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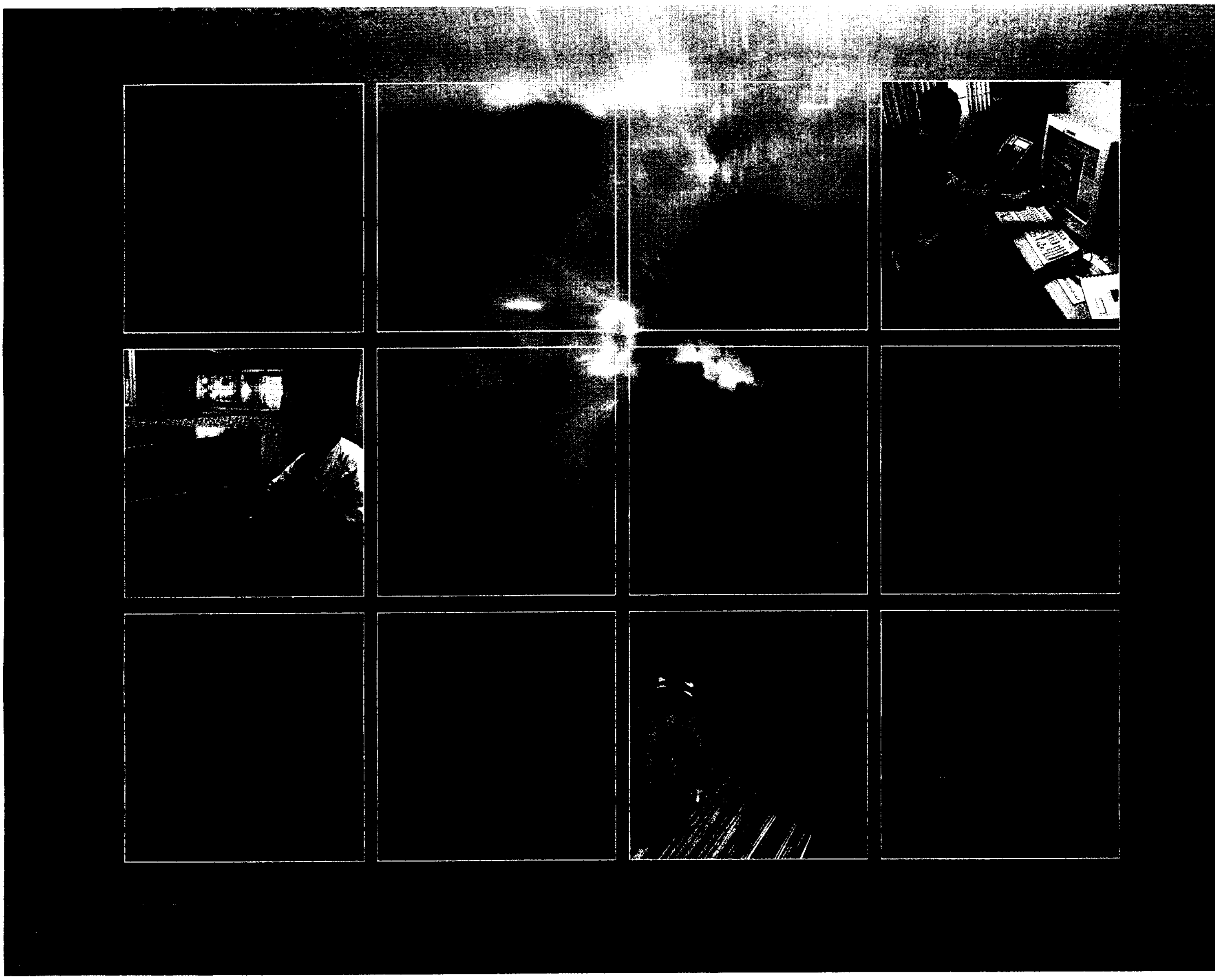
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

Developing Countries and Technology Cooperation

Ten Business Cases



United Nations Industrial Development Organization

World Business Council for Sustainable Development

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Vienna, 2002

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Executive Summary

Technology transfer and cooperation linked with local capacity building make a clear difference in fostering sustainable development in developing countries.

This report provides an analysis of technology cooperation from the perspective of ten member companies of the WBCSD. In each case, we have analyzed the company's contribution to developing industrial capabilities to identify results, benefits, challenges and success factors. From the analysis we provide several key recommendations to business and policy makers.

For policy makers, the study highlights the need to reduce the impediments to Foreign Direct Investment (FDI) and successful technology cooperation, in particular the need to create greater synergies between Official Development Assistance (ODA) and FDI. For the business audience this study highlights specific considerations in undertaking technology cooperation with a developing country partner. For all readers, the study provides ten new examples of technology cooperation and insights into the way business is contributing to the creation of more sustainable livelihoods.

The report is divided into two volumes. The first volume provides an introduction to technology and development, a summary of each of the ten cases, and key findings in the form of project challenges and key success factors. Volume two provides the full documentation of each of the ten cases researched.

The ten cases were selected from the WBCSD Case Study Collection to be researched and analyzed under a framework jointly designed by UNIDO and WBCSD. This report is based on the input of a large number of individuals – from the WBCSD companies, local companies and organizations, national and local governments, intergovernmental organizations and other key people involved in all the projects.

However, it must be recognized that this study was compiled through the lens of the participating companies as technology cooperation *business cases*. The cases highlight the different roles business has to play in addition to that of governments, as well as the contributions businesses can make to strengthening a developing country's capacity for sustainable development. The cases look at technology cooperation from the stage the project is launched. They do not look at pre-project technology options evaluations.

Key Findings and Recommendations

The creation of viable enterprises in developing countries is vital for eliminating poverty and ensuring sustainable development. However, neither business nor governments can do this alone. Recipient governments, the private sector and civil society each contribute to achieving success.

Cooperation is essential – for technologies new to the host, and in order to meet development objectives, the host country government and the investor must communicate continuously and intensely at the appropriate level. Also the cooperation must bring mutually beneficial outcomes to ensure the necessary long-term commitments from all parties.

On the policy and government side

Greater synergies between ODA and FDI must be created. Many of the challenges highlighted in this study translate into potential risks for the companies providing the technology. As long as these risks are present or perceived, it is less likely that firms will invest and engage in technology cooperation. Governments should use a portion of ODA to reduce these risks by building local technical and social capacity, including better governance, accountability and administration. Used in this way, ODA can improve the local business infrastructure and foster technology cooperation, investment and enterprise creation.

Government spending within developing countries should be directed at reducing private investment risks. This includes supporting capacity building, from basic education to specialist research and development capabilities, as well as supporting necessary infrastructure developments. In addition subsidies and taxes could be redirected to support technology development and sustainable enterprises.

On the business side

Acceptance and understanding must be generated at the local 'user' level. A future benefit and improved livelihood must be anticipated from the proposed technology. A fundamental first action is the provision of basic explanations, conveying the message of 'why' a technology should be adopted. Efforts devoted to explaining the technology and its potential benefits will enhance the initial acceptance of the technology as well as the presence of the implementing organization(s). It can also enhance the effectiveness of subsequent capacity building efforts.

Capacity building should be broadly inclusive and adaptable. Technology cooperation is rarely successful and sustainable without some form of capacity building. This study further highlights, however, that capacity-building efforts are made more effective when they are extended, adapted and localized. This involves the extension of education and training to include women and children; the adaptation of methods and delivery of education and training to local conditions and to the knowledge and skill levels of the trainees; and the development and delivery of training by local trainers.

Pre and post project assessments enhance the likelihood of success and the ability to replicate technology cooperation in other countries. Businesses must conduct a detailed assessment of the people to be involved, including their needs and capabilities. Existing infrastructure must also be evaluated. This requires, in some instances, a detailed analysis of the needs and capacities of separate regions, communities and even individuals.

Dialogue and partnerships with stakeholders must be maintained for technology to be accepted, diffused and adopted. This allows the firm to better understand all those impacted by the technology and to better facilitate the necessary cooperation.

Effective communication and interaction is essential at all stages. Sensitivity to languages and dialects, as well as cultural differences, must be demonstrated early for the cooperation to be successful.

Businesses must seek to capture learning opportunities from each technology cooperation effort. While each new project will pose location specific considerations, knowledge and experience from previous projects, if captured and shared within the organization, increase the chance for success of the future projects.

In conclusion

The analysis of the ten cases did not reveal surprises or success factors that had escaped the notice of other experts in technology transfer and cooperation. All the factors listed above and detailed in this report have been covered extensively elsewhere.

This confirms the reality of a generic, robust technology cooperation model process that can be replicated and disseminated through capacity building programs that only need to be adapted to local economies and cultures.

It is not necessary to reinvent a good process project by project. An efficient program that deals with needs assessment, capacity building and cooperation guidelines will enable technology recipients and providers to work together and reduce the risks, misunderstandings, wasted efforts and disappointments. Such a program, with the support of ODA, will accelerate foreign direct investment into and development within the developing economies.

Alcoa: Alumar operations - Brazil

Summary

Alcoa operates a large company called Alcoa Aluminio in Brazil. The Alumar plant in Sao Luis, in Northern Brazil, is the largest Alumina refinery in South America and the second largest smelter on that continent. This case details the technologies that make this one of Alcoa's most modern smelter and one of the most modern refineries, and the intensive and extensive training programs that have enabled local people to form a dedicated, high performance workforce. The company's values, training and financial support were made available to Alumar, along with technical assistance to the employees in Brazil.

A labor force of about 13,000 people was employed at the peak of construction. More than 80% of the construction workers came from Maranhão, the region where the plant is situated. Since the commencement of operations, Alumar has become an important regional economic center, offering more than 1,950 direct jobs and another 1,500 indirect jobs. Currently more than 98% of the employees come from the local region, even in the managing seats. To support the "heavy industry" a medium-heavy industry has developed in the region, mainly focused on fabrication workshops and industrial gas production. Other significant industries on the island are two breweries, a cooking oil factory, and several clay brick and tile plants. Due to the large amount of goods transaction within São Luís, dozens of local industries have developed since the Alumar installation.

Introduction

Company profile

U.S. based company Alcoa is active in all major aspects of the industry-technology, mining, refining, smelting, fabricating, and recycling. The company employs 129,000 people in 38 countries and generated US$22.9 billion in revenues in 2001.

Alcoa's aluminum products and components are used worldwide in aircraft, automobiles, beverage cans, buildings, chemicals, sports and recreation, and a wide variety of industrial and consumer applications, including Alcoa's own consumer brands such as Alcoa® wheels, Reynolds Wrap® aluminum foil and Baco® household wraps.

Alcoa's Brazilian operation, Alcoa Aluminio do Brazil S.A., consists of about 20 large manufacturing plants, as well as sales administrative and distribution operations. Alcoa in Latin America is the largest privately owned integrated aluminum producer and the second largest subsidiary of aluminum and alumina producer Alcoa.

Alcoa is responsible for approximately 1% of Brazil's overall exports, and is ranked amongst the top fifty single largest exporters in the country. The company has manufacturing presence in five South America countries and fifteen manufactures facilities throughout the region. Alcoa is the major supplier of packing materials to South America's carbonated soft drink industry

Country Profile: Brazil

Brazil, with a population of over 174 million, is by far the largest and most populous country in South America. Brazil became Latin America's leading economic power by the 1970s due to vast natural resources and a large labor pool. However, unequal income distribution remains a pressing problem. GDP in 2000 was $1.13 trillion and GDP per capita was $6,500.

The countries main natural resources are bauxite, gold, iron ore, manganese, nickel, phosphates, platinum, tin, uranium, petroleum, hydropower, and timber. With large and well-developed agricultural, mining, manufacturing, and service sectors and an economy that outweighs that of all other South American countries, Brazil is expanding its presence in world markets.

The Island of São Luis has a total area of 885 Km² and a population of about 900,000 people. The island is also the state capital city and has the seat of government for the state. The island is separated from the continent by water over a distance of around 200 m. The Plant is located on a distance of approximately 17 Km from the perimeter of the main center of population on the island and about 35 Km by road from the city center.

Project Drivers and Objectives

Drivers
Northeast/North region, specifically São Luís was chosen to receive the Alumar project as part of a Federal Governmental Program, called Grande Carajás, set at end the of 1970's and beginning of 1980's, to stimulate industries implantation in this region. The Tucuruí Dam, that supplies the hydropower for Alumar, and the Carajás Mine Site the giant iron ore owned by CVRD were other examples both installed in the Pará a nearby State.

Latin America, especially Brazil, plays an important role in the global aluminum industry. From a supply perspective, Brazil possesses the third largest bauxite reserves in the world and is the fourth largest producer of primary aluminum in the Western World, when including output from the "Eastern Block" countries, Brazil is the fifth major producer. It was therefore an attractive option for construction of a refinery and smelter.

Aluminum consumption in Latin America is evolving; demand was high at the time of the Alumar installation and remains so today. In addition to the bauxite reserves, a hydropower station was installed as part of the Grande Carajás program. A reliable and cost-competitive supply of energy is of critical importance to any aluminum production process.

Objectives
The initial objectives were aluminum importation substitution and exportation of the surplus production, resulting in increase of currency inflow for the Brazilian Government perspective at the time of Alumar installation.

The initial production goals were 500 thousand metric tonnes of alumina and 100 thousand tonnes of aluminum ingot per year. Other company objectives were integration of Alcoa's Business System while maximizing the number of local people hired.

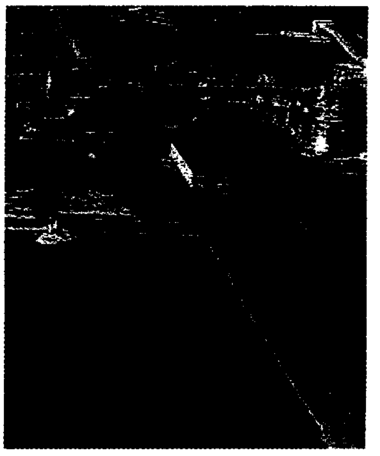
More recently Alumar is being guided by Alcoa's 2020 vision, the company's sustainable development targets. This strategic framework with six focus areas shapes the company's environmental initiatives for the next two decades. These are:

- Elimination of all Waste
- Products Designed for the Environment
- Integration of Environment with Manufacturing
- Incident-free Workplace
- Environment as a Core Value
- Reputation

Project Detail

Construction Timeline

1979
Installation of the Alumar project construction, a cost-sharing joint venture between Alcoa Aluminio and Billiton Metais
1984
Start up of Alumar operations with production capacity of 110,000 metric tonnes/year of primary aluminum and 500,000 metric tons/year of alumina
1986
Completion of Alumar's first expansion program with production capacity of 245,000 metric tonnes/year of primary aluminum and 800,000 metric tonnes/year of alumina
1989
Completion of Alumar's second expansion program with production capacity of 380,000 metric tonnes/year of primary aluminum and 1,000,000 metric tonnes/year of alumina



Financing and ownership
Capital invested was around US$ 1,7 billion. The investment was made jointly by Alcoa Aluminum S.A (AASA) and Billiton Metais S.A. through a consortium structure. The project is divided into two components – the refinery and the smelter. The Refinery is owned by a consortium of Alcoa Aluminio do Brasil S.A (35.1%), Billiton Metals S.A (36%), Alcan S.A (10%) and Abalco S.A (18.9%). The Smelter is a three potline operation and it is owned by Alcoa Aluminio do Brasil S.A (53.66%) and Billiton Metals S.A (46.34%). AASA is formed by Alcoa Inc., and Camargo Corrrea, a Brazilian group. Billiton is currently owned by the BHP group.

Assessment & Monitoring
A comprehensive assessment, including environment and social aspects was performed prior to plant installation and before the Brazilian Environmental Ministry establish a specific regulation for it that was enforced only by 1986.

The findings of this study suggested that the Alumar installation would provide a new pattern of development to São Luís, through the promotion of new business opportunities in the Island, besides the offering of more than 13,000 jobs direct and indirect jobs for construction, and more than 3,000 in the operation of both the refinery and the smelter.

A monitoring program that included physico-chemical, biological analyses, hydro-biological surveys assessments and studies was performed and is still part of the environmental monitoring program.

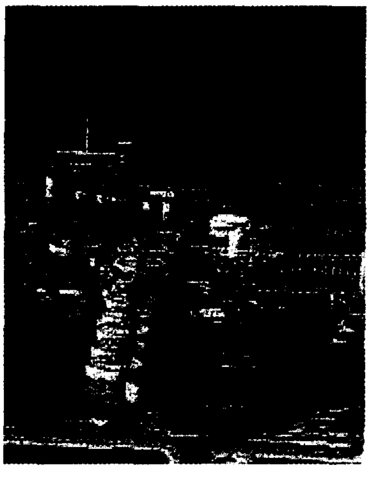
Land acquisition
The first activity related to Alumar installation was land acquisition that was initiated in 1980.
To acquire the land for the plant installation a complete assessment regarding all landowners, tenants and their respective real estate status was performed. Specialists were hired to perform these tasks and the survey was followed by social welfare personnel from the Maranhão State.

Several small farmers and some large properties occupied the area where Alumar was to be located. The land designated for the plant was acquired by the state and then sold to Alumar. All landowners were compensated. This included more than eight hundred families; a total of about 4,200 persons were relocated. Most of them were not the landowners, but were tenants that were using the land for shift cultivation - cassava plantation in a slash and burn methodology.

The greatest difficulty encountered by the company in this instance, was to establish the property boundaries. There was a considerable amount of real estate with incomplete documentation. This caused several problems for establishing the amount of land to be compensated and determining who was eligible to receive that compensation. As a result of these difficulties, most of the compensation, especially related to tenants, exceeded the real value of the assets, even native vegetation and some palm trees were compensated. In addition, Alumar, in collaboration with the Maranhão State Government, bought and donated more than 1,000ha of land and besides this constructed roads, water wells and electrical power line to resettle more than two hundred of the relocated families. Alcoa also supported a water line construction to São Luís, more than US$1,000,000 was invested at that time.

Construction of the plants
The earthmoving works began in 1980 and were completed in 1984. Plant start up was in August 1984. Two years later the Smelter's second line was constructed. By this time production reached 650 thousand metric tons of alumina and 245 thousand tons of aluminum ingot per year due to improvements in the efficiency in the Refinery and construction of the second potline – the room where the smelting cells are placed - in the smelter. A third potline was then constructed in 1989 and started up in 1990. About 13,000 people were hired during construction, more than 80% were from local contractors.

Technology hardware
In the Refinery the alumina is extracted from bauxite ore through a hydrometallurgical process known as Bayer process. The bauxite is ground and then mixed with a caustic soda solution and sent to Digestion Area, where it is heated in high-pressure vessels, resulting in alumina dissolution. Sedimentation and filtration separate impurities, allowing removal of bauxite residues. The following process is alumina precipitation into the tri-hydrate form. The hydrate is calcined at temperature of about 1000ºC and the result is calcined alumina



In the Smelter the process consists of the Electrode and Potroom areas and the Ingot Plant. In the potrooms the electrolytic dissociation of alumina, dissolved in a molten electrolytic bath by means of direct electric current, is performed. This process, carried out in pots operating about 950ºC, results in molten aluminum, which is transported in crucibles to the ingot plant.

Employment and training
In the beginning many workers were hired outside from Maranhão, as there was a lack of industrial background in the region, hence very few specialized workers. This was in fact the first heavy industry of its type in the area. Several staff were supplied by Alcoa's plant in Poços de Caldas to run the plant, as there was no skilled workforce at this time. In addition several technicians came from the USA to conduct, teach and follow up the

operational activities, mainly at the aluminum plant. Several technicians hired by Alumar in São Luís were also sent to other plants for training.

In the earlier stages, when a high level of expertise was not required, some of the non-specialized workforce was obtained locally. However, it was necessary for a large proportion of the specialized workforce used in the implementation of the Alumar project to be sourced from major cities where this type of industry had already been established.

As the company had a policy of maximizing the number of local employees at all levels, several efforts were directed at increasing local employee content. In the early stages the company launched a newspaper campaign in the South States of Brazil to entice professionals who lived previously Maranhão to return to the region.

In addition, a trainee program was designed for engineers to support them through to College graduation and provide a guaranteed job after graduation. Internships in Alcoa's units in Brazil and overseas were part of this program.

The contracting and training of all employees was managed by the company's Human Resources Department. An intensive and extensive training program was put in place in the late 1980's. All employees received training in team works, interpersonal relationships, communication and quality awareness throughout their careers. A specialist trainee program was designed for maintenance technicians and a training center was established.

Partnerships with vocational schools in the city were also established to help selected candidates to improve their knowledge.

In 1983, an Operator Training Program began to be delivered to newly hired operators and was then extended to the other levels. This program prepares an operator in every task to be performed in their area. It considers aspects such as safety, quality, cost and environment. As part of a career development plan this training extended beyond just technical skills to behavioral and managerial training activities. To support this, several national consulting groups developed training programs in organizational development and behavioral skills for use at Alumar.

The training was delivered to different levels. Operators received training in teamwork, interpersonal relationships and quality awareness. Those in leadership positions received training in people management, situational leadership and communication. The newly hired employees for the initial operational positions were trained with completely new skills, because for many of them it was their first job. The first level of leadership, as well as those who had some experience and were being prepared to take a leadership position in the future, needed to improve their skills in managing people.

For operational skills, training was required to improve standards and develop expertise and a specific development program was designed for these employees.

The Alcoa Business System

A key part of employee development was the implementation for the Alcoa Business System (ABS) at Alumar. The Alcoa Business System grew out of the Total Quality Management process. Benchmarking for TQM purposes drove employees to recognize how this could be adopted and modified to unify Alcoa's production across all its operations and business units. ABS implementation requires changes in work patterns, flows, workplace organization, layout, raw material selection, process design and other considerations. In addition Alumar adopted Alcoa's Environment, Health & Safety standards (EHS). This was based on a belief that a knowledgeable and motivated workforce with the right behavior leads to an environmentally sound and incident-free workplace which will ultimately represent competitive advantage.

R&D and community education

In Brazil there are several colleges and Universities able to provide support in all branches of studies and technologies, from metallurgical to environmental. Alumar has performed several tests with local and federal colleges and research institutes. A very close relationship is maintained with the local university and there is a program with this university to receive students for supplementary training. Partnerships with vocational institutes, colleges and universities have given many students a chance to enhance their education and apply their knowledge in a practical environment through internships. Alumar is also sponsoring community programs in environmental education, as well as supporting the refurbishment of community schools.

Project Outcomes

Alumar is now recognized worldwide as one of the world's largest industrial complexes for production of alumina and aluminum. The plant was designed and established with modern process technologies in order to guarantee a manufacturing model that is integrated into advanced concepts of economic and industrial development.

In the Refinery the present production rate is around 1.27 million tonnes per year of alumina, and in the Smelter the current capacity is 365,000 tonnes per year of metal.

The company's share in the primary aluminum sector in Brazil has reached 30% of total national primary aluminum production. Alumar sells approximately 20% of its products (alumina and aluminum) to the domestic market and the remaining 80% to the international market.

<u>Economic impact:</u>
Raw materials: US$ 186 million
Power supply: US$ 144 million
Payroll Charges/Salaries/benefits: US$ 59 million
Local suppliers: US$ 60 million
<u>Taxes paid:</u>
State: US$ 22 million
Municipal: US$ 2,8 million

São Luis claims to have about 70% of the industrial capacity of the state of Maranhão. To support the "heavy industry" a medium-heavy industry developed itself mainly focused on fabrication workshops and industrial gas production. Other significant industries on the island are two breweries, a cooking oil factory, and several clay brick and tile plants. Due to the high levels of goods transactions within the São Luís dozens of local industries have developed since the installation of Alumar.

Alumar is an important regional economic center; it offers more than 1,950 direct jobs and other 1,500 of indirect jobs (contractors). Currently more than 98% of the employees came from Maranhão, even in the managing seats.

A labor force of about 13,000 people was employed at the peak of construction. More than 80% of those workers came from Maranhão. On completion of construction a great part of these workers remained with the company as operators.

Great improvements have been recognized in the quality of the operations over time. Training and development programs have led to a highly skilled and qualified workforce. In particular employees have been noted for developing a strong commitment to policies, cost awareness and a sense of ownership, as well as improved group work and responsibility for self-development.

All employees now receive training. Depending on their position they can receive anything from an introductory course on safety and legal procedures through to a complete College education. Career plans are developed to determine the appropriate training for each individual. This is a win-win for the employees, the company and the region - more skilled employees means enhanced and more competitive outputs and consequently an improvement in the local industrial capability.

As a result of process efficiency and high management standards, Alumar was awarded both ISO 9002 and 14001 Certifications by July 2000.

Integration of the Alcoa Business Systems has been highly successful. The plant is in fact recognized within Alcoa worldwide as one of the most rapid facilities to implement new ideas and management programs successfully. Alumar has become the ABS world benchmark for Alcoa and more than one hundred technicians from Alcoa worldwide visited Alumar last year to better understand the success achieved with the ABS implementation. Alumar is also a benchmark in EHS results, especially in the environmental area; the plant had already received five international environmental prizes.

The plant is the best Alcoa's unit worldwide in terms of Smelter fluoride emissions. Alumar Smelter has progressively reduced fluoride emissions levels by more than 65% despite production increase over the time, more than 45%. Currently emissions levels are 70% below legal requirements

Another major initiative of Alumar was the creation of Environmental Park. The main objectives were: preservation and recovery of natural environment and development of environmental education activities for Alcoa's employees and the community, demonstrating that it is possible to have industrial operations and environmental protection in good harmony. Since July 1996, more than 57,000 people from local community have already visited the Park.

ProjectChallenges

Lack of trained and skilled workforce
As there was no other aluminum industry in the region, and other kinds of industry were scarce at the start of the project, the lack of skilled workforce presented a challenge, especially given the company's objective of hiring locally.

Distance from training centers
São Luís is located away from the country's major cities, which hosts most of the industries. To have the workforce trained extra expenses (accommodation and transportation) had to be incurred

Development of reliable suppliers
In the beginning local suppliers had some difficulties to provide goods and services as requested for the project, they had also were at times unable to achieve the desired quality standards.

Public opinion concerned re: environmental aspects
As a foreigner investment there were some demonstrations against American presence on the Island, with major concerns relating to the environmental aspects and the mainly the bauxite residue areas and fluoride emissions; there was a fear that bauxite residues would flood the island with red mud.

Land acquisition
One of the greatest difficulties in managing the relocation of land tenants in the area intended for development was the establishment of property's boundaries. There was a considerable amount of real estate with incomplete documentation. This caused several problems with establishing the amount of land to be compensated and who was eligible to receive that compensation.

Process and operational technology development
In the beginning, as a new operation and new operators there were some natural difficulties to implement some standards operating procedures.

Success Factors

Key factors for these successes were:

- Establishing clear procedures related to operational practices
- Extensive training and environmental education programs related to operating practices and responsibilities
- Development of measurable audit processes and feedback system for results and consequences
- Total integration between operational and environmental areas
- Developing a sense of ownership among all employees was key, and was the development of leadership ability to stimulate and challenge the plant workforce
- It was vital to provide correct, direct and simple information to all segments of the Plant
- Policies and principles of the organization needed to be conveyed clearly, and policy and practice aligned.

Bayer CropScience: Integrated Crop Management Capacity Building Projects – Brazil & Guatemala

Summary

German company Bayer CropScience developed an Integrated Crop Management (ICM) training program for farming families in Latin America. A pilot project began in May 1995 in Brazil and was recently replicated in Guatemala. Participatory training approaches in communities, with an emphasis on all family members and especially women and children, formed the cornerstones of this campaign.

The overall campaign was based on the basic concepts of ICM. Special attention was given to Integrated Pest Management (IPM), which includes indirect measures of weed, pest, and disease prevention such as crop rotation and monitoring pest populations against threshold levels; it uses direct control through biological, biotechnological, mechanical, and chemical measures. Under this system, the use of crop protection products is defined by targeted and optimized use, and adapted to local environmental and economic conditions. The correct and efficient handling of chemical crop protection products was also an important aspect of the project.

Particular importance was attached to finding appropriate methods for conveying information to the many beneficiaries that could not read or write. Visual materials - such as stickers, films, and posters - containing pictograms on safety aspects and other visualized messages were among the most effective ones.

In Brazil, 25,000 small-scale farming families were reached between 1995 and 2000, including 1,300 teachers and 2,500 children. A mix of communication tools and the inclusion of women and children enhanced the effectiveness of this program, especially due to the varying literacy rates of individuals. Positive results were recognized in relation to crop and pest management aspects such as crop rotation and conservation tillage, the value of beneficial organisms, the effective use of crop protection products and the value of protective clothing.

In Guatemala about 3,000 people have attended the training sessions in the first 6-month since its launch in June 2001. New agricultural techniques and better natural resource management systems are aimed at improving practices, yields and ultimately the livelihoods of farmers. Results have already been achieved in peanut production, where yields and earnings tripled. The program in Guatemala is also meant to conserve biodiversity through the avoidance of unsustainable land gaining activities by farmers, who often leave their unproductive land in search of "new lands" for agricultural purposes in tropical rain forest area.

Introduction

Bayer CropScience & GTZ

The Bayer Group has had a presence in Latin America for more than 100 years and now has subsidiaries in almost every country in the region. It employs 9,300 people and achieved sales of 2.4 billion Euros in 2000. The Bayer Group's activities in the region focus on the life sciences and the supply of products for the diagnosis and treatment of diseases in humans, animals and plants.

The technical department of Bayer CropScience is responsible for the Integrated Crop Management Campaign. The department deals with activities of technical validation, registration, marketing, sales, and stewardship of crop protection products.

The pilot project in Brazil was initiated by Bayer CropScience, and implemented closely with several different partner organizations including local authorities, health, education, and agriculture departments, as well as the farmers' association.

In Guatemala the project differed in that it was formally a partnership venture between Bayer and the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), which is the technical aid organization of the German Ministry of Development. GTZ has been operating as a service company since 1975, and the organization's primary goal is to improve the living and working conditions of people in partner countries. GTZ is operating in over 120 countries, employing over 10,000 people.

Technology Recipients

The Pilot Project - Brazil

The Brazil pilot project took place in eight communities around Santa Cruz do Sul. The city with its some 100,000 inhabitants, lies about 200 km to the west of Porto Alegro, the capital of the southernmost state of Rio Grande do Sul. In this part of Brazil, the majority of the population is of German descent. The language is therefore still a mixture of a German dialect and Portuguese.

Of the farmers and their families that participated in the training 45% had not completed primary school education and therefore were mostly unable to read and write properly.

Agriculture characterizes the appearance of the landscape. Smallholding predominates: 46% of farms have around 10 ha land, 33% have up to 20 ha and 19% have more than 20 ha land. The farmers mainly grow tobacco, maize and beans. Tobacco has been the major source of income for many families in this part of Brazil, and the industry provides high levels of employment, not only for the farmers, but also to many women in the regions who are involved in the processing of the tobacco crops.

Guatemala – La Verapaces

Almost 60% of the farmers (~ 30,000 in total) in Las Verapaces are involved in subsistence farming or marginal agriculture production. For this group, the yields are very low due to unsustainable use of the natural resources. Their earnings are one of the lowest within the country and come from their own crops and from their labor in other farms as labor force. Main crops are corn and beans. A second group, comprising 20% of farming activities, are dedicated to tomato, pepper, cucumber, onion, peanut, potatoes, broccoli and cauliflower production. The remaining 20% - better off farmers – produce export crops such as: coffee, cardamom, orchids, leather leaf and other ornamental flower productions.

The target audience of the project belongs to the first two groups. The **first** group of farmers produces for their own consumption and the needs of their families. They go to the local market to sell their crop surplus, if any. The **second** group of farmers exports and sells their pepper, tomato and vegetables production to other Central American countries like El Salvador, Honduras, Nicaragua and Costa Rica.

Pushed by marginal yields, the farmers (of the first and second group) tend to move to the northern region (El Petén, tropical rainforest area) in search of "new lands" for agricultural purposes, destroying more natural forest habitats each year. Poor or non-existent soil conservation knowledge/techniques lead to erosion and the soil becomes degraded, pushing the nomad farmers to other forest areas.

Similarly to the Brazilian pilot project, illiteracy rates were an issue for the project's design and implementation. In Las Verapaces the illiteracy rate is around 58%.

Technology description

The pilot training project in Brazil, and the subsequent replication of the project in Guatemala, are based on the principles and concept of Integrated Crop Management (ICM).

The company encourages the implementation of sustainable farming systems such as ICM, as this approach combines care for a diverse and healthy environment with the economic demands placed on agriculture.

Special attention was given to Integrated Pest Management (IPM). IPM is an integral part of ICM, and includes the techniques of indirect measures of weed, pest and disease prevention such as crop rotation and monitoring pest populations against threshold levels. Direct control measures through biological, biotechnological, chemical and mechanical measures are equally needed. The use of crop protection products is defined by targeted and optimized use, adapted to local environmental and economic conditions.

Aspects such as biological control measures and the identification of beneficials were covered along with aspects of safe, efficient and judicious use of crop protection products. Great emphasis was placed on: protective measures for the user, safe storage of crop protection products, regular maintenance of equipment and careful "triple rinsing" of empty containers. Marketing and promotion of products did not feature at all.

Project Driving Forces and Objectives

Drivers

A main driving force behind the development of the program was corporate strategy. Specifically, the aim of developing clever solutions that are economically viable and give the company the necessary competitive edge to secure the long-term success of the business it strives. This particular project also emerged from the company's corporate social responsibility and Responsible Care attitudes and approaches.

The company's commitment in 1995 to ICM and the recognition of the need to improve training programs and activities related to the safer and more efficient use of crop protection products was also an important driver.

While the company had been involved in education and training activities for many years, the quality of this training was not being evaluated for its impacts. Therefore this pilot project was designed to develop measurements that could enable evaluation of outcomes in order to gain experience and to improve future training activities.

Recommendations from Agenda 21 were taken on board and used as an institutional approach to guide the project planning and communicate objectives.

Bayer CropScience employees in the project's regions also drove the program. They are local employees who are eager to find solutions that will improve the livelihoods of their people.

After the success of the pilot project in Brazil, Bayer CropScience and GTZ saw a value in extending the project concept to a broader focus as both organizations believed this was a wider, more holistic, and therefore even more efficient approach in terms of achieving sustainable agriculture as a whole. The very difficult economic situation of the marginal farmers in Las Verapaces region of **Guatemala** moved partners to take actions oriented towards developing more sustainable production of agricultural goods under the Integrated Crop Management approach.

Objectives

The objectives of the project for Bayer were to provide capacity-building efforts centered on a more sustainable approach to agricultural practices.

Bayer CropScience's objectives for the farmers in both regions were mid, to long-term based:

- Integrated Crop Management education for trainers, promoters and farmers
- Integrated Pest Management education for trainers, promoters and farmers
- Demonstrative Plots on ICM/IPM in the different working areas as method for continuous training of opinion leaders, to propagate the use of sustainable agricultural techniques
- Lectures and practical courses on calibration, use and maintenance of knapsack sprayers for trainers, promoters and farmers.
- Education modules on development of crop protection products for the integrated crop/pest management, for local school students.
- Education on safe disposal of empty containers that may be around the house in order to avoid misuse of such material
- Diversification of crops (Las Verapaces)
- Alternative soil and water management techniques (planned Las Verapaces)
- Agricultural produce marketing (planned Las Verapaces)
- In the Las Verapaces region, a further objective of the project was to teach farmers how to increase productivity, so they will be encouraged to remain on their ancestor's land; this would ultimately contribute to the conservation of the tropical rainforest in El Petén area and in Las Verapaces itself.

The objective for growers participating in the projects in both regions was to gain knowledge on ICM/IPM in order to better use/conserve their natural resources, and to produce more and better quality agricultural products for their own consumption and when possible for export, in order to improve their economical situation/livelihood.

Project Detail

The Pilot Project in Brazil

Bayer CropScience attached great importance to co-operation with different partner organizations in the campaign. Local authorities were engaged in the project, including health, education, and agriculture departments who were most familiar with the region and the issues pertinent to this project. Due to traditionally high levels of tobacco cultivation in the region, the tobacco industry became involved. The farmers' association and the agricultural workers trade union were also partners. Other groups – including one state authority - who were approached, and whose contribution would have been desirable, did not take part in the campaign however.

While Bayer CropScience beared the costs for the pilot project, including all the training material and the local staff coordination, all partner organizations substantially contributed in-kind. They provided trainers, and the farmer's association office provided space for the project office.

Surveying

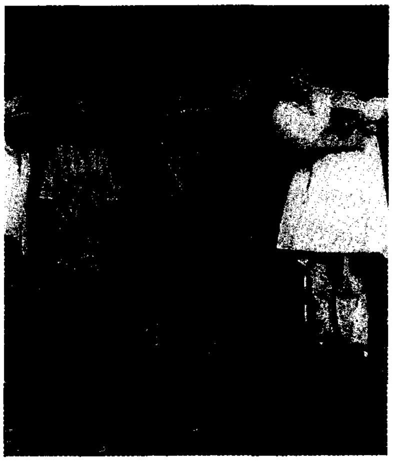
Prior to commencing the Brazilian pilot project in 1995 a baseline survey interviewing 200 community members and trainers was conducted. This was designed to find out the needs of those taking part in the training so that the campaign could be targeted more accurately. The survey also examined the distribution of means of communication such as radio and television.

Results from the survey highlighted several important issues that would direct the planning and implementation phases of the project. Of greatest concern from the survey results was the large number of people who were unable to read or write. This required adopted approaches that did not rely on communicating through written words.

A follow up survey was also conducted in 1998, therefore allowing for a comparative analysis with the baseline survey in 1995.

Preparation

The preparatory stage started a year before the official start of the campaign in 1995. During this stage, particular importance was attached to finding appropriate methods for conveying information to the many of the beneficiaries that could not read or write. Visual material was developed, including stickers and a card game, containing pictograms on safety aspects and other visualized messages, as well as training material such as documents, posters and overheads. In addition, the core themes of the campaign were summarized in an easily comprehensible, educational 14-minute film.



About 70 trainers were prepared for their forthcoming role in a two-day seminar. Thorough training was provided to them from specialists who came from government agencies and institutes, the Brazilian Crop Protection Association (ANDEF) and Bayer CropScience. Those trained were "agricultural extension officers" of their employers - the partner organizations. All trainers were from farms in the region in which they were to work. They knew the local conditions, the people and their needs very well. They received an attendance certificate for the two-day seminar – which was a great motivation for them.

Implementation

The project aimed to reach the 25,000 small-scale farming families in the region. The courses began in May 1996 with farmers, their wives and older children and schoolteachers taking part. In agriculture, training is often restricted to training just to farmers themselves. Since women are particularly concerned with aspects such as hygiene and health precautions, which are of great importance to the campaign the "traditional exclusion" of women from training programs was therefore deliberately broken.

The farming families were invited to the training sessions by word-of-mouth. The trainers made visits to families and provided information to the schools to inform children. This was a time consuming but necessary effort in a region where many farmers live in remote areas and do not have modern means of communication.

Interest varied between regions slightly, but most people were keen to participate in new activities, particularly where there was a perceived benefit (especially economically). In some areas woman did not attend, but the curiousness of the ongoing activities enticed more people to attend over time. The average percentage of women who took part was 19%. However, this also varied greatly between locations, as a result of differing customs.

Children played a key role, as they were important conveyors of information in regions where their level of education was often higher than that of their parents. By setting up a school - and a photo competition, and by staging a play on the subject of farming and crop protection, they became highly motivated and interested in the subject.

After around 1300 teachers in the 450 primary schools had taken part in the courses for farmers in 1996, they passed their knowledge on to the children in a second stage (approx. 25,000 in the 6–12 age group). The emphasis here, too, was on treating the environment with respect. For example the difference between beneficial organisms and pests was explained to the children in practice in the school garden or a nearby field.

In view of the high rate of people unable to read and write (up to 50%), it was decided not to distribute course literature. Instead, card games were developed and given out which were devised specifically for this purpose and which displayed the most important content of the training in symbols. This was considered to be useful from a didactic point of view, as playing card games are a very popular pastime in the region.

The Las Verapaces project - Guatemala

Surveying

Similarly to the Brazil pilot project, the preparation phase included a baseline survey to aid in developing the project focus and to design the education and training. Further information was also provided by several organizations already working in the area such as the Ministry of Education and GTZ.

The design of the project in Las Verapaces is slightly different, based on the different environment and the needs and lifestyles of the people. For example, the card game was used in Brazil, as in that region this is an important "pass-time". However, as this is not the case in Las Verapaces, different tools were developed. Also in Brazil the training using charts/overheads often took place indoors due to the colder weather conditions. In Guatemala, the rotating poster was most frequently used.

Preparation

The educational material was designed by the local technical department of Bayer CropScience in close cooperation with GTZ executives. Much of the materials were audio-visual tools such as rotating posters, films, slides and computer based power point presentations. For the younger audience, workbooks, educational comic strips, history tales and teaching sessions were designed. Radio broadcasting programs were especially designed for women, as many of them could not read but would often listen to radio programs while at home.

Qualified and experienced trainers were readily available in the region. Those contracted were all local people, possessing between 8 – 12 years experience in agricultural development programs. Emphasis was placed on their level of local language skills. The farmers in the area are K'eckhi Indians (belonging to the Maya group) and their native language is K'eckhi.. All of the trainers contracted received comprehensive training via a seven-module program, as well some ongoing training.

Implementation

Growers and family members were enticed to attend first sessions through invitations made by lead farmers, community leaders and teachers. Radio broadcasting also contributed to propagate the interest in the program in each chosen community. The economic incentive behind the increased quality and quantity of the production was a very strong tool for keeping the interest in the project activities.

The project remains ongoing in its very first stage. The supervisor and the promoters of the project are carrying out review and follow up of results themselves. An external review is planned for June 2002, and at the end of the first stage of the project (June 2003). After this, a decision will be taken on the further continuation of the educational program.

Project Outcomes

Pilot Project Brazil

About half of the 25,000 small-scale farming families, 1,300 teachers and 25,000 children were trained. Those farmers who took part in training sessions had a higher level of basic education. Children were very motivated and stimulated to participate in the project and the response from women that did attend was very positive.

No-one single tool was noted as being the most successful; rather it was the use of a mix of communication tools that proved most effective. In such areas, where poverty is high, it is difficult to tell people to be environmentally responsive and expect the message to be heard and acted on. It was necessary to communicate messages in a variety of ways and highlight the economic benefits from behavioral changes. In some instances it was easy to demonstrate clear economic benefits – for example that better care of knapsack sprayer would prolong their life, and reduce the need for purchasing new ones. However in some instances where benefits may not be so obvious, or where behavior changes conflicted with culturally driven behaviors this task required different approaches. For example, the use of protective clothing generally went against the common belief that the men didn't need such things, and health related arguments were not as convincing in this instance. Here the use of role models such as doctors using protective clothing was a more effective means of incentivizing farmers to take up this new behavior.

The surveys conducted provided information about the changes that had taken place and confirmed that there had been an increase in the awareness of the importance of responsible action amongst farmers and their families. The survey clearly showed that the awareness of risks was generally very high and that the campaign led to a remarkable improvement in the use of crop protection products. Knowledge about beneficial organisms and their importance was greatly increased. The value of protective clothing was better appreciated. Demand for protective clothing increased, which could be measured through increased sales at the local shop.

Positive results were also recognized in relation to crop rotation and conservation tillage, the value of beneficial organisms, the difference in terms of risks between mixing and applying crop protection products, personal hygiene and washing of protective clothing, storage of crop protection products and spray equipment, fate of residual spray solution, as well as triple rinsing of empty containers.

Las Verapaces – Guatemala

From June 2001 to December 2001 917 growers, 2610 pupils from 37 communities, and 40 external trainers attended the training sessions. The initial reactions were very good, because of the types and variety of educational material used. Audiovisual tools were among the most effective. Adults responded well to the rotating posters, films, slides and computer based presentations, young people and children preferred workbooks, educational comic strips, history tales and teaching sessions.

The participation of women in education and training activities in this region is traditionally very low. Despite social/cultural barriers however, participation by women in the projects activities has grown and is key because of their influence in the decision taking process within the families. After over 20 years of armed conflict in the rural areas there are also many widows living in the communities. They are heads of their families and need to participate in the training sessions.

Children participation has become a priority focus area, because changes that are achieved with them are quicker and more sustainable.

Since appropriate nutrition was a concern, the project focused on the high protein peanut crop in order to improve the population's diet. The first achievement recognized was with peanut production. While through traditional methods of peanut production, farmers were obtaining no more than 975 kg/ha, new cultivation techniques (new varieties, healthy seeds, integrated plant nutrition, and appropriate disease control) improved the yield to over 3,500 kg/ha. The net earnings increased from US$ 738/ha to US$ 2027/ha. This was a very significant yield/income raise that improved the farmer's livelihoods while also improving their daily diet in terms of quality and quantity.

Tomato production was also targeted. Due to the presence of pests the tomato production area declined in the last years. New concepts and programs for pest control are reopening production zones that were abandoned for many years. Demonstration plots helped people to learn ICM/IPM techniques in a very practical way.

The community was very excited about peanut/tomato production possibilities, however it has been necessary to caution this enthusiasm, because of the limited capacity of the markets. Too much peanut/tomato production, could have a negative impact on the market prices and therefore on farmers income.

The interest of the growers for the project's activities is increasing. They are all very eager to learn how to produce more and better quality as compared to what they obtained in the past. After each activity, the attendants fill out questionnaires to help determine if concepts and key messages of the trainings are being assimilated. Data has been filed since the beginning of the project and the first evaluation of the project's impact in the communities is scheduled for June 2002.

Project Challenges

Both projects identified similar challenges:

- The main challenge has always been to maintain the interest for the activities, and to achieve active participation of the people involved.
- Illiteracy rates and a lack of basic knowledge among the rural populations has been one of the greater challenges faced. In some instances the greatest challenge was a denial that there actually was a literacy problem at all.
- The integration and participation by women has also been a big challenge, but is being solved with the help of relatives and local leaders that cheer women to attend meetings and field activities and push them learn to read and write.
- Outreach to people in remote areas has been a challenge (particularly as it is not possible to send information by mail and a lot of personal contact is needed).
- Cultural differences also presented challenges, however these need to be addressed on a case by case basis, as there is no one solution to all.

Success Factors & Lessons Learned

Partnerships and networking
Joint efforts with authorities and local organizations have better and quicker impacts. Since the magnitude of the number of small holders encountered is enormous, an integrated approach from all stakeholders is needed. The expertise of industry, growers, local authorities and the agricultural unions together laid the ground for the success.

The "local" management and partner organizations in the region ensured acceptance of the project amongst all those involved and "networking" was improved overall as a result. Project coordinators rated cooperation between the different partner organizations as particularly successful.

The formation of educational networks was also very important as resources and efforts are used more efficiently. For example, in the Chilasco community in Las Verapaces, the project already involves 12 different organizations, from Education, to Health, environmental, agriculture, financial institutions, worker unions (national and international level) and NGO's. Each one supports the project in its area of competence, so that all together do contribute to the ultimate objective of the project.

In addition, for the communities networking emerged between groups that had not worked together before.

Establishing clear economic benefits.
Farmers will only adopt new technologies if they are given the appropriate incentives, knowledge and practical skills. The success of the projects has come from the establishment of clear economic benefits as motivators for change and the use of "learning by doing" participatory training techniques and local demonstration projects.

Government support for education
A low level of schooling makes the success of "development projects" more difficult in general and the lack of basic education also creates a barrier to efforts to promote sustainable agriculture.

As the project's survey in Brazil showed, those who demonstrated the most interest in further training were those who had the higher levels of basic education. A sign that a start must be made at primary school level if fundamental changes are to happen. The political will of the government is necessary for this if widespread and lasting success is to be achieved.

Learning from a pilot project
The pilot project allowed a great deal of experience to be gathered. It assumed the role of example and led to the development of similar projects in other regions and countries in Latin America. This not only promoted communication and awareness of the subject amongst the partners involved but also increased internal communication and awareness within the company.

Involving women and children and teachers

Capacity building should be targeted at all levels. Integrated programs such as family and community-based training can be particularly useful as interest and enthusiasm for the project's implementation rises when all players involved engender a sense of ownership.

During both projects it was only the involvement of the whole family that led to greater communication and thereby promoted discussion of the subject within the family. The trainers were very much in favor of the training of children. They believed that it is very difficult to achieve changes with adults, but children are more open and take on the role of mediator in regions where the adults cannot necessarily be assumed to be able to read and write. The pressure which children were able to exert on their parents, for example with regard to safety aspects, should not be underestimated either.

As the more communicative teachers often took part in the training sessions, they were able to break down the reserve of some of the less forthcoming farmers. Lively discussions were the result and became a lively element in the courses.

Effective communication

The programs were especially tailored for small holder farmers and were implemented with the help of many established organizations in the rural areas and through supervisors and promoters that spoke the native languages.

Educational material and teachings need to be performed in the native languages (for example, in Las Verapaces they all understand Spanish, but what is taught is only fully accepted when it is heard in the local language, K'echki).

Involving, lead farmers, and opinion leaders also contributes to success. These individuals have gained respect among their communities and are followed by their country men and women.

BP Solar: Municipal Solar Infrastructure Project - Philippines

Summary

BP Solar has been supplying equipment and systems to rural development projects for over 15 years as part of the company's commercial business. In remote locations, particularly for poor, un-electrified communities, solar products and services can be a highly effective means of meeting essential needs such as lighting, telecommunication, fresh drinking water and vaccine refrigeration.

In the Philippines, BP Solar undertook the Municipal Solar Infrastructure Project (MSIP), in conjunction with Philippine and Australian Governments. This rural infrastructure project uses solar energy as an "enabling technology" to target specific needs and upgrade basic facilities in remote un-electrified communities.

On completion this development project provided health, education and governance benefits to more than 500,000 poor Filipinos in 11 Provinces, 53 Municipalities and 435 villages in the Mindanao and Visayas regions. In addition, 2,250 people were trained as part of this program. The project, one of the largest solar contracts in the world was completed at a cost of US$27 million.

This case documents the social preparation and capacity building activities that were a vital foundation for the success of the project. Particular attention is paid to the impacts of the provision of solar power and new facilities to communities that have never received or paid for such a service before.

Introduction

Company profile

BP Solar is a wholly owned subsidiary of BP – British Petroleum. With nearly 20% of global market share and more than $240 million in revenues, it is one of the largest solar companies in the world.

BP Solar operates manufacturing plants in the U.S., Spain, Australia, and India, employs over 2000 people, and has products deployed in over 160 countries.

BP Solar manufactures, designs, markets, and installs a wide range of crystalline silicon and new generation thin film solar electric products for residential, commercial, and industrial remote and grid-connected applications.

In 2001 BP Solar created a division called Solar Solutions to develop large-scale sustainable development projects. Major recent projects from Solar Solutions include multi-million dollar contracts for rural development in the Philippines.

BP Solar have been supplying equipment and systems to rural development projects for over 15 years as part of the company's commercial business offer. The company is working in partnership Rural Development Agencies to improve the quality of life of individuals and communities in developing countries, by offering end-to-end solar-based solutions.

These solar-based solutions are tailored to communities' needs and aim to stimulate community development by meeting basic needs, economic development and institutional strengthening.

Country Profile: The Philippines

The Philippines archipelago is located between the Philippine Sea and the South China Sea east of Vietnam, and numbers some 7,100 islands. Only approximately 1,000 of its islands are populated, and less than one-half of these are larger than 2.5 square kilometers. The population of the Philippines is 76.5 million persons, an increase of 11.5 percent since 1995. If this growth rate continues, the Philippine population is expected to double in approximately 29 years[1]. Population density increased from 160 per square kilometer in 1980 to 220 in 1990.

1 National Statistics Office, 2000 Census of Population and Housing, http://www.census.gov.ph/census2000/c2khighlights_final.html

Where it is available, even for limited hours during the day, electricity in rural regions is more costly than in metropolitan Manila, while household incomes are substantially lower than average. In addition, more than half of Philippine households draw drinking water from "doubtful sources", and large percentages of households have unsanitary or no toilets. In rural areas, access to many health services is difficult. Some district hospitals and regional health units have little or no electricity, and many barangays (villages) rely on shallow wells or surface springs for water. Due to the lack of electricity, community halls and schools are rarely used at night and opportunities for adult and further education and involvement in community affairs are limited.

The BP project was targeted to the Mindanao and the Visayas Provinces. Generally, these Provinces face several difficulties. Access by either land or sea is difficult. There is little regular transport and virtually no transport infrastructure such as roads and bridges or passenger wharves. More than 50% of the barangays have limited or no supplies of electricity. Where electricity is available, it is usually for less than 12 hours per day, and grid connections are restricted to densely populated areas. As a result, these communities have been deprived of economic opportunities that will enable them to join the mainstream of the country's growth and development. Basic services are inadequate for effective health programs. In most cases, medical facilities can provide only first aid because they have no means of storing medicines and vaccines. The majority of the barangays have only Level I water systems and water borne disease is endemic.

Technology description

Solar energy was the source of electrical power for all systems provided, bringing the advantages of very low operating costs, high reliability, and suitability for operation in isolated communities. The use of solar energy as the power source ensured that the project had a benign impact on the environment and will in fact help to lower the demand for imported fossil fuels in the Philippines.

These rural communities cannot afford grid connection or a generator so solar was selected as the enabling technology. By definition this was not an energy project, but rather a project that provided energy to catalyze development by meeting basic needs. Under this scheme, the project provided not only for the solar systems but also for the systems to provide the energy service. This included, for example, water pumps, lighting components, vaccine refrigerators, televisions and VCRs.

In this type of rural environment solar powered packaged systems:

- Can be easily targeted to meet minimum basic needs
- Are modular and can be scaled to immediate needs without limiting their capacity to cater for increased demand in future
- Require minimal servicing and are appropriate for service at the local level
- Are extremely reliable
- Are sustainable because life cycle costs are incorporated in the capital

In remote locations, particularly for poor un-electrified communities, solar products and services can be a highly effective means of meeting essential needs such as lighting for homes, schools and community centers, as well as remote telecommunication, fresh drinking water and vaccine refrigeration.

Project Drivers and Objectives

Drivers

The Philippine's Presidential Council for Countryside Development identified a wide range of constraints to development in rural communities. Inter alia, these included, ' lack of adequate infrastructure and support services, inefficient delivery of social services and inadequacy of local government capability'[2]. While the economic vision of the government was to attain the status of a "Newly Industrializing Country" by the year 2000 and to base economic

[2] Overall Assessment of sixteen Initial Priority Provinces. - Presidential Council for Countryside Development

development on internationally competitive activities, it also recognized that people suffering poverty have neither the resources nor the access to markets to start competitive industries. The government has stated in the Medium Term Philippine Development Plan that where people are unable to meet their basic needs in food, health and potable water there is a case for intervention by government to assist and to set aside the principle of user pays in favor of social equity. For the Philippine government the BP solar project was a first step toward enabling these rural communities to improve their livelihoods.

Objectives
The initial objective of the project was the provision of 1,003 stand-alone solar powered equipment packages to be installed in 400 Barangays within 49 municipalities. The project aimed to deliver these systems so that the recipient communities could gain better health services and water supplies, and improved opportunities for education as well as safety. Beyond this, the use of packaged systems was meant to place control in the hands of the end users, empowering them to fulfill their functions and meet their responsibilities more effectively.

The projects aimed to strengthen Local Government Units (LGU) in the poorest provinces, using solar energy as the enabling technology to upgrade infrastructure facilities that would enhance LGU abilities to deliver essential social services and elicit the participation of community organizations and individuals in governance.

Further, a crucial feature of the project was that each Barangay receive specific training in management, operation and maintenance of all systems, and that they in turn accept responsibility for all future costs to sustain the services.

The perceived benefits were that the project would have a direct influence on almost half of the population of the seven provinces involved in the project. This would be delivered by:

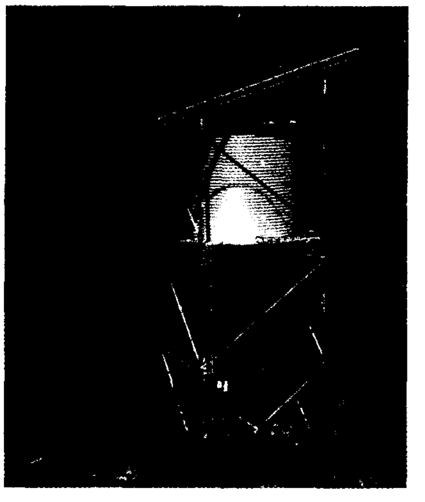
- The improvement in the hospital facilities and vaccination services a total of more than half a million people living in the areas serviced by the District Hospitals, Rural Health Centers and Barangay Health Centers will benefit directly.

- All groups in the served areas would share in the health benefits. Reductions in infant and maternal mortality would result from improved capacity to store and utilize vaccines and medicines of all kinds and this would also assist adults in tetanus prevention and general treatment of illness.

- Community safety lighting that would reduce accidents on fishing wharves during night unloading, as well as providing safer navigation for fishing vessels at night.

- In areas where Level 2 water systems are provided, women in particular would benefit through easier access to potable water and a reduced illness within their families. All groups would benefit from the reduction in water-borne disease.

- Poverty alleviation would be served by the improved quality of life associated with improved health and easier access to potable water. In addition, in barangays receiving education systems, there would be a further improvement in quality of life through access to the school facilities at night for adult education or entertainment.



For BP Solar, such a project was also an attractive business opportunity. The company is developing a great deal of experience in this form of comprehensive project delivery. Rural infrastructure projects are now at the core of BP Solar's business strategy, and in the future the company intends to 'clone MSIP' in other regions, incorporating the lessons learned.

Project Detail

Getting started
Following the successful completion of a project in Sri Lanka in 1992/3, supported by the Australian International

Development Assistance Bureau (AIDAB), BP Solar presented government officials in the Philippines with a concept for a large-scale project using solar power for empowering remote communities. Officers in the Philippines Department of Interior and Local Government (DILG) recognized that such a project could help meet objectives for social and health development programs.

Funding was provided by way of a "soft " loan (under the OECD guidelines) from the Australian Government, which incorporated a grant component of 35%. As part of the initial feasibility study, BP Solar conducted an extensive field study in these Provinces during January and February 1995, to obtain the data necessary to define more accurately the scope of the project.

The feasibility study did not include an evaluation of every Barangay however. Existing information was unreliable; in some cases Barangays marked on the map did not exist; in other cases existing Barangays had a different name. Essentially, the National data was unreliable and a full review, and validation was necessary. Therefore, as a first stage of the project a more detailed evaluation phase commenced.

This included detailed surveys and community consultations to determine the Barangays that would be included, the items of equipment to be installed and the associated training to be provided.

Social preparation phase
The next step was the social preparation phase. It was necessary to provide the communities with information regarding what might happen under this new project were they to become involved. A particular challenge was that electrification was new to these regions and many had never paid for government provided services before. This phase commenced with a visit to the Municipality and Barangay to explain the project, and to describe the maintenance commitment and payment program that would be required. If the Mayor and municipality were interested, then the group met with the Barangay and Barangay captain and made agreements to proceed.

To undertake the social preparation and training work, approximately 150 community development officers were trained by BP. Predominantly these individuals were selected from the areas they were to work in to enable communication in local dialects. Where possible these people had at least a small amount of community development experience.

The next step was to evaluate the current infrastructure and the future needs of the community of each Barangay – did they have a school? What were their requirements for acquiring a clean reliable water supply? Were the women traveling lengthy journeys to find water that was unclean? If so, was it necessary to build a new well and install a new pump or could a nearby well be improved?

It then became necessary to bring Barangay community members together in an assembly. The purpose of this to conduct a needs assessment and to explain the project and the new systems that were to be installed and what the community could expect to receive from this new service. It was also necessary to explain the commitment that needed to be made to maintaining the systems and the need to undertake revenue-generating activities to enable each community to pay for the systems and components that accompanied them (lights' fridges, televisions etc.).

Based on an evaluation of infrastructure, individual income, means of employment and revenue generation capabilities, the DILG determined what could be offered to each Barangay. The field teams then moved on to the next Barangay to enable the previous community to continue to develop their own planning work prior to implementation.

Before BP left each barangay, interested individuals were gathered together to form ad-hoc committees that would continue discussions. In most instances there were 3 committees in each barangay - the health committee, the school committee, and the barangay water committee. BP trained these individuals in running these committees, managing budgets and addressing procedures such as conducting meetings and documenting discussions through effective minute taking.

BP also spent time with each barangay, exploring revenue-generating opportunities that would enable them to pay for the services provided by the solar systems. They explored activities such as growing onion bulbs, animal breeding, and basket weaving. These activities would cover the service costs of receiving the benefits of the solar energy, such as amount of water pumped from a new solar energy powered water pump. This was also required to fund maintenance and parts replacement, as well as upkeep of the service systems (such as light bulbs for the lighting systems). This money could also be allocated to upgrading products and services, such as the purchase of new videos to play on the new solar powered televisions and videos.

Provision of systems
Each system was supplied to a specified location and installed. In each location, arrangements were made for operating, servicing and maintaining all equipment locally through training and support programs. Documentation, service kits and basic spares for up to ten years were provided and located to ensure that each packaged system could be repaired.

The initial reaction at the first stages of construction of the systems was one of skepticism. Many barangays had been promised electrification for some time by the Government, but previously these promises had not delivered any power. BP was greeted by amazement when the first deliveries of equipment started to arrive in the barangays.

There were no pre-payment meters in this project. Rather, each barangay captain made a commitment to pay for the maintenance of some systems (Communal Light, Barangay Hall) from their Internal Revenue budgets. Villagers were then expected to commit to undertaking revenue generating activities to make financial contributions to the maintenance of the other systems (School, Water, and Health systems). In many cases villagers were quite motivated to undertake revenue-generating activities as a result of the immediate benefits they were recognizing. Women who had previously had to walk long distances back and forth carrying heavy containers to transport water for their families were now saving hours (and a great deal of effort) by using the new well-situated pumps that guaranteed clean, reliably flowing water.

Training
In each barangay elections were held for the Barangay Technical Team (BTT). This involved 2 people in each barangay, and these individuals usually had at least a small amount of electrical experience. They were trained in ensuring modules were washed correctly, checking electrolyte levels of batteries; topping up batteries etc. Each BTT was provided with a set of tools. Local BP employees were trained, who then in turn trained the BTTs in each Barangay. Additional positive impacts included raising the self-esteem of the individuals, as they were treated with an increasing respect, as they were able to maintain the new systems. On the down side, in some instances these individuals are leaving the barangays to build on this training and find work elsewhere.

In addition to this very basic level of training, 3 more complex levels of training were offered to support the systems:

1. In each town a Municipal Operative was trained. This was an individual operating a small, private business, usually a small-scale operator who worked in repairs already.

2. In addition a Municipal Engineer was trained. This individual was someone already employed by the government.

3. High level training was given to the Universities. They were at an advanced stage, being able to fully dismantle, repair and reassemble the components.

MSIP was completed in May 2001.

Project Outcomes

This rural development project provided health, education and governance benefits directly to more than 500,000 poor Filipinos in 11 Provinces, 53 Municipalities and 435 Barangays in the Mindanao and Visayas regions. The project, one of the largest solar contracts in the world, cost US$27 million. In total 1,145 packaged solar systems were installed in 435 Barangays. On completion of the MSIP the community facilities upgraded and provided with a packaged solar system were as follows:

- 4 District Hospitals
- 11 Rural Health Centers
- 104 Barangay Health Centers
- 260 Barangay Potable Water Supply Systems
- 6 Municipal Halls
- 201 Barangay Halls
- 266 Schools
- 289 Communal area lighting for markets and fishermen's wharves

Overall 2,250 people were trained as part of this program. At the peak there were 340 individuals working on MSIP at the one time; the general figure ranged from 180 to 200 per month. It is difficult to evaluate at this stage the impact on local businesses; Municipal operatives were likely to have undergone an expansion in their operations as they include solar activities in the businesses.

As this was a tied-aid project, BP was obliged to source a minimum of 87% of components from Australia. TV's and videos were however sourced from the Philippines. In addition some of the construction materials were sourced from the Philippines such as cement for the solar system foundations, as well as wood and taps, amongst a number of other such items.

In particular, there has been a great benefit derived by women, who previously suffered most as a result of the labor and time intensive tasks of collecting water from far away wells and rivers. These women are now able to walk to a nearby pump, access reliably clean water and complete tasks in a considerably shorter time. With the removal of such arduous tasks, many women are now able to seek further education and there has been an increase in women attending night classes, in particular for literacy education.

Electrification is also benefiting children, both for their health and education. The provision of solar systems and vaccines refrigerators to health centers means that children no longer have to wait a week for a doctor. Their education also benefits from the additional of video programs into curriculum that they can now view as a result of the MSIP's provision of TV's, videos and videotapes. For many children they are witnessing scenes from outside their areas and outside the Philippines – places they may never have seen or heard about before.

Project Challenges

Revenue generating activities
The levels of understanding for the need to generate revenue differed greatly between Barangays. BP conducted multiple visits to each barangay to encourage ongoing activities for revenue generation; however, the level of enthusiasm and success varied between villages. In some instances efforts were meeting with considerable success and Barangay members displayed great commitment to these enterprises in order to maintain the system and purchase additional items. . The lethargy and indifference of other barangays resulted in little revenue generating activities and low-level commitment was displayed.

A great problem is that many inhabitants never had to pay for any sort of government service before, so comprehension of this concept was not always straightforward. Some people were of the attitude of "why should we do anything", whereas others saw the benefits quite clearly and understood the connection between saving money and an increase in the benefits from solar electrification. BP now sees that it is necessary to try to develop a sense of enthusiasm and ownership among villagers.

Infrastructure
The implementation of over 1,100 solar systems in more than 400 Barangays within 49 Municipalities, spread out over a large geographical area (nine Provinces) and locations that are very difficult to reach, within a time period of three years was extremely challenging.

Logistics are a problem; the difficulty of getting into Barangays with all the required construction materials and the systems and equipment was an impediment to the project. In many cases it was necessary to travel using Caribos hence a need to improve infrastructure was identified as a major challenge for the future.

Community Expectations
At the outset of the project there was some skepticism in some communities, which hampered motivation and buy in.

In addition, as the MSIP program was the first to focus specifically on the provision of solar electrification to community areas, it encountered frustration on the part of inhabitants who questioned why they couldn't all have these things in their own homes. As the funding at this stage does not extend to such an extensive deployment, BP is unable to meet all these needs.

Political Uncertainty & Security problems
It was necessary for BP Solar to pull out of several areas due to political uncertainty. These were predominantly in the Mindanao region and were a result of a very real threat of attacks on employees and vehicles, as well as the increasing occurrence of theft of systems.

The project has experienced security problems from the NPA (Communist rebels), the Abu Sayef (Commander Robot's group) and the MILF. In all instances the problems were dealt with satisfactorily, and no one was hurt. In two Provinces the project implementation had to be stopped completely, (Tawi Tawi and Sulu) and in Basilan the project never began due to insurgent activities. However, additional provinces benefited from the project's withdrawals from these areas.

During the time BP was working in this region, there was an incident of a Christian Muslim shooting as well as the highjack of a BP vehicle. BP had initially hoped that the visibility of their efforts might overcome previous negative perceptions of Aid agencies and the Philippine government who had been under fire for not doing anything for their people. BP had hoped that in witnessing the large implementation of solar systems and the provision of electrification and electrified products, there might be a reduction in the threat from these areas. Unfortunately this was not the case.

Success Factors

The development need has to be the starting point for any (solar) project. The MSIP project assessed in each community what the exact development needs were, and how solar energy could be used as the enabling technology to meet these needs to maximize the community benefits in terms of health improvement, education, economic development, etc. The project was designed to enhance the Local Government Units (LGU) to deliver essential social services and elicit the participation of community organizations and individuals in improved governance.

For the project to be successful the community has to be committed and involved throughout the entire project, well beyond the implementation phase. Participation and a sense of ownership from communities and individuals in the design, implementation, and maintenance of the project is key; a central element of the MSIP project was community organization. Community ownership can also be enhanced by building incentives to perform in project design, for example by paying a fee to the BTT for maintenance of the equipment.

The MSIP project experimented with this concept by making communities pay for clean water for example, and it was important that such a scheme encompasses education of people to understand the health and other benefits of clean water.

For communities to be fully committed to make the project a success, they must see a clear and direct benefit of the project. It is important that the project design incorporates not only community benefits (health, education etc.) but that the project also identifies areas where individuals and companies can accrue direct economic benefits from the project, such as enabling fishermen to navigate or unload their catch at night. The MSIP project has generated indirectly substantial economic benefits (e.g. lights and television in schools increased children's attendance and motivated women in some villages to take up education), but paid limited attention to research direct economic benefits.

A key success factor of these projects is to ensure their sustainability, the simple interpretation of which is that the project elements (technology or equipment, as well as governance and maintenance) should function in 5, 10, 15 years down the road, after the project has been implemented. A key element in the design of the MSIP project, to ensure its sustainability, was training. Over 2,000 people have been trained - including 'training of trainers' - on the governance of the project (how to organize meetings, accounting and reporting; how to collect fees/local revenues for sustaining services/maintenance, etc.) as well as technical aspects (maintenance - including local repair and replacement of parts).

To some extent, the MSIP project has built an infrastructure or network of spare parts, by stimulating existing technicians and LGU to take on solar maintenance and manage the spare parts. Widespread use of manuals proved efficient. The project benefited from existing capacity in the University of San Carlos in Cebu, which met BP Solar's high standards for the repair of defective electrical components.

The management and implementation of the project relied largely on local people. The MSIP project was implemented with help of two full time BP staff from Australia. All other staff involved were local.

A key to the success of this project was its simplicity in funding arrangement. The project relied on a single recipient, the Department of Interior and Local Government (DILG). On the community level, it is important that any revenue collection scheme ensures that such schemes are affordable to many and equitable (e.g. it would not be fair to charge for community services such as electricity or potable water level II, where neighboring villages get such services free of charge).

The projects management was simple with limited red tape and delegated responsibilities as much as possible to local levels. Responsibilities have to be clear. Although the Government of the Philippines (DILG) accepted the mixed credit arrangement from AusAid/EFIC and bears responsibility to repay the "soft" loan, in the MSIP project the Local Government Units in municipalities and Barangays were held accountable for the successful implementation of the project. The DILG and LGU's have appointed Field Officers for day-to-day supervision. The project also established school and water committees. It is important to establish a simple but effective accountability system, including regular measurement of progress and success.

Finally, a key of this projects success was the rapid development, the ability to get this project off the ground in a very short time, and bring a visible pay off. At the outset of the MSIP project there was much skepticism among those that had been approached several times by development agencies, multinationals or other project developers without ever having seen any results. These projects are very complex in nature, so flexibility is important. It must be realized that one size does not fit all, but at the same time reaching a large number of people requires streamlining and replication of successful elements.

Lessons Learned

These projects by their very nature are complex to implement because of their integrated nature and remote locations. This requires professional and competent on-ground management.

The tools for sustainability are correctly sized and designed packaged solar system designed up to long-term performance specifications not down to a price and a well-thought through "Train the Trainer" program that can lead quickly to the establishment of well-managed and competent local project management committees.

Sufficient funds have to be made available in the Project Design and Approval Phases for such Technical Specifications, Social Preparation and Community Development and Maintenance Supervision to be adequate.

Future projects
Since MSIP's completion a number of subsequent projects have been built around its example, mostly funded by the Government of Spain. These projects have learned from the success and mistakes of the MSIP project. In particular the next generation of 'Integrated" projects will expand on the community benefits model and incorporate communal income generation and poverty alleviation aspects. As BP Solar has completed one major development project it has incorporated the lessons learned - not just Technical but more importantly the Social Preparation and Community Development aspects of the project.

Daimler Chrysler: Sisal Fiber Project South Africa

Summary

In East London, South Africa, DaimlerChrysler have undertaken a project to transfer technology used in the manufacture of Mercedes vehicle components from locally produced and manufactured sisal fibers. The technology came from a German firm already experienced in natural fiber component production. The technology recipients were two local South African firms, who now process the sisal fibers and manufacture the components. In addition DaimlerChrysler have been working with a local R&D group to improve the entire process supply chain, including the natural fiber production at the sisal farms.

The first sisal component was released for inclusion in the Mercedes-Benz C-Class vehicle in October of 2001. The sisal - cotton mixture from the local manufactures now makes up 75 percent of the material in the Mercedes Benz C Class's rear shelf. The two local firms have benefited from this technology transfer in that they are now successfully processing the fibers and producing the components to the required standards for the Mercedes vehicles.

The R&D component of the project has explored addition uses for the natural fiber that will present additional opportunities for these firms to expand their production. In addition a number of other automobile manufacturing firms have also begun using natural fiber components and the customer base for the two South African businesses is continuing to grow.

Introduction

Project partners

Daimler Chrysler South Africa
On April 19, 1999Mercedes Benz of South Africa became DaimlerChrysler South Africa. DaimlerChrysler Germany holds a 100% shareholding in DaimlerChrysler South Africa, making the corporation one of the largest German investors in South Africa.

DaimlerChrysler South Africa is one of the biggest employers in the Eastern Cape region with approximately 3,800 staff. Through extensive investment, DaimlerChrysler South Africa boasts a state-of-the-art manufacturing facility, which produces world-class products for international markets.

DaimlerChrysler South Africa is also active in component exports with components being exported to Germany, Spain, USA and the Far East.

Local firms Brits Textiles & NCI (technology recipients)
South African firm Brits Textiles conducted the initial two stages of manufacturing the fleece and shaping the components. The second firm, NCI, was responsible for the last stage of production prior to the release of the components to Daimler Chrysler.

Brits Textiles was founded in 1968 in the Gauteng Province of South Africa where it spent the first 9 years of its existence engaged in the production of fillings for the household textile and upholstery markets. In 1977 the Company moved to the Cape Province and now has 8 non-woven production lines split between their premises in Cape Town and Durban. Market segments served include automotive, apparel, household textiles, air filtration, construction, upholstery and agriculture. The automotive market sector accounts for nearly 50% of the Company's turnover of some R100 million / annum. 240 people are employed and around 55% of the Company's total output is exported either directly or indirectly.

NCI was founded in 1957 in East London as a clothing factory. In 1965 DaimlerChrysler South Africa, then known as CDA, approached NCI to convert and supply door panels for the W116 model. Since that time, NCI`s association with the automotive industry and DaimlerChrysler has grown to become the focus of its business. During this partnership that has spanned 4 decades, NCI has signed License agreements with numerous international companies resulting in the transfer of world-class technology to the Eastern Cape Region. Typical components supplied to the local automotive industry from NCI are carpets, parcel trays, sun visors, headliners and foam pads.

Council for Scientific and Industrial Research (CSIR)
The Council for Scientific and Industrial Research (CSIR) was engaged in the project to explore sisal-farming options, conduct a process chain assessment and examine alternative applications for sisal fibers

The CSIR has seven divisions operating in fields as diverse as manufacturing, defense, food processing, transportation, building, chemicals, mining, textiles, information technology and environmental science. With over 3000 employees, the organization has provided products and services on a number of continents. In its role as a contract and consortium research partner, it aims to provide technology and information solutions to support sustainable economic growth. The CSIR operates in all provinces of South Africa. It also works extensively in the Southern African Development Community region[3], with special emphasis on sustainable economic development activities.

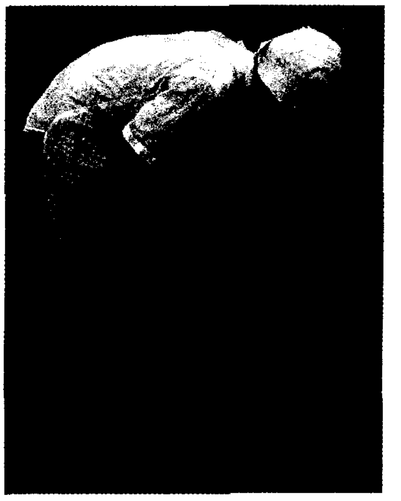
Country Profile: South Africa
The Republic of South Africa has a population of 43,586,100. South Africa has 11 official languages: Afrikaans, English, Ndebele, Northern Sotho, Southern Sotho, Swazi, Tsonga, Tswana, Venda, Xhosa, Zulu; English is widely spoken throughout the nation. The country consists of nine provinces: Gauteng, KwaZulu-Natal, Mpumalanga, North West, The Eastern Cape, The Free State, The Northern Cape, Northern Province and the Western Cape.

South Africa is a middle-income developing country with an abundant supply of resources, well-developed financial, legal, communications, energy, and transport sectors, a stock exchange that ranks among the 10 largest in the world, and a modern infrastructure supporting an efficient distribution of goods to major urban centers throughout the region.

Despite being a middle-income country, however, the income disparities are amongst the largest in the world, and fifty percent of the population lives below the poverty line. GDP as of 2000 was $369 billion, with GDP per capita of $8,500.

The country suffers from 30% unemployment and daunting economic problems remain from the apartheid era, especially the problems of poverty and lack of economic empowerment among disadvantaged groups. Other problems are crime, corruption, and HIV/AIDS.

At the start of 2000, President Thabo Mbeki vowed to promote economic growth and foreign investment, and to reduce poverty by relaxing restrictive labor laws, stepping up the pace of privatization, and cutting unneeded governmental spending. Further economic growth now rests on the government's goals of increasing overall living conditions, cutting unemployment and promoting exports.



The Sisal Industry
Sisal is grown commercially in a number of countries such as Brazil, China, Tanzania, Kenya and South Africa. It is indigenous to Central America and its origins can be traced back several centuries; the plant's name comes from the Mexican port city of Sisal. Sisal was first planted in South Africa around 1912, on a very small scale, at Ndumu near the Mozambique border. Widespread cultivation began in the early 1960s as a job-creation drive within the former homelands. By 1965, about 25 000 hectares of sisal had been established. Before 1960 most of the sisal used in South Africa was imported, however trade sanctions subsequently imposed on South Africa greatly stimulated the growing of sisal.

Current global demand for sisal fibers is approximately 286,000 tons per annum and is not expected to decrease during the next few years. Of this Brazil, with a market share of around 50%, is the largest producer followed by China, Mexico and Kenya. South Africa is currently one of the smallest sisal growers, producing about 500 tons per annum.

3 SADC member-states are Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

Local demand for sisal is approximately 3 000 tons per year. In South Africa there are 23 state-owned farms and one commercial farm. However, as a commercial farm can only supply 300 tons per annum and there is very little sisal take-off from state-owned farms, about 2 500 tons of fiber have to be imported each year. This imported sisal is approximately $600 per ton.

More recently, sisal was mainly grown in KwaZulu Natal and Northern Province. There were three commercially operated farms in KwaZulu Natal; two have ceased operations during 2000 and 2001, mainly due to labor problems. The third farm, Mkonge, which is still operational, is 700ha and produces approximately 25 tons of sisal per month. Two of the state-owned farms, Bendstore and Globe, are in the process of being privatized. Six additional farms are earmarked for development into a small-scale farm concept. It is envisaged that a central processing area will serve these small farm units. The remaining farms in this Province will ultimately be closed down.

Sisal fibers

Sisal fibers processed from the pointed blue-green leaves that can be up to two meters long. The leaves can be harvested for 12- 20 years before the agave starts to bloom and subsequently dies. Sisal is usually grown on land that is unsuitable for any other agricultural activity apart from grazing.

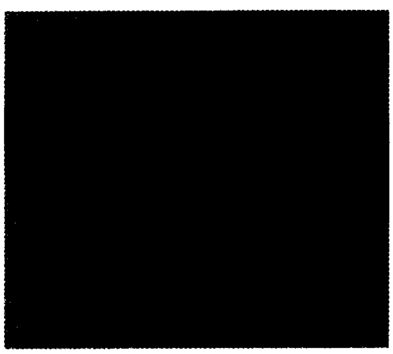
Manufacturing the natural fiber into a fleece mat requires only 18 percent of what is needed to produce previously used mats made of glass fiber. In addition the mat's density is approximately 45 percent lower than that of glass fibers. The components can also be easily recycled. Even when fiber quality is reduced due to repeated recycling the parts can be disposed of without any net increase of carbon dioxide in the atmosphere. There are also positive aspects for worker safety; in the past there have been negative affects such as skin rashes as a result of using glass fibers for making the same components

The strength of the interior components manufactured from sisal is very high, and is impact resistant and does not splinter. Refrigeration chamber tests have demonstrated that at various levels of humidity these parts exhibit high dimensional stability – a requirement all DaimlerChrysler vehicles must meet to ensure the proper safety levels in a crash.

Driving Forces and Objectives

Drivers

The initial effort to explore the possibilities of natural fiber was driven by the company's declared aim to make its products and processes as environmentally preferable as possible.



This declaration spurred research into environmentally compatible materials in 1991. By 1993, results from the six-member research team highlighted that the high stiffness and tensile strength of natural fibers made them highly suitable for use in the interior vehicle components. Several years of research identified flax, hemp, coconut, cotton and sisal as the most preferable fibers.

This project in South Africa, and the pilot project in Brazil were both driven by the company's objective of maximizing local content in vehicles. The current local content program is customs driven aimed at promoting two-way trade. Imported vehicles and components used in the manufacture of locally produced vehicles are liable for duty. Local content in fully built vehicles and components, exported from South Africa, earns credits that are used to offset import duties. Local content is therefore critical to the business in South Africa, and has spurred the active involvement in technology transfer projects that promote the use of South African resources.

Further, the properties of natural fibers not only provide environmental benefits, but there are often price and physical advantages over synthetic alternatives. For example, they are often stronger than some synthetics and, as they are lighter, they contribute to reducing vehicle weight.

Objectives

The objectives of the project were to set up an entire process chain that included:

- Farming of sisal
- Processing of the fibers
- Manufacture of the components
- Release to Daimler Chrysler South Africa

DaimlerChrysler aimed to transfer the technology for processing the fibers and manufacturing the components from Germany to South Africa, and to establish a system that provided reliable and consistently high quality components to Daimler Chrysler South Africa.

For the farming of sisal, the company's objective was to work with the CSIR to develop a model to commercialize state-owned sisal farms, for the main purposes of:

- Ensuring a stable local supply of sisal to avoid importation
- Generating long term sustainable jobs in a poverty stricken area
- Promoting local economic growth and development in the Northern Province
- Developing small, micro and medium enterprises
- Mobilizing investment into the area with an identified location advantage

This work was seen as a step toward improving the efficiency of sisal production, as well as a means of securing jobs for sisal farm workers in a more stable industry.

An additional objective was to identify alternative applications for sisal in vehicles so as to support industry growth and stabilization. This was of particular importance as the absolute volume of sisal to be used by Daimler Chrysler, at least in the early stages of the project, was quite low. A sustainable industry would essentially require other customers, and most likely other uses, to be sustained and grow over time.

Daimler Chrysler and natural fiber experience to date – POEMA

DaimlerChrysler was able to make use of the experience and expertise gained during its *POEMA project. POEMA* stands for "Programma Pobreza e Meio Ambiente na Amazônia " - the Poverty and Environment in Amazonia Research and Development Program.

The "Production Technology" Department of DaimlerChrysler do Brasil worked closely with DaimlerChrysler teams from Ulm and Stuttgart to make valuable technical know-how available to *POEMA*. DaimlerChrysler also joined forces with the University of Pará to study renewable resources from the rainforest with a view to establishing their suitability for use in auto manufacturing, especially coconut fibers and latex. March 7, 2001 saw the start of production at the "POEMAtec Fibras Naturais da Amazônia " (Amazonia natural fibers) company based in Ananindeua near Belém, Pará. This new facility was set up by the government of the state of Pará, the University of Pará and DaimlerChrysler. DaimlerChrysler made it possible for the company to purchase the latest production systems for processing natural fibers. These products are used in seats and headrests of DaimlerChrysler's commercial vehicles.

Project Detail

Commencement of South Africa project

The South Africa project benefited from the experience of a pilot project in Brazil; however, this new location did pose many new scenarios and considerations. To address this, the project commenced, in 1998, with a monitoring study. This involved several visits to South Africa by the Daimler Chrysler team to review and evaluate the entire process chain for manufacturing natural fiber components in South Africa.

An important first part of this initial review was examining the different fiber options available and determining which was a best fit for the project. While a number of fibers may have been suitable in a technical sense, it was sisal fibers that were selected. This was largely due to the potential for establishing an entirely locally based supply and process chain. An already established industry for sisal existed, and it was possible for all activities from growing and harvesting, through to manufacture of the components, to be conducted in South Africa.

Setting up the process chain

The company sought to become involved in all stages of the process chain. This included the farming of sisal, the processing of the fibers and the manufacture of the components for delivery to Daimler Chrysler South Africa. The first challenge in setting up the process chain in South Africa was to identify a company or companies that could manufacture the fleece from the harvested sisal fibers, hot press the fleece with resin powders and shape the component, and then cover the tray with textile, and finish off the component.

To set up this local processing and manufacturing, DaimlerChrysler engaged German firm Johann Borgers GmbH & Co. KG (Borgers), who performed the process for Daimler Chrysler in Germany using flex and cotton fibers, to assist in transferring the necessary the technology to South Africa.

Before the technology could be transferred from Borgers however, it was necessary to identify the technology recipient organization in

South Africa who could conduct these activities. It was however not possible to find one single business that could manage all these processing steps, so two South African businesses were selected to undertake different process and manufacture stages.

The first local business, Brits textiles, was able to conduct the initial two stages of manufacturing the fleece and shaping the components. The second firm, NCI, was responsible for the last stage of production prior to the release of the components to Daimler Chrysler. Initially a large number of firms were reviewed for their suitability. As this new product required new production lines and equipment, many existing firms were unwilling to make the investment. While both Brits textiles and NCI were initially hesitant to make the investment, they did eventually come on board to manage these aspects of the processing chain.

Transferring the technology
Borgers worked with Brits textiles to help them introduce the new hardware into the activities and to set up the processing system. There was also an exchange of skills to Brits textiles, as they had not previously worked with sisal. This included an exchange of personnel, including a technical team to help set up the production line. The major objective here was to establish a production line that could produce a stable supply that was of a consistently high standard - high enough to meet the end goal of Daimler Chrysler component standards.

Borgers assisted NCI through provision of equipment and skills training. As NCI was responsible for the delivery of the parts to Daimler Chrysler it was vital that they possessed the capabilities to produce a high quality component on a consistent basis, which could then be approved for use in automobiles.

The skills transfer to Brits textiles took place primarily via a two-week visit to Borgers in Germany by three of Brits Textiles' senior technicians. In addition, Borgers' personnel visited periodically to provide assistance. The skill transfer to NCI was conducted through two three-day visits by a NCI technical director to the Borgers manufacturing site. Additionally, a Borgers technician spent one-week at NCI assisting with the machine setup and production trials. In addition, an NCI technician made a one-week visit to Swedish firm, Swedejet, for training in water jet cutting techniques.

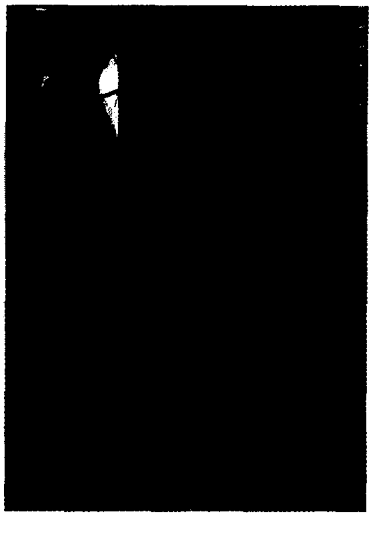
With the exception of the normal teething problems associated with a project of this nature, both suppliers experienced unforeseen problems with the onset of production. For Brits Textiles, the carding of the sisal pads was problematic and resulted in inconsistent weight and unequal distribution of the Phenolic resin powder and clogging of sisal fibers in the process that delayed the introduction. Further training, stronger relations and improved communication with Borgers led to improved production control, which successfully eliminated this problem.

For NCI, different lamination processes and trimming methods designed for South Africa affected the quality, resulting in capacity restrictions. In conjunction with Borgers and Swedejet the deficiencies were eradicated.

A cross-functional team approach between DaimlerChrysler South Africa, NCI, Brits and Borgers has proved successful in achieving the required results. Both are currently running at the required quality and quantity levels.

Sisal Farming
While the technology transfer occurred predominantly during these processing and component manufacture stages, Daimler Chrysler also became involved in the farming and research and development stages. To address this, Daimler Chrysler's Research Center in Ulm, Germany contracted CSIR.

This component of the project included work associated with the privatization of a number of sisal farms, and a process chain assessment to examine alternative applications for sisal fibers in South Africa.



Daimler Chrysler worked with CSIR to explore the best options for the privatization of farms. This work was seen as a step toward improving the efficiency of sisal production, and also as a means of securing jobs for sisal farm workers in a more stable industry.

DaimlerChrysler extended their efforts to exploring alternative applications and means for industry growth for sisal in recognition of the need to support the sustainability of the industry on the whole. Potential new applications were explored in an effort to increase overall demand for Sisal. Where this may result in an overall increase in crop levels as a response to demand it was hoped that the end result would be a more stable supply in the long term. This was of particular importance as the absolute volume of sisal to be used by Daimler Chrysler, at least in the early stages of the project, was quite low. A sustainable industry would essentially require other customers, and most likely other uses, to be sustained and grow over time.

The CSIR sought to develop a model for commercialization of state-owned sisal farms. Most of the sisal farms were located on land that owned by the state (Northern Province Government) or by a Tribal authority. The commercialization model developed proposed that the state land be also transferred to the community.

Structure and financing
DaimlerChrysler oversaw the technology transfer project in its entirety. However, contractual arrangements for each part of the process chain differed slightly.

Brits Textiles signed a Technology Agreement with Johann Borgers GmbH & Co. KG to receive technology for the manufacture of molded parts produced from natural fibers for the automotive industry. Brits Textiles made a one-off payment of U.S. $80,000 for this technology. Borgers' role included prescribing recipes suitable for the components involved; recommending raw material suppliers; assisting with plant sourcing and layout; and providing on-going technical and quality assistance.

Via an existing technology agreement between Borgers and NCI, Borgers provided assistance to NCI with the design and development of the lamination, trimming and assembly process. Under this agreement NCI pay a royalty of 2% on revenue generated to Borgers to retain their technological support.

DaimlerChrysler contracted CSIR directly to assist with research efforts into farming and project management.

The role of Daimler Chrysler
The research department and the development units of DaimlerChrysler were the main groups involved in the project. The research department assisted in all stages, capitalizing on their extensive experience to date and on the ability to bring all partners together.

The Daimler Chrysler Development Unit, responsible for the release of the components to the automobile assembly plant, was responsible for quality assurance. They were therefore required to monitoring the activities of all groups in the supply chain.

Daimler Chrysler maintained a passive role when it came to the earliest stage of the supply chain – farming. They conducted visits to farms and worked with CSIR to identify the best farms for privatization.

Project Outcomes

The first sisal component was released for inclusion in the Mercedes-Benz C-Class vehicle in October of 2001. The sisal - cotton mixture from these local manufactures now makes up 75 percent of the material in the Mercedes Benz C Class's rear shelf.

Brits textiles commenced processing of sisal fibers in August 2001 and NCI's component delivery commenced in mid August 2001. Daily demand is 220 parts per day. Both suppliers are currently running at the required quality and quantity levels after experiencing the aforementioned ramp- up problems. To date, the expansion of this new business for each firm has generated approximately 30 new jobs. The efforts to privatize sisal farms and stabilize supply are resulting in job retention for farms that may otherwise have been closed down.

Borgers have successfully brought Brits textiles into a new business field and now they are successfully processing sisal and constructing component pieces for NCI and Daimler Chrysler. They have also extended the network of Brits' contacts within the industry and future opportunities are beginning to emerge.

NCI were already established as an industry supplier, however the success of this venture has strengthened their overall business. Initially there were some problems with the consistency of component quality, however this has since been overcome and the green light was given for the release of all components to the automobile assembly. Some hurdles still remain however.

NCI have also benefited from international exposure as one of the principle suppliers in the natural fiber project. It has also experienced an increase in turnover on acquiring the parcel tray business and exposure to world-class logistic concepts such as JIT (Just in Time) sequencing.

There have also been various spin-off businesses from the initial project. These have included other parts for the same model, such as wheel arch sound dampers and also closed mould composite processes, architectural interior applications, civil engineering applications and plastic reinforcements.

The efforts to privatize the sisal farms have met with delays. However the commercialization model proposed by the CSIR was accepted for three farms. The main blockage has been at the political level (Northern Province) and relates to the understandable reluctance by government to commercialize these farms before having a packaged solution (social plan, land claims, commercialization model) for all 23 sisal farms.

However, in order to serve the demand from Brits Textiles and DaimlerChrysler, three sisal farms have been revitalized. That is, the fields have been cleared of bush encroachment, significant replanting has taken place, and all the equipment has been refurbished and is fully operational. These farms are now fully operational, but are still in state hands. Production is typically 1.5 tonnes per day per farm. Other local users have started to source sisal from these farms.

The future
DaimlerChrysler plan to increase the number of sisal based components in the future and the project's success is providing a foundation for several expansion activities. The company is exploring new components that can be made with sisal. The Development department is currently testing C class wheel arch dampings produced by Brits from South African sisal. Initial results have been positive and it is envisaged that production in South Africa will commence by the 2nd half of 2002.

New vehicles are also being considered as potential candidates for sisal component. The next stage in this process will be investigating the use of sisal-based composites on commercial vehicles components. Further, the company is seeking to use natural fibers in exterior components.

DaimlerChrysler's researchers have been studying the properties of natural fibers for many years now and exploring possibilities for using them in automobile production. As a result of the POEMA project in Brazil and the partnerships with CSIR, BORGES, Brits and NCI for the project in South Africa, DaimlerChrysler are now demonstrating that this technology can be successfully transferred to multiple locations, utilizing the different natural fibers available.

Project Challenges

Attracting local firms
The initial challenge was in convincing local firms to participate and make the necessary investments in the new-line for sisal production and component manufacture. With the project only requiring a small volume of sisal manufacture and the manufacture of only one single component piece it was difficult to attract firms that would be willing to invest in a new production line. While other potential uses and other customers may be attracted in the long term, the initial sales would only be of this smaller volume to Daimler Chrysler.

It required lengthy discussions and a high degree of interaction with potential partners before the two suppliers were identified and secured.

Need for constant monitoring
This project required a great deal of monitoring from Daimler Chrysler. It was necessary from the start to put a great deal of effort into motivating participants. Weekly calls were made to monitor progress against the project plan. If these had not occurred it was considered highly possible that progress would not have been made and goals not achieved.

One reason for this was the low level of profitability based on the initial levels of components required. It was therefore necessary to maintain momentum and motivation to keep progress on track.

Managing network and different business styles
The differing business cultures and communication styles between the organizations was problematic at times. As it was vital that there was a successful coordination of activities to ensure a consistent quality and output level, the different styles of doing business proved to be a challenge. Instability in output from the first processing supplier caused difficulties for the second supplier. Further, the business practices of the final supplier to Daimler Chrysler did at times negatively impact on the quality of the final component product.

It was vital for quality assurance reasons that the process descriptions were followed accurately. A resistance to change from one supplier led to deviation from process descriptions and ultimately a poorer quality component. It was necessary for Daimler Chrysler's procurement group to work with this supplier to ensure that they would not continue to cut corners to save production costs.

In addition, the differing communication styles proved to be a challenge at times. The reluctance of the South African partners to highlight problems was at times a challenge for Daimler Chrysler when trying to monitor progress against production goals.

Achieving a stability of supply
The process of introducing commercialization models to the sisal farms has been slow and complex. As a result of the delays incurred, it has been difficult for the supply of sisal to be stabilized. Failure to increase and stabilize supply may lead to a need for importing sisal for the component manufacture.

Success Factors

Achieving guarantees from the supply chain
The success of such a project relies on the ability of necessary supply levels to be guaranteed. Maintaining the desired level of local content within the supply chain has required DaimlerChysler to become involved in all stages, especially the first stage of sisal harvesting. As long as the farms under perform, and cannot supply reliable amounts, the success of the project is in jeopardy.

Local presence
It was vital for the success of the project that there was a high degree of personal contact. Such a venture could not be successfully managed from overseas.

Constant monitoring
Maintaining momentum and keeping progress on track requires very frequent communications and regular follow up on all issues.

Managing the network
Where such a project involves numerous partners in a supply chain, it is essential that the network do not become disjointed. Each organization is to some degree reliant on the action of others. The end product is a result of the cooperation of each organization and effective management of the supply chain.

Having a project champion
A project champion can enhance the success of such projects, particularly if this individual is from the local area.

Lafarge DuJiangYan Cement Company - China

Summary

French company Lafarge entered a joint venture agreement with DuJiangYan Building Materials Corporation to form the Lafarge Duijangyan Cement Company. Under this joint venture agreement, a new cement plant has been constructed in ChengDu, in the Sichuan Province of southwest China. The specific objectives of this project were to construct a new plant with state-of-the-art dry process technology, a new quarry and a railway for transporting materials.

While divided into three separate turnkey projects, the company's objective was for each to be built according to Lafarge quality, environment and safety standards. This was of particular importance in the construction phase as large-scale automation, strict safety requirement and high environment standards, and certain management styles were essentially new to the Chinese cement industry.

There was close collaboration between Chinese Engineering Institutes and the Lafarge Technical Center during the design phase and the implementation of the Technical Assistance Agreement that saw Lafarge provide managerial and technical expertise, reporting procedures, comparative data, training and advising capabilities to the joint venture company.

Lafarge best practices were transferred during the construction phase of each project, in particular those relating to safety and environmental practices. The Lafarge team worked with the design and construction firm's management teams to transfer skills and capabilities in manufacturing, installation and project management.

For the production phase of the project, Lafarge made available to the joint venture company, the company's worldwide practice in the cement activity. In particular, the experience of Lafarge's cement plant in Beijing was drawn on. Intensive training programs were carried out to ensure that all personnel were adequately informed and equipped with appropriate skills to manage and operate the plant in accordance with Lafarge's policies.

The plant, now in operation, has an annual production capacity of 1.4 million tonnes of high performance cement. Over 80 percent of the plant's production equipment was sourced locally and local firms were contracted for construction. The plant is equipped with the worlds most advanced technologies, and is noted for its environmental friendliness, fuel and electricity efficiency and high quality. Currently the plant and the associated quarry employ 338 people; mostly recruited locally in China.

Introduction

Company Descriptions

French based company Lafarge is active in 75 countries in four core areas: cement, aggregates, concrete, gypsum, and roofing. Lafarge employs nearly 85,000 people, and generated sales of €13.7 billion (US$ 12.15 billion) in 2001. In the cement industry, Lafarge operates 136 cement plants in 46 countries and employs 41,800 people.

Lafarge China Offshore Holding Company Ltd, a subsidiary of Lafarge Group, entered into the Chinese market in 1994. Since this time, Lafarge and its partners have invested around US$ 400 million in China, of which the Lafarge share is around US$ 220 million. Lafarge established its first joint venture in China in 1994 and has since created 13 joint ventures or wholly owned enterprises, in which Lafarge is the majority shareholder and operator. Currently the company employs 1,860 people in China.

The main operating units are:

- Lafarge Dujiangyan Cement Co., Ltd.
- Beijing Chinefarge Cement Co., Ltd
- Beijing Yicheng Lafarge Concrete Co., Ltd.
- Lafarge Boral Gypsum in Asia
- Lafarge Onoda Gypsum (Shanghai) Co., Ltd.
- West Gypsum (Chongqing) Co., Ltd
- Lafarge Roofing System (China)
- Lafarge Aluminates (China) Co., Ltd.

<u>Joint venture partner</u>
The joint venture partner in the Lafarge Duijangyan Cement Company is DuJiangYan Building Materials Corporation (DBMC). DBMC is a joint-stock Company invested by DuJiangYan State Assets Management Company and ChengDu WuNiuKeMei Investment Group Co. Ltd. The company aims to develop rich mineral resources in DuJiangYan and to build material industry in DuJiangYan with foreign investment. The Company was set up in February 1996.

Country Profile: China

China, the world's fourth-largest country and a landmass only slightly smaller than the US, has a population of 1.27 billion (as at July 2001) making it the world's most populous country. China stands as the second largest economy in the world after the US, but has a GDP of only $3,600 per capita.

China is however a rapidly developing country and recent industrial growth and a doubling in agricultural output has resulted in an increase in both domestic and export goods. The countries main industries are iron and steel, coal, machine building, armaments, textiles and apparel, petroleum, cement, chemical fertilizers, footwear, toys, food processing, automobiles, consumer electronics, telecommunications.

In 1985, China became the world's leading producer of cement, and today produces over one-third of total global output. China consumes about 35 percent of the world's cement, a figure expected to rise to about 40 percent by 2010. The country's cement demand and supply reached a good balance at about 620 million tonnes in 2001, but the increasing demand for high-quality cement outweighs current supplies. In Sichuan, the demand for cement in 2001 was 22 million tonnes, and this is expected to grow at around 10 percent each year.

ChengDu region and the project site
ChengDu, the capital of China's Sichuan province is located in southwest China at the confluence of the Nan and Fu rivers. The province has a population of 85 million people and 10 million of these citizens live in the ChengDu region.

ChengDu is an important regional center for metallurgy, chemicals, machinery, and electronics. It is also considered to be the cultural hub of southwest China and is the site of Sichuan University. As the center of Sichuan, Chengdu has a good technical base and strong construction force, which were available for the construction of this cement plant.

In Sichuan there are schools specialized in the cement industry, and as Chengdu is the Sichuan capital there is university research being undertaken in many relevant domains.

The project site is located in DuJiangYan, 55 km north west of Chengdu. The plant is situated on an area of around 34 hectares. The limestone quarry is linked to the plant by a 6.2 km conveyor belt.

Project Drivers and Objectives

Drivers
As part of the company's international growth strategy, Lafarge is committed to investing with Chinese partners in the long-term development of China's building materials industry in line with national industrial development priorities.

This is based on a strategy of establishing a substantial and profitable position in carefully selected regional markets. As part of this strategy, ChengDu was targeted as an increasing level of demand for cement was identified in the region.

In particular, an accelerated infrastructure development program is fueling this increase in demand - especially for high quality cement - as the Chinese government seeks to stimulate development in the west of China. The government, in particular, felt that this project was of strategic importance to regional economic development and that it could reduce the persistent supply/demand gap for high quality cement in the Chengdu region.

Objectives
The broad objective of this project was to construct a new plant with state-of-the-art dry process technology, a new quarry and a railway for transporting materials.

While divided into three separate turnkey projects, the company's specific objective was for each to be built according to Lafarge quality, environment and safety standards. This was of particular importance in the construction phase as large-scale automation, strict safety requirements, high environment standards, and certain management styles were essentially new to the Chinese cement industry. This project aimed to help improve the production technology of the cement industry in the Southwest region of China, including efficient management techniques.

As a result of the new dry process technology, production targets were set for an initial clinker production level of 3500 tonnes per day. Annually this equates to plant production 1,400,000 tonnes of cement.

The company aimed to develop this project in accordance with strict international cement standard, thus enabling the company to showcase a Lafarge "green plant" that could in turn set an example for environmental protection by a traditional industry.

Project Detail

Getting started
The project was first conceived by the joint venture partner DuJiangYan Building Material Corporation of China, who subsequently approached Lafarge with the proposal. The company made their first visit to DuJiangYan on April 1997 and after lengthy discussions to ensure objectives were aligned between each partner organization, the joint venture agreement was signed in September 1998. From this agreement, the joint venture company Lafarge Duijangyan Cement Co. Ltd. was formed.

Between April 1997 and September 1998, several studies were conducted to evaluate the proposed sites. This included a market analysis, a mineral resources evaluation and a feasibility study. In addition, the joint venture company, in conjunction with the International Finance Corporation (IFC) who provided project finance, undertook several efforts to guarantee that the project followed high environmental standards. This included an environmental impact assessment, a resettlement plan, extensive public consultation and development of an environmental management plan.

An application was then made for the business license; this was granted in February 1999. Land Use Right Certificates, for a 50-year term, and mining rights for the quarries, with a 20-year renewable term, were also issued to the joint venture company.

Construction plans were then divided into 3 projects – the quarry, the plant, and the railway.

For each of the three projects local contractors were employed for turnkey contracts. ChengDu Design Institute (CDI) was commissioned for the quarry project and the China Building Materials Industry Corporation (CBMI), led a consortium of contractors for the design and construction of the plant. The Sichuan Railway Bureau managed the railway project. Lafarge prepared the initial designs for each project, and consultations were held with each contractor so a complete and detail design could be agreed on. Work commenced in November 1999 for the quarry and May 2000 for the plant. Construction began on the railway in May 2001.

Capacity building – construction phase
Although these were turnkey projects, there was a high level of involvement from Lafarge for safety and quality control purposes. A quality control plan was devised between the contractors and the joint venture partners.

Representatives from the Lafarge Technical Center worked directly with the contracting firms. This required them to first develop a better understanding of how the contractors worked, and to also determine each group's strengths and weaknesses. This in turn determined the level of supervision and intervention that was provided during the construction phase of each project.

Lafarge best practices were transferred during the construction phase of each project, in particular those relating to safety and environmental practices. Many of the employees working on site were not used to safety requirements, even those as simple as wearing protective headwear and shoes. Typical of Chinese practice, there was a large workforce engaged for each project. This included up to 2,500 people, many of who were from the country areas, with relatively low education levels and little experience at working under safety guidelines or with safety equipment. It was not usual management practice for the Chinese partners to enforce these safety and environment standards, so the Lafarge team worked with the design and construction firm's management teams to develop these practices.

In addition, the construction partners were not used to compiling regular written reports, so efforts were made to ensure this became regular practice. Further, the Chinese partners had a tendency to adopt rigid hierarchical management structures that meant decision-making was often inflexible and non-inclusive. As part of this project, a more open structure was adopted to encourage information sharing at all levels, as well a commitment to targets and quality standards from all parties involved. All these activities formed part of an overall effort to ensure that each project was executed in accordance with the highest quality standards, thus avoiding any future remedial activities. This was a step-by-step process and change was not immediate. Increased communications and persistence eventually met with success and improved practices.

During the construction period, experts from Lafarge worked with the contractors to transfer skills and capabilities in manufacturing and installation. This was driven by the goal of having the construction works conducted in line with Lafarge principles. This included:

Lafarge project team - 24 people
- ✓ 6 foreign engineers
- ✓ 11 local engineers
- ✓ 7 supporting staff

Chinese Supervision Company
- ✓ 9 engineers

(Representing the Chinese authorities and conducting Chinese Standard compliance checks)

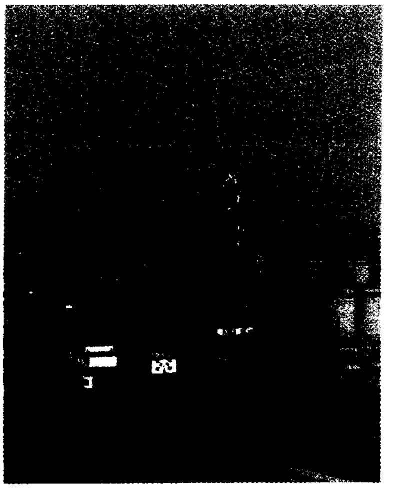
Lafarge Technical Center
- ✓ 29 trips from Europe in two years
- ✓ 13,000 hours spent dedicated to the project issues by CTI engineers

Reporting
- ✓ Regular Steering Committee meetings
- ✓ Daily contacts between team on site and Lafarge Technical Center
- ✓ Monthly reports

Financing

The total cost of construction was US$158.8. 35% of this came from the IFC who provided project finance of US$ 55M. The other 65% was sourced from Lafarge and the Chinese partner; equity sources were spilt 75% Lafarge, 25% from the Chinese partner.

Lafarge	US$ 77.4 million
Chinese partner	US$ 25.8 million
Debt - equity loans	US$ 55.6 million



Technology

The technology used to build this plant was the last generation of equipment that the company could source on the world market. The plant is equipped with the worlds most advanced technologies, and is noted its environmental friendliness, fuel and electricity efficiency and high quality. The process used is the "dry process" (5 stages) that permits optimal fuel consumption. All of the equipment is controlled by a central computer system.

90% of the mechanical equipment and 75% of the electrical equipment used for construction in the three projects was sourced from China. The China Building Material Tangshan Corp constructed production equipment for the plant. Construction standards adopted for the plant were Lafarge Standards unless the Chinese standards were stricter.

Capacity building- production phase

For the production phase of the project that is now underway, Lafarge have made available to the joint venture company, the company's worldwide practice in the cement activity, technical and managerial expertise, reporting procedures, comparative data, as well as training and advising *capabilities*. In particular, the experience of Lafarge's cement plant in Beijing was drawn on. This included many visits from the Beijing plant.

Sichuan is one of the most populace provinces and as a result it was possible to recruit from other cement plants in China similar to DuJiangYan. Some skilled managers were seconded from other Lafarge units.

Intensive training programs were carried out to ensure that all personnel were adequately informed and skilled to manage and operate the plant in accordance with Lafarge's international policies. This included a one-year of training program for all management and supervisory employees in the form of Lafarge's "OPG" program – Operational Preparation Guide. This was previously used in Beijing with successful results.

Project Outcomes

Progress

➲ **Quarry contract**
- ✓ Turnkey contract signed in September 1999 with CDI - a local cement and mining institute
- ✓ Installation totally completed
- ✓ Delivery of first limestone in the plant on December 1st 2001

➲ **Plant contract**
- ✓ Turnkey contract signed in November 1999 with a consortium leaded by CBMI
- ✓ Installation totally completed
- ✓ Kiln firing on January 28th, 2002
- ✓ 16000 t of cement produced by April 18th.

➲ **Railway contract**
- ✓ Engineering contract signed in November 2000
- ✓ Turnkey contract signed in May 2001 with Sichuan Railway Bureau
- ✓ End of commissioning on February 28th 2002

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*CDI - ChengDu design Institute
CBMI – China Building Materials Industry Corporation

The quarry was completed in December 2001 and the railway project was completed in February 2002. The plant was completed mid-April 2002. Each project was completed within budget.

The plant has an annual production capacity of 1.4 million tonnes of high performance cement. Currently the plant and the associated quarry employ 338 people; many of these are local employees, 181 come from DuJiangYan area, 31 come from ChengDu, 80 come from other parts of Sichuan, 39 come from other provinces of China and 7 from outside of China.

Capacity building efforts with the local design institute and construction groups has resulted in a transfer of skills and capabilities. Particularly in relation to quality control processes and safety and environment practices. In addition, for many this was the first time they had collaborated with an international company and the first time they had worked with such a large-scale project and equipment. As a result of this project, local construction capabilities have been developed that will contribute to ongoing regional economic development, particularly that related to new process technologies, environmental protection and high grade products.

This is the first turnkey project in China's building materials industry, and is expected to have a far-reaching effect on the construction of future cement plants.

Project Challenges

Quality control (construction phase)
Even where education levels were good and it was easy to transfer these skills, the main difficulty was to change bad habits.

Cultural differences
There were cultural differences and varying business styles that impacted on the planning and construction phases of the project. Different parties strongly felt that their way of doing things was the best approach, and at first there was a resistance to considering alternatives. The issue of 'losing face' for the Chinese was not something familiar to many of the expatriates. High sensitivity to such cultural differences was necessary.

Song relics on plant site
There was a delay in plant construction after the discovery of Song relics that lasted for five months; a museum to house these on site was then constructed. Plant site work stopped for 5 months. Construction of a museum inside the plant.

Conflicts with local farmers
Construction was very close to the many farmers' houses and hence the contractors employed from these families. There were instances where the contractors did not pay the farmers on time and the

grievances were then made directly to Lafarge; and construction was delayed in these instances.

Safety problems
The Chinese contractors did not have high safety standards and were unfamiliar with the safety equipment used by Lafarge. Changing the behaviors of these employees so they adopted safety practices and used the appropriate equipment was a time consuming and challenging effort.

Autumn 2001, heavy rains
In one night alone there was 250mm of rain. There were landslides along the roads and the belt conveyor. As a result it was necessary to rebuild the roads and conduct new soil surveys.

Lack of experience of general contractors
To manage large project and to organize properly no-load tests and commissioning

Training new staff
There were some difficulties experienced in the transfer of skills and knowledge to the Lafarge DuJiangYan project. This was predominantly related to the need to alter deeply embedded practices and habit. In this instance the efforts made to explain why such changes would contribute to improved performance and the move to implementing safety standards and reporting requirements led to improvements over time. The younger, better-educated staff were most receptive to new principles.

Success Factors and Lessons Learned

- Financial strength and technical support of a large International Group with extensive experiences in cement

- Strong management team and well developed procedures (cost control, scheduling, quality control, etc)

- Good working relations with our local partner and support of the Government

- Close collaboration between the Lafarge team and the Chinese General Contractors

- Listening to the different parties in taking into account the cultural differences

- Value of experience: having managed operation in China for over eight years and set up twelve joint ventures, Lafarge has gained extensive experiences in working together with local firms. The company has developed a good understanding of the local practice, and is able to assess the local firms' capabilities

SC Johnson: Pyrethrum Sourcing from Kenya

Summary

Flowers, grown by subsistence farmers in the highlands of Kenya are the key active ingredients for value-added products found in households around the world. Pyrethrum, a unique daisy, is the source for a naturally occurring insecticide that degrades quickly back into the earth. Over the past 30 years, U.S. company SC Johnson has become one of the biggest single end users of natural pyrethrins, for RAID™ household insecticide products

The Pyrethrum Board of Kenya (PBK), a parastatal agency that controls and operates the entire pyrethrum business in Kenya, manages the country's total supply of pyrethrum through a network of farmer cooperatives. SC Johnson has worked directly with PBK since 1970. This relationship has extended considerably beyond that of a normal supplier-purchaser relationship, characterized increasingly by a strong degree of knowledge and technology exchange.

SC Johnson has helped PBK develop planning and forecasting abilities through sharing of best practice examples and on-going advice regarding establishment and maintenance of a safety stock to help offset harvest shortages. SC Johnson has also provided technical assistance to PBK. The company has provided bio-efficacy testing protocols and tools to allow for a better comparison of results between products tested at PBK in Kenya and at SC Johnson in the US. In addition, SC Johnson has collaborated in the development of up to date analytical chemistry methods that have aided in the identification of new and different pyrethrum extracts.

As a result of this long-term capacity building effort, there has been a notable improvement in product quality and a rise in production standards. PBK have made continuous improvements in their quality control programs, and they have passed supplier audits from SC Johnson. Standards continue to rise and PBK is now seeking ISO certification.

Introduction

SC Johnson

SC Johnson is a 116-year-old family-owned and family-managed business that manufactures home cleaning products and products for home storage, insect control and personal care. Annual sales are estimated at more than US$4.5 billion and the company, based in Racine, Wisconsin, U.S. employs 9,500 people and markets its products in over 100 countries worldwide.

Country Profile: Kenya

The Republic of Kenya lies on the Indian Ocean coast and forms part of the East African Region. While it is the most developed economy in East Africa Kenya's population of over 30 million people, realize a GDP per capita of only US$300.

Employment in Kenya is largely dependent on the agricultural sector. The major export commodities in Kenya include, tea, coffee, horticultural products including cut flowers, processed petroleum products, pyrethrum, and other miscellaneous chemicals such as fluorspar, soda ash, sodium carbonate and diatomite.

Kenya's development challenges are not unlike those of other developing economies. Long term barriers to growth, such as the dominance of key sectors by the government, endemic corruption and a high population growth rate continue to retard development.

Natural Pyrethrum and Synthetic Pyrethroids

Pyrethrins are the class of insecticides derived from the dried flowers of the Pyrethrum daisy (Chrysanthemum cinerariaefolium). Natural pyrethrins are not used widely in agriculture because they degrade easily upon exposure to sunlight.

For this reason, several pyrethroids - synthetic chemicals with a molecular structure and biological activities similar to natural pyrethrins - have been developed for use in agriculture. The largest use for natural pyrethrum is in the manufacture of consumer household insecticides.

Pyrethrum was introduced to the highlands of East Africa in the

1920's and by 1938 Kenya had become a major world producer. It has been the largest source of natural pyrethrum for the last 60 years and currently produces over 70 percent of all pyrethrum traded in the world. Pyrethrum provides valuable economic and social benefits to more than 200,000 subsistence and low-income farmers in Kenya.

Pyrethrum is a perennial crop that requires renewal once every five years and is grown in highland areas enjoying moderate well-distributed rainfall, cool night temperatures and rich volcanic soils. In some areas where pyrethrum is grown the climate and soil structure cannot support other cash crops such as tea or coffee.

Other advantages for farmers are that it grows with limited inputs, such as fertilizers and pesticides, and farmers can rotate with other crops to compliment land use and avoid disease difficulties. The size of the land owned by pyrethrum growers in Kenya averages 3 to 5 acres in which the homestead is located and where the pyrethrum and food crops such as maize, potatoes, cabbages and kales are grown.

However, some growers do not own the land on which they grow pyrethrum and have to rely on either hiring land from neighbors, planting on government owned forest land, or even using road reserves.

For many Kenyan farmers, pyrethrum represents an important entry point to the monetized economy, and provides considerable social benefits to farmers, their families and communities. The price remains stable for a one-year period, and for over 200,000 subsistence farmers it is the only reliable source of cash. It is well suited to the economic circumstances of smallerholders, as input requirements consist only of readily available planting material and labor for planting, weeding and picking; chemical inputs are not required

Pyrethrum has a favorable environmental profile in that very little chemical and fossil fuel inputs are consumed.

The Pyrethrum Board of Kenya

The Pyrethrum Board of Kenya (PBK) is a parastatal agency that has been mandated to oversee all activities related to the production of pyrethrum in Kenya for the benefit of growers and consumers.

PBK is a cooperative body established in 1934 through an Act of Parliament. The Act gives PBK the responsibility of licensing and providing extension services to growers, and mandates the Board to purchase all pyrethrum grown in Kenya.

Growers are paid monthly and PBK processes the entire crop into suitable products for sale to companies such as SC Johnson.

However, other government legislation limits the Board in its abilities to source for bank credit and thus better manage pyrethrum inventory and supply. For instance, PBK must seek government approval for funding from the parent ministry– the Ministry of Agriculture – to finance a buffer stock, which would bring the much-needed stability to supply. Such approvals are needed quickly to maintain the quantity of the supply, but the bureaucratic approval process is often too long to achieve this. Further, the Act demands that PBK remit all surplus earnings in a given year to growers, thus leaving little working capital to provide for reserves.

PBK provides a high level of transparency and consistency in crop pricing for growers. The annual price level is publicly announced in the media at the beginning of each year and remains constant for 12 months.

The crop grown by farmers is delivered to PBK through intermediaries, such as cooperative societies, self help groups and PBK collection centers. These cooperatives operate at different levels. Growers deliver the flowers to individual cooperatives who form a union that subsequently supplies PBK. The intermediaries between the grower and PBK deduct commissions for their services.

This lengthy and complex supply chain is inherently inefficient, and PBK is looking for ways to increase efficiencies into the structure. PBK is working with farmers and cooperative management to develop new and better ways of managing the supply chain, and to encourage transparency within each cooperative structure. This is of particular importance as these cooperatives enable individual growers to consolidate their often meager flower output into viable quantities for delivery to PBK, as well as providing communities an opportunity to learn business skills and a reason to collaborate across tribal lines.

The industry is preparing for liberalization in line with current government policy as a result of IMF rules and directions. This is expected to change the ownership and the way parastatals are managed. The PBK looks forward to the day it can operate as a self-sufficient, commercial entity unfettered by government bureaucracy. It desires to operate as a market oriented enterprise that is able to seek investment capital for property, plant and equipment, and to build a suitable inventory to stabilize supply through the creation of buffer stocks. While this will mean that farmers will be able to grow pyrethrum without requiring PBK licenses, the processing and refining equipment of the PBK is necessary to produce the saleable product. Unless an alternative group invests in this technology, the growers are likely to remain with the PBK.

Industry structure

Initially ground pyrethrum flowers were used as a raw material input for making mosquito coils and powdered insecticides resulting in a limited customer base. Success in the extraction and refining of purified pyrethrins from the flower gave this natural insecticide much broader applications, such as water-based aerosols that SC Johnson pioneered. There has been increasingly wider recognition of the value of natural pyrethrum and pyrethrins for use in household insecticide products. The US is the single biggest market today, and only 6-7 major American buyers of purified extract remain, most of which are distributors who purchase from the PBK and later resell to manufacturers.

During periods of shortage, some pyrethrum consuming companies have shifted supplies, in full or part, to synthetic pyrethroids to reduce their supply risk on the natural product and save costs. Currently the market is consuming approximately 60 percent synthetic pyrethroids and 40 percent natural pyrethrins.

Project Drivers and Objectives

SC Johnson produces a variety of household insecticide product forms under the RAID name, which utilizes natural pyrethrin and synthetic pyrethroids. Due to corporate environmental objectives, SC Johnson prefers the use of natural pyrethrins if an adequate supply can be reliably sourced. Less- expensive, high quality synthetic pyrethroids are also a viable option for product formulas since regulatory agencies governing the safety and marketing of insecticides characterize and regulate the natural and synthetic as the same.

PBK processes and markets all of Kenya's pyrethrum, of which over 95% is exported. Kenya's production constitutes more than 70% of global supply. The reliance on a single supplier in any business presents a certain risk, so a high level of reliability and consistency of supply is required. For SC Johnson's RAID business, this stability of product supply is essential. The company needs to determine product formulas years in advance of actual manufacture and sale due to the rigorous and lengthy government registration and approval processes for household insecticide products worldwide. As a result, in some instances product formulas have been based on access to a stable supply of either natural pyrethrins or synthetic pyrethroids. For PBK the more reliability they can provide the more likely natural pyrethrins would be included in formulas, thus securing a higher level of sales.

While the supplier of synthetic pyrethroids has proven to be able to provide a very reliable consistent level of supply, Kenya has not. PBK has not always been able to provide reliability, and following an audit process it was identified that there was considerable room for improvement before PBK could become a satisfactorily rated SC Johnson supplier. As long as this remained the status, the issues of reliability and consistency would always pose a threat to keeping natural pyrethrins in product formulas.

Therefore, as a result of SC Johnson's long-standing relationship with PBK and the preference for natural pyrethrins, an ongoing capacity developing effort was undertaken to assist PBK in developing its capabilities as a global supplier.

Project Detail

History of involvement
Over the years, SC Johnson has become one of the biggest single end users of natural pyrethrins. As a result the company developed a direct purchasing relationship with the PBK rather than purchasing through an intermediary. From this has developed a 30-year relationship.

SC Johnson has worked directly with PBK since 1970. This relationship has extended considerably beyond that of a normal supplier-purchaser relationship, characterized increasingly by a strong degree of knowledge and technology exchange. SC Johnson developed a strong commitment to this relationship and the provision of capacity building to address a range of issues and practices. In the early days there was a focus on exchanging skills and knowledge pertaining to pyrethrum growing, crop husbandry, laboratory maintenance and pyrethrin analysis. Education and training was offered to PBK's personnel in this area in the late 1980's. There has also been dialogue and exchange of views and technical information, with SC Johnson helping PBK to develop and maintain a state of the art manufacturing and quality assurance program in its factory. This collaboration is ongoing.

In addition, SC Johnson has helped a major PBK customer set up a factory to manufacture mosquito coils in Kenya utilizing Kenyan pyrethrum. SC Johnson purchases the pyrethrum-based coils from this PBK customer for sale in Kenya and the surrounding countries. For this, SC Johnson provided a company scientist to work in Kenya with PBK's customer and has provided on-going periodic technical support over the years.

The focus of the efforts shifted however in the last ten years, predominantly as a result of shortages experienced, as well as the increasing competitiveness of synthetic pyrethroids.

Initially SC Johnson was sourcing primarily natural pyrethrins. However during the supply shortage of pyrethrum in the early 1980's, SC Johnson turned to synthetic pyrethroids that had improved in quality, price, and availability. A supplier was identified in Japan, which provided very high levels of customer service, efficiency and professionalism that made them an appealing supplier.

On one hand this made the task of sourcing the input materials easier for SC Johnson Global Purchasing and Procurement Group, and the R&D Group were able to alter and register product formulas for this synthetic input.

However, the company maintained a preference for using natural pyrethrins and felt strongly about maintaining the relationship established with the PBK. While formulation with only natural pyrethrins was not possible due to the shortages to be expected from any naturally sourced ingredient, the company looked to PBK to maximize their input. The decision to work with only one supplier entailed a certain level of risk, and it was in the company's best interests to consider how productivity of the output of the PBK could be improved, especially in relation to quality standards and reliability of supply.

The challenge then was to help PBK to reach higher standards as a supplier. The company had to address why PBK could not offer the same level of service that came from the synthetic suppliers, and consider what actions could be taken to improve the situation.

SC Johnson introduced its Quality Assurance Audit to PBK in 1995 and at this time their processes were significantly below established criteria to be considered an SC Johnson "Partner in Quality." Efforts were then directed at helping PBK reach this global standard. This effort is still ongoing.

Understanding each organization
An important part of this knowledge transfer and capacity building has been the initial and ongoing process of exchange that has enabled each organization to better understand each others business as well as the operating constraints faced. Business cultural differences and the structure of each organization have resulted in a clear disparity between the way in which each organization approaches the relationship and the resulting expectations that emerge.

PBK do not operate with the same level of understanding of customer service that SC Johnson may be more familiar with from other suppliers. PBK differ from many of SC Johnson's other suppliers in that they are a parastatal organization, based in rural Kenya and reliant on the output of 200,000 growers operating within cooperative social structures. Therefore they face different challenges and have different needs as a supplier. Due to a range of operational and institutional constraints PBK requires for example, a considerably longer lead-time for orders that has in turn required adjustments from SC Johnson.

SC Johnson on the other hand operates in a considerably different environment. The company is largely driven by the need to have consistent supply levels to enable effective planning of production. It has therefore been helpful for PBK to spend time with SC Johnson to understand how product formulas are developed and how large-scale production of RAID is planned. PBK also needed to better understand issues such as impurities and how they affect products.

Understanding and adapting to these factors has required reciprocal learning on both sides. In one effort, there was opportunity for the Chief Chemist of PBK to spend 3-4 months with SC Johnson in the US. Internship exchanges that see PBK employees spending 3 – 5 days at SC Johnson in Racine, as well as SC Johnson employees spending time with PBK in their Nakuru research laboratories, have also been valuable in building skills and understanding for both PBK and SC Johnson personnel.

There are regular visits by PBK personnel to the US. This often includes two visits per year to SC Johnson headquarters. SC Johnson personnel also visit PBK in Kenya, on average twice a year. This provides an opportunity for SC Johnson to examine the operations of PBK and the pyrethrum growers, and better understand the hurdles they face. SC Johnson staff spends time in the fields, with farmers and with officials of co-operatives, field extension staff and other employees of PBK.

In addition, the process of conducting quality audits has brought a better understanding and direction to PBK regarding improvements necessary to upgrade their performance level.

Helping with planning and forecasting

Strengthening PBK's ability to provide a reliable level of supply has become a focus of the capacity building efforts. This has required different levels of involvement and support, largely in an informal nature, rather than through a highly structured capacity building effort.

SC Johnson has helped PBK develop planning and forecasting abilities through sharing of best practice examples and on-going advice regarding establishment and maintenance of a safety stock to help offset harvest shortages.

During visits to PBK, SC Johnson experts have helped PBK learn how to better and more accurately forecast yields from dried flowers which is necessary for ensuring a reliable level of supply.

Recognition of the need for a greater understanding and appreciation of each organization's position, has led to a situation of constant feedback between the groups. Planning and purchasing personnel from SC Johnson conduct monthly teleconference calls with PBK to address supply quantity, pricing and quality issues, and these issues are further addressed during the visits made by SC Johnson personnel to PBK and vice versa.

SC Johnson has also worked with PBK to help develop a more customer service oriented mindset. While there are many limitations faced as they operate in rural Kenya as a parastatal organization, it is important for them as a supplier to adopt more customer-oriented practices to enhance their competitiveness.

Technical assistance

SC Johnson has also provided technical knowledge to PBK. The company discusses the limitations of various bio-efficacy testing methods to enable PBK to ensure that biological performance matches the analytical quality of their production.

SC Johnson has shared bio-efficacy testing protocols to allow for a better comparison of results between natural pyrethrin products tested at PBK in Kenya and at SC Johnson in the US. The company has also collaborated in the development of up-to-date analytical chemistry methods that have aided in the identification of new and different pyrethrum extracts, as well as enabling the more accurate determination of active ingredient levels in pyrethrins shipped to Racine from PBK. Information on new product formulations utilizing pyrethrins has also been shared with PBK. This has been accomplished by SC Johnson scientists visiting PBK; by PBK scientists and representatives visiting the company's Entomology Research Center in Racine; and by discussions held at various international meetings.

Project Outcomes

As a result of this long-term capacity building effort, there has been a notable improvement in product quality and a rise in production standards. PBK have made continuous improvements in their quality control programs, and they have passed supplier audits from SC Johnson, as well as by other buyers such as Aventis. Standards continue to ise and PBK is now seeking ISO certification.

PBK is now recognized as an SC Johnson "Partner in Quality." The company's quality audits rate supplier performance from 1.0 to 5.0. A 4.0 is the minimum audit score required for a Partner in Quality status, which PBK achieved after only three audits by working in collaboration with the SC Johnson Supplier Quality Audit team.

The planning systems SC Johnson introduced to PBK were something they had not used previously and have led to an increase in the stability of supply levels. SC Johnson has also benefited through continued consumer-preferred products; more efficient use of the active ingredient; new product ideas that utilize natural pyrethrins; and access to a continued supply of this natural ingredient. While supply has become more stabilized, continuous improvements should be addressed and a diligent effort made to maintain consistency. The most recent shortage experienced may have created the most significant shift away from natural pyrethrin formulations than any time in the last decade, and it can take years for the industry to fully recover.

The company is also working to develop a sustainable business model for RAID, and recently conducted a detailed field survey in Kenya to evaluate the financial and non-financial capital being gained by pyrethrum farmers. The total life cycle analysis of pyrethrum was a first step in designing a model for all SC Johnson businesses that values the financial and non-financial impacts of raw materials. Such a commercialization model will build on a foundation of economic, environment and social equity ('3E'), including supply chain and external stakeholder partnerships. This may have further potential impacts on the SC Johnson/PBK relationship.

Clearly, pyrethrum is a complex crop and industry, yet the PBK and SC Johnson have done well to bring so many subsistence farmers up to standards and given them the ability to manage this crop effectively and profitably.

Social Benefits

200,000 farm families are now benefiting from pyrethrum as their primary cash crop, and PBK employs 680 people, with an increasing number of women in management. Overall, approximately 300,000 jobs are attributable to the growth and stabilization of the industry.

Pyrethrum has been generating economic benefit for communities, with part of the income generated being utilized for social development, such as being a major contributor to the building of schools, health centers, roads and other rural infrastructure. In addition, the profits from pyrethrum are having a considerable impact on schooling levels.
The income derived from two acres of pyrethrum is sufficient to pay the school fees for three children in primary school and one child in secondary school or college. It is estimated that the school fees of more than 300,000 children are paid from pyrethrum earnings each year.

This cash crop is of enormous value to subsistence farmers, and a measure of success can be gauged by evaluating the increase in numbers of children attending schools in the areas where pyrethrum is now being grown as well as the overall standard of living enjoyed by pyrethrum farmers.

The cooperative structure, while problematic as a tool for managing the marketing of pyrethrum at a community level, contributes positively to a sense of cohesion. Cooperatives are also bringing community members together to determine how funds should be allocated for investments such as building new schools, bringing about a sense of participative decision making to the communities. Pyrethrum is also having a positive impact on families, as it is often a family enterprise that involves women and children as well. Many PBK employees have fond memories of picking pyrethrum after school and have pyrethrum to thank for their education. They stress how the children's role of weeding and picking pyrethrum is important in their social development as responsible members of their family and community. Pyrethrum is also grown in schoolyards and tended by students and teachers to raise funds to purchase supplies and equipment, and to improve facilities.

Environmental Impacts
Environmentally the impact of this crop is considerably lower than most other cash crops especially in comparison to other agricultural industries in Kenya. Chemical use is high for flowers, but negligible for pyrethrum; the crop grows well without fertilizer inputs, which in any case many farmers cannot afford or easily access. Weeding is generally done by hand and the plant itself is a natural insecticide, plus it is relatively easy for growers to rotate their way out of problems.

Farmers that shift to pyrethrum are often moving away from such environmentally damaging activities such as deforestation for charcoal burning so it offers an environmentally preferable source of income for these individuals.

Pyrethrum in Kenya: Financial and non-financial capital impacts		
Economic Capital	**Environmental Capital**	**Social & Human Capital**
US$25 million in export sales value to Kenya	Rotation crop helps maintain soil in 17,600 to 32,000 hectares on Kenya highlands.	200,000 farm families can educate up to three or four children each year through elementary and high school.
Natural compound. Broad bio-efficacy and food handling approval	Little chemical and fossil fuel inputs versus other cash crops like coffee, tea and flowers.	680 direct employees at PBK makes it the largest employer in Nakuru. Over 300,000 direct jobs are created by the pyrethrum industry
200,000 farm families rely on pyrethrum as their primary cash crop.	Grows in the highlands, and does not tie up the land like other cash crops	80% of proceeds returned to farmers via a cooperative structure.
900,000 Kenyans (farm families and day workers, PBK employees) have economic access through pyrethrum.	Marc, a production by-product once considered waste, is sold as mosquito coil filler. Remaining vegetable waste by-product is used as animal feed.	Primary support in agricultural husbandry, technical support for pyrethrum growing and cooperative business management
A cash crop that enhances food security by growing in rotation with subsistence crops (potatoes, corn, beans and dairy)	Pyrethrum crop does not require irrigation. Relies on natural rainfall.	Women (and children) have primary role in pyrethrum harvesting. Women are beginning to be represented in management positions in PBK and cooperatives.

Project Challenges

Reliable Supply
This natural agricultural product will always be subject to the vagaries of weather. Technological advances have made the pyrethrum plant more drought tolerant and able to be cultivated in a wider range of altitudes, but the impact of weather continues to loom as a critical variable.

A predictable, consistent supply of high quality pyrethrum will likely continue to be the number one challenge facing this partnership.

Value proposition and cost competitiveness
A challenge for the industry remains regarding the value of natural pyrethrum. As long as natural pyrethrins and synthetic pyrethroids are considered 'equal' by the EPA (US regulatory agency responsible for oversight on pesticides,) and synthetic pyrethroids are available at a much lower price than natural pyrethrum, the growth of the pyrethrum industry is threatened.

It will require the market to consider environmental and social value throughout the supply chain and in the calculation of the value proposition to conclude that a higher cost naturally sourced material is competitive with synthetic analogs. The challenge for PBK as a long-term raw material source is to create greater awareness and demand for the natural product, in conjunction with increasing production of the crop.

In the long-term, an inability to do so may threaten the overall sustainability of the industry and the ability for SC Johnson to retain natural pyrethrins in product formulas.

Macroeconomic & social stability
Kenya continues to be left behind by the global community due to the slow progress of economic market reforms. While there is no past history of pyrethrum supply disruptions due to these factors, Kenya is facing problems of real and perceived corruption and slow economic growth, bringing into question the PBK's ability to provide a reliable supply of natural pyrethrins to the world market.

Currently the US EPA and other regulatory agencies, consider natural pyrethrins and synthetic pyrethroids to be equal. As a result, differential labeling cannot be used on product packaging and advertising cannot highlight the use of natural pyrethrum. This limits the ability of the marketer to provide the necessary facts about natural pyrethrins to the broadest consumer audience. The PBK's ability to grow the market would be greatly enhanced by a shift in the current position held by these agencies.

Success Factors & Lessons Learned

Focus on a market orientation
In an environment filled with subsidies and closed market policies, it is important to rely on open market principles and a competitive value proposition. Transparency, efficiency, technology and reliability will be the key success factors to gain global market share. Once liberalized, the PBK will be empowered to manage itself as a private business, requiring they make needed changes in staffing levels and pursue growth-oriented investments. As a private business, it will no longer be tied to government constriction, and will be better positioned to promptly seek investment capital whenever needed.

Face to face meetings
No number of written reports can replace the learning that occurs both ways when business partners meet on each other's soil, especially with partnerships that transcend culture and economic resources. A one-way road with the supplier always meeting at the buyer's home turf is not sufficient. In this case, SC Johnson's knowledge of actual conditions faced in the growing, production and exportation of pyrethrum was key to finding opportunities to become better business partners. A common understanding of each other's strengths and weaknesses is one path to a synergistic partnership. For instance, SC Johnson shared detailed production planning, whereas PBK shared growing and harvesting data, so both partners can work to achieve the best 'just in time' production and make effective use of PBK's limited working capital.

Proactive and frequent communications
Many traditional supplier - purchaser relationships are still based upon limited information sharing, perhaps in hopes of protecting a negotiating position. However, true supplier partnerships go beyond this to up front and rapid information sharing. This is especially key to allow advance warning of potential problems. An environment must be created where potentially 'bad news' can be delivered early in the process without fear of losing the business.

Creativity and innovation work both ways
For the multinational partner, don't expect to have all the answers, but be prepared to be both the teacher and the student. This is the best way to find the most effective solutions as well as to leverage the unique creative solutions that generally comes from living in developing countries with somewhat less predictable conditions. The PBK's clever uses for pyrethrin production waste as animal feed and bi-products as mosquito coil filler are but two examples.

Long-term commitment
The major challenge in working with PBK has been their lack of a reliable predictor of pyrethrin supply and demand. Equally problematic has been their difficulty in responding to shortfalls in production given the nature of the cropping system. However, SC Johnson's relationship with PBK can certainly be characterized as successful. One of the quintessential success factors in such a relationship is the necessity of a long-term commitment from both the supplier and the customer. Trust, mutual respect, and a quality product are key ingredients in any successful relationship.

Lydec (Suez): Temporary Electrification of Shantytowns – Casablanca, Morocco

Summary

In 1997 Casablanca-based Lydec, a branch of the worldwide energy – water and waste services group, SUEZ, was charged by the Urban Community of Casablanca with managing the Casablanca electricity, water and sewage networks.

In Casablanca, more than 400,000 people live in slums, with no access to electricity and minimal access to water and sanitation. The first stage of the project – electrification - is detailed here, as priority was given to electricity provision due to the growing demand of the population. Cost-effective technologies were put in place and an appropriate tariff structure was defined in close relationship with local communities, neighborhood organizations and municipalities. Neighborhood associations of local inhabitants and private electricians were organized to became responsible for the street electricity supply for 20 houses as well as services ranging from technical management to bill collection. The company provided the materials and technical assistance, and local communities were able to reduce the cost of the project by providing labor.

So far, about 110.000 people have benefited from this program in about 40 districts. Work is on progress for 100.000 people spread over 45 districts. The innovative financial scheme that has been designed provides a sustainable economic system, based on the inhabitant's economical reality and allowing flexibility. The introduction of energy has also facilitated the creation of SMEs, and the new energy technologies introduced are helping to avoid the use of more polluting traditional energy sources like gas and small generating motors, reducing effect on health and environment. In addition, illegal connection have significantly decreased and thus, electrical risks and physical – often– deadly accident. This approach will be replicated for water and sanitation, with pilot projects planned in 2002.

Introduction

Company Profile

Suez is a provider of energy, water, and waste services. As a worldwide services group, Suez has locations in 130 countries and 190,000 employees. Its mission is to deliver the essentials of life in a sustainable way, particularly through public/private partnerships. Lydec is a Ltd company ruled under Moroccan law with 3600 employees. Its shareholders are SUEZ (35%), ELYO (24%), EDF International (18%), ENDESA International (18%) and AGBAR (5%).

Country Profile: Morocco

The Kingdom of Morocco lies on the northwestern corner of Africa below the Strait of Gibraltar and forms part of the North African Region. The capital city is Rabat and other major cities are Marrakesh and Fes and the ports of Casablanca and Tangier. Over 30 million people live in Morocco where GDP is $105 billion, and $3,500 per capita. The official language is Arabic, however various Berber dialects are spoken, Spanish is also spoken in the north, and French is widely spoken in business, government and academic circles.

Morocco faces the problems typical of developing countries - restraining government spending, reducing constraints on private activity and foreign trade, and achieving sustainable economic growth. Drought conditions depressed activity in the key agricultural sector and contributed to a stagnant economy in 1999 and 2000. Long-term challenges for the country include: servicing external debt; preparing the economy for freer trade with the EU; and improving education and attracting foreign investment to boost living standards.

Low income areas in Casablanca

Casablanca has 4.5 million inhabitants. Its population increased considerably in the past century (up from 20,000 inhabitants at the beginning of the 20th century). During this time many shantytowns were created - at first in the city's periphery, but over time they have become incorporated in the urban fabric. Several projects were initiated to reduce these illegal settlements, however, they met with little success. As a consequence, there are today more than 400 shantytowns - varying from a few homes to

5,000 households - in the perimeter of Casablanca, hosting a population of 400,000 inhabitants.

Water, sanitation and electricity in Casablanca's slums
In these neighborhoods, drinkable water is accessible from public standpipes, and absorbing wells or septic tanks are used for sanitation. Precarious networks set up either by the communes or by the population, that generally discharge wastewater in their natural surroundings, are also used.

Electricity is not provided to these neighborhoods, except for public lighting set up in some cases at the initiative of the communes. This lack of service has resulted in the creation of many illegal connections to surrounding networks. This has led to a number of accidents, in some cases fatalities.

Project Drivers and Objectives

The Casablanca Urban Community (CUC) that comprises 27 municipalities is in charge of the public services that are common to all municipalities (i.e. water, electricity, sanitation, main roads and their lighting, solid wastes, sport equipment etc).

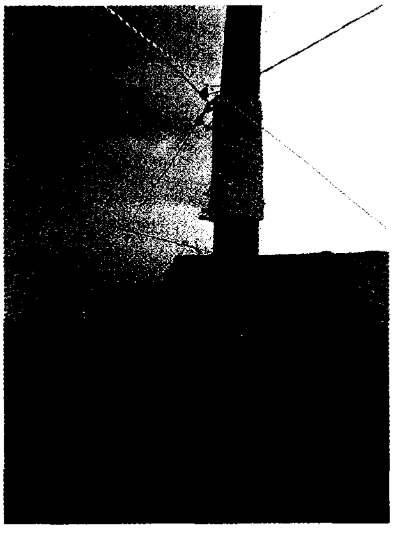
In 1997 the CUC unanimously voted for the delegation of Casablanca' services of water, electricity distribution and sanitation to Lydec. In addition there were 12 peripheral communes that also supported this management contract.

Following the decision of the CUC, and the signing of the 30-year contract, Lydec took charge of the distribution of electricity, water and sanitation services in Greater Casablanca commencing on August 1st 1997.

The main objectives of the contract were to:

- Increase the individual connections rate
- Increase the customer service level
- Invest almost US$ 3 billion
- Find a quick solution for Casablanca's sewage and drainage problems
- Implement a specific program for low-income neighborhoods

A population demand analysis conducted, identified a high need for electrification of the low-income areas. As a result, this was given priority for the first stage of the project commencing in 1998. This was largely attributable to the need to eliminate the major risks associated with the illegal connections being made through existing electricity networks.



The main objective of the electrification program was to *provide electricity to 30,000* households in the shantytowns of Casablanca, using cost-effective technologies and an appropriate tariff structure defined in close relationship with local communities, neighborhood organizations and municipalities.

Given that these shantytowns were in fact illegal settlements, and the government's re-housing program was not effectively relocating a large proportion of people in the immediate future, temporary grid connection was chosen as the most appropriate and cost effective means of providing electricity.

Project Detail

The first stage of work centered on the provision of electricity to Casablanca's shantytowns. This was based on a system of extending the main electricity grid via temporary connections on a street-by-street basis to serve each house in the street. Under this project suggests a temporary network was set up, pending the achievement of public re-housing programs. The facilities could then be removed upon the request of public authorities.

The structure of the project is such that primary network are established by sub-contracted local enterprises. Private electricians then set up the individual street networks that connect each house. An elected street representative is responsible for managing the connection and electricity supply once established.

Lydec provided the necessary materials, such as the connection lines and the meter boxes. They also trained the electricians and street representatives and monitored the quality of the work being done in each area. The role of the company was be divided into two main areas:

- Managing the construction of grid connections
- Organizing implementation of street networks by private electricians under street representative authority

The investments were shared between Lydec and the inhabitants who pay 1550 DH (US$130) per connection for access to service. On average, each neighborhood association became responsible for the street electricity supply for 20 houses as well as services ranging from technical management to bill collection.

Project phases

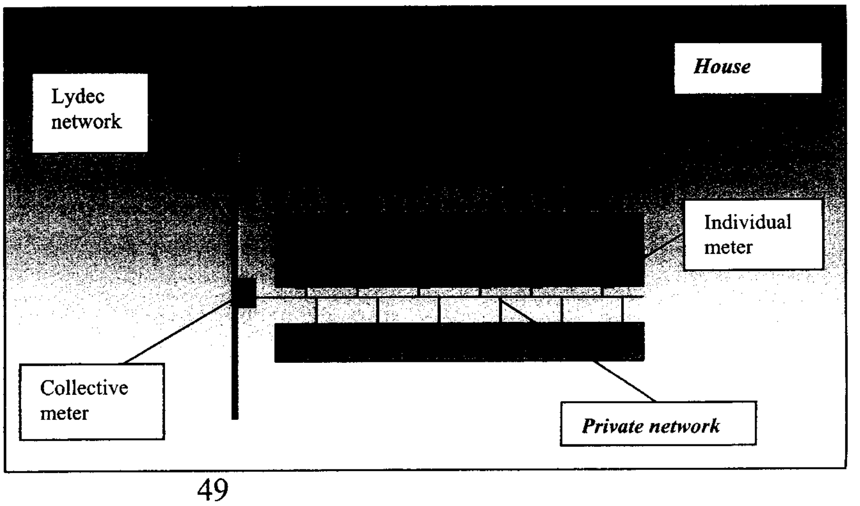
The first stage of the project was the identification and analysis of the context, the definition of the policy, and the technical and financial options. In this pre-implementation assessment phase, the needs of each district (up to 9,000 inhabitants) were studied in stakeholder meetings with the local authorities and local organizations. The needs analysis demonstrated that the expectations of inhabitants for electricity were very strong.

As a result planning activities were undertaken in consultation with the communes' authorities to establish the priorities for each neighborhood. This focused on identifying the extent of electrification needs, and the institutional involvement of each neighborhood in the project.

For each neighborhood, the next stage was directed at developing awareness and understandings of the project within the commune. Meetings were held to present the program and provide information to representatives of the commune, elected members of the council and key neighborhood representatives. Following this, additional studies, such as a census, were conducted. To accelerate implementation a number of local consultants were engaged to carry out these studies.

The census was conducted by specialized Lydec teams, with the support of local elected representatives, to make evaluations of individual households. During this exhaustive census the project was explained to each individual. This aimed at answering all the questions that people had, and to ensure that the same level of information was provided to all.

Within each community a representative from each street was elected to assume responsibility for the provision of electricity to each street. Guided by local elected representatives, the community then chose their street representatives (respectable personality, educational level and renowned honesty were the key criteria for selection).



This street representative then became responsible for managing the network implementation in the street. Once the connection established, he/she became responsible for monitoring individual meters, issuing bills and collecting payments. She/he also ensured the network was functioning well and coordinated repair activities. This role generally constituted a part time job for the representative.

Technical and managerial assistance

Lydec provided materials and technical assistance to ensure standardization and the effective management of the supply networks over time. The company offered training to both the electricians and the representatives from each street. Electricians were trained in how to establish connections to the grid and provided with the necessary equipment to do so.

Technical guides were also provided. Street representatives were trained in managing the electricity supply once established. This included identifying problems with electricity supply, reading electricity supply meters and collecting monies owed from each household.

They were provided with a basic training in electricity and safety, and with the work tools that were necessary to their activities.

Project Outcomes

To date, the project has seen 17,000 households - approximately 110,000 people - receive electricity.

Social and environmental impacts

There has been a significant improvement in living conditions by those now receiving electricity as a result of this program. Electricity is providing improved conditions for children's educations in shantytowns - children are now able to study inside during the evening, whereas before they would use candles or sit under streetlights. Plus, families that used candles and gas lamps for lighting in the past are now able to avoid the frequently occurring accidents such as burns.

The presence of television sets (often linked to a satellite receiver) has also increased considerably in these neighborhoods, providing these populations, that have for so long been marginalized, a window on the international environment.

Previously, many households were equipped with small generating motors that resulted in considerably high noises levels and air pollution. Even worse for the environment was the use of trucks batteries (24 Volts) to run television sets by those that could not afford the motors. As a result of the temporary grid connections a great deal of chronic air pollution is being avoided, which in turn is contributing to a reduction in the number of respiratory diseases, such as asthma and bronchitis. In addition, as a result of this project there has been a considerable reduction in the number of illegal connections and the associated safety risks.

Moreover, this project allowed the creation of community networks, encouraging dialogue that is helping these communities develop institutional capabilities. In particular, the streets' representatives who manage electricity have become new social intermediaries.

Economic impacts

Inside the neighborhoods, many production and commerce activities (i.e. micro- enterprises, such as hairdressers and clothing outlets) have been created as a result of the electrification of the zones. This is enabling integration of the shantytowns into the city's economic fabric.

It is estimated that 200 jobs have been created in shantytowns for the street network set up and maintenance activities. 400 jobs were created in order to carry out studies and set up the main networks from which the street networks were extended.

In addition, the electrification cost is lower than the price of traditional power sources that was unable to supply power permanently to electricity powered household devices, such as refrigerators.

This project has seen a reduction in households' energy budget, from 200 to 300DH/US$17 month (candles, batteries, butane gas) to about 70 DH/US$6 month for payment of electricity consumption. he global annual economy range from 30 to 50 millions DH (US$2.5- 4.2mil) for the 17,000 households already connected.

Conclusion

Continuous and successive improvements have been made in the duration of the project to date. The different principles that were conceived and elaborated during the project have been integrated into Lydec's functioning mechanisms and were assimilated by its employees.

In addition, documentation of this project has made this an adaptable product to other contexts and services.

Three years after the beginning of this experience, the company has noticed, for example, a strong request for information from other utilities in Morocco, other developing countries and international institutions such as the World Bank.

This approach is soon to be replicated for water and sanitation in Casablanca's shantytowns.

Project Challenges

Gaining local support

In the early stages of the project the challenge was to gain people confidence. Results have to be shown very quickly to prove the reality of the project.

Gathering information

Census phase is one of the most important. People give right information or figures when they know the project in details and when they perceive real benefits from real concrete projects.

Timing
While it took some time to convince people that the service would be delivered and organize the networks, once the project did receive community acceptance and there was evidence of results, the demand for the service increased considerably. With this demand for the service came the expectation that it could be delivered immediately; realistically establishment of the networks took 3-4 months.

Local competencies
It was essential that there was a high quality of work when establishing the connections to deliver the electricity. It was vital that this was emphasized and that representatives sought out the most appropriate people to do the work.

Success Factors and Lessons Learned

Shared management
The traditional mission of a public services supplier, which consists in serving every customer, becomes very difficult and costly in slums. Gaining access can be difficult, and identifying homes is an extremely delicate matter for anyone stranger to the areas. In the case of individual supply, this leads to operation difficulties and to excessive costs that are not affordable by the low-income population.

An alternative, that is likely to overcome these hurdles, is a structure of shared management. This principle was adopted here in the form of a collective of sub-entities, managed by a representative chosen by the inhabitants.

Community involvement
In order to make the best possible adaptation to the expectations of the community, involvement of community members in the project's conception was vital. In this instance, success was enhanced by having the community define both the level of service that it wished to receive, and the necessary commercial and financial modalities to set it up. Community representatives were the projects' keystones.

As gaining access to the shantytowns was difficult for people strange to the areas, these representatives facilitated the initial access. During implementation they acted as driving forces inside the neighborhood as well as communicating between Lydec agents and the inhabitants.

Cost reduction
In order to offer appropriate services that fit with beneficiaries' financing capacities, it was imperative to reduce costs. It was also necessary to reduce the investment costs. This was made possible through the delegation of a part of the work to the neighborhood electricians whose expense structure is lower than those of a larger sized company. In addition, adaptation of standards to the town's architecture enabled cost reductions and the use of locally made equipment; such as frontage supports instead of 9 or 11 meters posts.

In a project to increase access to public services, even for the poorest, exemption from payment is never the best solution. The objective should be instead adaptation of the financing scheme based on an analysis of the beneficiaries' willingness and ability to pay for the given service.

Adaptation of equipment standards
In this kind of projects, Lydec estimated that it would be necessary to redefine technical standards to be specifically adapted to the neighborhoods.

Normally high standards are developed in accordance with the needs of all customers (residential, production and commerce activities etc). However, in these neighborhoods the project's success was centered on meeting basic needs at a low cost.

Number of electrified households (mar 2002)	17.000 households (110.000 people)
Engaged works or studies	15.000 households
Objective as to the end of 2002	25.000 households (160.000 people)
Global intended investment cost (30000 households)	DH 80 million (US$6.6 million)
Achieved investment	DH 40 million (US$3.3 million)
Expected annual turnover in 2002	DH 24 million (US$2 million)
Estimated number of created jobs	600
Price paid by beneficiaries for service access	50DH/month (US$4.16 p/month)
Reduction of annual energy costs for clients (US$2.5-4.16 million)	DH 30-50 million/year

Coca Cola: The Entrepreneur Development Program in South Africa

Summary

Coca Cola's Southern Africa division, in conjunction with local bottling companies, have developed the Entrepreneurs Development Program in South Africa to help new entrepreneurs enter the supply chain and profit from new sustainable business ventures.

A task force comprising individuals from Coca Cola Southern Africa and each of the five Coca Cola bottling companies in South Africa designed the program in 1999. Promising entrepreneurs are identified for the program each year and training in basic business principles is provided. These entrepreneurs are shown how to turn their ideas into action and develop their businesses on a sustainable trajectory.

The Coca-Cola bottlers have also developed a number of creative innovations to meet the needs of these the developing entrepreneurs. These include for example sturdy transport bicycles, mobile mini kiosks, and mobile coolers for street vending. Strategically placed selling depots are also being developed to service these micro entrepreneurs, and as these micro businesses develop, Coca Cola are assisting the entrepreneurs to move up the supply chain and expand their profitability.

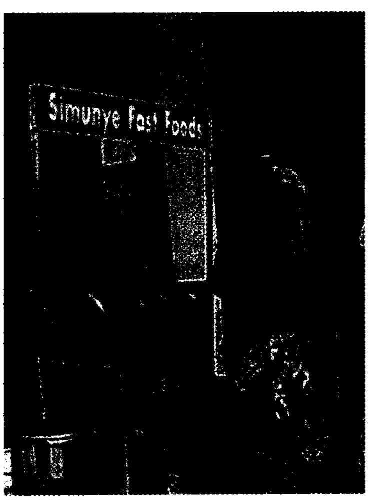
The formal and informal sector employment attributable to the Coca-Cola system is 30 000 jobs, the majority of which are in the informal sector. The entrepreneur development program is contributing considerably to this each year. In 2000 alone, over 12,900 jobs were created and 5,200 outlets were created.

The success to date of the entrepreneur development program highlights the importance of how trade, not just production, can create jobs and boost market development. This downstream distribution and capacity building has been vital to market development in South Africa

Introduction

Company description
In 1938 the Coca-Cola Export Corporation sent Howard Patterson to South Africa to establish a bottling operation on the African continent. In 1939 bottling of Coca Cola commenced at Benoni Mineral Works outside Johannesburg.

The company has grown and is now essentially a system, or alliance of companies, in South Africa. This system is made up of the Southern Africa office of The Coca-Cola Company (Coca Cola Southern Africa) as well as local bottlers and canners who make products under the Coca-Cola trademark. There are currently five bottlers in South Africa. These were originally family owned operations that identified an opportunity to supply Coca Cola to South Africa. These five businesses have since grown and now include a total of 21 bottling plants and 12 major sales/distribution centers in SA, each servicing a specific territory within a designated region of the country.



The Coca Cola system includes a broad group of businesses that operate around this core. These include suppliers, distributors, wholesalers, and retailers, offering employment to individuals in a variety of forms, from plant managers to street vendors. Thousands of retail outlets have been developed in South Africa to sell Coca-Cola soft drinks, including a growing informal sector that includes many home-based spaza and tuck shops.

Coca-Cola comprises about 96% of the total carbonated soft drinks market in SA. The Coke system currently, sells at a rate of 354 million unit cases per annum.

Country Profile: South Africa

The Republic of South Africa, the most Southern country in Africa, has a population of 43,586,100. South Africa is a middle-income developing country with an abundant supply of resources, well-developed financial, legal, communications, energy, and transport sectors, a stock exchange that ranks among the 10 largest in the world, and a modern infrastructure supporting an efficient distribution of goods to major urban centers throughout the region. Despite being a middle-income country, however, the income disparities are amongst the largest in the world, and fifty percent of the population lives below the poverty line. GDP as of 2000 was $369 billion, with GDP per capita of $8,500.

The country suffers from 30% unemployment and daunting economic problems remain from the apartheid era, especially the problems of poverty and lack of economic empowerment among the disadvantaged groups. Other problems are crime, corruption, and HIV/AIDS. Limited job growth remains a real concern as the South African economy sheds jobs in the post-apartheid transformation. The unemployment rate, already over 30 percent, may climb higher, frustrating government efforts to promote prosperity.

Within South Africa exist both developed (first world) markets and highly underdeveloped areas. In many communities of South Africa it is the informal (unrecorded, untaxed) retail operations that are providing the most employment opportunities.[4]

4 Woodward, D.P & Teel, S. J., 1999 **Doing Business in South Africa**

Project Drivers and Objectives

Drivers

Capacity and capability building were identified as key components for the success of Coca Cola in South Africa to the extent that the slogan "capacity and capability building ahead of demand" became the cornerstone of the business. To achieve this several key actions were identified: the recruitment and assimilation of diverse, talented associates into the Coca Cola system; the building of strong, local and diverse managerial talent; and the creation of new positions throughout Coca-Cola bottlers.

Historically, Coca Cola has served the more developed markets in SA, but as a volume driven business, the company recognised that undeveloped markets represented a major growth opportunity.

Once this potential was identified, the company recognized the need to extend this capacity building effort to new entrepreneurs in new markets. From this emerged the entrepreneur development program.

Objectives

The objective of the entrepreneur development program was to encourage and facilitate the entry of new business people into the Coca Cola system. The program targets specifically micro entrepreneurs in undeveloped markets who can enter the Coca Cola value chain to generate income and profits for themselves.

In order to realize that potential however, it was essential that the company did not impose the conventional 'Coke' channels on this segment, rather it needed to allow for and build on the natural evolution of entrepreneurship to define itself within these underdeveloped markets. Subsequently a need arose to ensure the sustainability of these entrepreneurs over the long term.

Part of the realization came from the fact that the Coca-Cola value chain has a very easy entry point for entrepreneurs who want to make a dependable living. They start their journey by selling Coke products. But without a deeper understanding of how to run a small business that is cash dependent these entrepreneurs soon come to grief.

Coca Cola Southern Africa, in conjunction with the five South African bottlers developed the entrepreneur development program to assist these new business achieve sustainable growth and service new markets. For Coca Cola the success of this project would inevitably lead to an increase in sales volume and penetration of new markets that previously may not have been reached through the standard supply channels. For many buddy entrepreneurs in South Africa this program is an entry point to a business network and in many cases the first step in developing profitable businesses and improving livelihoods.

Project Detail

Developing the entrepreneur development program

Representatives from each of the five Coca Cola bottlers and Coca Cola Southern Africa conceived the idea for the entrepreneur development program in 1999. A task force was formed at the group's bi-monthly Leadership Forum to lead the initiative. The program was designed to develop the capabilities of formal and informal traders. This included providing new skills to new entrepreneurs as well as enhancing the skills of existing entrepreneurs to enable them to grow their businesses successfully.

Coca Cola Southern Africa and the five bottlers jointly fund the entrepreneur development program. In addition, an agreement with the South African government has enabled a redirection of funding to support the program. The South African Government has, through an agreement with the South African Soft Drinks Manufacturers (Coca-Cola is a major player), gradually reduced excise tax over a number of years (Excise reductions: 1999 US$ 1.1mil, 2000 US$6.8 mil, 2001 US$3.2 mil, 2002 US$11.8 mil). In exchange for this reduction, Coca-Cola allocated these savings to various programs such as job creation through micro-enterprise development, as well as equalization of the recommended retail price across the country (primarily to benefit rural poor communities) as well as general price reduction.

Implementation

The Sales department of each individual bottler administers the program within their respective regions. The program consists of several key activities. Sales representatives talk with community groups, local government and local non-governmental organizations to highlight the entrepreneur development program as an opportunity, and encourage applications from new entrepreneurs. Each bottler seeks to generate a pool of entrepreneurs who demonstrate an interest in business and display potential capabilities and commitment. The subsequent selection process identifies individuals for the program from this pool, as well as from existing outlets demonstrating the capability and capacity for growth.

An assessment is then conducted in the areas in which each entrepreneur is likely to operate to ensure they can be sustainable and profitable over time. For example, the market potential and the logistical issues are analyzed and mechanisms for ensuring the availability of cold product are reviewed; in some instances, where facilities and/or infrastructure is not present but a potential market exist, the company will establish new ice plants and depots.

Training and equipment provision

Once selected, the entrepreneurs are introduced to the Coca Cola system and how it operates. They are provided with targeted support and training in basic business skills. This includes training in pricing, stocking, forecasting, legal requirements, sales, customer relations, advertising and marketing.

There are two levels of courses, levels 1 & II that are run for the entrepreneurs.

At the end of the Business skills I course trainees must be able to:

- Decide whether, or not, to start a business and, if so
- Understand the theory of what is required to do business effectively and properly (sub-objective is that participants must be able to prepare a business plan).

At the end of the Business skills II course participants must be able to:

- Write and produce an advanced business plan
- Manage their cashflow
- Realize profit
- Avoid making a loss (sub objective is appreciate and satisfy customer needs).

Training is delivered through written material as well as other forms of instruction by each of the bottlers. The training is based on a standardized format handed down from Coca Cola Southern Africa, however it is increasingly being customized to meet the differing needs in each region. Participants attend classes followed by plant visits to familiarize them with how the system operates. This is followed by coaching and mentoring in their businesses.

The new entrepreneurs (depending on the level of entry- Robo-vending, Spaza shop, Depot etc) enter into a business arrangement that makes it easier for them to access capital equipment like Trolleys, Coolers (e.g. rental or loan) and they are provided with start up stock.

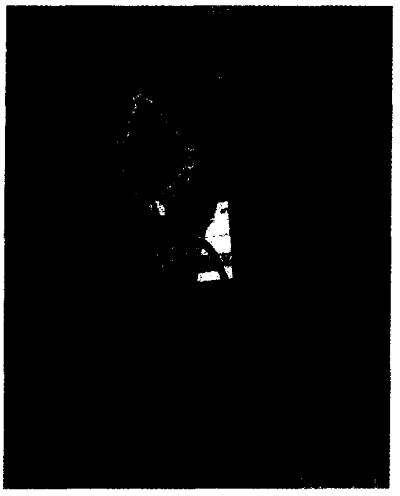
Monitoring entrepreneurs

Monitoring mechanisms to determine the effectiveness and possible improvements have also been introduced. This includes an assessment of each individual, monitoring his or her sales and profit levels over time. When each entrepreneur demonstrates improvements they are reviewed for an upgrade in their business and equipment. For example, a small-scale business may be provided with a larger cooler once it has been demonstrated that sales and profit levels warrant expansion. Five (5%) to ten (10%) of the Spazas created tended to move up the scale of entrepreneurship ladder in the form of volume growth.

New innovations for entrepreneurs
Initially, the process was focused on conventional training, however recently it has become more innovative. During implementation of the program, Coca-Cola bottlers came up with creative innovations to meet the needs of the developing entrepreneurs.
For example, in many communities women are running small home businesses - known as 'mamas buckets' - to sell Coca Cola products in their street. However, as it was not possible to take delivery vans to these often remote rural locations, a sturdy delivery bicycle was designed that could transport around 5-6 cases of product to these micro entrepreneurs.

For those operators seeking to expand their business by offering food products with Coca Cola products, a mobile mini kiosk was designed. This kiosk has a facility that stores drink products at the recommended selling temperature of 4 degrees C, as well as a built in two plate gas stove for cooking, and storage space for food. In addition, containers that have been converted to kiosks are strategically positioned for the convenience of potential customers and mobile coolers for street vending were designed.

To support the entrepreneurs, selling depots are strategically positioned to make supply easy and, where possible, ice making machines are also provided.
To support the entrepreneurs at the next stage – owners of sales depots – Coca Cola provided tractors with trailers for delivery of large quantities of product to customers who are in inaccessible (by truck) areas. Operators of selling depots are now also being trained in the basics of business management, bookkeeping, route sales, cash flow management and inventory management.



Project Outcomes

Impact on employment in SA
Currently, formal and informal sector employment attributable to the Coca-Cola system is 30,000 jobs. In 2000 Coca Cola created 5,000 new outlets and 3,500 of these were by participants in the entrepreneur development program; this resulted in the creation of 12,900 jobs in the Coca Cola system. In 2001 just over 3000 new outlets were created, and in 2002 the focus will be on ensuring that these continue to stay in business and remain viable. In total, over 7000 people were trained is sessions that took place in a number of locations in the country.

Importance of informal sector for economic development
The majority of new jobs are created in the informal sector, which accounts for 60% of sales volume. In fact, Coca-Cola products account for one-third of the monthly operating profits of most informal retailers.

This is an important aspect of development in South Africa as many micro-enterprises serve as a safety net at times when the formal sector struggles -- as has been the case in South Africa in recent years. The opportunities presented by the entrepreneur development program are therefore promoting a sustainable means of economic support and poverty reduction.

In recent years in South Africa an influx of people moving to urban centers in search of employment has created an overcrowding in city centers. The SA government therefore supports programs that encourage people to remain in their communities. The entrepreneur development program is a valuable contribution in that it provides a mechanism to encourage and support entrepreneurs in rural and remote locations, enabling them to remain in their communities and improve their livelihoods.

Operating in this informal sector is also not merely a means of survival, but rather it can be a sustainable form of growth. Most of the wholesale and retail operations stay in business and remain profitable for years. They develop into stable enterprises and are a prominent feature of many communities. Some expand from small, home-based operations into larger distribution centers and even into soft-drink production.

These informal traders are revealing a propensity to spend much of their income on capital improvements. Further, they help to build and improve communities and create demand for electricity, water, construction and transport.

Project Challenges

Identifying participants
The first hurdle encountered was identifying the appropriate candidates for the program. As the economy was shedding jobs and unemployment levels were growing sharply there was a large pool of potential participants. However the challenge was to identify those individuals who possessed the necessary long-term interest in an entrepreneurial venture.

Communicating training material
Once the suitable candidates were selected, the next challenge was in the communication of training material. This relates to both language differences and the varying education levels of the individuals taking part in training activities. While English is predominantly used as the business language in South Africa, many of the program participants did not speak and/or read English. In South Africa there are eleven 'official' languages, but in fact there are 20 languages spoken across the country. As the training manuals from Coca Cola Southern Africa are presented in English, it has been necessary to rely on translators and/or non-written training tools in many cases. This slowed down the training in some instances, however the sales personnel from each bottler are able to speak the local languages and dialects and have increasingly been customizing their training programs.

A further issue was the disparity of education levels between participants. Unfortunately many of the participants had only a low level of skills and education and therefore lacked a foundation that would enhance the basic business skills training.

Motivating current outlet owners
Another challenge was the fact that some participants were owners of outlets so taking two days off to attend training programs meant sales would be lost over these days. Some outlet owners resisted attending training sessions because they had seen or experienced businesses being run in the unconventional ways and sometimes this had seemed successful.

Framework conditions
The regulatory framework in SA has been in part unsupportive of Coca Cola and while there has been considerable support for the entrepreneur development program, there have been some hurdles encountered with local governments.

There was in the past a lack of effective policing of regulations, to such an extent that whilst the Coca-Cola system adhered to requirements, competitors did not, leading to a dilution of competitive advantage. The bulk of the legislative framework has been developed in the last 10 years. Prior to this period, the legislative framework was geared at protecting local industry primarily because of sanctions and the policies of the regime of the time. Currently, the legislation is geared more toward opening the markets to enable fair competition, attract foreign direct investment and allow local companies to compete globally.

National government support for the entrepreneur development program has been high, so much so that there has been a complete abolishment of excise tax as part of the agreement with CCSEA. However, local governments were not aligned with the thinking of the National government and thus became barriers to the efforts of the program. Implementing the program regionally has required re-negotiations with many local governments - often a lengthy process that has delayed the program.

A changing market
The changing economic situation in South Africa is presenting a number of future challenges to Coca Cola and South African entrepreneurs. Firstly, there is a limit to the market, and there are a lot more aspirant retail outlets owners than market demand can sustain. In addition, the patterns of other industries and individual businesses affect many entrepreneurs. Some of the outlets rely solely on one large business, such as a mining site fro example, and with the closure of such operations the business can lose its entire customer base.

Further, as the economy has been shedding jobs, this is lessening the number of people with discretionary income hence lowering the demand for soft drinks. To address this the company will be reinvesting the next phase of excise tax savings into subsidizing the prices of the pack sizes that are major sales volume drivers in these newly created outlets.

In addition, there was an expectation that there would be across the board price reductions for all size packs. While this was part of the company's goal, this needed to be balanced with maintaining price levels that would enable micro entrepreneurs to make a profit on their sales. Failure to achieve this balance would have defeated the sustainable job creation commitment the company had to the government.

Success Factors & Lessons Learned

Adapting to changing market circumstances
It has been vital for Coca Coal to adapt to this changing market in many ways.

Following the re-entry of The Coca-Cola Company, after the political transformation of South Africa, the challenge was to implement business programs which were aligned to the transforming environment e.g. the market is not a developed market but a combination of a small, fairly profitable base and a massive underdeveloped segment. The business had to change its mindset and it's go "-to-market" strategy.

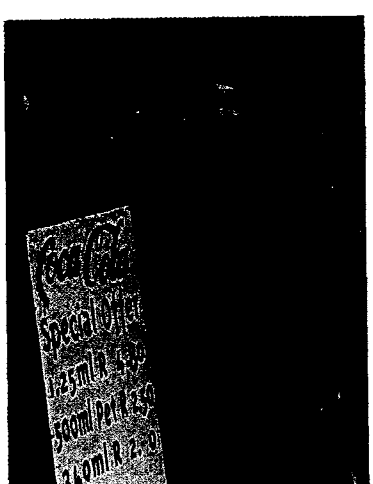
It is this adaptation of business strategy that ultimately led to the entrepreneur development program and this continues to be a driving success factor. The success of the program itself has relied on the ability of the company and its bottlers to adapt to local needs and challenges and continually come up with new ideas to help this segment of the market grow.

Specific to the entrepreneur development program, several key lessons (and future challenges) have emerged:

- New retail outlets that survive the winter months have a higher chance of survival. During the winter months cold drink sales tend to drop dramatically. This is further exacerbated by the fact that there are shorter daylight hours and longer nights as most purchasing and consumption takes place during the day. Further, some outlets are in areas where electricity is unavailable, hence it is not possible to provide refrigerated drinks.

- The identification, selection and training of new retail outlet owners is time-consuming.
  Virtually thousands of unemployed people would like to have the opportunity to generate income through the Coke value chain, particularly as it is very easy to enter. However, to ensure sustainability of operations and maximum benefits from the program, the right participants need to be identified. Given the number of applicants, this is a time consuming activity.

Fifty to sixty percent of the Spaza shops, 100% of Mama's buckets are run by women. Most women in Previously Disadvantaged communities in rural and urban settings have over the years sharpened their survival (entrepreneurial) skills to meet the challenges of a repressive economic and political climate.



CH2M HILL: China Landfill Energy Recovery Projects

Summary

In November 1997, engineering and construction firm CH2M HILL was hired to assist the State Environmental Protection Agency (SEPA) of the Peoples' Republic of China CH2M HILL provided advise on technical and economic feasibility and construction requirements for energy recovery facilities at municipal solid waste landfills. The project was intended to provide incentives for eliminating greenhouse gas emissions of methane from landfills as China develops modern solid waste disposal methods.

In many of China's cities, solid waste disposal sites are not yet properly contained with impermeable lining systems and liquid and gas removal systems that are now considered standard practice in many countries. The project was conceived by China's SEPA as a way to promote better waste management practices through the adoption of proper landfill containment. Proper containment is a prerequisite for efficient recovery of methane, which produces economic benefits from using or selling the recovered methane as fuel.

Capacity building for both technical and institutional requirements was a major component of the project. Both technical hardware and an extensive training program were provided to the appropriate personnel in each city who would be responsible for implementing the energy recovery projects.

The feasibility of the projects in each of the 3 cities selected has been demonstrated and the capacity building efforts have been underway for some time However as of March 2002, the project is approximately two years behind schedule. This case documents the projects progress to date, the knowledge that has been developed and hard technology transferred, as well as the barriers to progress that have emerged in this technology transfer effort.

Introduction

CH2M HILL

Established in 1946, in Corvallis, Oregon, CH2M HILL began as a professional partnership of H. Cornell, J. Howland, B. Hayes, & F. Merryfield (CH2M). In 1971, the firm merged with Clair A. Hill & Associates (established in 1946), of Redding, California, to become CH2M HILL. CH2M HILL is now an employee-owned, multinational firm providing engineering, construction, operations and related services to public and private clients in numerous industries on six continents.

CH2M HILL is focused on developing solutions to complex environmental problems. The company has one basic "product" – knowledge: the knowledge about environmental issues and technologies that employees both individually and collectively bring to the service of their clients. CH2M HILL works with clients and other partners to creatively use the company's knowledge of issues and its understanding of technology in delivering projects that implement sustainability principles. To address this objective, CH2M HILL is working to integrate its service offerings in a manner that helps clients understand the advantages of strategic planning and comprehensive management for sustainable processes, companies and communities.

Country Profile: China

China, the world's fourth-largest country and a landmass only slightly smaller than the US, has a population of 1,273,111,290 (as at July 2001) making it the world's most populous country. China stands as the second largest economy in the world after the US, but has a GDP of only $3,600 per capita. China is a rapidly developing country and recent industrial growth and a doubling in agricultural output have resulted in an increase in both domestic and export goods. However this economic growth and improvement in living standards is under threat due to increasing environmental concerns. Air pollution (in particular greenhouse gases and sulfur dioxide particulates) and soil erosion is worsening, and water shortages and a falling water table also present problems.

In addition, the growing population and industrial expansion is fueling China's waste problems. Waste levels have grown rapidly in the past ten years, and currently China produces 110 million tonnes of municipal solid waste and 650 million tons of industrial waste each year, occupying approximately 500 million square meters of space5. With a rapidly growing population, the amount of waste produced grows each year, as does the amount of gas being released to the atmosphere as a result.

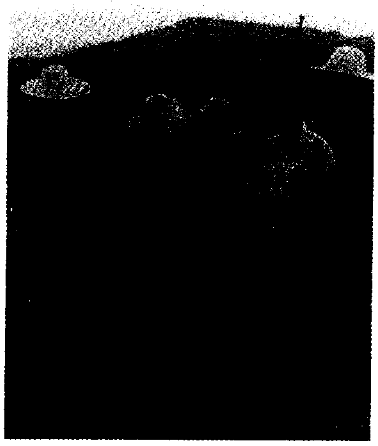
China's growing urban population means more urban waste releasing ever-greater amounts of gas to the atmosphere. Many landfill sites in China are open pits on urban fringes or in stream or river valleys or wetlands; polluting the air, ground and drinking water and attracting disease. Most sites do not meet Chinese or international construction and/or environmental standards.

According to the World Bank, "the single largest improvement in solid waste handling in China would be provision of adequately engineered and managed landfills"6 To address this the government has begun encouraging the development of a solid waste management industry within China, but local industry and government agencies lack the experience and technology to satisfy rapidly growing demand. A review conducted by UNDP prior to the project's commencement noted that skilled in-country personnel were not available to organize landfill management and the institutional structures among different levels of government were inadequate for these activities. In addition, many local governments regarded waste disposal as a "non-productive" investment and independent companies have not had access to adequate capital markets to invest in them .7

Methane recovery from landfill
Half of the gas that is released into the atmosphere from solid waste is methane. Decomposing waste produces huge amounts of this greenhouse gas that absorbs more than 20 times as much heat as carbon dioxide. While a naturally occurring gas, human-related activities, such as the landfilling of wastes, can release significant quantities of methane into the air.

Methane gas is produced when the debris inside a closed landfill decomposes. In most circumstances, the landfill will vent this gas into the atmosphere. However when captured, methane burns like natural gas, and with the appropriate technology this gas can be harnessed for its energy value. Used directly as fuel or to generate electricity, this underused energy source can reduce potent greenhouse gas emissions, while improving air quality.

The recovery and use of methane created in landfill sites provides environmental and economic benefits both locally and globally. This contributes to the reduction of greenhouse gas emissions that are of global consequence. Locally, methane capture and use can produce economic benefits, such as revenues from the sale of gas and electricity, as well as a reduction in trade waste charges.



Project Drivers and Objectives

Drivers
The landfill gas project is part of China's efforts to update its public solid waste management systems. China's State Environmental Protection Agency (SEPA) was seeking to promote environmentally sound and sustainable solid waste management practices. To address this objective, SEPA is promoting sanitary landfilling as practiced in the U.S. and Western Europe to ensure that new landfills will have the benefit of landfill gas recovery.

This project, centered on the design and implement of three demonstration projects to recover and utilize gas from municipal landfills, was the first stage in SEPA's efforts to develop new landfill practices. The overall project was intended to provide incentives for eliminating greenhouse gas emissions of methane from landfills as China develops modern solid waste disposal methods.

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5 Tradeport, 1999, 'SOLID WASTE MANAGEMENT TECHNOLOGIES', Industry Sector analysis.
6 World Bank, 1994, China Urban Environmental Service Management, Report No. 13073-CHA.

7 United Nations Development Programme, 199X, 'Promoting Methane Recovery and Utilization from Mixed Municipal Refuse: Project write up.

Objectives
The project's main objective was to demonstrate that the methane produced in modern landfills could be captured and used profitably.

Initially stated objectives were that the project should:

- Establish demonstration plants to capture methane from landfills and use it as fuel or to generate electricity
- Create a facility for training landfill operators, energy service companies, municipalities and other businesses on building and operating landfill energy plants
- Set up institutional arrangements to operate landfill gas recovery technology, and produce and sell gas and electricity at each site
- Demonstrate approaches to establish the price of electricity generated and lower the cost of future plants to make landfill-gas electricity financially viable
- Prepare an action plan to promote the widespread replication and adoption of landfill gas recovery technology in China

It was hoped that the demonstration projects would:

- Provide large quantities of a clean-burning fuel and decrease the need for coal, reducing greenhouse gas emissions and their adverse impacts on natural ecosystems

- Encourage more environmentally sensitive solid waste management practices, capture other landfill gas pollutants leading to ground-level ozone and protect groundwater from leachate contamination

- Provide local people jobs in small enterprises engaged in the recovery, cleaning and use of methane

- Increase institutional capacity of local government.

Project detail

Project organization
In 1995, SEPA requested assistance from the Global Environment Facility (GEF) for the demonstration projects. The proposal included the provision of advice on the design and operation of the landfills to enhance gas production, as well as to achieve the recognized state-of-the art in waste management. In 1996, funding was granted by GEF for the project.

The initial project schedule was four years and the funding was to cover feasibility studies, training of Chinese technicians, and purchase of equipment for constructing energy recovery systems at three selected demonstration sites.

The overall project organization is somewhat complex. The United Nations Department of Economic and Social Affairs (UNDESA) administers the project for GEF and the "implementing agency" for the project is China's SEPA. The UN put in place a project manager (a Chinese citizen stationed at UN headquarters in New York) and UNDESA hired a Senior Technical Advisor (STA) from Canada, a professional engineer with extensive public sector senior management experience in the field of waste management to advise on all aspects of the project, including institutional capacity-building as well as technical aspects.

CH2M HILL Inc. was hired by the UN to advise on technical and economic feasibility and construction requirements for the energy recovery facilities. CH2M HILL was responsible for providing technical oversight from the initial testing and planning stage through design of the full-scale gas collection and utilization systems.

The company has worked closely with both SEPA and the international funding agency in developing the demonstration projects. In addition to working with these two agencies, CH2M HILL worked closely with the public works bureaus and environmental protection bureaus in each of the three cities that are responsible for operation and environmental compliance of the waste management facilities.

The roles of each organization and representative complemented each other. The STA advised on overall project issues, including institutional arrangements and the establishment of a training center. CH2M HILL brought specific engineering expertise and experience to assist in building technical capacity for landfill management and design, as well as evaluation and construction of landfill gas-to-energy facilities. The STA also carried a monitoring function on behalf of UNDESA in order to ensure that sub-contractors retained by the project progressed in a coordinated fashion.

While the GEF provided the initial funding, the local agencies committed to provide part of the funding for the project, specifically for construction and operation. The

City public works bureau was responsible for working with the consultants hired by the UN to conduct on-site testing and site-specific alternative feasibility studies for different methods of recovering energy. The Cities were then responsible for constructing and operating the energy recovery facilities, with partial funding for capital and startup costs provided by GEF. This required the Cities to invest in the projects after concluding that the projects would be economically and technically sound.

GEF allocation:	US$5,285,000
Co-financing:	US$14,280,000
Total Financing:	US$19,565,000

Participation of Chinese technical consultants at the national level and at the local level in each of the three cities also was identified as a vital element of the project. As the primary goal was technology transfer, participation of all of these parties, especially those local agencies and technical specialists, was considered vital for the sustainability of this effort. In particular, it was felt that the Chinese consultants and agencies would benefit from working with experienced CH2M HILL engineers on these projects.

Getting started
As part of an initial overall feasibility assessment for the project, three landfill sites were selected as good examples of the range of conditions that would be encountered throughout China. The three sites are in the cities of **Anshan** in northern China, and in **Nanjing** and **Ma'anshan** near the Yantze River in central eastern China. The cities were selected to represent the range of conditions expected to occur in solid waste landfills throughout China.

The project began in 1997 with assessments of the three candidate landfill sites by CH2M HILL engineers. CH2M HILL personnel traveled to each site and met with the site operators. In February 1998, a team of CH2M HILL solid waste management engineers kicked off the project by visiting SEPA at its Beijing headquarters, and then observing conditions and meeting with responsible parties in each of the three host cities. Plans for testing the gas in each landfill were discussed with the local officials at these meetings. The team included experts in sanitary landfill design and operations who consulted with the city officials on improvements that could be made to their facilities.

The next stage of the project for CH2M HILL was to develop a testing program to determine the design parameters for a gas collection system in each of the city's landfills. This was followed by a market study and economic analysis of options for beneficial use of the recovered landfill gas.

Capacity building
Because the project was designed to promote better waste management practices, capacity building for both technical and institutional requirements was included in the project.

In China, as municipal solid waste generation burgeons with development, there currently are only two landfills that recover energy from the methane generated in the decomposing buried municipal wastes. These two sites are operated as proprietary systems by an international waste management company and so provide little opportunity for local capacity building in the municipal bureaus that are responsible for solid waste management in China's growing cities.

The public works bureaus themselves have carried out no similar projects, and therefore there was a need to build capacity in the public sector, which commonly assumes responsibility for this type of project in other countries and is ultimately responsible for municipal waste disposal.

Technical capacity building included training of SEPA and host city technical personnel in the techniques commonly used for testing and feasibility assessments of candidate landfill sites. Testing equipment was provided that could be used at the host city sites and could then be used by SEPA for future evaluations at other sites in China.

Institutional capacity building was required to establish the contractual and other agreements that would be necessary in order to sell the energy products. For example, electricity bureaus would need to co-operate in allowing power sales into the local grid by the small-scale landfill projects. No similar agreements had been established in the past, as electricity bureaus in China provide electric power from large central power plants operated by the bureaus themselves. Also, environmental protection bureaus would need to be involved to establish appropriate environmental protection requirements for both the solid waste disposal facilities themselves and the energy recovery facilities.

CH2M HILL conducted training for the technical personnel in each city who would be responsible for implementing the energy recovery projects. The training included:

- Techniques for estimating landfill gas production. These included both field-testing methods and computer models that used the field data as input. The computer models predict future production of methane from a given site.

- Testing methods to provide design information; for example, the number and spacing of wells and piping to extract methane from the landfills.

- Design methods and calculations for methane recovery systems

- Information on the different methods of recovering energy from landfill methane that have actually been used, including methods for cleaning the gas for use as fuel.

- Methods (spreadsheet models based on net present value) for evaluating the economics of landfill gas-to-energy projects

A tour of landfill gas-to-energy facilities in the United Kingdom and the United States also was conducted. Representatives of SEPA and from the public works bureau in each of the three cities participated in the tour.

Hardware supplied
In addition to the training the actual testing hardware was provided to the cities. The equipment included a mobile pilot-testing unit that extracts gas from test wells in a landfill, measures its volume and energy content, and burns it off. The mobile unit is trailer mounted and was used to conduct extraction tests at each of the candidate sites. It is available through SEPA for future testing at other candidate landfill sites. Also provided separately to each city were state-of-the-art portable gas analyzers designed specifically to measure the methane content and other characteristics of landfill-generated gas. CH2M HILL provided training of city and SEPA personnel in the use of this equipment.

Next steps
After the training, each city identified specific alternative candidate uses for the extracted landfill gas and evaluated the technical, economic, and institutional feasibility of each option.

The feasibility studies were completed by mid-1999. These studies were reviewed and commented on by CH2M HILL engineers and economists. The selected alternatives for each city are summarized below:

Anshan: Construct a facility to clean and compress the landfill gas for use as vehicle fuel in LNG vehicles owned by the city's public works bureau. The system capacity would initially be 15 standard cubic meters of methane per minute (133 liters gasoline per minute equivalent) and could be expanded over time to a maximum as high as 250 cubic meters of methane per minute (2,225 liters gasoline per minute equivalent). The growth over time is due to increasing methane production as more waste is added to the landfill.

Ma'anshan: Construct both a small electric-power generating facility and a facility to cleanup the gas and sell it as town gas for heating and cooking in a nearby village. The town gas would be supplied at a rate of 5 standard cubic meters per minute (scmm) to supplement gas in an existing coke gas distribution system. The carbon dioxide, which comprises about half of landfill gas, would not be removed. The gas would be tested to ensure that its combustion products would not be toxic. The electric generating plant would be a relatively small 300 to 400 KW plant and would be used for onsite power needs, rather than sold into the electricity bureau's power grid.

Nanjing: Construct a large electric-power generating facility using modular 800 KW engine-generator units that can be supplemented with additional units as landfill gas generation increases over time. The initial plant capacity would be 2.4 MW produced by three modular units. The power would be sold to the local electricity bureau.

Following the feasibility studies, CH2M HILL prepared conceptual engineering designs for each facility. The conceptual designs included drawings, specifications, and equipment capacities. Final designs adapted to the sites were the responsibility of Chinese civil, electrical, mechanical and structural engineers.

Project Outcomes

Current status of project
As of March 2002, the project is approximately two years behind schedule. The project is moving at different paces in each of the three cities. **Nanjing** finished the feasibility study, engineering design and landfill preparation. As of February 2002, they were installing a power generator of 1.3 MW imported from Australia. This system will be in operation by June. **Anshan** finished the study of converting LFG into vehicle fuel. As of March 2002, they are conducting engineering design and procurement of equipment for gas cleaning and compression. It is expected that they will conduct some sort of trial operation in September or October. Progress at **Maanshan** is somewhat slower because of the smaller scale of landfill and gas generation.

The city of Nanjing had formed a cooperative agreement with an Australian energy service company. In addition to project funding, Nanjing had invested significantly in the improvement of the landfill site conditions, including leachate collection and treatment and landfill cover. The Australian company invested in the power generation process.

The City of Anshan had committed to matching funding for project implementation. Maanshan is still seeking internal approval for matching funding.

Capacity Building
Approximately 60 people in all were trained at the Chinese project cities. They represented approximately equal numbers of technicians and supervisory personnel. If the projects do proceed successfully to full operation, the SEPA and public works bureau personnel who have participated to date will be able to provide an indigenous source of knowledge that covers a range of project types to help other cities in China in developing similar projects. This experience by Chinese engineers should greatly help in overcoming the communication and institutional problems described below, that have been encountered in implementing the demonstration projects. In that case, the value invested in these demonstration projects will have been realized.

Project Challenges

Institutional barriers to progress
A key aspect of the project as conceived was the close cooperation of technical personnel in the city public works bureaus with the advisory technical consultants. Engineers and other technicians in most countries today have grown accustomed to collaboration across organizational lines, even among competing organizations, once agreements have been made and common goals have been identified. The potential for collaboration has been greatly enhanced by dependable international telephone service and the ability to exchange and critique ideas and draft documents by email. The Chinese agencies have these tools available.
However, collaboration was frequently hampered, seemingly by the institutional requirements of the agencies involved. Exchanges of information often encountered delays that sometimes consumed months and put the project behind schedule.

Communication and translation problems
Language interpretation was a difficulty. Under the project formulation, document translation and meeting interpretation was to be provided by the host cities, rather than the international agencies or CH2M HILL. The quality of translation and interpretation was uneven, and made document review and other communications frequently difficult. Some document reviews consisted primarily of questions raised by the use of unclear and unfamiliar terminology that experienced Chinese-English translators would not have used. Resource shortages and other factors, including possibly unfamiliarity on the part of decision-makers with waste management issues in general, undoubtedly also contributed. Good technical interpreters are the easiest way to get quantum improvements in technical transfer projects. Because the information was very new, multiple messages were often required to convey the meaning and change practices.

Funding difficulties
Finally, the commitment of funds by the various parties was not consistent. GEF provided training, expertise, testing equipment and seed capital up front. The host cities were required to provide funding only after the preliminary work was done and its costs were sunk into the project. At this time (March 2002), only one of the three cities (Nanjing) has provided complete funding for construction of the gas-to-energy facilities, although all have endorsed the economic and technical feasibility studies conducted to date.

Success factors

It is important to ensure that all project participants have a common understanding of the overall project and their roles in it, including the schedule. The more complex the project organization, the more likely it is that some participants will misunderstand without an initial chartering and acknowledgement. Key factors to enhance a project's chance of success are:

- Gain real commitments from all project participants at the beginning of the project. Project formulations should not assume that commitments will be made later in a project based on hoped-for outcomes of earlier parts of the project. All parties should be asked to make binding commitments, enforceable under contract law, at the project outset.
- Quality communications are at the heart of technology transfer projects. Quality translation and interpretation should be first-funded activities by the project-funding agency.
- It is important that the host country lead agency (or the specific department within the agency) for project implementation be carefully chosen to ensure that the lead agency department have the responsibility and authority for the issues at hand. For example, in this case the appropriate departments within SEPA (in addition to the Office for Foreign Cooperation) must be in charge for project implementation. Ministry of Construction should also be more actively involved and be given a substantial responsibility for project implementation.

It must be pointed out that the responsibility of "proper" management of municipal solid waste in China is primarily within the responsibility chain of the Ministry of Construction from federal to provincial and municipal authorities. So the push for environmentally sound and sustainable solid waste management practices must be done with the full participation of the Ministry of Construction. Although it is fully recognized that the primary goal for this project is to control, recover and utilize methane from landfills, the project did provide a great deal of technology transfer for solid waste management.

RMC Readymix India

Summary

In late 1994 RMC determined that it should selectively expand outside of its operations in Europe and the USA into suitable developing economies that would provide future growth opportunities for its portfolio of construction products. This case study explores the establishment in India of the joint venture company RMC Readymix India and the company's efforts to establish a local employee base that could meet international production standards are also detailed. This was a major component of the project as effectively there was very little expertise in India in what was, and still is, an embryo industry.

RMC Readymix India's first plant was commissioned in May 1997 and the company currently operates 4 ready mix concrete plants, one in Mumbai and one in Navi Mumbai, one in Chennai and one in Bangalore. A further plant is under construction in Mumbai. During the last eighteen months the company has also acquired an aggregates plant in Chennai and Bangalore, and is currently developing a greenfield quarry in Navi Mumbai. Indian nationals were recruited over time and the initial Indian managers remain with the company today. There are now no expatriates in the company and an initial recruit has been appointed Chief Executive.

Introduction

Company Description

RMC Group p.l.c. is an international company operating in 30 countries. By annual turnover, the Group is the world's 4th largest heavy building materials company, focused principally on aggregates - sand, gravel, rock - ready mixed concrete and cement. RMC operates 1,500 ready mix concrete plants, producing over 50 million cubic meters annually. It employs over 34,000 people worldwide and achieved annual sales of over US$7.2 billion. In 2001, 22 percent of its business was in the UK, 17 percent in Germany, 28 percent in the rest of Europe, 26 percent in the USA and 7 percent in the rest of the world.

India & the Cement Industry

India is the world's second most populous nation after China, with a population of 950 million people living in the seventh largest country in the world. Fifteen languages are recognized in India, and over a few hundred dialects and languages are actually spoken.

India's economy is diverse, ranging from traditional village farming, modern agriculture and handicrafts, to a wide range of modern industries, and a multitude of support services.

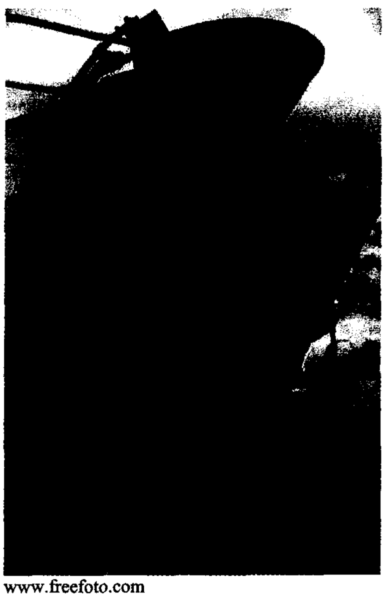
During the 1990's India was one of the world's fastest growing economies. After several decades of protectionist "import substitution" trade policies and foreign investment limitations, India began to open up to foreign investment and trade.

Policy changes have been made to encourage foreign investment. This included the lowering of tariffs on imported capital goods and a relaxing of restrictions on foreign ownership. Previously, foreign ownership usually had been limited to a minority ownership stake. Now, in many sectors, majority foreign ownership is permitted.
By the mid-1990s, India's real GDP growth rate had reached a rate of 7.4% (1995-96), and annual foreign direct investment (FDI) in India has hovered in the range of $3-4 billion.

India is the third largest cement consuming country in the world and, at the time RMC's entry into the market, there were only three companies supplying ready mixed concrete from a total of six concrete plants in the country. (By way of comparison, the UK consumes the equivalent of around 9% of the Indian cement market, and there are some 1,200 concrete plants).

Ready mixed concrete

"Ready mixed concrete" is a term first used in the 1930s to define fresh (wet) concrete produced mechanically in batches and transported to site using specially designed mixer trucks. The basic ingredients are aggregates (gravel/ crushed rock) cement and water. The water reacts with the cement to create an inorganic binder that locks in the sand and aggregates to create a solid matrix. By adding small amounts of other materials, the behavior of the concrete can be modified in terms of its strength, speed of curing, flow characteristics etc, to meet a wide range of applications.



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Serving local markets and using locally available materials, ready mixed concrete minimizes energy use and the environmental impacts normally associated with the distribution of products. Ready mixed concrete can also incorporate the use of suitable industrial by-products and similar materials, thereby minimizing waste. Ready mixed concrete is capable of re-using inert recycled demolition material as part of the aggregate component. In this way, buildings and structures made from ready mixed concrete are highly adaptable and can be metamorphosed time and again throughout their long life spans.

Project Drivers and Objectives

Drivers

In late 1994, RMC determined that it should selectively expand beyond its operations in Europe and the USA into suitable developing economies that would provide future growth opportunities. A number of developing economies, primarily in Asia Pacific, were evaluated based on the following primary criteria:

1. Political and economic stability
2. Economic growth prospects
3. Legal and financial frameworks
4. Exchange control and taxation policies
5. Business environment
6. Culture (including language)
7. Market structures and opportunities for market entry and subsequent growth

Following extensive studies and several field visits it was considered that India met with the company's investment criteria.

Objective

The company's objective for all overseas operations is to maximize the proportion of local employees. RMC Readymix India therefore sought to recruit Indian nationals and develop their capabilities over time, to increase local employee numbers and expand the skill base of local human resources.

Project Detail

Assessment of region and potential partners

Prior to commencing operations in India, a great deal of time and effort was spent in gaining a better understanding of the new market. This was conducted in two stages. First a general review was undertaken. This included general desk research, as well as regular review of Indian newspapers, as this was believed to provide a good insight into important issues for the country and the different regions. This was followed up by a number of visits where the head of Corporate Planning met people in both social and business environments to build familiarity and understanding.

The next stage of assessment was the formal risk assessment and feasibility study. The expatriate general manager who was to run the new India operation conducted this study over a three-month period. Overall, many months were spent in India talking to a wide range of people and organizations in order to better understand the issues associated with operating in this new market.

The first stage of developing this new business was finding a joint venture partner. Although it was possible in the mid-1990s for foreign investors to establish wholly-owned subsidiaries in India, RMC was determined to enter the Indian market with a joint venture partner. Discussions were held with many potential partners over a several months and in January 1996 a Memorandum of Understanding was signed and the joint venture formally established by May 1996. The selected partner was a local entrepreneur with a number of industrial interests, one within the cement industry in India. The partner has a broad portfolio of substantial investments and shared the company's values and long-term commitment.

Getting Started
Following the feasibility study, the new general manager commenced recruiting for the new operation. As indicated, the company strived to maximize the number of local employees. In terms of ready mixed concrete there was no R&D capability as measured by international standards, hence the company's decision to appoint an expatriate Technical Manager, from the outset, to establish quality standards; however, the aim was to have full Indian management within five years.

RMC Readymix India also targeted younger employees in the hope that they could overcome some of the negative behaviors associated with longer-standing exposure to rigid hierarchies. An important first step was to ensure all these new employees understood the values, goals and standards of the new business. The company targeted new graduates from good Engineering Institutions.

The selected candidates were put through an intensive training program which gave them clear idea about: the concrete industry; the processes and procedures required to achieve RMC International Standards; the ways and methods for industry to go forward; the setting up of new units; and operation and technical aspects. This criteria was also followed for middle management and at an operational level.

Selecting the technology for the first plant was the next stage in the project's development. RMC made a conscious decision from the outset to introduce the best available international technology when entering the Indian market. While it may have been easier to opt for a low-cost, low-tech solution, all plants were imported from Europe at a considerable cost, (largely due to prevailing import tariffs) to ensure a high standard of technological hardware.

A major reason for this was the company's goal to establish a quality differentiation in this potentially huge market. In addition, this approach, adopted in part by several competitors, has the effect of increasing barriers to entry, thus encouraging only the more serious players with a long-term commitment to this embryo sector.

The company was established with its Heaquartered in Mumbai, generally considered the commercial capital of India, as well as a leading place for technical advances. The company's' first concrete plant of the company was located in Taloja, near Mumbai. For this plant, the Indian company depended on its foreign shareholder to provide a UK manufactured batching plant along with 4 truck mixers. The batching plant incorporated a computerized batching system imported from the USA. The plant was imported into India in March/April 1997, set up in April '97 and commissioned in May '97.

At the same time, the company leased one plot each in Mumbai and Navi Mumbai to set up additional ready mixed concrete plants. At these sites the company selected European plant equipment that provided the most advanced level of technology and automation; truckmixer drum units were also imported from Europe.

Truck chassis were, however, ordered from a local truck manufacturer and other mobile machinery was purchased locally. The plants were constructed using local architectural and civil engineering expertise.

In addition the company also set up a Central Laboratory using the latest technology imported. This laboratory was used as a quality control center as well as a training center for staff, customers and specifiers.

Although the Indian economy has opened and single level permissions are now available, the reality in 1997 was that once an IEM (Industrial Entrepreneur's Memorandum) was received from Central Government, the company would have to apply for a host of other permissions. These were as follows:

- Pollution clearance approvals for setting up the unit
- Factory Inspector's approval for setting up the unit and getting the drawing plant approved
- Commencement certificate to began construction of the factory from local authority, which would be the Municipal Corporation, Village Gram Panchayat or

Local Development authority (this also included, on some occasions, permission from the Local Development Authority as well as the local Government Body)
- Pollution clearance permission for starting operation
- Factory Inspector's License to begin operation of the factory
- Building Occupancy certification from Local Government body

After the first three plants were set up in Mumbai/Navi Mumbai, the company decided to venture out to other cities and decided upon the South of India as a base. After initial studies a concrete plant was set up in Chennai. This became operational in August 1999. In 2000, the company had the opportunity to purchase the assets of a failed Indo Australian joint venture that operated a quarry in Chennai that was complementary to the existing concrete operations. In 2001, the company entered Bangalore, in South India. Here, the company set up a ready mixed concrete plant and quarrying operations.

Capacity Building Efforts
India enjoys a well-educated and plentiful pool of human capital. However, when RMC entered the market there was effectively very little expertise in India in what was, and still is, an embryo industry. The company commenced its operations with an expatriate General Manager and Technical Manager, but a considerable amount of time and effort was focused on training and development for all levels of staff.

RMC's global standards for health and safety, environment and operational procedures were introduced from the outset. The company also designed a lecture series, specifically targeted as a capacity building exercise for India. This brought together a number of technical experts to promote good concreting and construction practices. In addition, senior management from RMC Readymix India visited a number of RMC's other overseas operations to gain an appreciation of the Group's activities and gain an understanding of different markets.

More recently, employees have been encouraged to participate in distance learning programs. These have been particularly useful for the technical functions, where a high degree of success has been achieved.

To educate the workforce employed by the company was itself a challenge. The company followed a practice of recruiting newly-qualified graduates with little or no practical experience. As the education curriculum is very theoretical in India, the employees had to be trained about working in a factory environment, in addition to the practical and technical aspects of business. Further for most of these employees, this was their first opportunity to work in the private sector. Therefore it was necessary for these employees to be trained in a range of new management practices and, in particular, the practice of working to schedules The company also has extensive technical, operational and credit control training conducted in-house with its own personnel.

Standards and principles
Initially, RMC Readymix India faced standards and rules for concreting that were outdated, often being over 40-50 years old. Further, many local companies were not adhering to these standards or their interpretations differed considerably. Essentially this was not conducive to a level playing field and did not promote good practices.

To address this, the company has been working with the Bureau of Indian Standards to develop new industry standards during the past five years. The new Indian Standard for ready mixed concrete is due to be adopted in late 2002. Furthermore, the company is actively encouraging other ready mix concrete companies to form a trade association to promote technical standards for the development of ready mix cement as a product, and where appropriate, to lobby with local, state and national government bodies.

Project Outcomes

RMC Readymix India's first plant was commissioned in May 1997 and the company currently operates four ready mixed concrete plants, one in Mumbai and one in Navi Mumbai, one in Chennai and one in Bangalore. A further plant is under construction in Mumbai. During the last 18 months the company has also acquired an aggregates plant in Chennai and Bangalore and are currently developing a Greenfield quarry in Navi Mumbai.

The quantity of sales over the last 5 years of operation has risen in both the concrete and aggregates businesses.

Year	Concrete (m3)	Aggregates (Mt)
1997	2073	-
1998	42994	-
1999	105894	-
2000	90947	4504
2001	131611	152294

Employment and training
Currently RMC Readymix India employs a total of 184 people. The company has been successful in retaining most of its originally recruited employees. Over the last five years only four managers and six officers have left the company. Most have moved into other industries and in only one case an employee has left to join a competitor. There are now no expatriates in the operations in India and an initial recruit has been appointed Chief Executive.

Out of the total workforce, 22 employees have completed the City & Guilds London Institute course in Concrete Technology General Principals or Practical applications. The Technical Manager will be sitting his examinations this year for the Association of Concrete Technologists, the most highly regarded, international technical qualification within the ready mixed concrete industry. Other employees have undergone specific Business Management courses, as well as other courses in related areas such as sales, health and safety and accounting and finance.

RMC Readymix India has given a high level of importance to training. All employees have undergone training in areas relevant to their role in the business, utilizing internal and external courses, where appropriate. These training and development programs were implemented with a specific aim to develop skill sets and an understanding of the company's business. The company regards personnel development and ongoing training as key success factors.

Flow on business impacts
Over the past five years, a small number of global plant and equipment suppliers who also recognized the potential of the Indian market have established joint ventures with a view to manufacturing in India. RMC Readymix India has been proactive in encouraging this development as well as working with indigenous suppliers to improve the quality and service of their products.

The company has also contributed to industrial development through both product supply and the sharing of best practice to a number of major projects. For example in Chennai, fiber-reinforced concrete, designed to withstand the movement of heavy machinery, has been supplied to a vehicle factory. Feedback on this project was very positive and the product was praised for its technical capability.[8] The company has also sold this product to several other projects including flooring for Chennai's new railway locomotive shed and many industrial units. Customers from these contracts not only receive the direct benefits of the product itself, but have also received product demonstration sessions accompanied by the RMC 2000 lecture series that aims to widely promote good concreting and construction practices.

In addition, RMC Readymix India recently worked on a project to create a 5.6 km bridge joining Mumbai with its western suburbs. RMC Readymix India was the only company with the expertise to design and execute this project. Once completed, this bridge will provide a fast moving eight-lane road link that will relieve traffic congestion and result in $21 million of annual savings in vehicle operating costs, as well as saving travel time and reducing pollution.

Project challenges

India's bureaucratic environment
Historically, India has operated in a very hierarchical manner and this rigid, bureaucratic administration has presented a number of challenges. This included extensive procedural formalities for entering the market, relative to more mature markets, and in expanding the business within Mumbai, and more recently into Chennai and Bangalore. For example, the company faced a myriad of form-filling processes for gaining licenses and approvals. In addition, transferring money into the country was at times a lengthy process, with transfers initially taking up to 2 months to complete.

The structure of the country's administration is such that many civil servants do not remain in the same position for very long. As a result of frequent rotations of civil servants, there has been a lack of continuity and frequent changes in interpretations. This problem, coupled with the difficulty in conducting one-to-one consultations meant that decisions often took a long time

8 RMC Group In-house magazine (Comment from Kshemendra Nath, General Manager – Technical and Marketing TVS-Lucas)

to be made, if they were addressed at all.

Fluctuations in taxation levels also provided a challenge to the company's operations and required them to be flexible to market conditions. For example in one state in particular, the taxation rate changed four times in five years; this impacted on product pricing and the ability of RMC Readymix India to remain competitive in certain regions.

Acquiring or leasing land for development has also been challenging. Often gaining clean title to land, especially in the more desired locations, has been difficult. It has not been unusual for more than one person to have claim to the same land. In one instance, after construction was commenced on land purchased by RMC Readymix India, another 'owner' challenged the company's claim to the land.

As a result of this rigid bureaucracy, action has not happened quickly in India, for RMC and many other companies. Developing a viable business plan in a new industry, with its attendant uncertainty has been a challenge and, as the company continues to face many bureaucratic hurdles, a great deal of business planning is based around 'worst-case' scenarios.

Selecting a joint venture partner
It was a challenge to find a joint venture partner who shared the same values and was a committed long-term partner. The company encountered a great deal of 'short-term-ism' when reviewing potential partners for the joint venture. RMC was looking for a partner who had the necessary funds and who shared a similar ethical business vision. Luckily the company was able to identify such a partner and the relationship has been very successful to date.

Human resource challenges
It was important that RMC appreciated social differences and were mindful of how the long-standing hierarchy and the caste system in India influenced the behaviors of employees. Yet the company wanted to avoid having such a hierarchy within the business, especially as this rigid hierarchy prevented many managers and supervisors from being decision makers. In addition, the company wanted to avoid having their managers hire other employees based on caste, and felt that it was important to treat all employees the same regardless of caste. This was not a straightforward behavioral change.

There were also local pressures related to employing the workforce. In some instances communities placed a great deal of pressure on the company to employ large numbers of people from the area. Even when the numbers were not needed or skills unavailable, village leaders, for example, insisted that the company took on large groups of people. However, these issues can be, and were, overcome.

Success Factors and Lessons Learned

Comprehensive research 'on the ground'
A key to the success of this project was the comprehensive pre-project research that was conducted on the ground in India. This led to in-depth understandings on which the foundation of the business could be built. This upfront time has proven to be invaluable to the company as in practice most of the key issues and hurdles were identified in advance and, whilst they may have manifested themselves in subtly different ways, in substance there were no great surprises. That being said, it was noted that determination and the ability to respond to changing circumstances were pre-requisites.

Identifying and building a relationship with a joint venture partner
A key success factor was the selection of a joint venture partner that shared the company's values and long-term commitment. This relationship needs to be managed well on an on-going basis and trust, openness and continual dialogue were key factors identified for maintaining successful partnerships of this nature.

Commitment to training and development
It was vital that RMC were perceived as an attractive employer. Training and development activities were essential to attract the right employees from within India and strengthen the new venture in this new industry. This began with the selection of key employees and the provision of training and development activities to strengthen capabilities within the organisation. This was particularly important as the business sought to move away from expatriate employees to a full Indian workforce.

Success lay in providing focused training, development and balanced discussion to develop more improved ways of conducting their business. This is an ongoing process with the ultimate objective of achieving the best of east and west cultures and style.

Deliver international technology and performance standards

Following international standards with regard to performance and procedures has been an important factor for ensuring long-term success of the business. In this respect, the most modern equipment has been sourced and global standards, including safety and environmental standards, followed as guiding factors. The technical systems for quality control were based on the RMC Group's best practice models, such as the use of computerized delivery dockets, specifying complete product details - a first for India. Expectations of vendors and suppliers are also high and many suppliers have since converted delivery docket structure in order to meet with the company's internal control requirements.

Clearly establish objectives and policies

The establishment of clear guidelines and policies in terms of business behaviour was an important factor for success. This could only be done based on a thorough understanding of the operating environment. This includes understanding the national culture and business cultures. As a foreign firm, the RMC Group had to be very mindful of the different styles of doing business and the way cultural differences may manifest themselves within the workforce.

It was important for the development of the businesses that clearly stated guidelines were provided to, and followed by, all employees. This also included issues relating to the potential problem of corruption. The company had to clearly state a full anti-corruption policy and ensure that all employees consistently followed it.

India was always considered a long-term investment. The market potential is huge but in terms of market development is arguably 40 years behind Western Europe. RMC has laid the foundations to expand its business as the market develops and new opportunities present themselves.

about UNIDO

The United Nations Industrial Development Organization (UNIDO) was established in 1966 and became a specialized United Nations agency in 1985. Its work and activities are dedicated to promoting, in cooperation with its 169 Member States, sustainable industrial development in countries with developing and transition economies.

Mission
UNIDO helps these developing countries and countries with economies in transition in their fight against marginalization in today's globalized world. It mobilizes knowledge, skills, information and technology to promote productive employment, a competitive economy and a sound environment. Carlos Magariños, the Director-General of UNIDO, describes the Organization as a specialized United Nations agency that focuses its efforts on relieving poverty by fostering productivity growth.

Services
UNIDO's services are designed to be easily integrated into country-specific packages and local ownership ensures a custom-made approach. Services provided by UNIDO cover the following areas:

- Investment and technology promotion
- Industrial governance and statistics
- Quality and productivity
- Small business development
- Environmental management
- Industrial energy and Kyoto Protocol (Climate Change)
- Montreal Protocol (Reduction and elimination of ozone-depleting substances)
- Agro-industries

about WBCSD

The World Business Council for Sustainable Development (WBCSD) is a coalition of 160 international companies united by a shared commitment to sustainable development via the three pillars of economic growth, ecological balance and social progress. Our members are drawn from more than 30 countries and 20 major industrial sectors. We also benefit from a Global Network of 35 national and regional business councils and partner organizations involving some 1000 business leaders globally.

Our mission
To provide business leadership as a catalyst for change toward sustainable development, and to promote the role of eco-efficiency, innovation and corporate social responsibility.

Our aims
Our objectives and strategic directions, based on this dedication, include:

Business leadership – to be the leading business advocate on issues connected with sustainable development.

Policy development – to participate in policy development in order to create a framework that allows business to contribute effectively to sustainable development.

Best practice – to demonstrate business progress in environmental and resource management and corporate social responsibility and to share leading-edge practices among our members.

Global outreach – to contribute to a sustainable future for developing nations and nations in transition.

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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION
Industrial Promotion and Technology Branch
Vienna International Centre
P.O. Box 300, A-1400 Vienna, Austria
Telephone: (+43 1) 26026-3239
Fax: (+43 1) 26026-6805
E-mail: D.Liang@unido.org
Internet: http://www.unido.org

WORLD BUSINESS COUNCIL FOR
SUSTAINABLE DEVELOPMENT
4, Chemin de Conches
CH-1231, Conches-Geneva
Switzerland
Telephone: (+41 22) 8393100 / 8393147
Fax: (+41 22) 8393131
E-mail: fussler@wbcsd.org
Internet: http://www.wbcsd.org