recent arrival, without whom the work would have been... phew! A lot harder!

The task was successfully completed, Mario continued to manage every aspect of the flare station and each team member became an expert in his field of work. Jean-Pierre and I were supported by a highly efficient team, what a satisfaction... In July 2007, we achieved our production objectives, the team was more functional than ever before and I was able to leave the country with a the feeling of "task-accomplished", full of respect and a profound love for each member of BioEnergia, a feeling I will always keep inside me.

With all my gratitude and recognition, Frédéric

Frédéric Drouin at the
Nejapa landfill site (June 06) ▶



Aurora M. Hernández, Eng. M.Sc.A – Delegated general manager, BioEnergia

Every since I graduated, I wanted to work on project that would benefit a third world country somehow. I decided to prepare myself to do what I wanted. When BioEnergia offered me to be part of this project I was extremely excited, especially since the project was in El Salvador, my homeland, what more could I possibly ask for? I am indeed Salvadorian, born in El Salvador and naturalized Canadian.

I therefore had the great privilege of being part of this project and the working team, both Canadian and Salvadorian. Throughout this project and still today, I learned, am learning and will learn a lot from Biothermica's technical and professional resources, and I am deeply thankful for the opportunity given to me. I thank Jean-Pierre for taking the time to explain things again and again and Frédéric for always being there for me.

In the same way, BioEnergia was the practical “hands-on” school I needed to grow not only professionally, but culturally, technically and socially! It opened my horizons by meeting people of all kinds and it was a privilege to work among all of you! I thank Franco Mendoza and Mario Lemus for their support in every aspect of the project, Ernesto for his diligence and Mercedes for the special care she had for all of us with regard to our nutrition.

Even though I was only the last component of the very well structured chain of leaders that developed this project, and though my time with all of you was short compared to the others, I will always remember Nejapa as an essential part of my growth in the multiple aspects of my life. It was a challenge to take on the role of Delegated manager, to learn so much technology in so little time, to deal with so many people... when I've always considered myself an introverted person.

I also had to experience re-acculturation to my own culture, which I did not expect! I thought that being a Salvadorian, I was not going to have a cultural shock, but I did! – My identity was in play, so I learned to live in a duality which I call Salvado-Canadian. I learned unspoken things about my own culture (things I did not know and many still don't understand), I learned to drive manually, I learned to trust and enjoy people... I loved the people I worked with... and I still have that sweet and sour taste of the closure of the Nejapa project.

Thank you for allowing me to be part of your team, for giving me the chance to learn and to grow as a person, as a professional and as a human being. It is and will always be a privilege to be part of your team, a team that not only cares about the professional aspects of the projects, the environment and the lives of the people they work with, but also ACTS by doing things to make it better! The human side of Biothermica, represented by its leader's personality and vision, has astonished me and challenges me...

With immense respect and admiration, Aurora Maria

Aurora M. Hernandez in El Salvador – Lunch at Rosibel Arevalo's ▶ house (right: Aurora M. Hernández, left: Rosibel Arévalo)



Jean-Pierre Franzidis, Eng., M.Sc.A – Technical project director, BioEnergia

I think the funniest element of the Salvador experience can be illustrated by one of our employees. Juan Cajura, a little and toothless old man whose age I never knew, cannot be qualified other than a phenomenon. I never met anyone who laughed as much as he did. This man was probably the happiest man on earth. He wasn't the smartest of our employees but he surely made work more lively. This little man was called Don Juancito, a contradiction in itself because "Don" is used for a person of a certain age while "Juancito" usually designates a pre-adolescent child. His function in our team was better described by my girlfriend as the mascot.

I often got upset with him because I didn't understand why he insisted in ignoring me. I even came close to firing him on several occasions until the engineer Franco explained to me that he was almost completely deaf and that one had to be right in front of Juancito when talking to him.

It took me a year before I started to understand the local dialect, and when I did the whole team cried of laughter when I used their slang language. Juancito was also our weather report, he had lived all his life around the area so he could tell us better than anyone else if there would be rain, using the moon's position, the sun and the clouds. If you tried to take a picture of him you wouldn't recognize him: the eternal smile came off, he became serious and still, as if the picture was something extremely important, like in the old days. This small man worked so hard when we gave him something to do that we had to tell him to stop working; we of course had to yell at him so he could hear us. At the same time, he had a hard time understanding the simplest things, like opening a valve; many times he was simply not "there".

I think working with him helped me learn tolerance and patience. Every good person can have its place on a working team, but when we took Juan as part of the team, we initially didn't know which place was going to be his. Mario used to say "Juancito es cosa seria" – an expression difficult to translate, especially considering the intonation of his voice, but once we got to know him, we couldn't help but forgive his errors because the team had already grown to be a family, and this, in a way, thanks to him, whom we all loved.

There were other phenomena on the team. Mario, our operations director, is the joker, always telling jokes and making us laugh. Young José has his everlasting joke on his virginity, although he had a son at the age of eighteen (18). Juan Esquivel can eat fifteen (15) tortillas in one sitting during the lunch hour while a normal portion would be two (2). We would often find him soaking wet because he had done something wrong placing the leachate sprinkler.

There was also the time when David didn't pull the safety break and our pick-up ended up at the bottom of a pit. And Rigo, who had always built something new during his spare time. Finally, Franco, our construction director who is also a preacher of a local church, was like the father of this family, a role I had fulfilled previously, before he was hired and trained. I think I can now claim the title of "grandfather", whom everyone welcomes and greets when visiting.

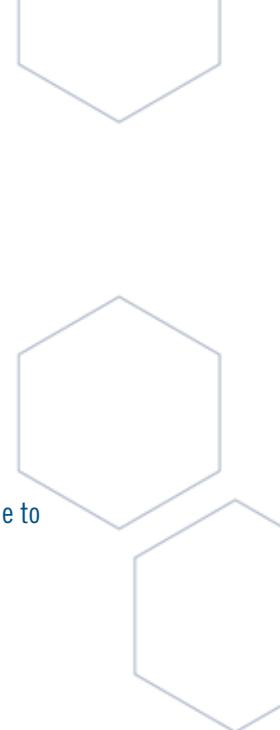
Not everything was perfect in El Salvador, there were some people who didn't understand me, but all I needed to do was to go back to the landfill site to cheer me up. To be honest, this was the family I had during the year and a half I worked there. There were also other people who helped me through the rough times, Ernesto, Jose Mario, Frédéric and Aurora. I thanked them all before I left while we enjoyed a supper I will never forget. Only two months have passed and the rest seems almost forgotten. I will be able to take pleasure out of every moment, for the rest of my life, having lived in El Salvador, knowing I did things well and kept myself just and right. Apparently it seems I am a good boss, one who is loved, I will try to live up to that!

Thanks for giving me the opportunity to experience this.

Sincerely, Jean-Pierre



Jean-Pierre Franzidis instructing our construction director engineer, ►
Franco Mendoza, about our next activity



Van Nguyen, Eng. – Electrical engineer, Biothermica

Best moment: During my first trip (July 06), Jacques asked me to arrive a little earlier but the control panel was not finished so I decided to go to the beach but I found the waves were too strong and high.

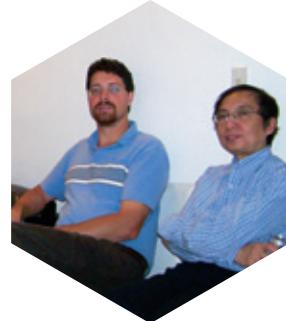
Funniest moment: One day, I asked for chicken, but I didn't pronounce the word "chicken" correctly so Ernesto took me to see the "chicas, chicas" (chicks)

Apocalyptic Moment: Staying at the flare station while the vibrations from the flare made us feel as if a scale six (6) earthquake was hitting the spot.

Greatest Impression: I am impressed to see the drinking capacity of Salvadorians, our friend Cesar drank almost ten (10) beers in a few hours without being drunk.

General perception: I am very happy to have participated and traveled to El Salvador, I am waiting for the next work order from AES to be able to return and work there again.

Van Nguyen in farewell supper at Biothermica's apartment ▶
in El Salvador (March 2008) – right: Van Nguyen, left:
Jean-Pierre Franzidis.



Paulo Koeberle, Eng. – Chemical engineer, Biothermica

One day, one of the landfill employees invited me to his house. I arrived at the meeting point, a few kilometers from his house and gave him the car to take us to his home. Without any major incident, we arrived to his house, located at the top of one of the various hills surrounding the region. The view was magnificent, wherever the trees allowed us to see.

The place was rustic but clean. I felt they had prepared everything to welcome me, including an honor guard, the faithful dog, sitting at the door. The small house was comfortably equipped with two sofas. This house would soon take an extraordinary dimension, not only because of the sofas, but because of the atmosphere, a feeling of welcoming warmth in a far and improbable place. I can imagine this humble employee was perfectly aware of this. He made me re-evaluate my own world and did so in a classy way.

The house had electricity, a fluorescent lamp and an incandescent one. I didn't ask if he had a television, but deep inside my heart, I almost wished he didn't; those who have it and always have are not aware of what can be done without it.

We went out to "discover" the place. The path had many fences which we had to either pass over or under, all in harmony and with the approval of the neighbors and their dogs, horses, chicken and cattle. We first stopped at the family's "washroom" (50 m away from the house). Four (4) natural water pools, at the base of a wall pouring drinking water, satisfy cleaning, hygiene and feeding needs. Each "pool" has its own purpose and there is even a small water reservoir where the dogs can swim and refresh themselves.

Paulo Koeberle at the Nejapa site ▶



We then went to the “cavern”, a shelter which, in times of the civil war, was used as an observation station by the rebels who were following the government army's activities. Those born during that period experienced very hard times while the government troops and the country's people seemed to be playing hide and seek in the forest.

Finally we arrived at “the tree” – everybody knew where the tree was - we took pictures at the request of my friends who probably thought it was their only chance to have one. I also had to have a picture of me taken on the “Titanic” (a big rock, and until today I still don't know if it is a local landmark or a joke of the moment – but after a few efforts to get there, the picture was taken).

When returning home, a chicken had been prepared for the occasion. A group of people gathered for dinner and we had to take turns to eat because there weren't enough forks and knives. After dinner, we left and took the car once more, the eldest man sitting in the cabin. Women and children were taken to the local church and the rest of us went to “the game”: the evening ended with a visit to the local “meeting point”: the soccer field!

Salvadorian most common hobby/sport/social event: football (soccer)



Local employee's house (2004)



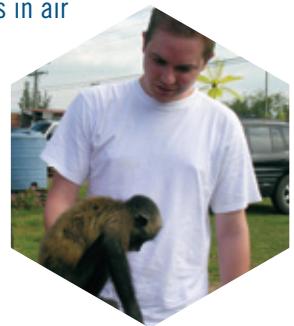
Natural water fountain found around the area (2004)

David Pineault – Gas emissions technician, Biothermica

The things that struck me in this project are:

1. During my first trip (no collection system in place yet), I was proceeding to surface sampling to find out the amount of biogas emitted to the atmosphere. I read the greatest biogas concentrations in air ever seen, greater than 10,000 ppm!
2. My learning experience was great, we learned out how to install pneumatic pumps and electric ones in such acid leachates – and to make them work with 240V in a well full of water!

David Pineault in one of his trips to El Salvador



Luc Bisson – Construction manager, Biothermica

In 2006, after several trips between Montreal and San Salvador, I had the opportunity to work five (5) months on one of the most important projects for Biothermica, a company I have been working for more than fifteen (15) years. On the professional side, I very much liked the fact that I landed in a completely different professional culture and administrative management. I had the chance to participate from the beginning in the decision making process regarding the entrepreneurs that would assist us and the people we would work with. I only keep good memories of this experience.

On the cultural side, I adapted rapidly to the warmth of the weather and its people. The Latin-American culture differs in many aspects from my own, so I took profit of my time in El Salvador to visit some parts of the country. I loved the experience of this country so rich in emotions and colors, as I discovered by visiting one of its numerous Maya ruins or one of the so many beaches that surround one side of the country or simply by sitting down and enjoying a meal in one of its restaurants.

On the personal side, I had the chance to be surrounded by good people, and this, in all of my trips to El Salvador. I had the pleasure of working with energetic people that had the same objective as me and our company, namely to make the project a success! Finally, I had the enormous privilege to meet my wife, with whom I share my life today. Therefore, I have to congratulate the work of each and every one involved in this project and thank all of those who surrounded me during my time there.

Luc Bisson eating sugar cane close to
the Nejapa site – right to left: Luc
Bisson, local worker, Ernesto Chávez



3.2. Salvadorian team

Mario Lemus, Eng. – Operations director, BioEnergia

I remember when Flare # 2 was starting to operate, it was very complicated each time we had to start both flares because the automatic sequence had two problems: the signal would go directly to the small engines which were disconnected and the valves were closed. So when the system wouldn't detect the flame – the whole starting process would stop and I had to start the process manually.

Thinking about the problem, we came up with a solution to start up both flares manually: four valves were opened from the small engines and those four engines had to be connected back to the start-up system. Once the flares were started, we closed these valves and shut down the small engines since the bigger one was able to support the system. Later on, this whole process was done automatically!

Farewell meeting – Frédéric Drouin's visit (May 2008) ▶
– Picture with Mario Lemus



Franco Mendoza, Eng. – Construction director, BioEnergia

In April 2007 we proceeded to the first vertical fusion, on the spot, with the fusion machine. We started late because we had to go to the company's headquarters (in San Salvador) in the morning. Considering it was the first time for us and that it was almost an emergency (the waste was very close and very high), we started the process.

7 p.m. hit us fast and while we were placing the casing, we realized some gravel didn't allow it to enter smoothly into the extension of the well – there was a risk of breaking the fusion. So we took it out to start all over again. It was getting late and we were all very tired, and while we were dropping the bentonite into the well, Efrain missed the spot and accidentally threw the bentonite where Juancito was standing, covering him completely with the powder. The incident allowed us to laugh and relax a little, and we were able to finish the work in a good mood, laughing at our bentonite ghost.

At the end of the activity, we felt proud of ourselves, we were able, in the midst of our tiredness, to efficiently improve vertical fusion procedures for well extensions and we learned to verify casings before placing them to make sure nothing would hinder its placing; all of this, in a humoristic mood for the whole working team.

I would like to say that we have learned a lot from you, not only professionally, but personally, you have been to us more than just co-workers, I truly appreciate each and every one of you.

It has been an honor working with you!



Efraín Medrano and Juan ▶
Canjura bathed in bentonite
(at night)



Farewell meeting – Frédéric Drouin's visit (May 2008) ▶
– Picture with Franco Mendoza

Iris Flores, Lawyer/MBA – Administrative manager, BioEnergia

Hello everybody,

I couldn't write all my memories here because it would be too much considering everything I have experienced in this project. What I will say with certainty is that this experience has been professionally, personally and socially a great experience.

I am left with a great satisfaction to have shared interesting things with so many people with different personalities, it has opened my evaluation criteria and perception of people. I feel very happy to have shared my time and work with you, I learned many things and send my greetings to all of you.

I thank you all very much, especially Guy, for his courage in investing in this beautiful country, I know this has been a learning experience for many, hard in many ways, but it has also given great satisfaction. I wish to thank Frédéric, Maxime, Luc, Jean-Pierre and Aurora, for the special treatment you had towards me and the employees, for making us feel that our work was valued and our human integrity appreciated.

Thank you Frédéric because aside from being co-workers you allowed me to share a friendship with you. BioEnergia will stay in my memories and in those of all who worked in it. The collaboration and eagerness we all put into this project in our respective fields of expertise will always bring nostalgia to my memory of our work.

BioEnergia was a branch of the big Biothermica tree, and it demonstrated that we can achieve everything we believe in, even in the midst of the obstacles.

I cannot think of the right qualifications that would fully describe the Canadian team, considering the head of the firm, Guy Drouin, almost died in his accident while he was here, and two other members of the team-Luc and Jacques - were also in danger while being here, due to the project and to the country's conditions. Nevertheless, there have been many satisfactions and the personal experience has been highly valuable.

My respect and love to all, Iris Flores Orantes.

Farewell meeting – Frédéric Drouin's visit (May 2008) – Picture with Iris Flores Orantes



Rosibel Arévalo, Bach. Accounting – General accountant, BioEnergia

My experience? I have many experiences, but the best one for me was preparing Christmas baskets for the employees. I loved to participate in the purchase of things, selection, arrangement, and the best was giving them; our operators were so happy and my family was thrilled because we had a little bit of everything.

The most intense moment in my work was when I started working here. The company's accounting was a little behind, so I literally lived in Maquilishuat (we slept there)! I miss that house! Almost a month with the same rhythm of work, going home only on Saturday night, returning Sunday to start again... It was hard, I was tired, we went to bed at 1 or 2 am, it was a lot of work but I loved it because I was doing what I love to do... This period ended when the Drouin family congratulated us for our work.

We are in debt to BioEnergia – We truly love all of you!

Farewell meeting – right: Mercedes Hernández, middle: Iris Flores, left: Rosibel Arevalo ▶



Ernesto Chávez – Transportation, security and sales, BioEnergia

My best experience was to have met you and have the opportunity to work for you. I have so many memories that I don't know which one to write down. What I do know is that all of you have been great and I don't think I will ever find another company like BioEnergia.

Greetings to the Drouin's family and to all the others who are part of the Biothermica family.

Farewell meeting – Frédéric Drouin's visit (May 2008) – ▶
Picture with Ernesto Chávez.



Rigoberto Torres – LFG recovery system calibration supervisor, BioEnergia

I remember one afternoon, we were excavating for well H6C3, but the loader had some mechanical problems, I had to drive the Rhino with Eto to bring a mechanic, but the trip was in vain because when I arrived with the mechanic, Saulo had made the loader work, so I took him back to the shop. While returning to the excavating point, it was already dark and raining, it was difficult to see and we were forced to stop the vehicle because we weren't on the road anymore, we had turned to one of the landfill's slopes.

Jean-Pierre called us for help – we had to cover the excavation with plastic. The whole group worked hard to cover it quickly, we were all soaked, filthy, but we did it! Then, we realized Juancito was nowhere to be found; we thought he had left somewhere. So once we had finished the task, we decided to return to the vehicles, and to Jean-Pierre's surprise when he opened up the pick-up's door, Juancito was there! Sitting calmly on the cabin, impeccable! Jean-Pierre became red of frustration and said: "Oh! Juan!!! He's of no help whatsoever today!"

Farewell meeting – Frédéric Drouin's visit (May 2008) – Picture with Rigoberto Torres. ▶



Wilfredo Carbajal – Pipe fusion and pumping system supervisor, BioEnergia

On a funny side, I remember the day I met Luc Bisson, he asked me my name and I answered: Wilfredo. Then he asked: Do you speak English? I said no! – French? I said yes! – How? He said surprised. You? French? Yes! I replied but French bread! – He understood immediately what I was saying and laughed at my attempt to make a joke. He said in Spanish: That was a good one Wil! (Note: In El Salvador when you offer someone bread the literal translation is French? As to offer French bread).

I'd like to express my thankfulness for allowing me to work with and for you; if ever we meet again, I would love to greet you, I hope you don't forget us, please return in December so we can share some beers together.
If you need me to go to Canada or wherever to proceed with the fusion of any tubes, I'm at your orders!

Greetings to all, through the distance, we will always remember you.

Farewell meeting – Frédéric Drouin's visit (May 2008) – Picture with Wilfredo Carbajal.



Efraín Medrano – Construction technician, BioEnergia

What I loved best from this project was the fact that we all learned together and I am now proud to have learned so much. Now, when I finish a task, I remember the opportunity I was once given to learn, and I appreciate it even more.

Today, I want to learn more and more – Thanks for giving me this chance!

Farewell meeting – Frédéric Drouin's visit (May 2008) – Picture with Efrain Medrano.



Mario Torres – Multiple task worker, BioEnergia

I started working for BioEnergia the 19th of February 2007, I was hired as a temporary worker (temp) to work only for fifteen (15) days. I went home for a week afterwards and I was very sad because I thought my opportunity was over, but then, I was called again and I worked for seven months as a temp: to my surprise, during the month of November, my brother gave me the good news that the company was requesting my documents to give me a permanent position. Ever since I have worked for BioEnergia and to me, it has been a great experience because I never had bosses as special as Frédéric, Jean-Pierre and Mario Lemus. Thank you for supporting me

May God bless you and look after you wherever you are.

Farewell meeting – Frédéric Drouin's visit ▶
(May 2008) – Picture with Mario Torres,



David Alegria – Multiple task worker, BioEnergia

I remember the day when we were trying to pull the fusion machine from cell 5 to cell 4 with the Rhino, when the chain broke, Will yelled: Move! – I threw myself to the ground just in time, Will came to help me and Jean-Pierre wanted to take me to the hospital but apart from some scratches on my arm, I was ok!

Farewell meeting – Frédéric Drouin's visit ▶
(May 2008) – Picture with David Alegria.



Juan Esquivel – Multiple task worker, BioEnergia

What I remember with pleasure was when we were building the 6" collector system. I was signaling the spot where the tubes were to be placed, with Jean-Pierre behind me, and I suddenly fell into an excavation made for the 18" tubes. Jean-Pierre also fell right after me and said: Oh my god! Look where I fell into! This excavation would also serve as cushion for Frédéric, Jacques and Mario Lemus.

Farewell meeting – Frédéric Drouin's visit ▶
(May 2008) – Picture with Juan Esquivel



Juan Canjura – Multiple task worker, BioEnergia

I only want to give thanks to all of you for allowing me to be part of the group and because you have been good with all of us. Thanks for all the gifts you gave us and for all the times you took us for dinner. We will never have other bosses like you.

Farewell meeting – Frédéric Drouin's visit ▶
(May 2008) – Picture with Juan Canjura.



Mercedes Hernández – Domestic services, BioEnergia

The greatest time for me was when Frédéric returned to visit us, when he came to say good bye, I loved sharing with him, being with him because he is such a humble person – this has impacted me far more than anything else! The time we spent with him when he took us for lunch at the *gabaly*, I will never forget it!

Farewell meeting – Frédéric Drouin's visit ▶
(May 2008) – Picture with Mercedes Hernández.



Conclusion

The Nejapa project fulfilled the company's vision, which was to contribute to the reduction of global GHG emissions, improve El Salvador's environmental conditions and enhance its technological and socio-economical development.

From an environmental perspective, the project reduced GHG emissions, eliminated odors and improved air quality. It contributed to the country's development by transforming the Nejapa site into a sustainable model for the region and other countries of Central America.

From an economic perspective, BioEnergia generated a direct investment of US \$3 million in the country and the possibility for El Salvador, once the electrical plant in place, to renew its source of energy and become energetically independent, therefore reducing El Salvador's dependency on fossil fuel importations.

Technically, the project was the initiation of a structured technological system for the utilization of renewable energy in El Salvador. A substantial technological transfer took place between Canada and El Salvador, as Biothermica agreed to entirely transfer its know-how to BioEnergia. An agreement was also established with the Central America University (UCA), according to which BioEnergia committed itself to the on-going training of students in the field of LFG.

The social component of the Nejapa project was also enhanced by the direct creation of fourteen (14) jobs as well as BioEnergia's team building structure, which promotes responsibility, autonomy and the development of personal and technical skills.

The Nejapa project has therefore been a substantial success. Thanks to an incredible team work and ingenuity, obstacles were overcome in order to reach and exceed LFG production objectives, as production in April 2008 was 10% above initial forecasts. However, our greatest success was to achieve these results through the improvement of the quality of life of our employees and to have contributed to their happiness.



Our energy for a cleaner environment



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