

Pursuing HSE Excellence





Zhang Xing
Vice President of CNPC America Ltd.
President of Andes Petroleum Ecuador Ltd.

The oil zone of AndesPetro is located in the heartland of the Amazon rain forest, a highly sensitive spot on the world's eco-protection map, with a large portion of the oilfield situated in the Ecuadorian national forest reserve. The unique geographic position and diverse biological environment has made the project a center of attention among environmentalists around the world.

From the perspectives of managers, responsible persons and contractors, AndesPetro has planned and formulated a systematic HSE management mechanism whereby HSE duties are specifically designated and interlinked, with the notion of HSE firmly implanted in employees' minds. First, company managers strengthen their leadership by regularly attending HSE training programs, performing emergency drills and sharing HSE experiences. Second, the responsible person implements a line responsibility system for safety and environmental protection by signing an accountability letter with the relevant person in charge to clarify the HSE duties for each specific post. And third, contractors shall be encouraged to share their experiences related to HSE in localized operations.

Apart from HSE publicity and education, we effectively promote HSE management by monitoring its execution to prevent hidden risks. The company conducts strict inspections of and encourages reporting of hidden hazards and performs close-loop management. We developed an online hazardous behavior/status reporting system, and track the correction status every two weeks and offer incentives to those who report hidden dangers, including a monthly "best report" award. The company has thereby established a professional supervision team that is knowledgeable about safety and management and capable of handling emergencies. We also designate local managerial personnel in charge of security, medical service, environmental protection and operational safety at the work site, with dedicated HSE personnel now accounting for more than 8% of the workforce.

In addition, we strictly abide by international standards to ensure the intrinsic safety of equipment, and focus our EHS management

on strengthening employee's safety awareness and building system management targeted at safe behavior. We persist in system maintenance and compliance audits. In 2004, the company successfully acquired environmental management system certification for its oil depot, and acquired ISO 14001 certification in 2010. Using a risk matrix approach to rank EHS risks, we prioritize EHS interested parties in view of the analysis, in order to determine the focus of our EHS efforts. To ensure the safety of each and every employee, the company performs post risk identification and occupational health hazard identification as well as risk assessment, to inform employees in an open and transparent manner of their job risks. We have also established a training center to develop safety training programs, with the annual average training time for each on-site employee (including contractors) totaling 34.5 hours. We also use a GIS geographic information system to effectively monitor the environmental impact of our exploration and development activities, and provide support to decision-making in location selection, positioning of pipeline leaks, wetland analysis, analysis and monitoring of nature reserves, and analysis of the traffic network.

Thanks to stringent and concrete safety and environmental protection work at the Andes project, there have been no deaths caused by oil production accidents or any environmental pollution accidents. Compared with the recordable incident rate per million work hours conducted by the U.S. Occupational Safety and Health Administration (OSHA) in the oil and gas sector, the Andes project did an excellent job in its OSH performance. The company has won a number of awards from the local government, the National Assembly of Republic of Ecuador and relevant institutions, such as the acknowledgment of its Corporate Excellence by the Ecuadorian Journalists Confederation. The company has also won awards for environmental protection and management innovation from BIZZ and World Oil & Gas, as well as an award for Excellent Work in Technology Transfer and Development of the Oil Industry in Ecuador from the Ecuadorian Ministry of Non-renewable Natural Resources and SPE Ecuador Section.

CNPC's nine principles for HSE management in global oil and gas operations are: HSE should be given priority when making any decision; Safety is a prerequisite to employment; Employees must be fully conversant with HSE compliance; Managers should take responsibility for HSE in their business scope; Managers must be engaged in HSE reviews; Employees must be engaged in post-hazard identification and risk control; Potential risks must be dealt with promptly; Accidents must be reported, analyzed and dealt with promptly; Unified HSE standards should be applied in contractor management.

Adhering to the concept of "putting the environment, safety, quality and people first", we protect the long-term interests of both the host countries and the company, by strictly complying with local environmental laws and regulations, attaching great importance to operational safety and environmental protection, and consciously being subject to the supervision and guidance of the local authorities. The focus of HSE management is procedural management and nurturing awareness targeted at promoting employees' safety awareness and behavior. Accordingly, by establishing a comprehensive HSE management system, the company and its partners strive to achieve the goal of "zero injuries, zero pollution and zero accidents". The company incorporates the essence of HSE as a key part of its culture, to foster the concept, system and behavior of a safety culture. Furthermore, we take incentive measures to encourage reporting of

hidden dangers in a comprehensive and truthful manner, organize HSE audits of all project companies on a regular basis, and conduct inspections of key production posts aimed at spotting potential problems at sites.

The Amazon region of Latin America is home to the world's largest tropical rain forest, where many primitive tribes dwell. The unique geographic position and diverse biological environment has made the area a center of attention of international environmental protection organizations. Our Andes project in Ecuador and Block 1AB/8 project in Peru are both situated in the heartland of the Amazon rain forests, while the Intercampo Oilfield project in Venezuela is located on Maracaibo Lake, which are all environmentally sensitive areas. To meet the strict environmental requirements for oilfield operations, we developed an HSE management system and methods tailored for projects in Latin America. By establishing an HSE management committee and a mechanism to designate an HSE responsible person and event coordinator for each project, we ensured timely and accurate reporting of HSE information and made sure all major crisis events are dealt with in a prompt and reasonable manner. Over the past 20 years, we have strictly complied with relevant international standards and criterion in our production and operations, with no major HSE accident occurring. The MPE3 project in Venezuela set a record of 20 million man-hours with no significant personal safety accident or environmental pollution accident. Well drilling and workover crews of CNPC's Greatwall Drilling Company and Bohai Drilling Engineering Company Ltd. have won



multiple awards and accolades from the Venezuelan Ministry of Environment and Natural Resources and PDVSA, including the title of “Green Drilling Crew” and production safety medals.

In 1998 when CNPC took over Venezuela’s Intercampo Oilfield on Maracaibo Lake, we were faced with considerable safety and environmental risks due to the thick mud on the lakebed with densely distributed cables and pipelines, as well as a multiplicity of production equipment on the lake surface. A detail-focused prevention method was adopted to identify major risks in each procedure, link and post, and effective risk preventive measures were implemented. For well drilling and workover operations on the lake, we divided the operational procedures into five key links: well site design, platform construction, drilling and workover vessel relocation, drilling and workover operation, and oil production. Meanwhile, potential risks in each link were analyzed and assessed. The company has thereby compiled with and enforced relevant operational procedures and regulations, effectively preventing the occurrence of accidents. For instance, to avoid blowouts, the company specified and strictly enforced the operating procedures for every step including equipment relocation, well drilling and well logging. Such HSE management and control measures have effectively prevented operational accidents, as

well as industrial waste pollution, thus helping keep the water of the Maracaibo Lake crystal-clear.

At Block 1AB/8 in Peru, oilfield produced wastewater was discharged into the Amazon water system only after preliminary treatment in the early development stage. After joining the project in 2003, CNPC made a proposal to introduce a three-tier wastewater treatment system to upgrade the original one, in order to improve treatment and reduce the oilfield’s environmental impact. Together with our partners, we launched a package of projects including wastewater treatment, water injection and power/fuel supply. Three residual oil power plants, three diesel topping plants and 12 water treatment facilities have been built, enabling the combination of secondary oil recovery and wastewater recycling. As such, all the produced water was re-injected into the underground formations after being properly treated. This has completely changed the mode of production prevailing in the local area for over 30 years and achieved clean production. In addition, Block 1AB/8 project also conducts dynamic monitoring of the domestic water, surface water, air quality, natural gas emission, soil quality and noise, to ensure that prompt countermeasures can be taken to protect the natural environment of the rain forest once abnormalities are spotted.



Surrounding environment of Block 1AB/8 in Peru before (left) and after restoration (right)



After CNPC took over the project, a major change was the heightened awareness of safety and environmental protection and improved compliance with a safety culture. Another obvious change has been stricter adherence to the laws of Ecuador in environmental protection, and occupational health and safety. For instance, the company launched a self-financed campaign to strengthen the treatment of solid and liquid waste. Now we can claim with confidence that AndesPetro is the best oil company in Ecuador, particularly in terms of environmental protection, safety and occupational health. In addition, we also boast top operating quality and strong technical competence.

Alfonso Carrera

Safety director, T Zone of Andes Petroleum Ecuador Ltd.



Located in the hinterland of the Amazon rain forest, over half of our oil zones in Ecuador overlap with national reserves. The Andes project gives priority to environmental management in business development and actively implements comprehensive wastewater treatment to recycle all the produced water. Highlighting the role of the EHS department, AndesPetro has formulated and enforced strict safety and environmental protection rules and procedures in accordance with the highest standards of the industry. When taking over the project, it developed a three-year plan aimed at addressing rain forest pollution. The president of AndesPetro assumes direct responsibility for safety and environmental protection work by regular attending HSE training, emergency drills and experience sharing sessions. In terms of risk management, the project company adopts a “work licensing system” as one of its most important management tools, and established an on-line work licensing system which clearly defines the authority and duties of the responsible person at each link. It has also developed an on-line hazardous behavior/status reporting system to track hidden dangers and make prompt corrections. In terms of team building, the company has established a professional supervisory team to equip the work site with dedicated managerial personnel, accounting for over 8% of the total workforce, which is in charge of security, medical services, environmental protection and operational safety. Moreover, the company has established a training center and requires all employees, contractors and visitors to receive EHS training before entering the work site, with the training time for on-site employees and contractors averaging 34.5 hours annually. In oil production, helicopters are used to transport drilling rigs and other equipment in order to avoid the destruction of vegetation; drilling cuttings and mud undergo bio-safety

treatment before burial; all formation water produced in the oil zone is re-injected underground, while the associated gas is used to generate electricity. After the completion of an operation, efforts are made to restore the ground surface as soon as possible. Meanwhile, a GIS geographic information system is used to monitor the impact of exploration and development activities on the environment, and offer support to decision-making in such aspects as location selection, pinpointing of pipe leaks, wetland analysis, analysis and monitoring of nature reserves, and analysis of the traffic network.

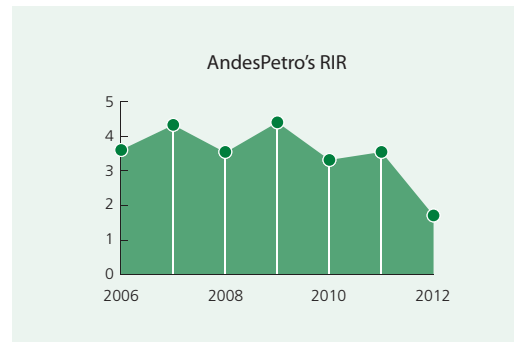
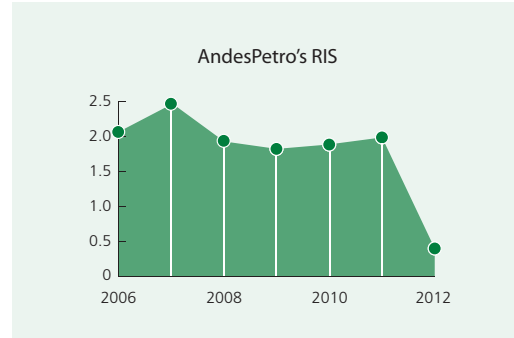
Aiming to maximize the recycling of resources, AndesPetro has invested in establishing a comprehensive treatment center. Organic waste from the oilfield is buried in sawdust, in order to convert it into organic fertilizer for vegetation restoration. Inorganic waste is sorted and processed. For example, plastic waste is crushed and sent to the waste recycling center approved by the Ecuadorian government for further processing and treatment. The remaining wood from packaging is donated to the local



“Best HSE/Sustainable Development Award” granted by World Oil Magazine to Andes Petroleum Ecuador Ltd.

community as fuel. In addition, oil and water are fractionally precipitated, with the resultant precipitate further treated for biosafety through the use of chemicals (a phased treatment process that usually lasts for six months), and then disposed of as harmless soil when all relevant chemical indicators reach the standard level. In addition, the company has also built seedling nurseries in the surrounding communities in order to provide seedlings for vegetation restoration.

Through comprehensive management and the implementation of multiple measures, AndesPetro achieved impressive RIS and RIR records at the industrially advanced level in the region, winning the title of "Best HSE/Sustainable Development Award" from the World Oil Magazine, and was nominated for the "Environmental World Award" by the Institute of Energy in the United Kingdom. Besides, the Ecuadorian Ministry of Environment and Natural Resources also spoke highly of the company's commitment to environmental protection and its advanced technology of bio-oxidation treatment of contaminated soil. It has won numerous environmental protection and management innovation awards from prominent organizations such as BIZZ and World Oil & Gas, as well as the award for Excellent Work in Technology Transfer and Development Oil Industry in Ecuador from the Ecuadorian Ministry of Non-renewable Natural Resources and SPE Ecuador Section.



Promote Clean Production to Achieve Green Development

Block 6 of Talara Oilfield is located at Lobitos Beach, an ideal surfing spot on the northern coast of Peru, which was designated in 2009 as an official site for international surfing competitions. Therefore, the local government has put a high premium on the surrounding natural environment. To meet the stringent local environmental protection requirements, CNPC's Block 6/7 project company strengthened its environmental protection measures for each and every step of its oil production process.

For instance, the project has invested in transforming its gas gathering and transportation system, with the aim of gathering associated gas produced during the oil pumping operations. It has also adopted the method of laying impermeable membranes at the bottom of mud pools to prevent slurry oil waste from seeping into the soil, with the gathered waste oil removed and processed collectively after well completion. Due to the fact that

Block 6/7 had been exploited for over 140 years, more than half of the producing wells rely on swabbing to produce oil. In oil pumping operations, the company has strictly required its contractors to take effective measures to prevent oil from spilling, overflowing, dripping or leaking so as to achieve clean production. Another fact is that waste oil buried underground in its early development stage had started to emerge out of the ground, exerting a negative impact on the ground environment. In order to clean up the oil contamination, the company hired local contractors to clear the oily sludge off the well sites and transport it to designated spots for further treatment, thereby solving the leftover problem and meeting the environmental protection requirements imposed by the local government. The company also organizes employees to go to the beach to clean up litter on a regular basis, in an effort to nurture a pollution-free environment for surfing fans.